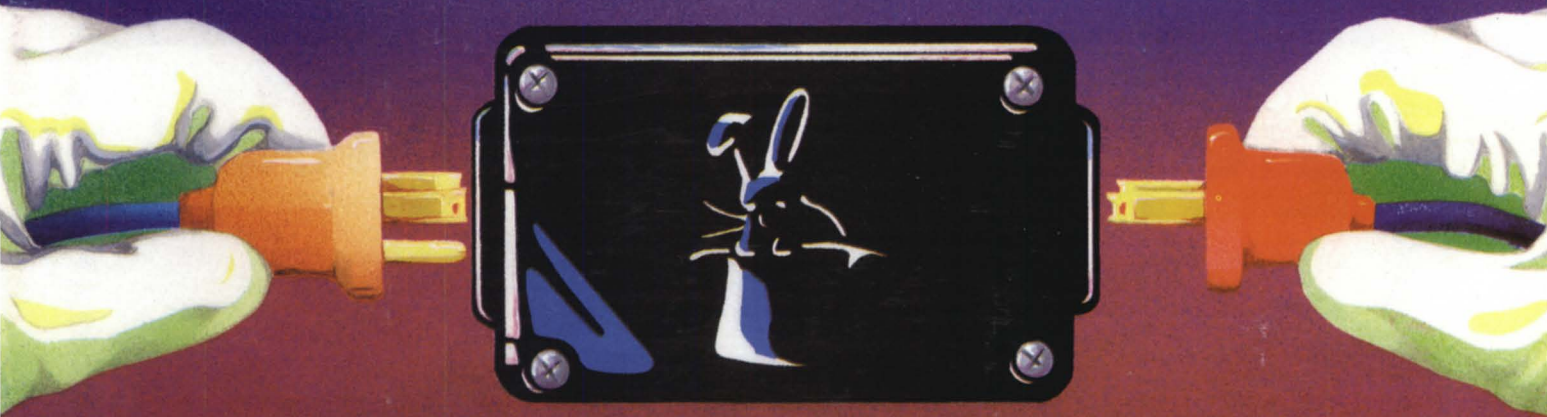


December 1986

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The Magazine of the North American Data General Users Group

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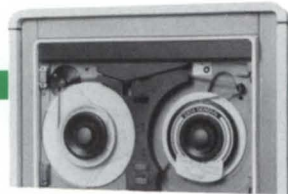
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Send no money!

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Join us!

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UESR REOP...R:O R...S...UAST=U S
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EORPAETR...M ODN...ED UTEO
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Communications Roundtable at
NADGUG's 1985 conference
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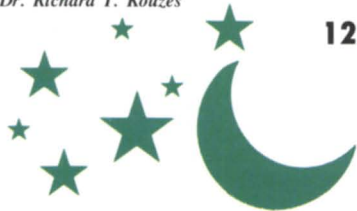
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About this month's cover (art by Elizabeth Soto): Arthur C. Clarke said, "Any sufficiently advanced technology is indistinguishable from magic." Our four theme articles address that enigmatic phenomenon known as mixed systems.

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The waiting is over. WordPerfect Corporation's recently released Library program is hard at work delivering phone messages, letters, memos, and files to Data General AOS/VS computers all

password can contain up to 78 characters.

Right on time

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PS.

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WordPerfect® Library Delivers the Mail

over the country. In addition to the electronic mail features, WordPerfect Library comes with a Calendar, Scheduler, and a shell program to tie everything together.

First letter arrives

A large department of the U.S. Government became the first official WordPerfect Library installation. Their system, which uses 14 MV/10000s and 10 MV/4000DCs, supports more than 600 users. In a test of the new system, a phone message was sent from one coast to the other in less than 30 seconds, including notification. In less than eight minutes, a message was delivered to all 600 users in four states and six locations.

Confidential services

WordPerfect Library includes a Password Encryption feature which lets you create a password to encode any mail document or file. The encryption is practically impossible to break, since the

attractive screen and supports to-do lists as well as daily appointments and memos. The alarm feature will notify you in advance of an appointment. And calendar entries can be converted to merge format for use with WordPerfect.

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With the shell, you can quickly move from one WordPerfect Corporation program to another, and with the shell clipboard, you can easily pass information between programs. The sources and explanations necessary for any software developer to support the shell and clipboard are included with the package at no extra charge.

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Brenda, the office manager, is very patient with most of my idiosyncrasies—including my attitude toward the mail. Her job description is quite clear about the subject: it's *her* responsibility to get the mail, open it, and distribute it. Yet I keep a key to the mailbox in my pocket, so if by chance I am in the vicinity around 11:23 am, I can get the mail and take it in. Probably three days out of five I get there first, and have already pawed open a couple envelopes by the time I get back to Brenda's desk.

My peculiar behavior probably dates from the early days of *Focus*, when cash flow was more like cash trickle, and every check in the mail was cause for celebration. I still like to see checks arrive, but these days I'm more interested in letters from readers.

Maybe it's that letters are rarer than checks. We get quite a few inquiries about NADGUG membership, and lots of business solicitations, and a steady flow of product announcements, but precious few letters.

I now know that I'm not alone in this. I used to think that readers were sending their questions, comments, and suggestions directly to the authors of articles. Brian Johnson set me straight on that subject, though. The manuscript for his column this month included a couple of paragraphs that had to be cut because there wasn't enough space in his regular column. Since they address the subject at hand, I'll include them here. (*I probably ought to feel a deep and abiding shame for ripping off his words this way, but I'll justify the theft in the name of editorial privilege.*)

"Apparently the preliminary results of the audience survey are in, and this column got voted 'Most Whatever.'"

"I feel a little bit like Jodi Foster—I'm flattered, but I wonder why your appreciation didn't take a more conventional form. As I mentioned a few months back, I can count the number of phone calls and letters I've received about last year's columns on the cursor control keys of my D400."

The survey B.J. refers to is the editorial

survey from the September issue. We now have a one percent response rate, which is pretty good, and the survey forms are still trickling in. The results aren't tabulated yet, but we are getting a pretty good idea of what readers like and don't like about *Focus*. Although we don't really plan to award any prizes for "Most Whatever," it's pretty clear that one of the things readers like best is the combination of practical advice and wit that B.J. serves up each month.

But the point was the mail. We aren't getting much of it, and neither are the columnists. Setting aside my liking for letters, there are quite a few good reasons why readers should talk back:

- **Feedback**—authors and editors need to hear from readers to know how they're doing. If a column is the answer for a problem you've had, let the author know, so he or she can provide more of the same. If it was a useless idea, tell us why, and we'll know not to waste your time with anything like it.

- **Encouragement**—the people who write for *Focus* aren't professional writers, but busy computer professionals who take time from their regular jobs to share their thoughts and experiences. If you like what they do, please take the time to tell them.

- **Ideas**—calls and letters are often the source of inspiration for the next column. If authors heard from readers more often, they might find deadlines less menacing, and the editors easier to get along with.

It's easy to get in touch with the authors, either by phone or mail. If you use the Quick Connect card that appears in every issue, it won't even cost you for postage.

■
Something else worth writing about is the chance to put member notices in *Focus*. If you're a NADGUG member and want to ask other readers for help—whether it's to locate a piece of software, or get help with a particular problem, or just to find somebody with similar interests—simply write up your request and send it in. The *Focus* staff will get it typeset and place it among the member notices in the classified section. There's no charge for the service as long as it's a non-commercial, reader-to-reader message. Δ

—G.F.

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Clarification on INFOS corruption

I received my November issue of *Focus* today, and one of the first columns I read was "System Manager's Log" by Brian Johnson (page 39). It contains some very good advice for INFOS users; however, I found the "STRATEGY" section a bit misleading.

Johnson's column deals with two types of corruption of INFOS files. As he explained, a file is logically corrupt if all the proper rela-

tionships that a program expects do not exist or are incorrect. A file is physically corrupt if INFOS encounters an unexpected error while accessing that file, or if IVERIFY will not accept the file. An INFOS file can be logically corrupt, yet physically correct.

It is true that the "Rebuilder" utility from Eagle Software will not correct logical corruption of an INFOS file. This requires knowledge of the index structure that no general-purpose program could have. However, Johnson's statement did not clar-

ify which type of corruption he was referring to. The Rebuilder reorganizes an INFOS file by recreating it, and will report the key path where a "FILE CONSISTENCY ERROR" (resulting from physical corruption) was found. Users then have the option to omit that key and record, or re-enter them using INQUIRE or a custom program.

The Rebuilder is only one of fifteen utilities found in Eagle Software's "VS Toolbox." Other utilities in the Toolbox satisfy needs described in later sections of Johnson's column.

EAGLE also provides an INFOS file reconstruction service for users who need immediate access to files that IVERIFY will not accept.

Thank you for the opportunity to avoid any misunderstandings.

Milton A. Larson
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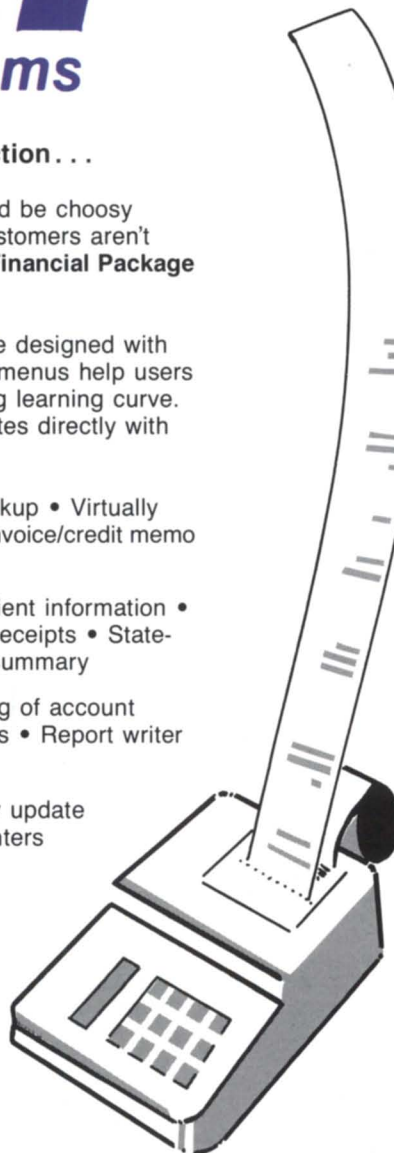
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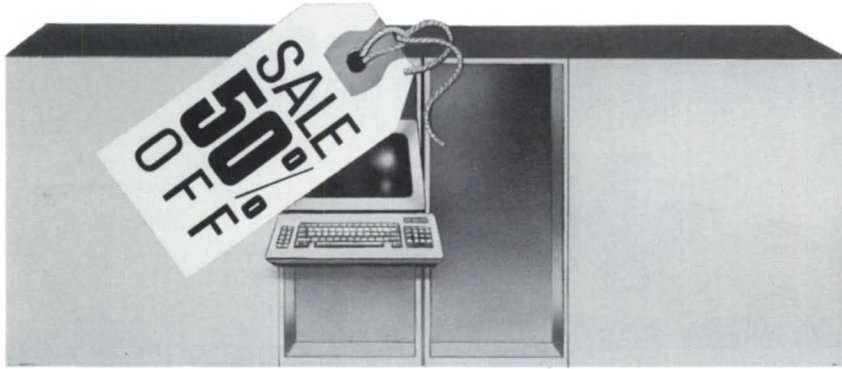


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- "The Dynamics of CS ISAM," by Gerry Manning of Gerry Manning & Associates
- "Superuser Tracking for AOS/VS," by Sharon Lindley and Robert McKosky of Boeing Computer Support Services
- "Hooking Up Terminals," by Brian Johnson of B.J., Inc.
- "Creating a Controlled Environment and System Architecture," by Michael J. Gaskey of Incepts, Inc.
- "Artificial Intelligence and Expert Systems," by Barry Allison of New Braunfels Utilities
- "32-bit EXEC: New Functionality," by Douglas Wood of Data General Corp.
- "AOS/VS and Multiprocessors: When Two Is Better Than Two," by John Gilgus of Data General Corp.
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Compiled by Brian C. Schimpf
Special to Focus

Editor's Note: Transcribing, compiling, summarizing, and double-checking the proceedings of a NADGUG roundtable can be a very time-consuming process. In the case of the Communications Roundtable at the 1985 NADGUG annual conference, it took more than a year to get the results into print. However, the information is still valid, and the questions and answers themselves are testimony to the value of the information that passes between DG users and DG employees at NADGUG's annual meetings.

This is a summary of the discussions that took place during the first roundtable sponsored by the Communications Special Interest Group (COMMSIG). The panel consisted of Brint Baker and Joe Forgiore of DG's ISD marketing, Mark Townsend and Brian Schimpf of DG's distributed systems development, and Kirk Honold, who as COMMSIG chairman moderated the session.

The panel responded to 35 written questions, which are summarized here. In addition, several related questions from informal discussions and the AOS/VS Roundtable are included. Rather than provide the exact text, we have tried to condense the discussions to capture the relevant points under topic headings.

First, let me make a special note on questions concerning when certain features will be supported. General comments about the things we are working on are interesting, but users would probably like to hear firm commitments

on timeframes. More often than not we have to be somewhat vague. It's to everyone's benefit that we not set unrealistic expectations or provide inaccurate information.

X.25

Q.: Can we expect to see more of X.25 offloaded into intelligent controllers?

A.: Yes. Most of the protocol code for the X.25 product runs in the IBC, ILC, and ISC in rev 5.10 of XTS.

Q.: Are there plans to improve performance of the X.25 user interface, such as not using IPCs?

A.: Yes, efforts are under way to do this. This will require coordination of releases with AOS/VS, and timeframes haven't been firmed up.

Q.: How does Xodiac on an MCA compare to Xodiac on an ILC with Ethernet for speed and efficiency?

A.: The performance of the transport system is approximately twice as fast using the ILC. More importantly, the transport software uses significantly less of the host CPU by running on the ILC processor, so the impact on other host processes is substantially reduced. It's difficult to quantify how much less host CPU is used when achieving the 100 percent improvement mentioned above. Note that this discussion is limited to the transport system; the Xodiac agents (e.g., FTA) are impacted by numerous other variables, such as disk performance.

Q.: Can I add MVs to a Xodiac network using SNA links?

A.: Yes, the XTS/SNA Backbone package is designed to do exactly this.

Q.: Will Xodiac support autoanswer and autodial for async lines?

A.: These features are under consideration; timeframes have not been established.

Q.: Can DG fix routing in X.25 so it routes incoming PAD calls? Telenet provides a mechanism to do this.

A.: We'll look into the way Telenet works. We have to worry about other Public Data Networks besides Telenet; and since it appears that the Telenet mechanism is not X.28/X.29/X.3 standard, that may be a factor. Up until now we didn't consider the inability to route incoming PAD calls to be a serious restriction.

Q.: Do you have any plans for async Xodiac between an MV and a Dasher/One?

A.: Yes, you'll see a great deal more about networking between MVs and Dasher/Ones over the next year.

Xodiac Agents

Q.: Virtual terminals using Xodiac is a slow method of host selection. What improvements are coming?

A.: There will be some immediate improvement with the greater use of intelligent controllers by the transport software. Longer term improvements are also being looked into.

Q.: Will there be enhancements to the UFTA FILESTATUS command to support the /TYPE= switch?

A.: We'll look into the situation. Providing all the switches and templates supported by CLI would be a very major effort, and frankly we don't think at this point the benefit gained is worth the effort.

Q.: The Xodiac (X.29/Host PAD) product doesn't support COBOL formatted screens. Will this be enhanced in the future?

A.: X.29/Host PAD is limited to hardcopy functionality. To support full screen function, we would have to allow single character reads. This could easily result in multiple X.25 packets crossing the PDN for *each keystroke* the user types. Not only would the performance in this case be unacceptable, but since most PDNs charge by the packet, it would be very expensive for the user. This is why this function isn't supported.

Q.: Can FTA handle simultaneous requests (on different IPC ports) from multiple tasks in the same process?



Once PMGR reports transmission errors to the application issuing the ?READ, the application needs to determine the course of action

A.: Yes, FTA can handle this situation as long as the transfer requests come in on different IPC ports.

Q.: Xodiac (RMA) currently requires the OP passwords on networked machines to match exactly if OP is to access remote resources. This is a major security problem. Are there any plans to remove this restriction?

A.: We're considering changes to both AOS/VS and Xodiac that would allow usernames with different passwords on two systems to use the various Xodiac agents. This would require changes to a number of products and careful revision coordination.

Q.: There is a problem using deep directory pathnames on Xodiac—the :NET:HOST: prefix counts as two directories. It is possible to create directories that are accessible locally but not remotely, due to excessive directory depth. Is this a bug or a feature?

A.: This is a restriction. Certain CLI commands cause the local CLI to do pathname resolution before the system does enough processing to figure out that this is a remote reference and should be deflected to RMA. An example would be a CLI command containing a template. A possible workaround might be to create a link on the target system which points directly to one of the lower level directories in the desired tree. This might be of very limited use since certain commands, such as FILESTATUS, don't work through links.

Q.: Are there any plans for DG to provide a "communications management" (i.e., enhanced network management) system?

A.: There are efforts under way to improve the current Xodiac network management capabilities.

IBM products—SNA and Bisync

Q.: Will DG/SNA be made a 32-bit process? This is needed both for additional capacity, e.g., supporting a greater number of logical unit sessions and the convenience of a 32-bit interface. The 16-bit interface places some restrictions on 32-bit customers, e.g., only

being able to pass 16-bit addresses to buffers, etc.

A.: Yes, AOS/VS DG/SNA is being made into a 32-bit process.

Q.: When SNA/RJE sends IBM a job that blows up, the entire SNA link gets reset (SNRM). Is this a configuration problem, or is it just the way IBM SNA is?

A.: An SNRM is an SDLC-level reset initiated by "operator command" on the IBM host, either the real operator or a component of system software. Since the DG system is the secondary, we can't issue a SNRM to the primary. This may be a configuration problem. Please let us know some more details about what happens on the IBM host.

Q.: When is there going to be a new version of the RCX70 manual that includes some hardware specs as well as readable system generation notes?

A.: Considerable documentation resources have been devoted to the communications products in general over the last several months. The focus of this resource was originally new products, i.e., AOS/VS Internet, followed by the more active existing products, SNA and Xodiac. We should be able soon to put some effort into revising the manuals for older products such as RCX70. Also, in this particular case, we're considering making some changes to the product to simplify the system generation dialog. If we decide to do that, we'll hold off on updating the documentation until we finalize what the new dialog will look like. Please note that this issue is still under internal discussion—this is not a commitment.

Q.: Under AOS and AOS/VS, when will we be able to preface the ADO response to a line bid with a user ID? This is a feature of the 3780 bisync protocol required by the Federal Reserve Board.

A.: We'll take a look at the situation; generating an STR on the request will probably help by documenting it clearly and providing a tracking mechanism. It's very doubtful that this feature will be supported by AOS bisync; AOS/VS is much more likely.

Q.: Will DG support SNA Host capabilities? We have many different types of terminals that need to process on a remote Data General.

A.: We recently announced support for the VersaLynx controller under an Independent Hardware Vendor agreement. This allows IBM 3270 class terminals to communicate with DG hosts as a DG terminal via an async line.

PMGR/System

Q.: Are there any known conditions that will cause an IAC to "hang up"?

A.: There are a number of conditions that can cause problems for an IAC, but none which a user normally has much control over, e.g., removing a board in the chassis while power is applied, static discharge in the chassis, etc.

Q.: When will products like RCX70 and TPMS be able to handle modem disconnect errors more "gracefully" (the way EXEC does)? Likewise for framing errors and other "temporary" transmission problems that don't really justify killing the line and requiring operator intervention to re-enable.

A.: We're looking into the issue of "temporary" transmission problems on async lines. Once PMGR reports these errors to the applications issuing the ?READ, the application needs to determine the appropriate course of action.

Q.: Can hardware flow control be enabled with something other than ?MOFC? Conversely, can an alternative to ?MIFC be provided using RTS or another pin?

A.: Support of hardware flow control is planned to be supported; timeframes aren't firm at this point.

AOS/VS Internet (TCP/IP)

Q.: Are there plans to move the TCP/IP transport process out into the ILC? Are there plans to have the IBC supported by TCP/IP? Will FTP support an EXEC and program interface the way FTA does? Are there plans to support SMTP? Are there plans to run TCP/IP over a synchronous interface?

A.: We have just completed the first release of the AOS/VS Internet product. Discussions are now under way as to which features ought to be added to the product in terms of enhancements and the priority order of those features. These questions will be used as input to those discussions.

Miscellaneous

Q.: Is DG's implementation of uucp the same as on other Unix systems?

A.: The DG/UX implementation of uucp is directly off the AT&T System V release tape. The implementation that runs on MV/UX has a few modifications to handle the restrictions of MV/UX, e.g., case sensitivity, file and pathnames, etc.

Q.: Does DG have or know of any store-and-forward message switching product, specifically a dial-out network to approximately 80 remote sites for sending reports?

A.: Such a product would be interesting, but DG doesn't have one like it in its current inventory.

Q.: What about DG networking support of DECNET and UGNET?

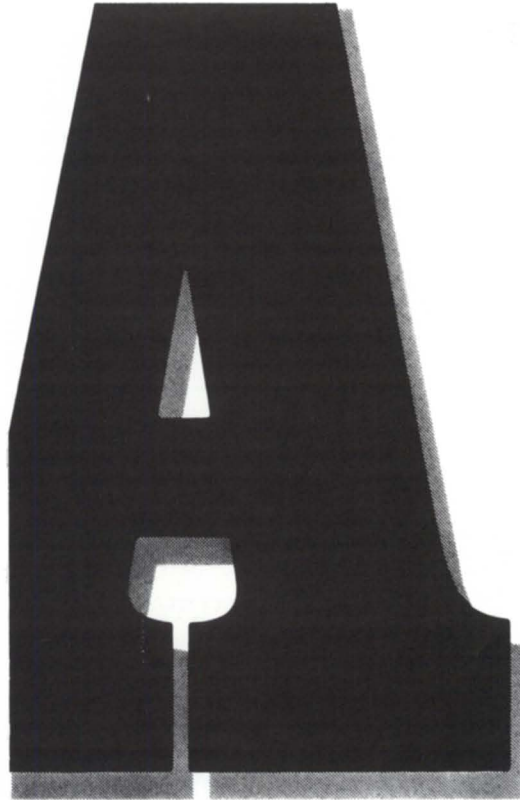
A.: DG is committed to supporting standard communications protocols, both formal standards such as the OSI protocols and de facto standards such as TCP/IP and SNA. The combination of these will allow for meaningful (i.e., more than just transport layer) interconnection of heterogeneous networks. In particular, we feel that Internet currently allows connection of DEC systems and that OSI will allow more extensive interconnect in the future as Digital also implements OSI-standard protocols. A specific implementation of DECNET protocols for AOS/VS would be evaluated and a business decision made as to whether such a product should be built. We will look into UGNET in a similar manner; any information that can be provided to us regarding this specific network would be a help.

Q.: We'd like to see better support of the communications products—maybe some easier access to the product development team.

A.: DG has programs under way to do a better job of training both the field force and the Support Center in Atlanta on the communications products. This will include documentation to provide a general overview of the entire product set. Another mechanism

that should be used more as time goes on is the NADGUG COMMSIG. We think this is an excellent forum to provide two-way communication between the user community and DG development, marketing and product planning groups. Δ

Brian Schimpf, as DG's department manager for distributed systems, compiled this summary of the 1985 Communications Roundtable. He can be contacted at 617/870-6088.



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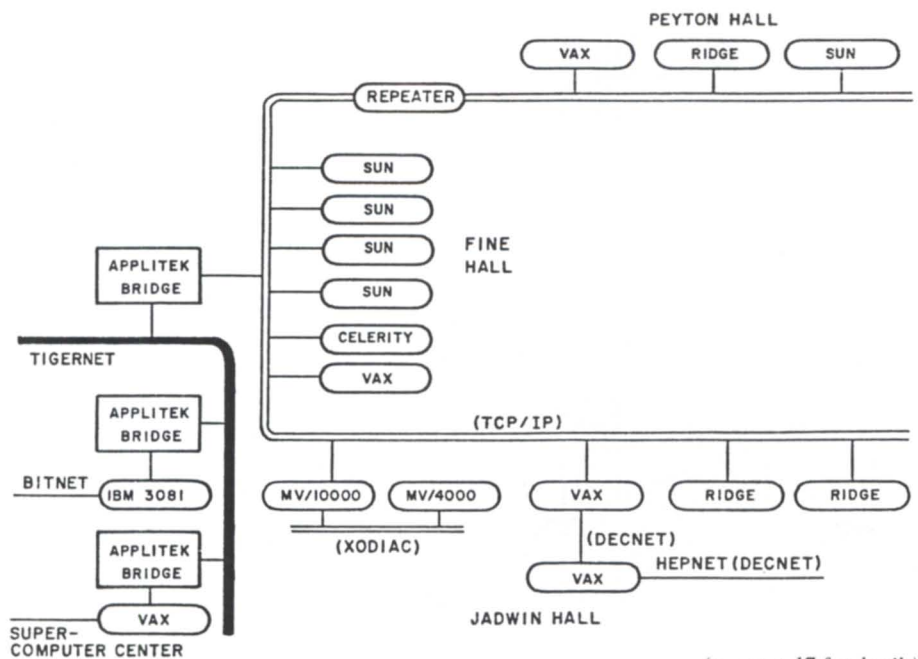
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Can we talk?

Figure 1: A piece of TIGERNET



(see page 17 for details)

Communications, networks, and Data General

by Dr. Richard T. Kouzes
Special to Focus

"Any sufficiently advanced technology is indistinguishable from magic."
—Arthur C. Clarke

The field of electronic communications is filled with a vast, confusing lexicon of terms, acronyms and abbreviations. In this article I hope to clarify my thinking, and perhaps yours, about networks and communications. In particular, I will describe the TCP/IP protocols and BITNET.

Definitions

The purpose of communications is to allow remote log-on to a computer and to transfer files between computers, including electronic mail.

The term "computer network" can be used to describe a variety of situations, from

remote terminals to multiple hosts sharing resources. Communications paths within the network may be temporary (such as dial-up lines) or permanent, and they may be arranged point-to-point with only two systems on a communications line, or multidrop with many systems sharing a communications path. Some systems on the network may act as "gateways" or "bridges" between multiple network connections.

The speed with which information is sent over the communications path in the form of electronic pulses is measured in bits per second (bps) for digital systems. More generally, it's measured in baud, the number of state changes per second. (The term "baud" is derived from the name J.M.E. Baudot.)

The information sent constitutes a "message" of varying size. On all but the simplest networks, the message contains headers and trailers that include the source, destination, and data validity information. On most sys-

tems, messages are broken into fixed length "packets" that conform to some standard or "protocol."

The term "protocol" is used extensively in communications. A protocol is a set of rules that specify how the hardware and software carry out their purpose.

The packets that make up a message may be broadcast on a small network directly to the destination, or they may be received and retransmitted by a series of machines (store and forward) over a predetermined route in a packet-switched network.

A good example of a protocol that is widely used for reliable file transfer is KERMIT. A public domain protocol, KERMIT runs on most mini- and microcomputers over temporary networks, and is supported by Columbia University. Other similar products include BLAST, from the Communications Research Group, and DG/Gate, available from Data General. These protocols, like all error-correcting protocols, require a program running on both computers involved in the transfer.

The hardware that actually makes the connection can be a twisted pair of wires, a phone line, a coaxial cable, or a specialized parallel link. The connection from the computer to the transmission medium is a device such as a modem (short for modulator-demodulator), attached to an asynchronous or synchronous interface or a local area network (LAN) controller such as an Ethernet controller. Large networks usually consist of a network of networks, where LANs are connected together into a wide area network (WAN). The LAN-to-LAN connection can be broadband coax cable over a distance of a few miles, leased four-wire phone lines, high-speed leased T1 lines that operate at 1.544 million bps, or satellite links.

In communications, there are many standards specified by such organizations as the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), the International Standards Organization (ISO) of which ANSI is a member, and the Comite Consultatif Internationale de Telegraphique et Telephonique (CCITT). ISO and CCITT are member



*Ethernet uses baseband signaling,
which means
that information bursts are placed
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a fixed frequency*

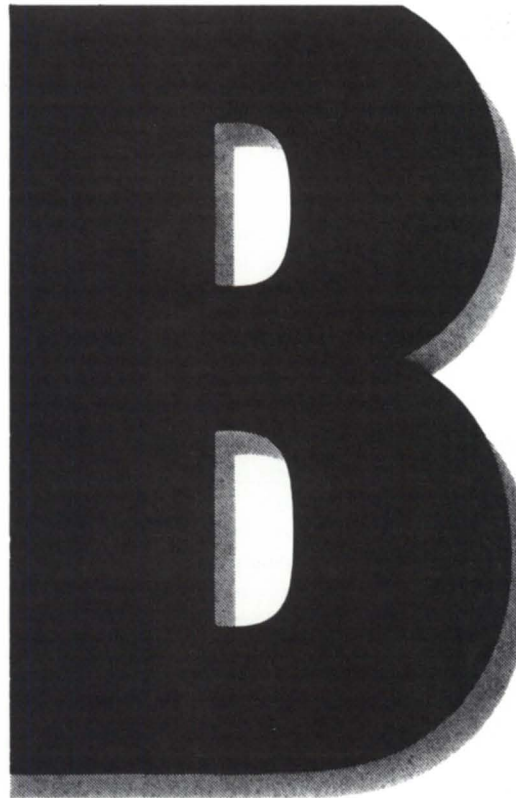
organizations of the International Telecommunications Union (ITU), an agency of the United Nations (UN). In addition to the sometimes competing standards produced by these organizations, there are innumerable other techniques introduced by private companies.

The binary code system that is used for transmitting data, and the rules for its use, are called the data link protocol. The ANSI standard for this is called the Advanced Data Communications Control Protocol (ADCCP), the ISO standard is called High Level Data Link Control (HDLC), and IBM's standard is called Synchronous Data Link Control (SDLC). These protocols replace the earlier IBM Binary Synchronous Communications (BSC or Bisync) Protocol and the ANSI Data Link Control Protocol.

ISO/OSI

The International Standards Organization has defined a model for interhost communications called the Open Systems Interconnect (OSI) reference model, consisting of seven layers of software and hardware. The communication from one layer to the next is called an "interface," and the communication from a layer on one computer to the corresponding layer on the other computer is called a "protocol." Here are the seven layers:

- Layer 7: applications layer—high-level user defined applications, such as distributed processing, occur here.
- Layer 6: presentation layer—makes use of the session layer programs in layer 5 to accomplish tasks such as remote file service or secure mail.
- Layer 5: session layer—responsible for process-to-process communication. This is where file transfer and virtual terminal service occurs.
- Layer 4: transport layer—responsible for reliable data transmission, including error recovery.
- Layer 3: network layer—data routing software routines are located here to determine if the packet is intended for the local host, to be ignored, or to be forwarded.
- Layer 2: data link layer—firmware drivers for the hardware are incorporated here, for example, Ethernet controllers or ter-



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minimal drivers. The data link protocols, such as HDLC or SDLC, come into use here.

• Layer 1: physical layer—the actual physical medium being used for data communications, such as twisted pair, parallel bus, or Ethernet.

Data General's proprietary network XODIAC, Digital Equipment Corporation's proprietary network DECNET, Xerox Network Systems/Internet Transport Protocols (XNS/ITP), and the TCP/IP suite of protocols can be described in terms of this model.

Ethernet

Ethernet is a standard (IEEE 802.3) implementation of the lowest two layers of the ISO/OSI model, the physical and data link layers, originally specified by Xerox, Intel, and DEC. Ethernet uses a coaxial cable (fiber optic is also used) as the physical bus in a branching non-rooted tree topology. There is a maximum distance of 2,800 meters between stations, and there can be no more than 1,024 stations per LAN.

Ethernet uses baseband (as opposed to broadband) signaling, which means that information bursts are placed on the cable at a fixed frequency. Broadband can carry several channels, whereas baseband can carry only one signal at a time, limiting baseband to smaller systems. The data transmission rate on Ethernet is 10 million bps, though the actual throughput on a real network is more like 50 to 200 thousand bytes per second.

The way the bus is accessed is known as carrier-sense multiple-access with collision-detection (CSMA/CD), which means that any peer on the network can put data out onto the channel whenever it appears free; if a collision of two packets is detected (that is, if packets overlap each other), each of the stations will try retransmitting at a later (random) time. This technique is contrasted with a token-passing network (IEEE 802.4) in which a station is given permission to broadcast by keeping a token message that is passed around between stations when the network is clear. The Manufacturing Automation Protocol (MAP) originated by General Motors is an example of a token-passing network. (The Technical Office Protocol, TOP, is closely related to MAP except that it uses CSMA/CD).

The data link layer of Ethernet includes data encapsulation (framing, addressing, error detection) and link management (collision avoidance, collision handling). Error handling

is limited to cyclic redundancy checksums (CRC) to handle collision detection and single-bit errors. Complete error control is relegated to higher layers of the network.

Data General supports Ethernet with Interlan's ILAN board using XODIAC, or on their Intelligent LAN controller (ILC) board using XODIAC or the TCP/IP protocols.

XODIAC

XODIAC is Data General's proprietary network software system. The physical layer can be RS-232, Ethernet, a data control unit (DCU), an intelligent synchronous controller (ISC), or multiprocessor communications adaptor (MCA), among others. The HDLC protocol is used at the data link layer, while the network and transport layers use the CCITT standard X.25 protocol. This protocol, originally designed for use on public data networks (PDN) such as Telenet and Tymnet, defines a packet-switching interface with error detection and correction to guarantee reliable end-to-end delivery of packets.

At the session and presentation layers are the virtual terminal agent (VTA) for remote log-on as a terminal to another host, the file transfer agent (FTA) for file transfer between machines, the resource management agent (RMA) to access remote files, queues, devices and processes, and the X.29/host packet assembler-disassembler (X.29/Host PAD) for remote log-on to another host over a PDN. The latter server is an implementation of CCITT standards X.3, X.28 and X.29, which describe how data from terminals can be assembled and disassembled into packets (concentrated) for shipment across a network.

DECNET

DECNET is Digital Equipment Corporation's proprietary network protocol. It can operate with a variety of protocols at the physical and data link layers, including digital data communications message protocol (DDCMP) over synchronous or asynchronous connections, Ethernet, packet-switched environments using X.25 and X.29, and high-speed computer interconnects (CI).

The higher ISO/OSI layers use DEC's own routing and application protocols, and are functionally similar to XODIAC. (I would like to see a good point-by-point comparison of DECNET and XODIAC). Even though a DEC VAX (using a DEUNA or DEQNA board) may physically share an Ethernet cable with a Data General MV (using an ILAN or



any Unix system users who want to participate. USENET is a news facility based on UUCP that provides a bulletin board service.

PHYSnet (or HEPnet) is a DECNET-based network of VAX computers at high-energy physics laboratories and universities throughout the world.

NSFnet, planned as a nationwide network of networks for scientific research, is based on TCP/IP. The networks being assembled around the NSF supercomputer centers are components of this network, as are ARPANET and the individual university-based networks that connect to the supercomputer centers.

TIGERNET

In 1985, Princeton University started creating a campus-wide network (TIGERNET) motivated by the new supercomputer center located here. The network, which is expanding rapidly, uses the TCP/IP protocols and presently has over a hundred computers on net. The Ethernet LANs are interconnected into a WAN via a broadband system. In November 1985, I received Data General's ILC board and rev 1.0 of TCP/IP, at a total cost of about \$5,500.

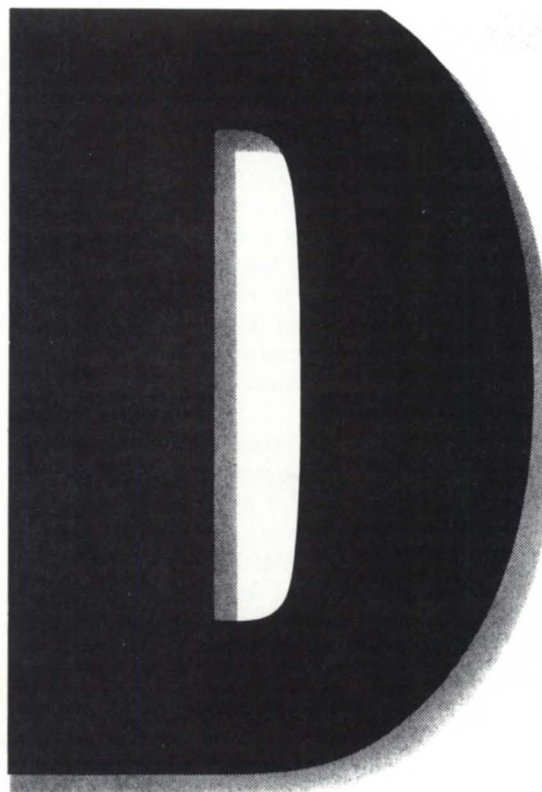
There were bugs in the product, and my initial attempts to get assistance were frustrating. After finding that the Atlanta software service doesn't support the product, I finally found someone at Research Triangle Park (RTP) who could help. By March 1986, two patches corrected the problems I had with the discarding of buffers and buffer lockup. This improved the situation, but problems still remain with Data General's TCP/IP in that it crashes unpredictably on a time scale of minutes to days, apparently due to incorrect handling of large blocks (perhaps traceable to VAX UNIX systems).

A major deficiency in DG's TCP/IP is that it has no SMTP capability. This would prevent us from receiving BITNET mail forwarded from our computer center, except for the fact that I have written my own SMTP handler. Other minor problems include the cumbersome way in which gateways to other networks must be defined, and the lack of local echo capability, which is needed when using TELNET to an IBM host.

Figure 1 shows our LAN as a piece of TIGERNET, which is tied to the John von Neuman supercomputer center (JVNC). Our MV/4000 and MV/10000 (the only two MVs

at Princeton) are tied together with a XODIAC Ethernet link utilizing Interlan ILAN boards. The MV/10000 is connected, via an ILC board, to another Ethernet LAN

that runs between the Physics, Math, and Astrophysics Departments. This LAN demonstrates how a common protocol suite, TCP/IP *(continued on page 56)*



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Breaking down the walls

Incompatible computer systems don't have to stay that way

by David A. Down
Special to Focus

Although Apple Computer's Macintosh differs from Data General machines in many ways, and neither brand was designed to work with the Hewlett-Packard LaserJet printer, these odd triplets *can* communicate with each other. As with just about any allegedly incompatible systems, they can share information with the help of suitable translation utilities. This article will give a snapshot view of some of the techniques we have devised at Cities Service Oil and Gas Corporation for making these machines talk to one another.

Unless a universal standard computer and operating system is established (Unix is a step in the right direction, but still has a long way to go), there will always be a need for ways to make our diverse systems get along together instead of living in their own little worlds.

I use a DG system most of the time at work, and although I like DG systems a lot, the Macintosh at home is my favorite computer. The Mac environment is very different from AOS/VS. Everything on the Mac is designed with pull-down menus, windows, icons, buttons, and the ever-present mouse for cursor movement.

Occasionally, I need to move data between my Mac and the DG system at work. Text files are simple—they only need carriage-return/newline conversion. Binary files can be considerably more complex, however, and they require special processing.

The big difference with Macintosh files is that in addition to a data portion (referred

to as a fork), there may also be a resource fork containing information about icons, menus, window definitions, font definitions, and other special Macintosh resources.

Data-only files such as text files can be transferred over a modem just as with any other system, but files with resource forks must be sent in Macbinary format (a special format for file transfer). Macbinary uses the first 128 bytes of the file as a directory header that includes the size of the data and resource forks. The data and/or resource forks follow in that order.

Most Macintosh communications programs now automatically format files into Macbinary when doing XMODEM sends; they also will recognize and restore Macbinary files on XMODEM receives.

I've written a set of utilities in C to handle file transfers from a Macintosh to a Data General MV/ system running under AOS/VS. The program I call TEX (for terminal emulator with XMODEM support) includes both a terminal emulator and routines for managing the XMODEM file transfer at the DG end. I'm making it available as a public domain "shareware" program, so if you're interested in getting a copy, send me a small reel of tape and a postage-paid return mailer.

The following two programs are for use on AOS/VS systems after you transfer the Macbinary file to a DG system via XMODEM. They, too, are written for Data General's AOS/VS C compiler.

The first program is simply for extracting the data and resource forks from a Macbinary file after it is received. This can be useful even when sending data without a resource fork, because XMODEM pads all transmissions to a multiple of 128 bytes.

The program (shown in Figure 1) requires the first argument to be the name of the input file. It will read the header from the file and display the Macintosh filename, type, creator, and fork sizes. If an output filename is given as a second argument, or if the input file was found after adding a ".MB" extension, the data and/or resource forks will be extracted.

The data fork name will be the filename without an extension, and the resource fork name will have a ".R" extension.

The second program (Figure 2) is for preparing a graphics file produced by Macpaint for printing from AOS/VS. It was built from the previous program, and expects a Macbinary filename as the first argument. The file must be a "paint document" with a file type of "PNTG". The Mac filename will be displayed, and if a second filename argument is given, an HP LaserJet-formatted raster graphics file will be created.

The output file begins with a control sequence to initialize the HP in raster graphics mode at 75 DPI. The program then processes the 720 raster lines that make up the image. Each raster line is expanded from its runlength-encoded format and prefixed with a command header for the LaserJet. Another control sequence is added to the end of the file to exit raster mode and print the image.

The output from the program can be sent directly to the HP LaserJet by specifying its console name as the output file, or it can be written to disk and later copied (COPY/B for binary mode) to the printer.

Processing other Macintosh files is handled in a similar manner. Reading resource fork information such as font definitions, however, requires a few extra tricks, because the complex structure of resource information (as described in *Inside Macintosh*) is more difficult to handle.

As an example, a font definition for a particular point size consists of a header, a bit image, and a character index into the bit image. This definition is one segment of a font resource, indexed by a resource ID with an associated font name ID for each group of font styles. The font resource has its own header and index, and is itself a member of the resource fork, which in turn has a header and directory of resource type members. This "box within a box" structure provides a lot of flexibility, but also makes it more complex to locate particular bits of data.

This may sound like a lot of trouble, but



ILC), the two machines cannot communicate unless they both use TCP/IP, which is not as robust as DECNET or XODIAC. (Is there any truth to the rumor that DECNET will be available for Data General machines?)

TCP/IP

Transmission control protocol/internet protocol (TCP/IP or IP/TCP) was developed by Bolt Beranek and Newman for use on ARPANET, which converted from its network control protocol (NCP) to TCP/IP in January 1983, after TCP/IP became a Department of Defense standard. This suite of protocols has become widely used, largely because it was incorporated into rev 4.2 of Berkeley Unix. Data General has a TCP/IP network product available for both the DG/UX and AOS/VS operating systems.

TCP/IP describes protocols that appear at layers two and above of the ISO/OSI model. The address resolution protocol (ARP), as defined in RFC-826 (request for comment), is used at the data link layer by the device driver to find the hardware address corresponding to an Internet address. The Internet protocol (IP), as defined in RFC-791, appears at the network layer, and is responsible for routing between hosts, and for the store and forward of data on the network. The Internet control message protocol (ICMP), as defined in RFC-792, is also at the network layer; it is used to send messages concerning unusual events occurring on the network.

The transmission control protocol (TCP), as defined in RFC-793, appears at the transport layer and is responsible for the reliable transfer of data to higher layers, including acknowledging of data and retransmission of bad data blocks. TCP establishes a virtual circuit with its counterpart on the remote machine, and then guarantees the successful receipt or transmission of data. One of its powerful features is that messages are correctly delivered even if packets are received out of order.

Another protocol of TCP/IP that resides at the transport layer is the user datagram protocol (UDP), defined in RFC-768. UDP is used for data transmission where data validation checks can be minimized, because the hardware performs some error checking (Ethernet is an example). TCP and UDP pass data they receive on to the user level protocols at the session layer.

The user level protocols that receive error-free data from TCP are in the session layer.

There are three protocols that function at this level: the file transfer protocol (FTP) described in RFC-959, the simple mail transfer protocol (SMTP) described in RFC-821, and the virtual terminal protocol (TELNET) described in RFC-854. FTP is used for file

transfer and manipulation including directory listing, file status, and file deletion. SMTP is used as an automatic electronic mail system including return of undeliverable mail. Unfortunately, Data General does not yet support SMTP. TELNET is the remote log-on facil-



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ity of TCP/IP.

Most systems (but not Data General) also implement a number of commands for user network information. Examples are "rwho," which gives the names of all users logged onto the network, and "ruptime," which gives up times for all machines on the net.

One of the important features of the TCP/IP protocols is that it gives users the ability at the presentation layer to define and implement unique user level protocols that utilize the TCP virtual circuit.

Internet is the name given to those computer systems interconnected via the TCP/IP protocols. Unique Internet addresses consist of four numbers separated by periods, such as 128.112.24.1 (my address). Internet addresses are assigned by Stanford Research International (SRI, phone number 415/326-6200). SRI is also the source for copies of the TCP/IP standard.

TCP/IP's wide usage on a variety of machines allows a connectivity available from

no other network standard.

Existing physical networks

It's time now to describe some real networks.

ARPANET, one of the best known nationwide networks, was created as an experimental network in 1969 by the Department of Defense Advanced Research Projects Agency (DARPA), using 56,000-bit-per-second communication links. ARPANET is managed by the Defense Communications Agency (DCA) and has a service center at SRI. Since 1981, ARPANET has used the TCP/IP protocols and servers for remote log-on, file transfer and mail between computers at government offices, labs and contractors—and through gateways to many universities.

MILNET, which was split from ARPANET in 1983, is the operational, unclassified network component of the Defense Data Network (DDN). In 1985, the National Science Foundation (NSF) signed an agree-

ment with DARPA to expand ARPANET for use by the NSF supercomputer centers.

CSNET was established with NSF funding for computer science research in 1980, and consists of several physical components. The purpose was to create a self-supporting network with a wide range of capabilities accessible to researchers, to support collaborations and resource sharing, and in particular to support isolated researchers. Components include ARPANET, Phonenet for message relaying, X.25 Net for PDN access and centralized mail service.

MFENET is the Department of Energy's (DOE) magnetic fusion research network, which uses 56,000-bit-per-second satellite links for supercomputer access. DOE is exploring how to migrate MFENET from its present specialized protocol to TCP/IP.

UUCP, for Unix-to-Unix communications protocol, is an informal store-and-forward mail and file transfer network that uses dial-up telephone circuits. The network is open to

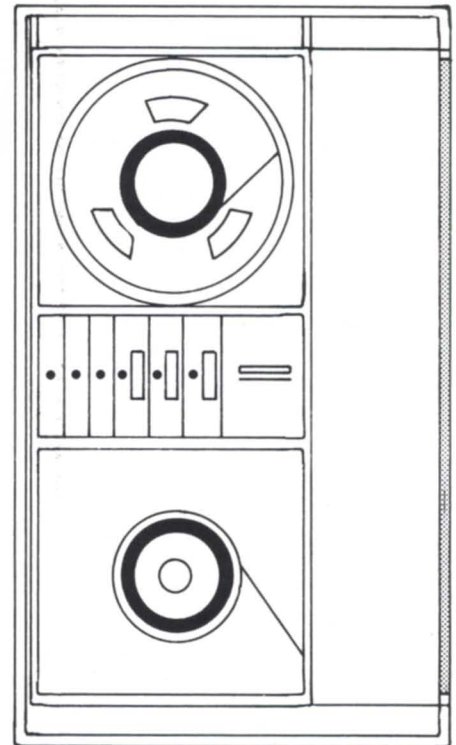
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*The "box within a box" structure
provides a lot of flexibility,
but makes it harder
to locate
particular bits of data*

people who have done word processing on the Macintosh will appreciate why it's worth doing. Being able to compose your thoughts in a variety of fonts is a communication tool that goes beyond basic word processing.

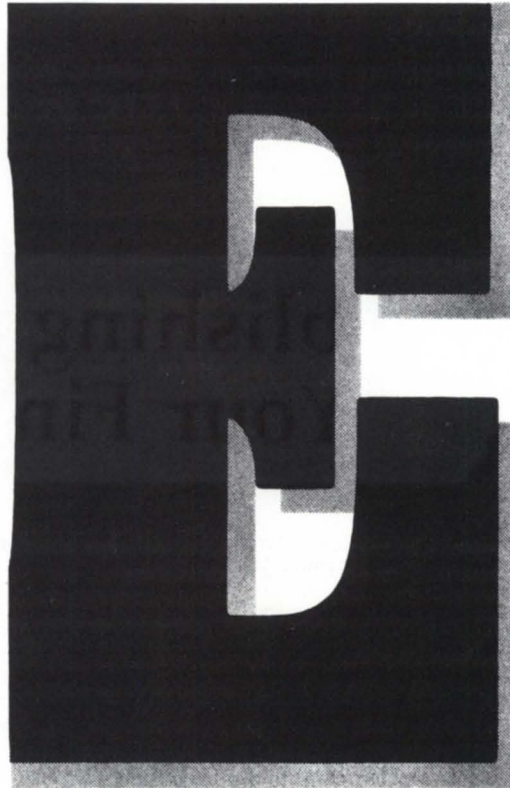
We do a lot of word processing on our DG systems. In fact, we were in on CEO since 1981, when we helped beta test it. Those early versions of CEO word processing left a lot to be desired, and although DG implemented many of the suggestions we made, our secretaries decided they preferred WordPerfect (from WordPerfect Corporation). We also had some Wang, Lexitron, and 5520 systems, but WordPerfect on the DG has become our primary WP system.

Initially, we used NEC Spinwriters for WP printers, but even with sound hoods they were not quiet—and with sound hoods they also were bulky. Either way, they were limited to 45 characters per second, and were prone to mechanical problems. They required carbon ribbons for good print quality, which don't last long and aren't cheap. When the cost of a sheet feeder and sound hood was added to the basic cost of the printer, it was over \$3,000.

The first we saw of the HP LaserJet was in a magazine ad with a list price of under \$4,000—our interest was aroused. We borrowed one from a local dealer, and after trying it out, we just couldn't let it go. It was quiet, compact, and could print a one-page document by the time you walked over to pick it up! We decided to cancel the orders for new NECs and order LaserJets instead. We still have a few Spinwriters in low usage positions, but LaserJets (and LaserJet+) are now our dominant distributed printer.

The interface from the LaserJet to the computer will handle serial connections at up to 19.2 Kbaud, and the LaserJet+ will accept a Centronics parallel connection for an effective rate of up to 50 Kbaud (depending on the data being transferred).

The LaserJet can print copies of a single page at eight pages per minute. Transmis-



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*The HP LaserJet comes with
a default font for both portrait (normal)
and landscape (sideways) printing.
Both normal and legal size
paper can be used*

Figure 1: C program for transfer of Macintosh files

```

/* MACBIN - Extracts data and resource forks from MACBIN format files
   - Written by David A. Down / Tulsa, OK
*/
#include <stdio.h>
#define bsize 2048
char fname[128],buf[bsize],*efn;
FILE *data,*outf;

ferr(txt) char *txt; {
printf("FATAL ERROR: %s.\n",txt); exit(0);}

int nbr(chr) char chr[4]; {int nr;
memcpy((char *) &nr,chr,4); /* Align number */
return nr; /* Return it */
}

copy(len) int len; { /* Copy 'len' bytes */
int i=len,bl=bsize;
while(i>0) { /* Copy whole fork */
if((i-=bsize)<0) bl+=i; /* Short last block? */
fread(buf,bl,1,data); /* Read data block */
fwrite(buf,bl,1,outf); /* Write it out */
}
fclose(outf); /* Close up */
}

main(narg,argp) int narg; char *argp[];
{
int dlen,rlen,i,bl;
struct {char zero,nlen,name[63],type[4],creat[4],flags[2],
misc[8],dlen[4],rlen[4],crdate[4],mddate[4],fil[29]} hdr;

if(narg<2) ferr("Missing input file name");
strcpy(fname,argp[1]); /* Copy name */
strcpy(efn=fname+strlen(fname),".MB"); /* Add .MB extension */
if(!(data=fopen(fname,"r"))) /* Try to open */
if((data=fopen(argp[1],"r"))) efn=0; /* Try without ext? */
else ferr("Can't open input file");
fread((char *) &hdr,sizeof hdr,1,data); /* Get header record */
if(hdr.zero || !hdr.nlen || !hdr.name[0]) ferr("Wrong file format");
printf("Filename='%s', Type='%4s', Creator='%4s'\n\
Data fork size=%i, Resource fork size=%i\n",
hdr.name,hdr.type,hdr.creat,dlen=nbr(hdr.dlen),rlen=nbr(hdr.rlen));
if(narg>2 || efn) { /* Output file given? */
if(narg>2) {strcpy(fname,argp[2]); efn=fname+strlen(fname);}
/* Copy name */
else *efn=0;
if(dlen) { /* Data fork non-null? */
if(!(outf=fopen(fname,"w"))) ferr("Can't open data output file");
printf("Writing data fork to '%s'.\n",fname);
copy(dlen); /* Copy data fork */
}
if(rlen) { /* Resource fork non-null? */
strcpy(efn, ".R"); /* Add '.R' extension */
if(!(outf=fopen(fname,"w"))) ferr("Can't open resource output file");
printf("Writing resource fork to '%s'.\n",fname);
copy(rlen); /* Copy resource fork */
}
}
}
}

```

tion time will slow it down between different pages, however, particularly for raster graphics data. A full page of 75 dot-per-inch raster graphics is 60 KB of data—at 9600 baud it will take more than a minute to transmit. A page of 150 DPI graphics on the LaserJet+ will take nearly 5 minutes when you include the time it takes to print it!

The HP LaserJet comes with a default font for both portrait (normal) and landscape (sideways) printing. Both normal and legal size paper can be used, as well as manual feed of envelopes, index cards, transparencies, etc. Using the default settings with normal paper, a page will be 62 lines of 80 columns. With a small line printer font, up to 84 lines of 133 columns can be squeezed on a page, and for spreadsheet and tabular data rotated on legal paper, 64 lines of 227 columns is possible.

Margins can be set on all four sides, and horizontal and vertical spacing can be dynamically changed. The print position can be changed incrementally, or it can be set directly to any position on the page. Fonts are selected by their characteristics, and several font cartridges are available with fixed and/or proportional fonts. On the LaserJet+, fonts can also be downloaded, and soft fonts are available on diskette. The LaserJet+ also allows any command sequence to be stored in the printer as a numbered macro without parameters.

Raster graphics are available at 75 DPI, 100 DPI, 150 DPI, and 300 DPI. The LaserJet is limited to about 60 KB of raster data per page (75 DPI for full-page graphics), and the LaserJet+ is limited to about 360 KB of raster data per page (150 DPI for full-page graphics). Download fonts and macros on the LaserJet+ will restrict the memory available for raster graphics.

Forms can be created on the LaserJet+ with commands for drawing lines and shaded or patterned rectangles. The commands for creating a form can be downloaded as a macro, and can be set to be automatically called for every page. A short control sequence imbedded in a document can be used to call downloaded macros and forms. Macros and downloaded fonts can either be temporary

*We looked at DG's desktop laser printer
and liked its more powerful
graphics commands,
but we decided the price was too high
for the incremental benefit*

or remain permanent until the printer is turned off.

In addition to using the LaserJet as a WP printer, we are increasing its use for graphics and plain text. I wrote a utility to rasterize

D450/D460 graphics and format them for the HP. The primary use of this utility is to provide hardcopy of Trendview output, but a D460 screen from any program can be directed to disk, and then rasterized and printed. The default output is 100 DPI in por-

trait mode, but it can create anything from 75 DPI landscape to 300 DPI at any position on the page, with scale factor. For LaserJet+ printers, the output can even be generated as a macro and inserted in the middle of a WP document!

For plain text, another utility will add margins, format multiple columns, rotate, and/or select a compressed font to squeeze more on a page. I use it exclusively when printing C programs—rotated, small, two pages up. Our line printer is uppercase only, which is not good for C listings and many other mixed case text files.

I also wrote a forms definition utility for the LaserJet+ to simplify the creation of forms overlays. This makes it easy to add boxes, shading, and constant lettering to documents. When creating user manuals, a very professional-looking product can be produced.

We looked at DG's desktop laser printer and liked its more powerful graphics commands, but we decided the price was too high for the incremental benefit. Most of our printers are used primarily for WP documents, so the basic LaserJet has been the most cost-effective printer. In the past year, several other companies have also introduced desktop laser printers in the same price range, but I haven't seen any that price their printers significantly less than the HP.

The operating record for our LaserJets has been excellent. Adding paper and occasionally changing toner cartridges is about all that is usually needed. We originally had a service contract, but made so few calls that we decided to cancel the contract and just pay for service when it was needed. Some of our printers handle over 10,000 pages per month, but when we looked at the cost of higher speed printers, it was cheaper to buy multiple LaserJets. Δ

David A. Down is a systems consultant in the Distributed Computer Services department of Cities Service Oil and Gas Corporation. He can be contacted at Mail Stop 15STB/TC, P.O. Box 3908, Tulsa, OK 74102; 918/561-5504.

Figure 2: Printing MacPaint documents on the LaserJet

```

/* PRPNT - Prints MacPaint documents on the HP LaserJet printer
   - Written by David A. Down / Tulsa, OK
*/
#include <stdio.h>
#define bsize 2048
char fname[128],buf[bsize],*efn;
FILE *data,*outf;

ferr(txt) char *txt; {
printf("FATAL ERROR: %s.\n",txt); exit(0);}

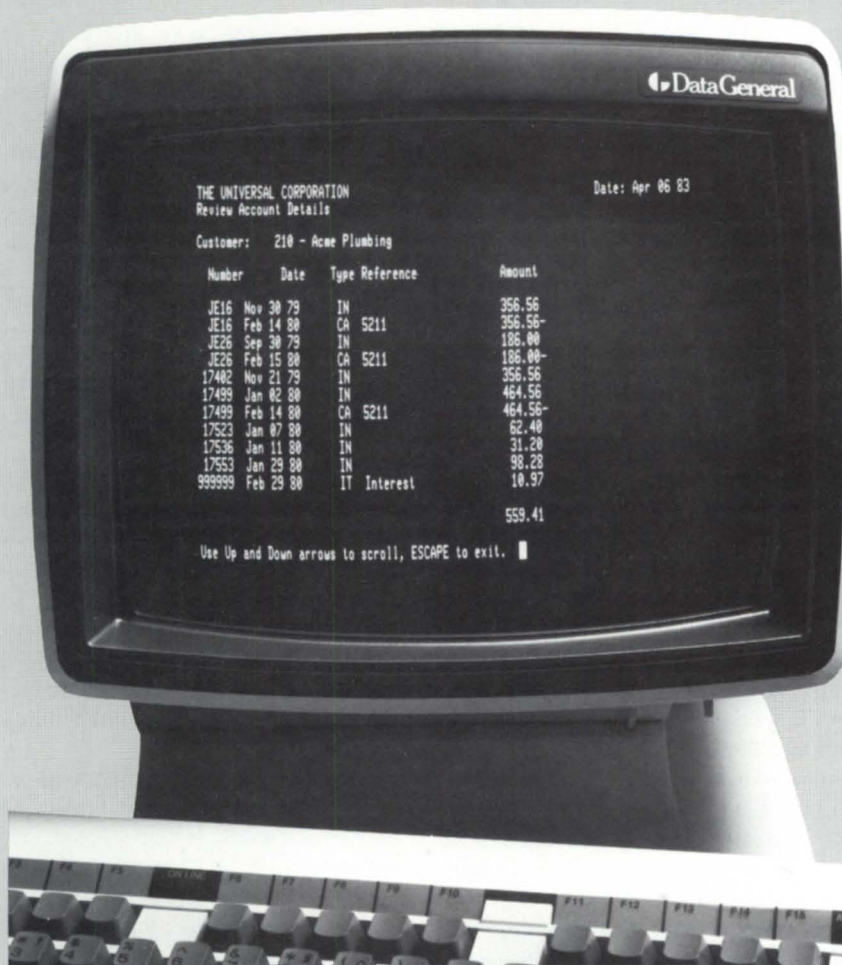
int nbr(chr) char chr[4]; {int nr;
memcpy((char *) &nr,chr,4); /* Align number */
return nr; /* Return it */
}

main(narg,argp) int narg; char *argp[];
{
int dlen,rlen,i,bl,n;
char *bp,*elp;
struct {char zero,nlen,name[63],type[4],creat[4],flags[2],
misc[8],dlen[4],rlen[4],crdate[4],mddate[4],fil[29]} hdr;

if(narg<2) ferr("Missing input file name");
strcpy(fname,argp[1]); /* Copy name */
strcpy(efn=fname+strlen(fname),".MB"); /* Add .MB extension */
if(!(data=fopen(fname,"r"))) /* Try to open */
if((data=fopen(argp[1],"r")) efn=0; /* Try without ext? */
else ferr("Can't open input file");
fread((char *) &hdr,sizeof(hdr),1,data); /* Get header record */
if(hdr.zero || !hdr.nlen || !hdr.name[0]) ferr("Not a MacBinary file");
if(memcmp(hdr.type,"PNTG") ferr("Not a paint document");
printf("Macintosh filename: '%s'\n",hdr.name);
dlen=nbr(hdr.dlen); /* Data fork size */
if(narg>2) { /* Output file given? */
if(!(outf=fopen(argp[2],"w"))) ferr("Can't open output file");
fputs("\33E\33*t75R\33*r1A",outf); /* Initialize plot */
fseek(data,512,1); /* Skip paint header */
for(elp=buf+72,rlen=720;rlen--;) { /* Convert 720 raster lines */
for(bp=buf;bp<elp;bp+=n) { /* Build up a raster line */
if((n=fgetc(data))<0) goto exit; /* Get code, quit on EOF */
if(n<128) fread(bp,++n,1,data); /* Read sequence? */
else memset(bp,fgetc(data),n=257-n); /* Set repeating value */
}
for(bp=elp;bp>buf && !*--bp); /* Find last non-null byte */
fprintf(outf,"\33*b%dW",bl=bp-buf+1); /* Write line header */
fwrite(buf,bl,1,outf); /* Write raster line */
}
exit: fputs("\33*rB\33E",outf); /* Finish up plot */
}
}

```


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Immigrant's aid

Simplifying the naturalization process for foreign applications

by Barry McNicol
Special to Focus

Through the marketing activities of OEMs and the DG salesforce, the DG user community grows day by day. Much of their activity goes into finding first-time users or upgrading existing DG accounts, but the real challenges come when their prospects already have non-DG systems.

The hardest customers to win over are those whose existing software is working reasonably well, even though they are feeling hemmed in by their present system. Maybe they're looking for more computing horsepower, or perhaps office automation, or the ability to communicate with Big Blue.

Many of the companies in this category are using equipment, operating systems, or languages from companies that are now minor players. Even a smoothly running set of applications can be a liability in such cases, because the company is unable to take advantage of recent technological advances. Unfortunately, the more these companies spent on their existing systems, the harder they find it to make the jump to a more current environment.

However, by thinking strategically and planning ahead for a phased conversion into the DG mainstream, these companies will be able to take advantage of the price and performance advantages of the current generation of hardware—without having to write off their investment in application software.

The path isn't necessarily an easy one. It begins with converting existing applications to a standard DG language and operating system. Once the conversion is complete, however, the company will be able to make hardware and operating system upgrades as necessary.

Obviously, the hard part is the first step. Having been through it a few times, I may be able to offer some guidance. My examples come from converting applications to Business BASIC from MICOS BASIC (an operating system/language interpreter that was

designed to run on DG Novas and Nova-compatibles) and from SMC BASIC (a language used by Prime, Rexon, and MAI). Converting from MICOS was comparatively easy, because the underlying philosophy is similar to that of DG's Business BASIC. SMC BASIC is structurally much different, and therefore more difficult to convert—but not impossible.

There are several ways to handle a conversion:

1. Manual line-for-line recoding
2. Third-party operating system that runs the target code on DG hardware
3. Translator package approach with minimal manual recoding.

This article focuses on the translator approach, particularly SMC BASIC. Let's take a few minutes to look at the language differences and gain an appreciation of the problems in conversion.

The fundamental difference is that of data storage, both in memory and on disk. BBASIC users pass variables between programs by means of BLOCK WRITE instructions, but SMC uses a common data area for each job to store all variables. Therefore, program A creates variables and SWAPs or CHAINs to program B, which sees the same variable names and contents. At first glance, this seems quite nice, with no need for BLOCK WRITES. The problem is that variable names can only be a single letter followed by a single digit (followed by a \$ if alphanumeric). Pretty soon you run out of variable names, and program C (which you run next) may have an entirely different use for A\$. You have to issue frequent instructions to clear out the data area.

The other problem is that SMC users are used to 8 KB partitions per terminal, and you have to define up front how much of this 8 KB is for data and how much for program use. You can imagine the problems when this boundary needs to be moved.

To make things more difficult, you don't have to DIM alphanumeric variables prior to use. Simply use them. It doesn't matter whether they grow or shrink during program execution. So, what happens in the data storage area when a 20 byte variable suddenly goes to 2000 bytes? The answer is a lot of messing around by the operating system, and diminished performance.

Data is stored on the disk in text form. That is, there is no "packing" of numeric data into 2, 4, or 6 byte variables. Numbers are stored with a decimal point and sign (if negative). So the number 21000000.00, which is stored in DG in 4 bytes, actually takes 11 bytes plus 1. Why plus 1?

Plus 1 is the "field separator"—SMC's way of separating variables with unspecified field lengths. This specific ASCII value sits between every field in the record. (It reminds me of the Word Mark concept in 1404 Autocoder . . . anyone else old enough to remember it?) When the system reads the record, it has to look at every character to see if it's a field separator, and if so, conclude that the variable it has just loaded is now complete.

The only advantage to SMC BASIC is its language compactness. Statements aren't limited to 132 characters as on DG systems and can have multiple statement types in a paragraph. File I/O, in particular, requires far fewer statements. Consider the following SMC statement:

```
0200 READ (1,KEY=K$,END=1000)A$,AO,B$
```

This translates as read file 1, using K\$ as the index argument. If EOF is found, then go to statement 1000. Otherwise, read data into variables A\$,AO,B\$.

Under DG BBASIC, this could be minimally coded as:

```
0200K$FIND D$,B$,K$,RN
0210 IF RN=0 GOTO 1000
0220 READ FILE(2,RS*ABS(RN)),A$,AO,B$
```

SMC BASIC can combine both index and data files into one file structure. This file structure would have to be broken down into two DG files. File I/O changes and a lack of DIMs are the two biggest obstacles to an easy conversion.

Our first client had approximately 300 programs/overlays to convert. After spending half a day looking at his programs, we decided that if we wrote a series of small programs to convert such things as syntax differences, we could manually code the remaining changes. The client was willing (to be truthful, he was desperate), he trusted us, and he had a reasonable budget for conversion. Curiously enough, our undiscounted hardware configuration, including conversion costs, resulted in a more powerful and less expensive system than what MAI was offering for



a straight upgrade.

At the time, MAI didn't offer magnetic tape, so getting programs and data off the client's computer was going to be a major obstacle.

We started the project by designing a cable to connect one MAI port to one DG port, then wrote some simple programs to send data one way (MAI to DG). We never found a reason to transmit DG to MAI. Knowing that communications worked, we then wrote a program to create a file of all the program names from our file and list the programs to the screen. However, there was no screen connected to that port. Instead, our cable fed the displayed information to our DG system. Soon we had all the programs sitting in LIST form on the DG system.

We now started writing a series of small programs (which we nicknamed the translator) to convert syntax, e.g., swapping row column to column row on PRINT statements, handling LET statements, etc.

We quickly realized that the translator would have to know the file layouts of each

file it was looking at, in order to determine maximum field lengths and DIM them in the program. We wrote a simple file definition program for the DG and had the customer's operations staff key in all the definitions. This also made file transfer easier. We wrote an MAI program to store the names of all data files in a file. Then we wrote another MAI program to get the file name, open the file, read the records (READRECORD), and print the record on the screen (remember, MAI BASIC has no binary fields).

Of course, our trusty cable was there the whole time. At the DG end, another program accepted the file name, looked up its definition, and then, as data came down the line, wrote out a reformatted record: it stripped out field separators and decimal points, packed numeric fields, and padded alphanumeric fields to their full length. This procedure worked so well that we usually fired it up at 5 pm and left it running overnight. The transmit and receive programs had to be synchronized, so we couldn't leave other jobs running that could cause degradation, espe-

cially on the receiving DG end.

Then the real fun began—we had to fix all the remaining language differences. As manual coding proceeded, we kept saying, "If I spend half an hour now adding this feature to the translator, it will save countless hours of manual coding later." While our stomachs were in constant turmoil as we discovered new problems, we usually found solutions and incorporated them into the translator. So ended our first conversion.

The next job was much larger in terms of programs and data, time, and cost. It was a little trickier, since many software companies had been writing for the system, and therefore we had to accommodate a variety of styles.

Recently we tackled yet another conversion. This one led us to conclude that you have to have the right circumstances in place before you have a reasonable chance of success. As a software house, this client had some 1,600 programs to convert, but no data files.

We were given a sample of program

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listings—they looked reasonable, so we took on the project. We contracted to educate the staff in BBASIC, run the programs through the translator, and spend some time acting as resources while the staff corrected any translator deficiencies.

We soon found that the sample programs we had received weren't representative of the system as a whole; they were the client's simplest, cleanest programs. Most programs had been written some five to seven years before, and were full of patches, unused logic, and unusual program segmentation that caused lots of swapping. Needless to say, this project is still ongoing.

So, what conclusions are to be reached?

1. Make sure the customer has strong and valid reasons for migrating to DG BASIC—not just that you were the least expensive option.

2. Look at as many customer programs as you can, and make sure that you, not the customer, pick the programs. Talk with the staff to identify the complex or problem programs and look at them closely.

3. Make sure the customer has staff members who are very knowledgeable about the application. Remember, it is most likely that you didn't write the code, so you're going to need help.

4. Make sure the customer understands that while you are writing a "translator" for the project, this is only a conversion aid, and not a 100 percent translation package.

5. Ensure that your staff understands all differences between the languages being converted.

6. You must have correct file definitions.

7. Be prepared to spend a lot of time developing your translator. (We estimate that 12 man-months are invested in ours.)

8. Make sure that if the client's programs SWAP, they don't do it every 10 lines of code, and that the data passed from overlay to overlay is minimal.

9. Check to see if the client uses a standard file maintenance program generator or report generator. These often have "off-the-wall" code that was written at 2 am by programmers who were overdosing on

caffeine and Camels. This will drive you, and the translator, crazy!

Currently, our translator is driven by some 16 modules of about 30 KB each. Conversion of SMC code to BBASIC is usually 98 percent correct (syntactically speaking). Depending on the quality of SMC program, some require 5 to 10 minutes of work to get going. Really bad ones can take two to three hours, even though you might change only a few instructions. (This is usually the infamous DIM problem.)

So there it is. Don't be put off by the problems, but put them into the perspective of what the customer requires and can afford, and ensure that the pros outweigh the cons. Δ

Barry McNicol is president of Freedom Software Inc., a newly formed, Toronto-based DG OEM specializing in translation work and distribution systems. Send questions or comments to Freedom Software Inc., 39 Dallington Dr., Willowdale, Ontario, M2J 2GA, Canada; 416/499-9062.

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Join us! The ins and outs (and ons and offs) of NADGUG's OIS bulletin board

by Brad Friedlander and
Anna Mae Malozzi
Special to Focus

Now that you know that the NADGUG bulletin board is available under the OIS umbrella (see the October 86 issue of *Focus*, page 10), we would like to welcome you to the system and show you how easy it is to use. So far, only a limited number of members have been active on the NADGUG bulletin board. We hope that a quick review on how to read and leave messages will make you feel comfortable enough to give it a try—and get hooked!

Through the bulletin boards, you have access to message exchange, conferencing, reference library, member interest file, and bulletins. We'll focus on the message exchange facility, which lets you read and leave messages on any of the bulletin boards.

Electronic bulletin boards

The NADGUG bulletin board is accessed through the Data General On-Line Information Service (OIS) via the CompuServe network. All you need is a modem (300, 1200, or in some instances 2400 baud), a phone line, and a terminal. Access is also available via Telenet, Tymnet, and Datapac. After you log on, the first menu will be the OIS top menu. The NADGUG bulletin board is choice #2, NADGUG and OIS user forums.

1. How to use these forums (general HELP info)
2. User forum for general NADGUG and DG topics
3. AOS/VIS SIG
4. OASYS SIG
5. Communications SIG
6. Business BASIC SIG
7. Other special interest groups
8. NADGUG executive bulletin boards

After entering this area, you'll choose whether to access the board as a visitor or a member. We recommend that you choose to be a member, since a visitor has limited use of the bulletin boards. As a member, your name and ID will be registered and added to the membership file. Don't hesitate to fill in your correct name and ID. Your account is secured by your password (which you should change the first time you access the system). Instructions for doing this are covered in choice #6 on the OIS top menu.

After you register as a member, someone can direct a message to you. You'll be alerted that there is a message posted to you the next time you access the system. All OIS users can read any message on the bulletin boards. The use of an individual's ID flags a message for that user; however, it's still a new message to all users. It is important to remember that this is a bulletin board and not a mail system.

Now that you've signed on, you may:

- browse through the messages posted to the board,
- leave a message and direct it to a specific member,
- respond to a message that is on the board.

Functions and common commands

Use either the numbers or the letters in parentheses to make your selection from the functions menu.

1. (L) Leave a message
2. (R) Read messages
3. N/A
4. N/A
5. (B) Bulletins
6. (MD) Member directory
7. (OP) User options
8. (IN) Instructions.

There are a few simple control and navigation commands you'll be using wherever you go in the menu structure:

- use Control C to exit an area and return to a menu
- use Control H to delete the last character you typed in
- use Control U to delete a whole line
- use T at the prompt to return to the user forum menu

Reading messages

Why not try reading a message? A

typical message might look like this:

#10: 10 SO/General Information
22-Aug-86 15:24:03
Sb: # File libraries
Fm: David A. Down 43200,1160
To: Brad Friedlander SYSOP (X)

Have you considered a file library for this conference? I'm sure there are many users who would be interested in sharing programs, etc.

*** There is a reply: 11

An "X" after the recipient's name means that the individual has seen the message directed to him or her.

Once again, you'll be greeted by a menu that sets out a number of options for reading messages. But don't fret—it's easy. Each message posted to the system is assigned a number. (The above message is #10). The prompt will tell you how many messages are on the system. You choose which message number you start with. You could start at #6 if you desire.

You can view forward by typing "RF" (for example, from #1 to #10) or read reverse by typing "RR" (for example, from #10 to #1). "RR" will give you the more recently posted messages first. To view all of the messages with the most recent first, enter "RR" and then the highest message number posted.

Before you start reading a message, remember that you may use:

- Control S to pause while reading
- Control Q to reactivate the system.

Here's a quick summary of the other menu options for reading messages:

- RI: Individual—select a specific message to read by entering its number after RI
- RM: Marked—read a message addressed to you
- RS: Search—read messages in a category to be selected
- RT: Threads—read replies to an original message and replies to replies

To read message #10, enter "RI" or "6" from the read messages menu (read an individual message), and then "10" for the message number. After reading a message,

It is important to remember that this is a bulletin board and not a mail system

you'll have the option of "N" for next message or <CR> for the next menu. The read actions menu gives you the following choices:

- RA: Read again
- RE: Reply with current subject
- UA: Reply with new subject, and
- RR: Read a reply where there is a reply to a message.

The reply to the sample message to Brad Friedlander from David Down states that file libraries will be offered as part of the bulletin boards.

Read threads

A message thread is the original message, replies to the original message, and replies to replies. A thread is equivalent to a conversation among several members.

To read a thread, enter "RT" at the read messages menu. When reading the messages of a thread, you'll first get the original message and be given a choice to read the first reply.

If you keep going, the third message you'll read will be a reply to the first reply, and so on. When this branch of replies is exhausted, you'll see the second reply to the original message. Eventually, you'll view every message in the thread.

Leave a message

All messages, even those directed to a specific individual, are for *all* users to read. To leave a message on the bulletin board, enter "I" or "L" at the functions menu. At the prompt "TO:" type in one of the following:

1. an individual's name
2. an individual's ID
3. an individual's name and ID
4. ALL
5. SYSOP.

If you want to direct a message to a specific individual, that individual's ID must be used. If you don't know the user's ID #, you may be able to locate it in the member directory (if the person has submitted his or her name to the directory).

Unless the message is for a specific person, you should use "ALL" to get as many responses as possible to your messages. Use SYSOP to send messages to the system administrator (such as Brad Friedlander).

Next:

- enter your message
- terminate each line with a <CR>
- use a blank line or Control Z to end it.

The body of the message is limited to 96 lines or 2,000 characters, so you'll want to *plan ahead*. At this point, before you actually leave the message on the system, you'll be directed to another menu, which will give you the option to edit the message, store it, or abort the leave function.

If you decide you want to log off, use OFF, otherwise you should use LOG. This will get you out of the bulletin board but allow you to be prompted again for your ID to log back on.

With the bulletin board, on-line help may be obtained by entering "I", "H", "?", or a <CR> at the prompt.

Just a note: the help file and instructions

may be downline-loaded by any user who has a PC and the ability to capture information. Use "IN" or choice #8, which is instructions on the functions menu. The instructions will give you all of the information you need concerning the NADGUG and OIS user forums.

Now that you're all ready for the fun part, we'll talk to you on the bulletin board. If you've already subscribed to OIS, log on to the bulletin board and give it a try. If you need assistance in signing up for OIS, call a Data General telemarketing representative at 1/800/325-3065; 1/800/952-4300 inside MA; 416/823-7830 in Canada. Δ

Brad Friedlander, a past president of NADGUG, is coordinating the new NADGUG bulleting board. Anna Mae Malozzi is a communications specialist with DG Service. Contact them on the OIS bulletin board.

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Q's & A's on BB

DG fields questions about BBASIC at the Systems Supplier's Conference

by George Henne
Contributing Editor

I just returned from yet another Data General conference; this one was the Systems Supplier's Conference in Atlanta. Have you ever noticed that the fancier the hotel and the more ambitious the chef's menu, the more likely it is to be doomed in the hands of the cooks and waiters? There's a lesson here somewhere.

Fortunately, attendees don't live by bread alone, and the conference supplied ample food for thought. From the viewpoint of BBASIC Business users, the most interesting event was a panel of DG developers fielding questions from the audience. Data General was represented by Ann Pete, manager of Channel Development (Westboro), and Mark Tau and Dave Cochran (of Research Triangle Park). As moderator, I had a chance to add a few comments on behalf of users.

The audience was made up of systems suppliers. I recognized many people in the room who represented in excess of 100 BBASIC installations apiece. Obviously, they have a keen interest in the product.

Q.: We've recently converted from RDOS to AOS/VS. Is there anything available like STAT, SHOW, or SCHANS? Is there a way to force an IKEY on another terminal?

M.T.: No. Under RDOS, only a single copy of BBASIC is running, which controls all the jobs. Under AOS/VS, each user has his or her own copy of the BBASIC process. The type of information you're looking for can therefore only be known by each local process: the information can't be shared.

G.H.: What we did to get around the STAT problem is have our menu program write out to a control file before it chains to an application. It works just as well, and adds no measurable overhead.

Q.: What's happening with enhancements to BBASIC?

D.C.: There's a development team actively looking at enhancements. We'd appreciate your suggestions.

Q.: What's different about MV/RDOS BBASIC?

M.T.: This is the version of Business BASIC for the MV/2000 DC running RDOS. It's nearly identical to rev 8.20 BBASIC for DG/RDOS, which runs on Desktops and Eclipses. The main difference is that instead of IDEFing its own mux driver routines, the RDOS routines are used. The main difference you'll notice is that the primary and secondary interrupt keys will now lead in with a Control-C, much as they do under AOS/VS. Very little else should be different.

Q.: What can be done to build a better user interface to CEO?

M.T.: I wish the people from CEO were here to answer that. (Laughter). Seriously, there is a CEO Toolkit available, and I believe Tremco (Tremco Consultants, of Orem, Utah) has actually used it to create an interface.

G.H.: I've seen the Tremco CEO interface, and can confirm it works. The problem is that you have to design it into your applications from the beginning, since CEO will wipe out part of your screen, and you'll have to put the stuff back up when you return from CEO. It would be nice if BBASIC could do something to make this easy, such as keeping a screen buffer for you.

Q.: How about some better BBASIC sales literature?

A.P.: We've updated the Business BASIC product brief in the past six months. If there is interest in something more, let us know about it and we'll examine the possibility.

Q.: How about some sales literature for the Data Dictionary and Report Writer?

A.P.: We'll do that as well if there's also interest.

Q.: How about enhancements to the Data Dictionary and Report Writer?

D.C.: We're interested in hearing your suggestions or problems. We don't get much in the way of STRs on these two products.

Q.: When will we be able to have logical files greater than 32 megabytes?

M.T.: In BBASIC rev 4.20, which is currently in shipping. You'll have to rebuild your .VL files. A field that was stored in just two bytes has been expanded.

Q.: How about more than 16 channels?

D.C.: Good suggestion. You can effectively use more than 16 files by using logical files, but they're there mostly for compatibility with early revisions. To accomplish this, we'd have to make some changes to the internal tables.

Q.: Will a full set of benchmarks be published for the new MV/2000, MV/7800, and MV/20000, much as you did before?

D.C.: The MV/2000 and MV/20000 benchmarks will be coming in a matter of months. They were delayed when we were getting BBASIC for the RDOS MV/2000 out the door. I'm not sure when we'll get results for the MV/7800 out.

Q.: How can we get the results?

D.C.: Ask your SE or salesperson—they should be able to get them.

Q.: What about a compiler?

G.H.: No point.

(See my BBASIC Business columns in previous issues.)

Q.: Will DG be bringing out a 32-bit version?

M.T.: We don't have plans right now. We understand there is a product called B32 that is supposed to do a lot of nice things.

Q.: Should DG be looking at it?

M.T.: We got a copy of it about a year ago, and ran our standard set of tests on it. It failed pretty badly then. We sent the results back, and haven't heard anything since.

Q.: I understand that 85 is the maximum number of locks that can be in effect at one time. Will this be increased?

M.T.: You're correct—RLS_2 has this limitation. However, with terminals locking and unlocking constantly, we don't think this should be much of a problem. Why, do you

have a situation?

A.: Yes, I've got a site that will be topping 100 terminals soon. We use locks for more than just files; with their low overhead, it's an extremely cheap way to set flags, especially between processes.

M.T.: OK, we'll have a look at it.

Q.: Is BBASIC a profit center, or just a way to pump iron?

A.P.: BBASIC is an extremely important product to Data General. About 40 percent of our resellers in the U.S. use it, and this figure is closer to 50 percent outside of the U.S. About 50 percent of DG's sales are driven by value-added resellers such as yourselves. Of course, it's an important product and we'll continue to look at it.

Q.: What about the problem of running a large number of jobs (over 19) under RDOS BBASIC rev 8?

D.C.: It's being worked on. For obvious reasons, we're having trouble reproducing it in our lab.

A.: (follow-up) Then come to one of my sites—we can make it happen any time.

Q.: Is anything happening with multi-precision?

D.C.: No, but there might be a version that supports both double and triple precision.

M.T.: A few years ago, there was a multiple precision version on BBASIC for the Enterprise. It didn't go very far.

Q.: We saw lots of activity for a while with RDOS BBASIC revs 7 and 8, and AOS/VS BBASIC 3 and 4. We feel the momentum has slowed, and we aren't seeing much new. Why not?

M.T.: There has been activity, most recently with Business BASIC for the RDOS MV/2000. There has also been impact from the movement of many of the language products from Westboro to our group in Research Triangle Park.

Q.: How are Business BASIC licenses selling?

A.P.: Steady and increasing, especially in AOS/VS, though AOS/VS has not yet caught up with RDOS BBASIC.

Q.: How about putting in a TRACE capability, to trace program flow by statement? This exists in many other versions of BASIC.

D.C.: We'll be glad to look at it.

And finally, a question from DG to the audience:

Q.: Is there any interest in a BBASIC compiler or interpreter for Unix or MS/DOS?

A.: Yes! Δ

As vice president of MAXON (formerly MICOM) Computer Systems, George Henne has worked with BBASIC users for nearly a decade. Send questions or comments to him at 575 Madison Ave., suite 1006, New York, NY 10022; 416/445-4823.

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The image shows a computer terminal screen with a dark background and light-colored text. The screen is divided into several sections by lines. At the top, it says 'CUSTOMER ORDER STATUS'. Below that, it lists 'Customer: ABC Corporation', 'Orders In House 3', 'Total Line Items 41', and 'Total Dollar Value \$125,675.00'. To the right of this, it shows 'Oldest Order 12 Jun 85', 'Newest Order 15 Aug 85', and 'Customer Info? YES'. Below the status section, there are two columns. The left column is titled 'CUSTOMER INFORMATION' and contains 'Bill To ABC Corporation (1/3) 111 Main Street Des Moines, IA 22222', 'Ship To ABC Corporation (0/3) 555 Elm Street Waterloo, IA 11111', and 'Contact Smith, Donald', 'Credit Rating AA', and 'Order List? YES'. The right column is titled 'ORDER LISTING' and shows 'Order Numbers 12345', '12346', '12347', and several blank lines. At the bottom of the screen, it says 'Customer Order Status'.



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Errant messages

When error messages don't communicate, users become confused and angry

by Tim Boyer
Contributing Editor

You'll have to guess for yourself what inspired me to take up the subject of error messages in programs—or the lack thereof. It's a topic that can inspire users to fury, and I don't blame them—I find nothing wrong with users expecting that coherent error messages be a part of the package their company purchased.

Before I get down to suggesting a technique for banishing cryptic error messages, I'd like to fulminate against a few of the transgressors:

- One program for our PC sends the message, "Device fault in module XR55 at address 153F:2995." Translation: "Turn the printer on, dummy!"

- TurboPascal sends messages like this: "Runtime error 01, PC=2F54". Translation: who knows? It may mean something to a programmer, but means absolutely nothing to the end-user.

- FDUMP has given me "Sys err retn—offset 001171 in FR" more than once. COLLAPSE favors me with "Fatal to process error 12 Reported from 36016 Routine called from 660". Translation: again, who knows? There isn't a manual to look up the error, and the message doesn't give a clue (to me, at least) as to what went wrong or where. I'd like to suggest that the authors include an error message file for these programs. It couldn't take up that much room—the whole CLI error file is only 3500 bytes long. Failing that, how about putting something in a manual?

Then there's BURST. The last time I got an error message from BURST, I did a screen dump to the PC just to make sure I got it all down: WRITE ERROR OCCURRED ON MT0, REEL # 1. MOUNT NEW TAPE REEL # 1 AND ENTER "RDY" WHEN

```
READY. SYSUENCROEVCEORVAEB-
RLAEB LTEA PTEA PSET ASTTUAST
UESR REORRR:O RS:T ASTTUAST=U S
0=1 41110401 0 B SARBTORNTGI NOGP
EORPAETRIAOTNI ODNU ED UTEO
TFOA TFAALT AELR REORRR(OSR)( )
000764!
```

On the other hand, ICOBOL is one of the Data General programs that uses nice error messages. "Character must be numeric Pic 9(3).9(2)", "Field does not permit a decimal point Pic 9(4)S", "Field does not permit a sign Pic 9(4)": these are error messages that a user can understand and react to. If you know a minimum of COBOL programming—enough to decipher PICTURE clauses—then these messages not only tell you that you did something wrong, and what you did wrong, but tell you what the acceptable response is. Now *that's* an error message!

I was sitting at the PC looking at the "Device fault in module XR55" error message, and feeling very self-righteous that *my* language doesn't do things like that, when our operator called me and asked what the heck an error 9F in OEINVITMFL was. I told her that it was a bad flag in the file, of course. Everybody knows that.

Oops.

I don't think anyone *designs* error messages to be cryptic. It's just that one person's clear message is another's head-scratcher. I'm sure that if you asked the author of our PC program what "Device fault in module XR55 . . ." means, he'd tell you that it was a "printer not ready" error. Everybody knows that. The same with FDUMP—someone out there knows exactly what that error means. Maybe even BURST—although I hope that the person who understands that message finds a good substance abuse treatment center soon.

The point is that if you want your programs to be around a good long while—and who doesn't—the error messages must be immediately understandable by anyone. Not that they will necessarily be able to do anything about it, but I think you will find end-users a lot easier to deal with if your access error message says "Possible file corruption" than if it says "Access error 9F".

How do you get these errors translated into coherent messages? Well, you can use a whole bunch of IF statements. Or, you can do it the easy way and have your declaratives read an error message file.

First, we used CRTEDIT (although any editor will work) and set up a text file called MESSAGES with the error messages. It looks like this:

```
00 FILE ACCESS WAS SUCCESSFUL
10 END OF FILE ENCOUNTERED
11 RECORD ADDED DURING READ NEXT
21 RECORD KEY ERROR
and so on. The wording isn't important—as long as it is clear and meaningful. We then REORGed this file into an ISAM file, called ERRORMSGFL, like so:
```

```
REORG/A MESSAGES/L ERRORMSGFL/I
32/O 1:2/K
```

to get an ISAM file with a 2-byte key. The FD for this file is as follows:

```
FD ERROR-MESSAGE-FILE.
LABEL RECORDS ARE STANDARD. 01
ERROR-MESSAGE-RECORD.
03 ERROR-MESSAGE-KEY.
05 ERROR-MESSAGE-NUMBER PIC X(2).
03 ERROR-MESSAGE-TEXT.
PIC X(30).
```

My declaratives then look like this:

```
PROCESS-A-FILE-ERROR. IF A-FILE-
STATUS = HARDWARE-ERROR OR
A-FILE-STATUS = NO-DIRECTORY OR
A-FILE-STATUS = DISK-FULL OR
A-FILE-STATUS = FILE-INCONSISTENCY
OR etc.,
MOVE A-FILE-STATUS TO FILE-ERROR-
STATUS,
MOVE "AFILE" TO FILE-ERROR-NAME,
OPEN INPUT ERROR-MESSAGE-FILE,
MOVE FILE-ERROR-STATUS TO ERROR-
MESSAGE-NUMBER,
READ ERROR-MESSAGE-FILE RECORD
INVALID KEY STOP RUN,
DISPLAY FILE-ACCESS-ERROR-SCREEN,
STOP RUN.
```

FILE-ACCESS-ERROR-SCREEN just displays which file the error is coming from, and what the error message is—like so:

```
01 FILE-ACCESS-ERROR-SCREEN.
03 BLANK SCREEN.
03 BLINK BELL LINE 10 COL 33 "E R R O R"
03 LINE 12 COL 10 " . . . FILE ACCESS
```

```

ERROR ".
03 PIC X(2) FROM FILE-ERROR-STATUS.
03 " : ".
03 PIC X(30) FROM ERROR-MESSAGE-TEXT.
03 LINE 14 COL 27 "FROM ".
03 PIC X(10) FROM FILE-ERROR-NAME.
    
```

Of course, there is no reason to be limited by 30 characters—you can put in detailed instructions, including who to call, or what to run on the file. For instance, if the access error is 9F, our message says "BAD FLAG SET—RUN ISAMVERIFY ON AFILE". For error 9A, the message is "KEY SIZES DO NOT AGREE—RUN ANALYZE ON AFILE, AND COMPARE THE RESULTS TO THE FD".

Tailor your own messages to your audience. If you are an OEM, you may want to put phone numbers in the file. A program error like "DIRECTORY NOT INITIALIZED" would tell the user to call your office, while one like "HARDWARE ERROR" would have the phone number of Field Engineering. You could save yourself a lot of time and phone calls, especially with errors

like the BAD FLAG—if given the name of the file, anyone could run ISAMVERIFY.

No one knows how long these programs are going to be around. Today, any ICOBOL programmer could tell you what an access error 30 is. Fifteen years from now, after the company has gone through 12 different programmers and the manuals have all been lost, who knows? If you make your error messages clear, it will save time and money now, and a lot of headaches in the future.

White knight department

Two months ago, I gave you my diatribe about RDOS on the MV/7800. Last month I talked about DISCOS, a multi-ground RDOS. This month everything is coming together. Ira Ellenbogen announced on the NADGUG bulletin board that his company, Nanosecond Systems, is developing DISCOS for the MV/7800. He hopes to have it ready by year end, and says that he will go ahead with it even if DG announces RDOS for the MV/7800, since his version will have multiple grounds and other enhancements.

So, for all you people calling and writing about my October column ("RDOS dies again!", page 38), don't jump out that window or start that \$100,000 software rewrite—help is on the way!

To quote Ira: "Please leave comments, suggestions, wish lists, and pre-orders on NADGUG BBS (415/924-3652), or write P.O. Box 81, Woodland, CA 95695, or call 916/662-4334."

My opinion is that we need to encourage people who think that RDOS still has a place in the computing world, and the best way to do that is to send them lots and lots of money. Δ

Tim Boyer is EDP manager at Denman Rubber Manufacturing Company and president of the Northern Ohio Data General Users Association. He may be reached at P.O. Box 951, Warren, OH 44482; 216/898-2711 or on the NADGUG bulletin board at 415/924-3652.

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A demon for work

Here's a handy tool that lets users do their own odd jobs

by Tim Maness
Contributing Editor

In response to questions from a couple of new system managers, I thought it would be fun to show you a useful tool you might not have. On our system we run a process called DAEMON. (I know of a number of other shops that run similar programs—and all of them have interesting names.) DAEMON is a process that runs under PID 2 and can be used for a variety of things. Here are four examples.

It allows users to enable and disable specific consoles. Although console management is restricted to OP, there are many reasons why some or all users should have the capability to enable or disable specific consoles. We have one modem line we use for both dial-in and dial-out, and we find it useful for everyone to be able to switch between modes.

It allows users to manage print spoolers and change default forms. In a shop with printers spread all over the place, it's nice for the people who actually use the printers to be

able to take care of them, without having to call the system manager each time something needs attention. Using DAEMON, an authorized user can take advantage of normally restricted EXEC commands.

It allows users to block and unblock processes with their username. This is another example of a job that users like to be able to do without calling the system manager.

It starts special processes. If you have some processes that should always run, DAEMON can listen on the global port for termination messages, and restart these special processes if they are terminated.

The following is an example of a DAEMON program that allows users to terminate processes with their own username. It also has a listening task that will restart specific processes if they terminate. The other features described above can be implemented in a similar manner. Our DAEMON has grown over time, and now takes care of all kinds of strange jobs. It's a handy place to stick odd things you'd like users to be able to do, but without OP or superuser privileges.

The program is started from PID 2 by issuing the following commands:

```
) DIR :PER ) PROC/DEF/IN=@NULL/OUT=@NULL DAEMON
Users issue commands using the CONTROL command, for example:
```

```
) CONT @DAEMON TERM 15
```

The accompanying listing shows the annotated source code for the sample DAEMON program. The main task appears first, followed by the listening task and the other routines referenced.

To close with something in the holiday spirit, I made a short Christmas wish list of things I'd like to find under my MV/4000 on Christmas morning:

- ☞ A \$15,000 plug-in CPU
- ☞ Rev 7.something
- ☞ A letter of apology from the credit department at DG
- ☞ A letter of appreciation from a user
- ☞ DG's customer list

They say software developers are eternal optimists, and I guess I'm no exception. I'll be up early to see if Santa brings me anything on my list.

Here's to a fresh start next year! Δ

Tim Maness is president of DMS Systems, Inc., a software development firm specializing in data base management. He can be reached at 1111 Brickyard Road, Salt Lake City, UT 84106; 801/484-3333.

```
C Sample DAEMON program
PROGRAM DAEMON

EXTERNAL LISTEN
INTEGER GETINT
CHARACTER*32 USERNAME, USERNAME1
CHARACTER*256 REQUEST, REPLY
COMMON /ALIGN2/ REQUEST      | force word alignment
COMMON /ALIGN/ REPLY        | force word alignment

C Become a super user and super process
CALL SUSER (ICC)
CALL SUPROC (ICC)

C Create the IPC file in :PER for users to send requests to
CALL CIPC ("DAEMON",1,ICC)
IF (ICC .NE. 0) THEN          | complain
  REPLY = "(Daemon) - IPC port already exists"
  CALL SEND (2,REPLY,36,icc)
  CALL RTNCLI                 | and die
ENDIF
```

```
C Create the task to listen for process termination messages
ITID = 2          | task id number
ITPRI = 0        | equal to priority of main task
ITSTK = 0       | default on stack size

CALL TQSTASK (LISTEN,ITID,ITPRI,ITSTK,ITICC)
IF (ITICC .NE. 0) THEN          | tell pid 2 and die
  REPLY = "(Daemon) - Can't start listen task<12>"
  CALL SEND (2,REPLY,35,ICC)
  CALL RTNCLI
ENDIF

C Tell pid 2 we're alive
REPLY = "(Daemon) - Rev. 1.00 Running<12>"
CALL SEND (2,REPLY,29,ICC)

C Start of main loop - wait for a user request
DO WHILE (TRUE)
  ISF = 0          | system flags
  IPORT = 0       | global port of zero implies we'll
                  | accept messages from anyone
```

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Cheap tricks

Sometimes boosting system performance doesn't cost much

by Brian Johnson
Contributing Editor

:OOPS

I had originally intended to cover a subject near and dear to most system managers' hearts this month: analyzing disk drive performance.

However, I started out by doing the end of the column first. That's the place where I put errata, last minute thoughts, and interesting tidbits culled from last month's phone messages and client visits. This month, the scraps combined to a critical mass and preempted the main topic.

:CHEAP_TRICK:NO. 1

A while back, somebody mentioned to me that they had improved the performance of their system by PROCing up certain programs as permanently blocked sons of PID 2 (e.g., PROC/BSON/DEF SED). They wanted to know how this worked and how much it cost.

Well, it turns out that this trick is relatively cheap, but only works under a particular set of circumstances. The circumstances are:

- The program(s) involved are frequently executed, but there are lots of times when someone executes the program and no other process is currently using the same program;
- You're not in a memory contention situation.

Typical examples of programs that fall into this category are compiler .PRs and LINK.PR in situations where compiles and links are relegated to batch and only one or two batch streams are active. Another typical example would be programs like SED, SSIWP, CEO_CP, and CEO_WP on a system whose primary load is on-line editing and word processing.

So how does PROCing up a blocked copy of a program help other intermittent users of the same program? To understand that, we need to review some underlying AOS{/VS} concepts.

AOS{/VS} takes as much memory as it and the active users need. Then, with whatever is left over, it builds two lists of pages: LRU pages and FREE pages. The

FREE page list is where AOS{/VS} puts pages that are no longer in use and have no potential for reuse. The LRU page list is where AOS{/VS} puts pages that were recently in use, are no longer in use, but might potentially be used again.

When AOS{/VS} steals a page from a process, it moves the page to the front of the LRU list on the assumption that the process may fault it back in again. When a process is using shared page I/O (?SPAGE/?RPAGE/?OVLOD/?TOVLD/?OVREL system calls) and it releases a page, the page is moved to the front of the LRU list on the assumption that the process may request the same page again. The net effect is that a substantial amount of disk I/O can be avoided if needed pages can be supplied from the LRU instead of from the disk netherworld.

When the last process using a particular program terminates, or when the last opener of a particular shared page file closes it, AOS{/VS} moves any pages belonging to the program/file from the LRU list to the FREE list after flushing them to disk, if they've been modified. If someone immediately executes the same program or opens the same shared page file again, then AOS{/VS} has to go to the disk to get the pages.

PROCing up a program as a blocked son of PID 2 has the effect of avoiding the conversion of LRU code pages used by a program to FREE pages when the program terminates, because the .PR file is always open by at least one process (the blocked son). Unshared process pages will always be converted to FREE pages; this is appropriate and unavoidable since unshared pages are just that: unshared. They can't be reused by other processes.

Avoiding the conversion of shared page file pages from LRU to FREE pages is a little trickier. You have to write a program that ?SOPENS the necessary file(s) and then blocks itself indefinitely. Writing such a program is rarely necessary since shared page files are typically open all the time anyway.

Why, you might ask, doesn't AOS{/VS} just leave the shared code and shared page file pages in the LRU instead of converting them to FREE pages when the last user of a program terminates or the last user of a file closes it? Well, the assumption is that when you close a shared page file, any modifications that have been made should be written to disk, because precious LRU space is better used to hold pages of files that are actually open instead

of holding pages in anticipation of future opens.

In addition, normal disk I/O doesn't take the extra time to search the LRU for modified pages of a file, which means that backup of an INFOS file that was only closed a short time ago might produce a bad backup if modified pages from the volumes were still lurking around in the LRU.

In case any DG developer is reading this, I'd like to propose a research project: how about changing the AOS/VS logic so that when the last user of a .PR file terminates, or the last opener of a shared page file closes it, any modified shared pages in the LRU belonging to the file would be flushed to disk, but left in the LRU as unmodified pages? Of course, unshared pages from terminating processes would still get converted to FREE pages.

In this way, systems with gobs of extra memory would rapidly convert most of the FREE pages to LRU pages, with at least some disk I/O being avoided. If the net-net is positive, convert the research project to a permanent change.

In a development shop that does heavy batch compilation, the compilers and linkers would never need to be retrieved from disk, even when only one batch stream was active. That might appeal to you DG developer guys, right? Seems to me you must be compiling and linking occasionally. . . .

:CHEAP_TRICK:NO.2

A lot of you have batch jobs that run cyclically. The most common use of cyclical batch jobs is to force INFOS file checkpoints at frequent intervals during the day.

The problem with cyclical batch jobs is that they are very disruptive to the system due to the high overhead of the logon/off cycle, coupled with the fact that EXEC has to wake up and get involved, and at least one process has to be created (CLI). In the case of INFOS checkpoint jobs, the page faults, I/O, and CPU associated with the logging on and off often exceed that required by the checkpoint itself.

A far better way to handle cyclical functions is to spawn a CLI son from PID 2 during the UP macro and pass it the name of a cyclical macro. Here's an example of how to create the two macros needed to perform cyclical checkpoints of an INFOS file called FOO:

```
) CREATE/I SPAWN.CLI
```

*Using DAEMON,
an authorized user can take advantage
of normally restricted
EXEC commands*

```

ILP = 1      ! local port number
LB = 128     ! maximum request length in 16 bit words

CALL RIPIC (ISF,IUF,IPORT,ILP,LB,REQUEST,ICC)
IF (ICC .NE. 0) GOTO 10 ! ignore problems
C Get the sender's PID
CALL GPORT (IPORT,IPID,ICC)
IF (ICC .NE. 0) GOTO 10

C And username
CALL GUNM (IPID,USERNAME,ICC)
IF (ICC .NE. 0) GOTO 10

LUSER = INDEX (USERNAME,"<0>")

C See if request is legal
IF (REQUEST (1:4) .EQ. "TERM") GOTO 20

C Tell them we don't know what they wanted
NCHR = INDEX (REQUEST," ") ! length of request
IF (NCHR .EQ. 0) NCHR = LB * 2 ! all of it

REPLY = "(Daemon) - Unknown command: " //
*      REQUEST (1:NCHR) // "<12>"
LREPLY = 30 + NCHR

CALL SEND (IPID,REPLY,LREPLY,ICC)
GOTO 10 ! go wait for another request

C Terminate the process
20 CONTINUE

C Get the process id
ICPOS = 1
JPID = GETINT (REQUEST,ICPOS)
IF (JPID .LT. 3 .OR. JPID .GT. 256) THEN
REPLY = "(Daemon) - Process id out of range<12>"
CALL SEND (IPID,REPLY,35,ICC)
GOTO 10
END IF

C See if the usernames match
CALL GUNM (JPID,USERNAME1,ICC)
IF (ICC .NE. 0) GOTO 10 ! process is gone?

LUSER1 = INDEX (USERNAME1,"<0>")

IF (USERNAME(1:LUSER) .NE. USERNAME1 (1:LUSER1)) THEN
REPLY = "(Daemon) - Command Ignored.<12>"
CALL SEND (IPID,REPLY,28,ICC)
GOTO 10
END IF

C Terminate the process
CALL TERM (JPID,ICC)
IF (ICC .EQ. 0) THEN
REPLY = "(Daemon) - Pid terminated.<12>"
CALL SEND (IPID,REPLY,27,ICC)
GOTO 10
ENDIF

10 END DO
END

C This task listens for a process termination message,
C then restarts the process.
SUBROUTINE LISTEN

CHARACTER*256 TERMMESSAGE
COMMON /ALIGN1/ TERMMESSAGE

DO WHILE (TRUE)
ISF = 0
IUF = 0
IPORT = 8 ! global port that receives
! termination messages

```

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```

        ILP = 0
        LB = 128
C Wait for a message
        CALL RIPC (ISF,IUF,IPOINT,ILP,LB,TERMMESSAGE,ICC)
C Check the process against a list of processes we care about.
C We read our list from a file so we can add processes without
C having to change this code.
C Restart it
        (Put the PROC code here)
C Go wait for the next message
        END DO
        END
C Turn on Superuser mode
        SUBROUTINE SUSER (ICC)
        INTEGER ACO,AC1,AC2
        ACO = -1
        AC1 = 0
        AC2 = 0
        ICC = ISYS (113K,ACO,AC1,AC2)
        RETURN
        END
C Turn on Superprocess mode
        SUBROUTINE SUPROC (ICC)
        INTEGER ACO,AC1,AC2
        ACO = -1
        AC1 = 0
        AC2 = 0
        ICC = ISYS (53K,ACO,AC1,AC2)
        RETURN
        END
C Create an IPC port
        SUBROUTINE CIPC (NAME,LOCAL_PORT,ICC)
        CHARACTER * 256 NAME
        INTEGER LOCAL_PORT, ICC
        INTEGER ACO,AC1,AC2
        INTEGER PACKET (3)
        INTEGER*2 PACKETS (6)
        EQUIVALENCE (PACKET(1),PACKETS(1))
        DATA PACKET /3*0/
C Build the packet for ?create
        PACKETS (1) = 36K           ! type is "IPC"
        PACKETS (2) = LOCAL_PORT   ! local port number
        PACKET (2) = -1            ! default time block
        PACKET (3) = -1            ! default acl
C Set up the AC's
        ACO = BYTEADDR (NAME)
        AC1 = 0
        AC2 = WORDADDR (PACKET)
C Create it
        ICC = ISYS (0,ACO,AC1,AC2)
        RETURN
        END
C Send a message to a console
        SUBROUTINE SEND (IPID,MESSAGE,LENGTH,ICC)
        INTEGER IPID,LENGTH,ICC
        CHARACTER*256 MESSAGE
        INTEGER ACO,AC1,AC2
        ACO = IPID           ! pid to send it to
        AC1 = BYTEADDR (MESSAGE) ! byte pointer to message
        AC2 = LENGTH
        ICC = ISYS (316K,ACO,AC1,AC2)
        RETURN
        END
C Quietly return to CLI
        SUBROUTINE RTNCLI
        INTEGER ACO,AC1,AC2
        ACO = 0
        AC1 = 0
        AC2 = 0
        ICC = ISYS (310K,ACO,AC1,AC2)
        RETURN
        END
C Receive an IPC message
        SUBROUTINE RIPC (ISF,IUF,IPOINT,ILP,LB,REQUEST,ICC)
        INTEGER ISF,IUF,IPOINT,ILP,LB,ICC
        CHARACTER * 256 REQUEST
        INTEGER PACKET (4)
        INTEGER*2 PACKETS (8)
        EQUIVALENCE (PACKET(1),PACKETS(1))
        DATA PACKET /4*0/
        INTEGER ACO,AC1,AC2
C Build the packet for ?irec
        PACKETS (1) = ISF           ! system flags
        PACKETS (2) = IUF           ! user flags
        PACKET (2) = IPOINT         ! global port number
        PACKETS (5) = ILP           ! local port number
        PACKETS (6) = LB           ! length of receive buffer
C Message buffer address
        PACKET (4) = WORDADDR (REQUEST)
C Set up the AC's
        ACO = 0
        AC1 = 0
        AC2 = WORDADDR (PACKET)
C Create it
        ICC = ISYS (26K,ACO,AC1,AC2)
C Return everything
        ISF = PACKETS (1)
        IUF = PACKETS (2)
        IPOINT = PACKET (2)
        ILP = PACKETS (5)
        LB = PACKETS (6)
        RETURN
        END
C Returns PID associated with global port number
        SUBROUTINE GPORT (IPOINT,IPID,ICC)
        INTEGER IPOINT,IPID,ICC
        INTEGER ACO,AC1,AC2
        ACO = 0
        AC1 = IPOINT
        AC2 = 0
        ICC = ISYS (64K,ACO,AC1,AC2)
        IPID = AC1
        RETURN
        END
C Gets the username of a process
        SUBROUTINE GUNM (IPID,USERNAME,ICC)
        INTEGER IPID,ICC
        CHARACTER * 32 USERNAME
        INTEGER ACO, AC1, AC2
        ACO = IPID           ! process id we want username of
        AC1 = 0             ! ACO contains a pid
        AC2 = BYTEADDR (USERNAME)
        ICC = ISYS (72K,ACO,AC1,AC2)
        RETURN
        END
C Terminate a process
        SUBROUTINE TERM (IPID,ICC)
        INTEGER IPID, ICC
        INTEGER ACO,AC1,AC2
        ACO = IPID           ! pid of process to terminate
        AC1 = 0             ! ACO contains a pid
        AC2 = 0             ! no ipc message
        ICC = ISYS (304K,ACO,AC1,AC2)
        RETURN
        END
C Returns next integer in string - if there is one
        INTEGER FUNCTION GETINT (STRING,ICPOS)
        CHARACTER STRING*256
        INTEGER ICPOS
        LOGICAL BAD
        BAD = .TRUE.
        GETINT = 0
        JCPOS = ICPOS
        DO 10 I = JCPOS,256
            ICHR = ICHAR(STRING (I:I)) - 48
            ICPOS = ICPOS + 1
            IF (ICHR .LT. 0 .OR. ICHR .GT. 9) THEN
                IF (BAD) GOTO 10
                RETURN
            ENDIF
        ENDIF
        IF (BAD) BAD = .FALSE.
        GETINT = GETINT * 10 + ICHR
10    CONTINUE
        RETURN
        END

```



```

))
PROCESS/DEFAULT/OUTPUT=%1%.OUT
:CLI %- %
)))
) CREATE/I CHECKPOINT__FOO.CLI
) CHECKPOINT FOO.DB
) PAUSE 300.000
) CHECKPOINT__FOO
)))
) SPAWN CHECKPOINT__FOO PID: 24
)

```

There is no logon/off overhead, 50 percent less process creation overhead, and EXEC is out of the picture. Not bad, huh?

:MUSINGS: MV2K

I've had occasion to use an MV/2000 extensively over the past few weeks, initially running AOS/VS 7.03 and now running AOS/VS 7.51; a few strange things have happened.

The strangest is that I like SMI (the System Management Interface utility) and START-UP.PR (the menu-driven boot program). Coming from a dinosaur like me, that's high praise.

Less strange is that AOS/VS 7.51 has been very stable, but is a little rough around the edges. For example, the /WRP logic seems to work only sporadically, and batch jobs submitted at the same priority do not get processed in FIFO order. Surprisingly, the limitation on the maximum number of jobs in the queue seems to still be quite small (less than 300) in spite of the new 32-bit EXEC.

In the unpleasant surprise category, I find that heavy disk I/O has a tendency to cause spongy character echoing on the LAC asynch controller. This lends credence to my preconceived notion that anybody who thinks they can replace an MV/4000 with an MV/2000 based on the MIPS numbers alone is indulging in wishful thinking. Any difference in the MIPS is more than offset by the disk I/O and terminal I/O differences.

All things considered, the MV/2K seems to be a very nice processor for a limited number of users doing moderate amounts of screen and disk I/O.

:7.51_MUSINGS

Attention: all users who are running systems with marginal memory situations need to start saving money for an additional memory board or two.

A preliminary review shows that the cost of the new 32-bit EXEC process is an extra

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200 pages of working set. Yes Virginia, that's almost half a megabyte!

Also, the simple CLI cum AGENT working set seems to have grown by around 20 pages. If you assume half of that is unshared and multiply 20 KB by the number of CLIs you normally have lurking around, it could mean bye-bye to another megabyte or two. We're rapidly approaching the time when it will take 2 MB just to boot an AOS/VS system with a normal complement of global servers (CEO or XTS, or both).

If you're one of those with marginal memory, I'd suggest you make sure you've got a lot of disk space left on your system disk before you install rev 7; your :PAGE and :SWAP directories are going to be eating a lot more disk space than they used to.

:20MA:UPDATE

I'm still receiving mail and phone calls on the now-legendary 20 milliamp versus RS-232C column I wrote (*Focus*, June '86) in which I offered a listing of a program called

RUNAWAY to detect runaway mux ports. Not a month goes by that I don't run into a performance problem caused by runaway mux ports. In fact, I've seen two in just the last two weeks. One of them was an Eclipse C/350 with DCU-assisted ALMs. It had one 9600 baud runaway line causing an average of 30 percent CPU consumption by PID 1 (PMGR) when the line was enabled. Disabling the line relieved PMGR, but not the DCU.

In the RUNAWAY documentation I mentioned a "shorting plug" to calm down unused 20 ma lines. Several people have called to say that their local field service offices have never heard of it. If this happens to you, refer them to wire list no. 008-000319/005-001307 in the office microfiche. The schematic shown on that wire list is for the old 4060 mux, but is equally applicable to any 20 ma port.


Last night I was having dinner with the Grey Eagles (the informal fraternity of former DG journeymen), and I mentioned the lack of these shorting plugs to one of my fellow Eagles, who happens to be one of the founders

of INMAC. He seemed interested in getting it into their catalog. Until that happens, if it ever does, I've arranged to make the plugs available through :SYSMGR (41 Sutter St., suite 1512, San Francisco, CA 94104) for a measly \$25 each.

Do-it-yourselfers can make their own 20 ma shorting plugs by scoring a 2N4123 transistor. Wire the base lead to TD through a 1 K resistor, the collector to RD, and the emitter to ground. Then add a 100 pf capacitor between the emitter and base.

EIA plugs are easy to make for yourself by wiring a connector with TD shorted to RD. On modem ports you should also short CTS, DSR, and CD to ground. Δ

Copyright © 1986 by B.J. Inc. All rights reserved. B.J. is the president of B.J. Inc., a San Francisco-based consultancy specializing in system auditing, system management, and performance analysis. He can be reached at 109 Minna St., suite 215, San Francisco, CA 94105; 415/550-1444, Telex 296544.



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Minor wrinkles

Installing an MV/2000 is easy—if you stick to the script

by Jim Siegman
Contributing Editor

This month I had the opportunity to install my first two MV/2000 systems for our clients. The installations went in with only a couple of minor wrinkles—and the wrinkles make a good piont of departure for this month's column.

Due to a mixup (which wasn't DG's fault), the first system arrived without a system console, so we decided to use one of our graphics workstations that emulates a D2 terminal instead. However, on power-up we got garbage on the screen.

One quick call to DG identified the problem. The installation manual for the MV/2000 lists two different power-up routines, one for Dasher terminals and one for non-CRT units such as the TP2. We should have used the non-CRT method—holding down the NEWLINE and REPEAT keys to flood the MV/2000 with a steady stream of data. This causes it to reset the baud rate to match the console that's plugged in. If you have a normal Dasher CRT, this isn't necessary, because the system will poll the ports in all baud rates until the terminal responds to the control sequence requesting terminal ID. Therefore, if you're using any terminal that doesn't support the Dasher answerback request, you must use the non-CRT method on the first power-up. From then on, the system keeps the baud rate of that (and all other) ports in non-volatile memory.

The other problem appeared when I edited :UP__EXEC.CLI and :UP.CLI, the two macros that autostart the system under the default SMI interface. I discovered that it's very easy to hang the system during the boot process; I had to reload the system software (it took about an hour) to get out of it. It seems that you can't put anything in the up macros

that will produce screen I/O if you're using the SMI.

I'm not sure of the exact details, but I think the SMI causes PID 2 to read input from a pipe file, and @OUTPUT is unassigned until :UP.CLI enables CLI logging. If you're going to change :UP__EXEC.CLI or :UP.CLI, I strongly recommend that you first generate another system with no SMI interface and no initial IPC. That way if your edits cause the system to hang, you can simply boot the non-SMI system and undo your edits.

Overall, though, I find the MV/2000 an incredible improvement from a system installation viewpoint. It does take a little getting used to in that you don't have a PID 2 CLI. Learning the details of the new software will take care of most of the problems I encountered, but I think there are still a few minor problems for DG to fix.

One of them is that if you use SMI to define a console line that isn't genned in the system, the :UP.CLI will blow up when it gets to the :UP__LINES.CLI macro that SMI builds. This is no problem if you're familiar with the interface, but it could be a problem for a novice user.

A couple of months ago I mentioned a product from Method Systems, Inc. that I thought might be able to take care of that old bugaboo, foreign terminal support. Last week at our Chicago users group meeting, Dave Cox of MSI demonstrated his "gold box" (not to be confused with an ordinary black box). It's capable of massaging data flowing in both directions on an asynchronous line; the rules for modification are user-programmable, and can be different for each direction. It can also handle hardware-to-software handshaking, parity conversion, baud rate conversions, and a number of other problems.

I observed only three limitations: there are no autobaud capabilities, the data buffer is small, and the program size limitation might rule out very complex data modification. However, I'm impressed with its design—it would probably be able to do a DEC-DG conversion similar to the Fortran routines John Grant presented in his August column in *Focus* (page 42). For more information, contact Dave Cox at 216/942-2100.

And now to the mailbag . . .

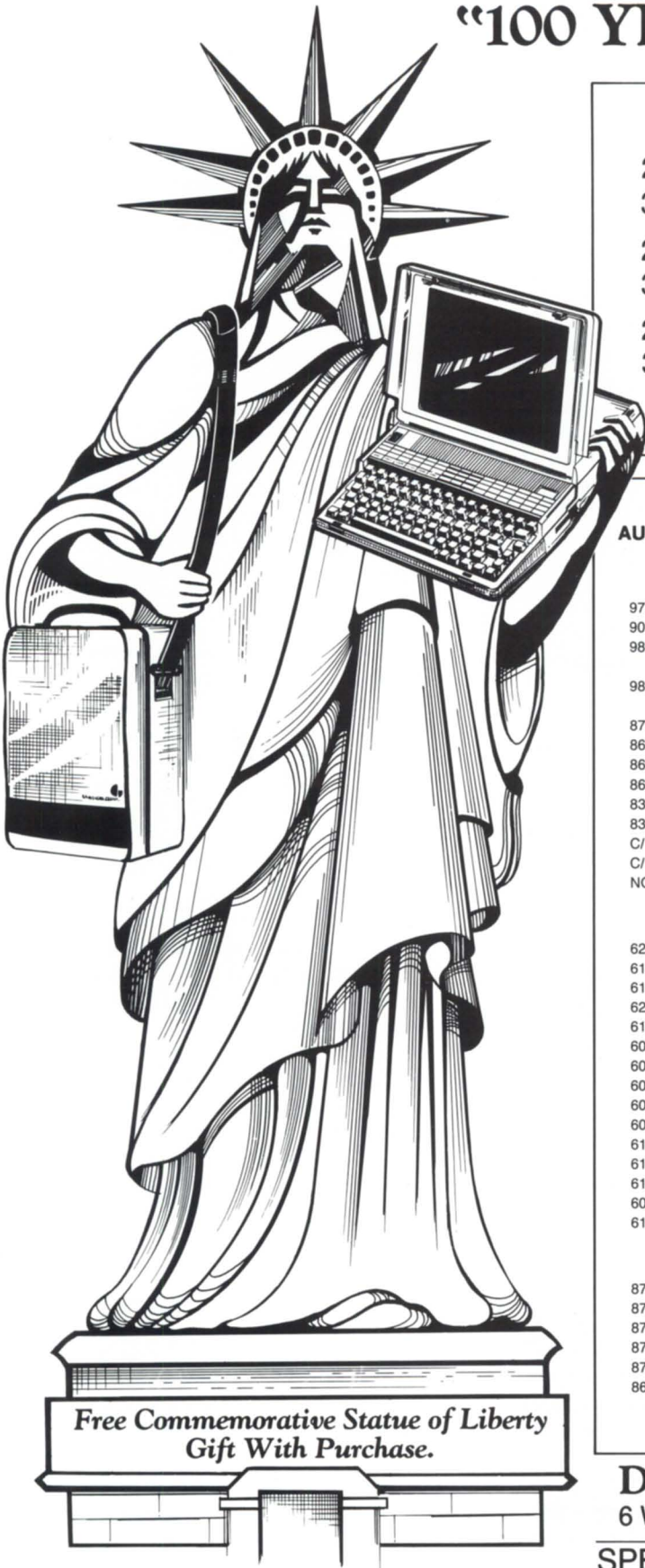
The first card is from Sheila A. Strunk of Champion Auto Stores. She writes, ". . . it would be extremely beneficial to have a list of available hot sites for DG users." I agree. I think it would be a good idea to compile such a list in a future issue, but I know of only one totally dedicated hot site at the moment. The only way we can compile a list is to have those people who provide hot sites, cold sites, warm sites, or any other temperature sites drop us a line. I'd like to invite anyone who has information along these lines to send us a Quick Connect card or a letter containing that information.

An anonymous user wrote to ask if I would elaborate on formatting secondary disks as a system disk. For background, I covered the RDOS method in my September column (page 43). In the AOS{/VS} world, all you have to do is answer "Y" to the "SYSTEM DISK" prompt in DFMTR. This reserves several tracks (cylinders) of the disk as invisible space for a copy of SYSDISK and whatever SYSTEM you choose to put on the secondary disk. I usually put FIXUP or PCOPY or another utility on as well.

If I find my system disk has been corrupted, I can then use a SYSTAPE to load the complete operating system on the secondary disk and boot it via the INITIAL LOAD technique, thus making a system disk out of your secondary disk. The only limitation to this scheme is that if you're using other than unit 0 on any disk controller, you must first boot file 4 of the SYSTAPE to be able to boot the operating system on that disk. Note: this procedure must be altered for the MV/2000 (due to the SMI) and for rev 7.5+ on the larger systems (due to changes in the format of the SYSTAPE). I'll try to get the details for a future issue.

By the way, if you're going to the trouble of sending a letter or Quick Connect card, please include at least your name and phone number. For some requests we may want to call you with the answer immediately so you won't have to wait for an issue or two. If you don't want to have your name printed, just tell us—we'll be happy to honor your request.

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an incredible improvement
from a system installation viewpoint*

■
Tim Kanuka of Oilfield Accounting Service wrote in response to the day of the week macro in the October issue (page 45): “. . .it’s much simpler to write a program in a language that does a ?FGDAY system call, takes the result mod 7, converts this to a string, and returns that string in [!string] using ?RETURN. Our DAYOFWEEK takes 7 seconds on a loaded S/250 and is written in RDS/PASCAL . . .”

Tim, I agree with you 99 percent of the time. However, there are two good reasons why I like macros such as DOW.CLI. The most important is that they demonstrate that the CLI is an incredibly powerful (albeit sometimes slow) way to get the work done. The other is for users of turnkey packages such as UniGraphics who don’t have anything

other than the operating system. Their only “programming” options are the CLI or MASM—and few, if any, want to delve into the murky depths of MASM. By the way, I’m kind of interested in RDS/PASCAL. How about getting in touch to tell me about your experiences with it?

■
John J. Walton of Academy Insurance Group writes, “I once read an article where the author indicated he wrote a book teaching how to program in assembly. I cannot find the article or the author’s name. Could you help?” I don’t know of the article you’re referring to, and I don’t know of any materials for DG assembler other than ones from DG.

Osborne/McGraw-Hill publishes a number of excellent introductory books for other CPUs, such as the 6502 (Apple, Commodore,

etc.) and the 8080/Z80 (Altos, IMSAI, North Star, etc.). These are available from major bookstores. If you have access to these machines, you could use one of those books to learn the concepts of assembler and then move into the DG world. I found the first assembler class from DG to be an excellent introduction, but since I was already somewhat familiar with Z80, 6502, and IBM 360 assemblers it was a matter of applying the basic concepts to a new syntax. Δ

Jim Siegman is chairman of the NADGUG publications committee, and treasurer of the Chicago Area Data General Users Group. Send comments or questions to him c/o Focus Magazine, 5332 Thunder Creek Road, suite 105, Austin, TX 78759-4022.

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DMS announces enhanced disk backup and recovery for MV

Salt Lake City, UT—DMS Systems has released a new version of their Disk Backup and Recovery System (DBR) for Data General MV/ systems.

According to DMS, DBR is faster than DUMP__II and LOAD__II, and it provides efficient handling of hard tape errors. Any tape with a hard tape error can be read by DBRload, regardless of whether it was created using Dump, DUMP__II, or DBRDump.

According to the company, DBR dumps do not need to be restarted when a hard tape error occurs. DBR also allows faster reloading of specific files from multi-volume backups, because it creates an index and allows the loading to start with any volume

of a set. Sequencing through preceding volumes is eliminated.

Enhancements to DBR include automatic reminder when dump or load is waiting for an operator response, status inquiry to check the progress of a dump or load, autopilot switch that automatically skips over hard tape errors when dumping or loading, 32-bit version of Load for faster reloading of files, pre-mounting of tapes, a statistics switch that shows how much dead time occurs during a dump, the ability to load specific files into any directory, multi-volume dumps to disk and floppies, file size and creation date information on dump listings, and enhancements to systems that have installed MegaTape drives.

DBR has been approved by the U.S. General Services Administration for inclusion on the GSA authorized price-list product schedule. The contract is effective October 1, 1986 through September 30, 1987, and makes it possible for federal agencies to order DBR

directly from the GSA authorized price list—FSC Group 70, Part 1, Section A, General Purpose Automatic Data Processing Software, Contract Number GSOOK87AGS5773.

DMS Systems, Inc., 1111 Brickyard Road, Salt Lake City, UT 84106; 801/484-3333.Δ

Storage subsystems for MV/ series, Nova/Eclipse

Woburn, MA—Aviv Corporation has announced a new generation of SMD disk subsystems and GCR tape subsystems. Both subsystems operate on burst multiplexor channel (BMC) and are fully compatible with RDOS, AOS, and AOS/VS with no software patches.

The disk and tape subsystems are fully compatible with DG's FCC-hardened and non-FCC chassis.

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The tape subsystems are based on Aviv's universal TFC 409 tape controller, which emulates 6300/4307 and 6026 software drivers. The controller is compatible with all Pertec formatted tape drives with transfer rates up to 2 MB per second. Up to four drives can be daisy-chained off one controller.

Five GCR tape subsystems are available with various combinations of recording speed and format. Two models feature a 256 KB cache buffer.

The tape subsystems are compatible with Aviv's multiport system MPS 300. The MPS 300 is an electronic switch that allows sharing one to four drives among up to six computers.

The disk subsystems are based on Aviv's universal DFC 407 disk controller, which emulates Zebra, Kismet, and Vulcan software drivers.

The controller is compatible with all SMD disk drives with data transfer rates up to 2.5 MB per second. Up to four drives can be connected to one controller.

Three SMD subsystems are available with disk capacities ranging from 277 to 550 MB and data transfer rates from 1.8 to 2.4 MB per second.

The disk subsystems can be supplied in 60-inch or 42-inch standalone cabinets, or they can be packaged in the 60-inch cabinet together with the tape system.

Aviv Corporation, 26 Cummings Park, Woburn, MA 01801; 617/933-1165. Δ

STRs on OIS now keyword-searchable

Milford, MA—Keyword-searchable STRs will give users of Data General's On-line Information Service (OIS) a new way to tap the Software Trouble Report (STR) data base on OIS.

The STR status look-up facility provides up-to-the-week updates on the status of all open STRs and all STRs that have been closed within the preceding eight weeks. To find the status of an STR, a user keys in the DG-assigned STR number. The system then displays the STR record that contains a synopsis of the problem description, the current status, and the problem resolution for a closed STR.

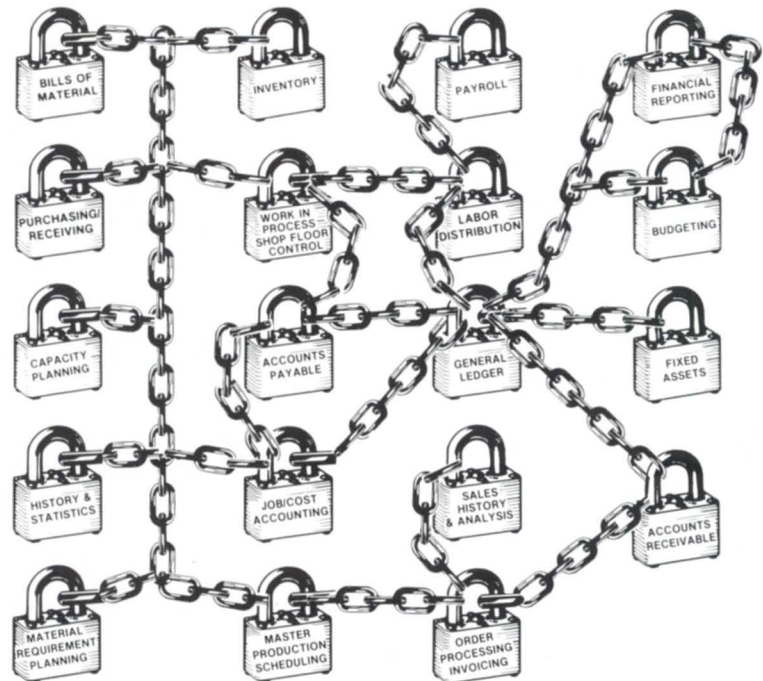
The enhanced facility now allows the STR data base to be searched by STR number, and

also by either the product name or revision level. With this new capability, a user may find other STRs that have been submitted on his or her products, and review the current status problem resolution.

When users log on to OIS, (a top-level menu choice on OIS), and enter the STR, they will see the following menu:

1. Search by STR
2. Search by products and revisions

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Each of the application modules are designed to function independently with automatic interfaces to other modules as they are added. Thus a client can start with a selective system and expand easily as required. The software operates on Data General Eclipse™ C or MV series hardware which allows a wide range of expansion without change in the operating system. For the smaller manufacturing company, a modified software package is available for the Data General Desktop Generation.*

JAI software may be leased or purchased and is fully warranted with full maintenance contracts available at a nominal fee. COBOL Source Code is available should the client choose to modify and/or maintain his own software.

* Eclipse and Desktop Generation are Data General Registered Trademarks.

Choice #1 will allow a user to input the STR number. Choice #2 will prompt the user for the product name and revision level from a menu of operating systems. Upon responding with the rev or product name, the user will be presented with a menu of STRs, and can choose to read any or all of the STRs.

Users now have access to all STR information in the data base on a specific product or rev, and the ability to review the associated problems and resolutions for those problems. This can help users evaluate the potential for problems when loading a new revision of software, and know whether there are fixes for those problems.

DG Service doesn't recommend the STR search facility as a substitute for submitting an STR. Although a problem description may be similar to what a user experiences, the problems may not be identical; therefore, the same solution may not apply to another user. The software development groups find that each STR provides additional information on

the possible causes of the problem.

If users have software questions that haven't been answered in the data base of product tips, workarounds and fixes, or the STR data base, they can submit them to DG through an on-line software assistance request (SAR). An SAR is directed to the appropriate software technical group in Atlanta. SAR questions are answered within three working days via the user's DG-Talk mailbox.

If you haven't logged on to OIS and would like additional information on the system or how to obtain an OIS user ID, user password and user's guide, call a telemarketing representative at 1-800/325-3065 (1-800/952-4300 inside MA or 416/823-7830 in Canada).

1.2 gigabyte fixed disk with backup

Chatsworth, CA—Interscience has introduced a new family of high-capacity, high-performance, disk/tape subsystems.

The standard configuration includes two disk drives totaling 1.2 gigabytes of formatted storage capacity and a 100-ips GCR tape drive for backup.

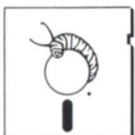
The disk drives utilize 10.5-inch Winchester technology to provide 689 unformatted MB each. They are SMD compatible, have an average positioning time of 18 milliseconds, and transfer data at 2.46 MB per second.

The drives have a mean time between failures (MTBF) of 20,000 power-on hours.

The subsystem comes with a 100-ips GCR tape drive. Dual-speed operation is standard: 50 ips in start/stop mode or 100 ips in streaming mode. For reliable interchange, the tape drive records data in dual-density ANSI compatible formats of 1600 bpi (PE) or 6250 bpi (GCR). Write access time is 6.0 milliseconds at 50 ips and 12.5 milliseconds at 100 ips. The 6250 bpi data transfer rate is 312.5 KB per second at 50 ips and 625 KB per second at 100 ips.

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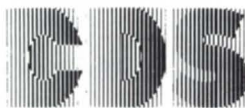
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All Interscience subsystems are serviced and supported by Interscience through a network of nationwide service organizations, including service centers in six cities.

The 1.2-gigabyte disk storage configuration with 100-ips tape backup is priced under \$45,000.

Interscience Computer Services, Inc., 8950 Lurline Ave., Chatsworth, CA 91311; 818/882-5600. Δ

Optical disk emulates magtape subsystems

Brea, CA—Intelligent Computer Integration (ICI) is now delivering optical disk subsystems for Data General and Rolm MIL-SPEC computer systems. Both the OD01 (for

DG computers) and the ROD1 (for Rolm computers) emulate existing magnetic tape subsystems. According to ICI, users can convert data previously archived on magnetic tapes to optical disk, and can begin using optical storage immediately in their current backup/archiving operations.

Applications for the OD01 and the ROD1 include transaction recording, oil and geophysical exploration, mapping and remote sensing, storage of engineering drawings, tape library replacement, mass storage substitute, and magnetic tape backup.

Both units operate in three application modes:

- In on-line mode, the units appear to the computer as a tape subsystem. According to the vendor, no software or hardware modifications are required. When data archiving takes place, however, the data is written to optical disk instead of tape, and the stored data can be accessed randomly in milliseconds.

- In off-line mode, the user controls tape-to-disk and disk-to-tape data transfers without intervention by the host computer. Menu-driven software, accessed through a required terminal, allows the operator to copy an entire tape, records between file marks, or a specific number of records; to display the optical disk directory; to compare disk and tape data for copy verification; and to restore a tape that has been copied to optical disk. The unit does not need to be connected to the host during off-line operations.

- In pass-through mode, the subsystem allows the computer to communicate through the unit to a magnetic tape drive attached to the subsystem. This mode allows the computer to continue performing existing tape read and write operations, in addition to new optical storage operations.

Intelligent Computer Integration, Inc., 570 West Lambert Road, Suite C, Brea, CA 92621; 714/990-1707. Δ

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(from page 17)

and Ethernet, allows computers from different vendors (Data General, DEC, Ridge, SUN, Celerity) to communicate.

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BITNET

There are, of course, many other large networks nationwide, statewide, and corporatewide that I haven't mentioned. One more, BITNET, deserves description. BITNET is a network of over 1,000 computers at nearly 350 institutions of higher education and research centers; it includes almost 200 computers in Europe (EARN), Canada (Net-

North), Japan, and the Far East. It is a store-and-forward network used for electronic mail and file transfer. Membership is free and is open to degree-granting institutions, consortia of institutions of higher education, non-profit organizations serving higher education, and industrial, government, or commercial organizations with substantial links to higher education. Its usage must be consistent with the goal of facilitating the exchange of non-commercial information in support of education and research.

BITNET is based on the IBM remote spooling subsystem (RSCS), which VM uses as a file transfer system for handling spool files (such as printing). BITNET uses one of several IBM communications environments such as HASP, ASP, RES, VSE/POWER, JES2, JES3, NJE, NJI, or VM/370(VNET).

The physical network consists of dedicated four-wire leased phone lines run synchronously at 9600 baud connected to 37XX communications controllers on mainframes. The IBM BSC data link protocol is used.

There is a network backbone that passes files in a store-and-forward manner from host to host and ultimately, if necessary, to a terminal node (a leaf).

For example, Princeton's backbone connections are to Rutgers, CUNY, and the University of Pennsylvania; a VM-to-VM binary line driver in RSCS is used on this backbone to send and receive packets. The leaves connected to Princeton include EDUCOM and the Institute for Advanced Study, which use VAX's running JNET, a program that accepts the RSCS protocol.

The Houston attached support processor (HASP) remote job entry protocol is one of those supported through an RSCS network job entry (NJE) line driver. This means that Data General computers can join directly to BITNET by running the HASP package (\$2,500 from Data General) using an ISC2 synchronous communications board (\$4,250 from Data General).

One of the Data General computers on BITNET is an MV/10000 at the University

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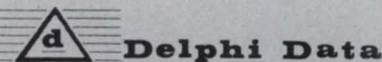


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of Utrecht in the Netherlands. It is connected via EARN, the European partner of BITNET. The users hope to work on a JNET package to improve their capabilities, and would like Data General's support for such a product.

BITNET connects to a number of other networks including ARPANET, CSNET, UUCP, MAILNET (EDUCOM's mail system), Great Britain's Joint Academic Network (JANET), and IBM's internal communications network (VNET). An NSF supported study is presently investigating how to migrate BITNET over to the TCP/IP protocols, to add remote log-on capability and generally improve network functionality.

Once a site has received approval to become a BITNET site, it must obtain appropriate RSCS-compatible software and hardware. The new site must obtain a leased line to an existing BITNET site, provide 9600 baud modems for both ends, and provide for connection to another new site. Further information about BITNET can be obtained from EDUCOM at 609/734-1878.

Summary

It is clear that TCP/IP will be a dominant standard in large networks, and Data General's implementation is encouraging. However, DG needs to keep developing the product's capabilities until we see SMTP and even XODIAC-like features included in its TCP/IP.

BITNET is continually growing to serve the needs of the academic community. I would like to see expanded support from Data General for its nodes on BITNET to provide more robust capabilities.

Networks seem a lot clearer to me now that I have gone through the process of writing this article. The field is expanding rapidly and we are bound to see new standards emerging along with new national networks of networks. Δ

Dr. Richard T. Kouzes is a research physicist at Princeton University, where he conducts research in nuclear physics and instrumentation. He is a member of the IEEE Technical Committee on Computer Applications in Nuclear and Plasma Sciences. He may be reached at Princeton University, Department of Physics, Jadwin Hall, P.O. Box 708, Princeton, NJ 08544; 609/452-4425—or at 0457523@PUCC on BITNET.

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Essex Computer Service, Inc.	25	20	THE SIERRA GROUP	56	45
FEDSIG	59	-	TRI-DATA Services Inc.	25	46
Freedom Software, Inc.	54	21	WordPerfect Corporation	3	47
Hanson Data Systems, Inc.	45	22	Xrytin Xolutions, Inc.	52	48

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MEMBER ANNOUNCEMENTS

Calling all FEDS: newly formed NADGUG Federal Special Interest Group (FEDSIG) open for membership, seeking U.S. Government and contractor employees who work with Data General computers. Organization's intent is to review new DG products applicable to federal marketplace, disseminate information about public domain software, and keep abreast of changing government procurement policies. Will be geared to real-time oriented contingent as well as business/office professionals. Annual dues of \$25 include monthly newsletter (the FEDRAG), membership directory, and coffee cup with FEDSIG logo. Send inquiries to FEDSIG membership, c/o Fred Rea, Interfacers, 4400 East-West Hwy., Suite 30, Bethesda, MD 20814.

MEMBER ADS

Member notices are a great way to reach the DG user community concerning new interest groups, seminars, problems, or any other non-commercial subject. Catch readers' attention while their feet are up!

These member-to-member notices are a free service to anyone who joins NADGUG.

If you or your organization would like to communicate with NADGUG members through Focus Magazine, contact Sharon Park, sales manager, at 512/345-5316.

NADGUG got a nice pat on the back in the October/November issue of *Association and Society Manager*, a magazine for people who run membership organizations. An article about the "growing phenomenon" of computer user groups cited NADGUG, and said: "The organization has more than 2,000 members nationwide, publishes a slick magazine, and holds a well-attended annual four-day national convention." Not to quibble, but the membership is well over 2,000, and includes members from Canada and Mexico, and countries in Europe, Asia, and Africa.

When CADGUG, the Chicago area RIG, held its annual meeting in mid-September, users attended from as far away as Lima, Ohio. The featured speaker was Brian Johnson, a noted *Focus* columnist, technical guru and storyteller. The door prize was a copy of :PERFMGR, B.J.'s performance monitor. Consolation prizes included an assortment of bottled beverages.

Not to be outdone, CODGUG, the Denver area RIG, held its premier meeting at the offices of DG's technical systems division. It was a show in three acts: RIG business, a presentation ("Sex, Drugs, and SQL Data Base Management," by Cybertek's David Piper), and workshops focused on individual interests.

The Federal Special Interest Group that got organized at Conference 86 has embarked on a membership drive. Yearly dues of \$25 cover the monthly newsletter (*FEDSIG RAG*, or as some Navy members call it, *NADGUG-FEDSIGRAG*), a twice yearly membership directory, and a coffee mug with the FEDSIG logo. For more information, check the member ad on page 59.

Data General's European MIS organization will be installing Cognos Corporation's PowerHouse fourth generation language in 26 regional and national MIS centers, including five major development centers and several production centers. According to Peter Herbert, DG's European MIS manager, "PowerHouse will be used to develop several new systems, and for add-ons to some existing applications."

DG shared its booth at the American

Banking Association's annual convention in San Francisco with four vendors whose products can be integrated with CEO. According to Mike Parise, DG's manager of marketing for the financial industry, "Our demonstrations show how departmental computing can meet the requirements of bank departments and branch offices." Showcased products were:

- Recovery 1, from Source Data, designed to track and collect loans that have been charged off.

- Applications from National Investor Data Services (NIDS) for mutual funds servicing, including portfolio management, accounting and information management, and shareholder servicing.

- Stock quotation service software for investment services from Track Data.

- PowerHouse, the fourth generation language from Cognos Corporation.

- DG/DBUS, DG's new conversion software to allow applications written in Datapoint's Databus language to run on DG machines.

To clear up longstanding confusion over their name, MICOM Computer Systems has become MAXON Computer Systems Incorporated. The change was timed to coincide with the firm's initial public stock offering on the Toronto Exchange, October 28. Trading under the symbol MXC.A, the offering sold out at the asking price of \$2.90 per share. The company says there will be no changes in its corporate direction.

MAXON also announced that they have acquired exclusive North American rights to market B32, a 32-bit implementation of Business BASIC that is said to offer higher performance than DG's BBASIC. MAXON also markets a complete line of accounting software for Data General computers.

Worlco Data Systems bounced back from its near-disastrous fire in 1984 (see the July issue, page 9), to post a much-improved financial report for 1986. Data center revenues rose 85 percent, while sales of turnkey systems were 50 percent higher. After sustaining a \$3 million loss in fiscal 1985, the net profit for 1986 was \$445,849.

Oracle Systems Corporation's first quarter financials showed a revenue gain of 149 percent, to \$17.6 million; net income was

up 14 percent to \$127,000. Noting that in eight of the past nine years the company had shown first quarter losses, CEO Larry Ellison called it an outstanding beginning to fiscal 1987.

Computer Associates International also reported good financials for its second quarter. Revenue was up 51 percent to \$63.6 million, and net income climbed 105 percent to \$6.5 million (\$.26 per share).

AOS/VS User Training, the most popular technical seminar from DG Educational Services, is going out on the road. Users can catch it in Bellevue, Washington, on December 1-5, and in Houston, Texas, on December 8-12. Tuition is \$1,125.

Independent support for DG's claim to leadership in support for communications standards came from the October 8 issue of *Computerworld*: "DG appears to be the most open of the three vendors. Its Xodiac reportedly fully supports the OSI model. Its DG/SNA communications software is compatible with IBM's SNA, and DG offers XTS/SNA to allow Xodiac and XTS/SNA nodes to talk to each other."

Daniel Systems, Inc. recently installed its Columbia system for two aviation firms in Canada. Columbia is a set of four RDOS or AOS modules to handle maintenance, spares inventory, flight operations, and passenger reservations. In Saint Hubert, it is running on a Desktop model 20 to track Pratt and Whitney of Canada's maintenance and spares inventory for testbed aircraft, developmental engines, and corporate aircraft. Air Bras D'Or, a commuter airline in Nova Scotia, is using Columbia on a model 20 to monitor maintenance, inventory, and flight operations.

NCC, once known as the greatest computer show on earth, is trying for a come back. The 1987 National Computer Conference is scheduled for Chicago's McCormick Place next June 15-18. The sponsors are promoting the show with an educational program featuring 10 tracks: systems software and languages; information technology management; personal computing; workplace applications; computer design and supercomputers; hardware directions; networking and connectivity; security, privacy, and law; educational and human resources; and artificial intelligence.

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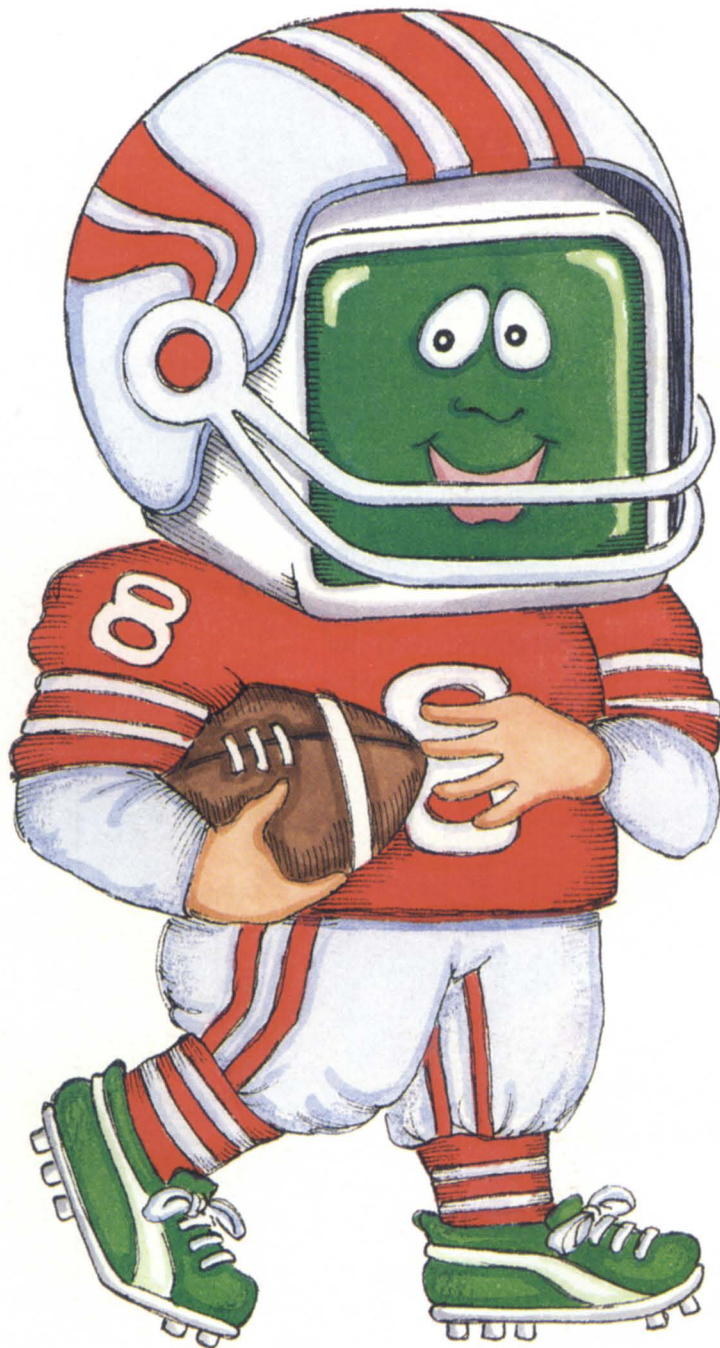


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