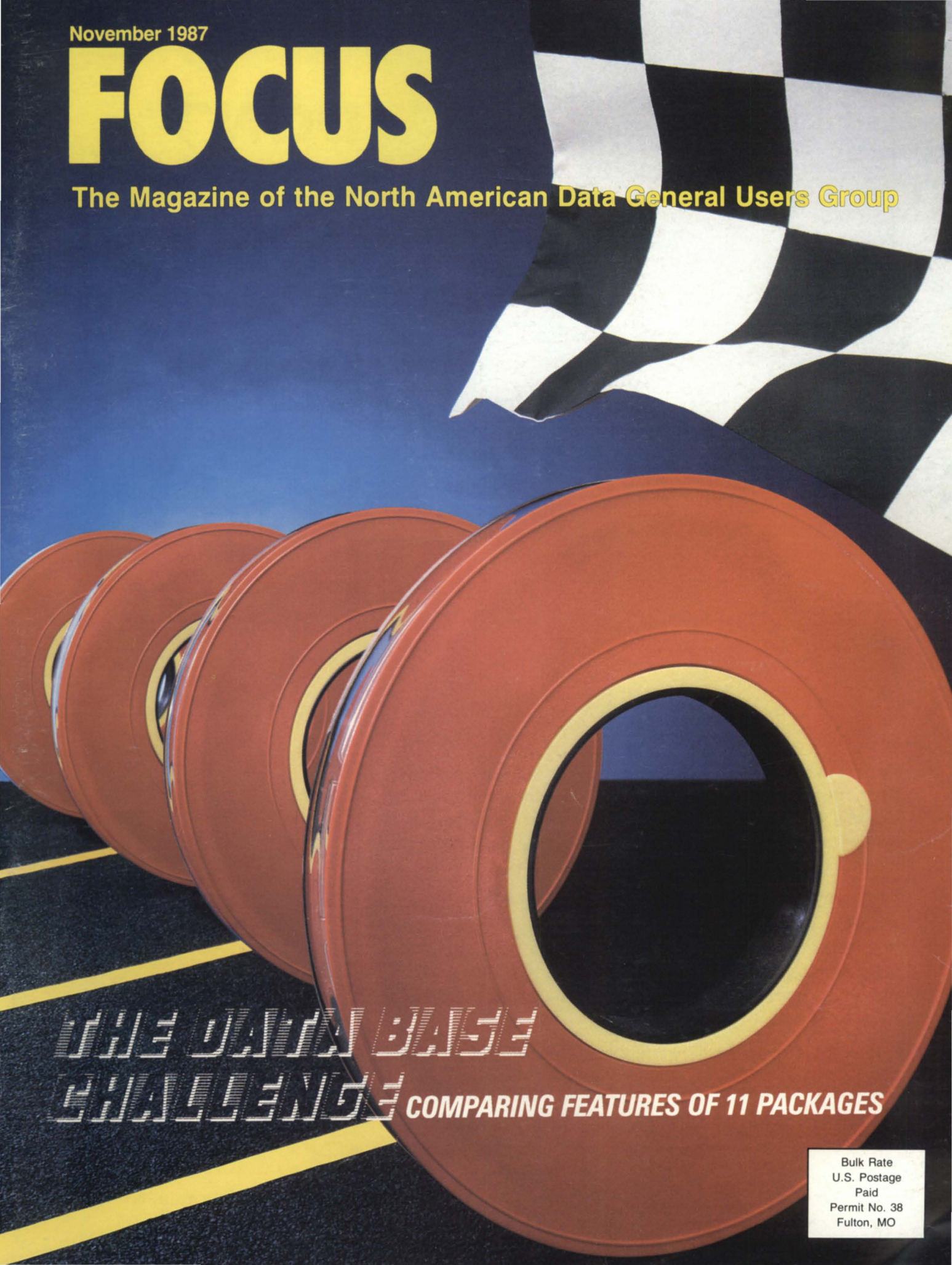
November 1987

FOCUS

The Magazine of the North American Data General Users Group



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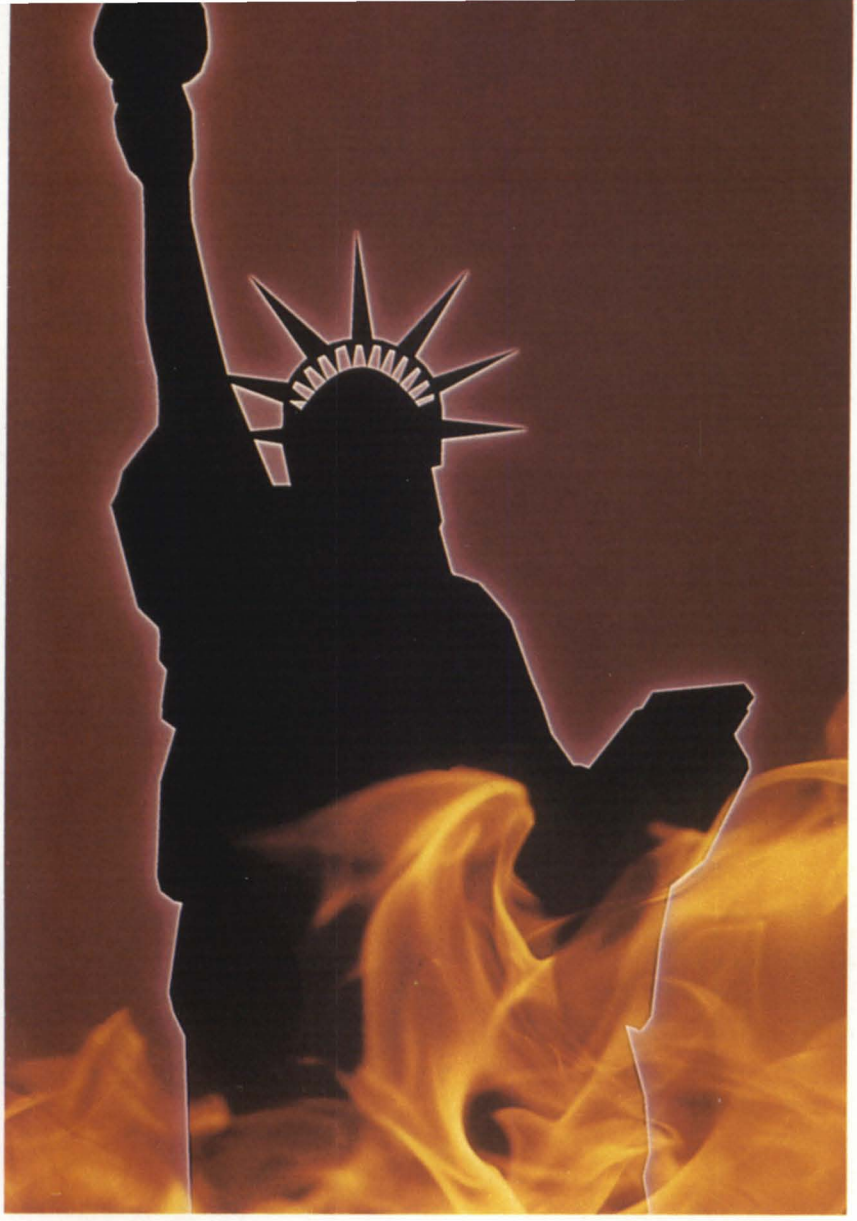

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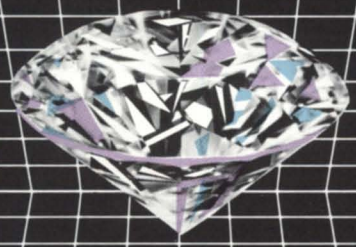

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GREAT IDEAS BEGIN HERE . . . AND NOW

Next year's conference is only a year away

by Calvin Durden
NADGUG President

Some of you may have a little trouble taking this seriously. I can appreciate that. After all, Conference 87 isn't even over yet, and I'm already trying to start you thinking about next year's NADGUG conference.

Well, why not? If you made it to Las Vegas, you probably realize that it will soon be time to start planning to renew acquaintances and make new friends next year in Philadelphia. And if you didn't manage to make it to Conference 87, you may have to spend the next 11 months helping your boss to understand what a valuable resource the annual meetings are. Where our conferences are concerned, there's no such thing as too much planning.

It wasn't that long ago that things were different. NADGUG's planning was so laissez-faire until a few years ago that we could never count on getting the hotel dates or rates we wanted. 1981 may have been a turning point: that was the year we had to book the conference into Chicago in the dead of winter. Since then, most of the members of the NADGUG board have become firm believers in the value of conference planning.

In any case, it's time for you to begin your own planning to attend next year's conference. If you're reading this while in Las Vegas for Conference 87, please take a few moments to come by and pick up some information at the NADGUG/*Focus* booth in the exhibit hall. And be sure to watch upcoming issues of *Focus* for more details. The call for papers will be ready by the time you read this, and you should expect to get a promotional mailing in the not-too-distant future. Who knows, maybe you'll have a great idea for a presentation next year.

Incidentally, next year's meeting will not be called Conference 88. The three-year-old tradition of naming our conferences by year came about by default rather than by design, and I doubt that many will miss it. Next year we'll have a name that's ready-made for Philadelphia during the 201st year of the U.S. Constitution: "Great ideas begin here."

Make that "here and now." To take advantage of those great ideas in Philadelphia, you have to start planning now. Put it on your calendar: August 29 through September 1, 1988. I'll see you there.

■

This is my last "President's Page" message. Next month, NADGUG's new president, Joyce Carter will take over, and I know she has at least two years' worth of ideas for these columns.

Joyce got involved with NADGUG while she was representing the Mid-Plains Users Group (the Omaha regional interest group), and then moved on to chair the RIG/SIG committee before being elected vice president two years ago. Among Joyce's other qualities, she enjoys a good party. In fact, she single-handedly dispelled a lot of stereotypes about Nebraskans the night she danced Frank Keaney under the table. (Keaney is DG's vice president for North American Sales.) I think it would be fair to say that her term in office will be a lively one.

As for me, I'm looking forward to being NADGUG's past president. They'll keep me busy on the planning committee, and there are still a few projects I'd like to see through to completion. But it will be nice not to have the *Focus* editor calling to pester me about when my column will be ready. Δ

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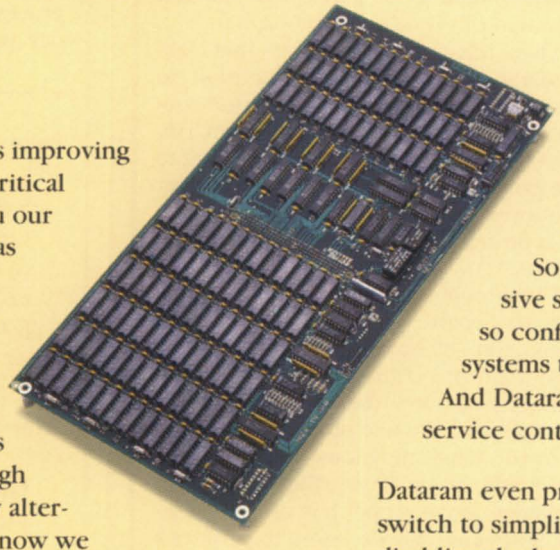

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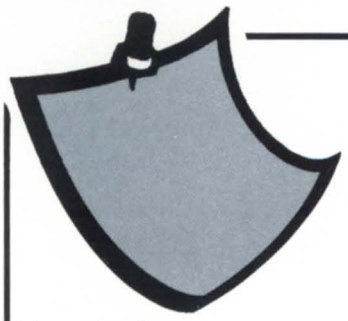

Board talk

Recently, much of the volleying on the Rational Data Systems' bulletin board has been *about* bulletin boards, not just the RDS board, but Data General's On-line Information Services (OIS) and other overall improvements.

This repartee has brought to attention some points that should be resolved at Conference 87; however, some of the systems' problems cannot be settled with a vote. Foremost is the low ratio of NADGUG members who use the BBS at all. Dave Appel suggested that the RDS board does not advertise or get enough editorial coverage. Also, the bulletin board telephone number printed in *Focus* is small and hard to find.

The number is listed each month in the on-line help box, which usually appears on the table of contents page. *Focus* printed an article in the November 1985 issue about the RDS board and another article in February 1987 about OIS. However, NADGUG's membership has doubled in the past two years, so many of those people didn't receive those issues, and they probably don't know about the availability of the bulletin board systems. As Tim Boyer said, "A good 75 percent of the people who call me for advice have never heard of [the NADGUG bulletin board]. Myself, I go into withdrawal if I don't check in every couple of days."

Other suggestions were made for improving both systems to make them more appealing to users. One recommendation was to offer people the opportunity to upload or download files. Doug Kaye, president of Rational Data Systems, plans on asking the Executive Board at their meeting in Las Vegas to fund a multiline, MS-DOS-based bulletin board that would upload and download files, support 2400 baud, etc. According to his messages, "We would start with two lines, one of which could be used for file transfers. The total cost to NADGUG would be about $2,500 for hardware and software, plus about $20 a month for the phone lines."

As far as advertisement, it was suggested that NADGUG perhaps pay for a small ad in a publication. Others discussed the ethics of advertising the RDS board on the OIS system, which brings up the point that RDS and OIS aren't exactly kissing cousins. Or as Jim Siegman put it, RDS is "the orphan."

There have been complaints that Data General views RDS as competition to OIS, and would probably not fund any RDS projects. As one message from Tim Boyer said, "I think we're just getting to the point where DG doesn't see the user group as a mortal enemy, and I'd just as soon not do anything to change their minds."

Unfortunately, according to users of the RDS board, an admittedly slanted view, the OIS board has its problems. The main objections, according to Lon Culbertson, are the hourly connect charges and the use of Compuserve.

Until some decisions and changes are made, users have other options to consider. Dave Appel has offered Master Software's BBS for users to post and share files. The number is 317/842-7728, but he requests that users not call until after 7 p.m. central time. He has 1200, 2400, and 9600 baud capability, but you need a U.S. Robotics Courier HST modem to use 9600 baud. You can upload with XMODEM or YMODEM.

(Also in this issue, Brian Johnson has made the :SYSMGR BBS available at no charge to DG users. Details are on pages 72 and 92.)

Additionally, on the RDS board, there was a request from Margrit McIntosh for an AOS/VS bulletin board. Her message reads: "Does anyone have a public bulletin board on a DG system like NETNEWS on Unix? We have about 4,000 CEO users, some of whom also use Unix, and they are wondering if there could be a similar bulletin board accessed through CEO. Does anyone know of any existing systems, or have any hints or suggestions?"

The bulletin board is an important issue for NADGUG, and the more ideas and input, the better. Anyone with suggestions, feel free to contact Greg Farman, the *Focus* editor, at 5332 Thunder Creek Road, Suite 105, Austin, Texas 78759, or call 512/345-5316.

And one more time, the RDS number is 415/924-3652. To get an OIS ID and password, contact a DG field engineering telemarketing representative at 800/325-3065. In Massachusetts call 800/952-4300, and in Canada call 416/823-7830. Δ

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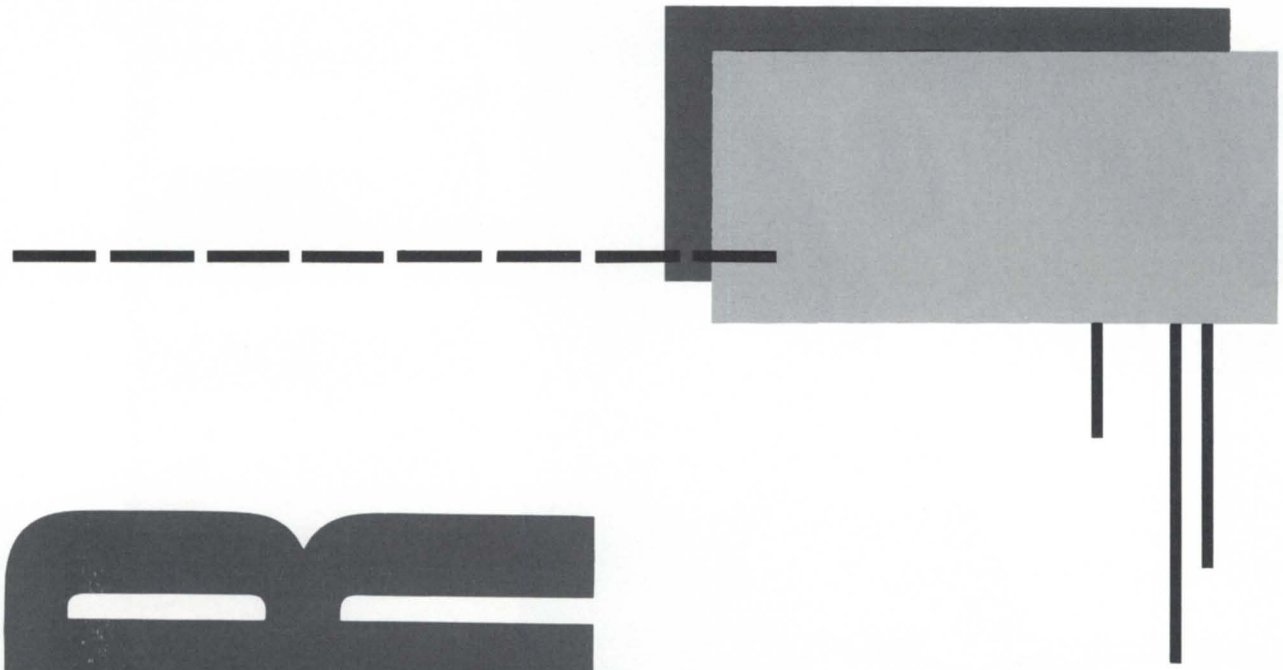

ROSTER

NADGUG roster

Here is the current roster of the North American Data General Users Group's Executive Board, and of all regional interest groups, special interest groups, and international groups.

If you would like to join a particular group, notify the person listed as the contact. If you do not see a regional group in your area or a special interest group that would serve you, notify the NADGUG staff in Westboro (617/898-4067) about your interest in seeing a new group start up. If you are aware of any changes or updates that should be made to the list of contacts, please notify the NADGUG staff.

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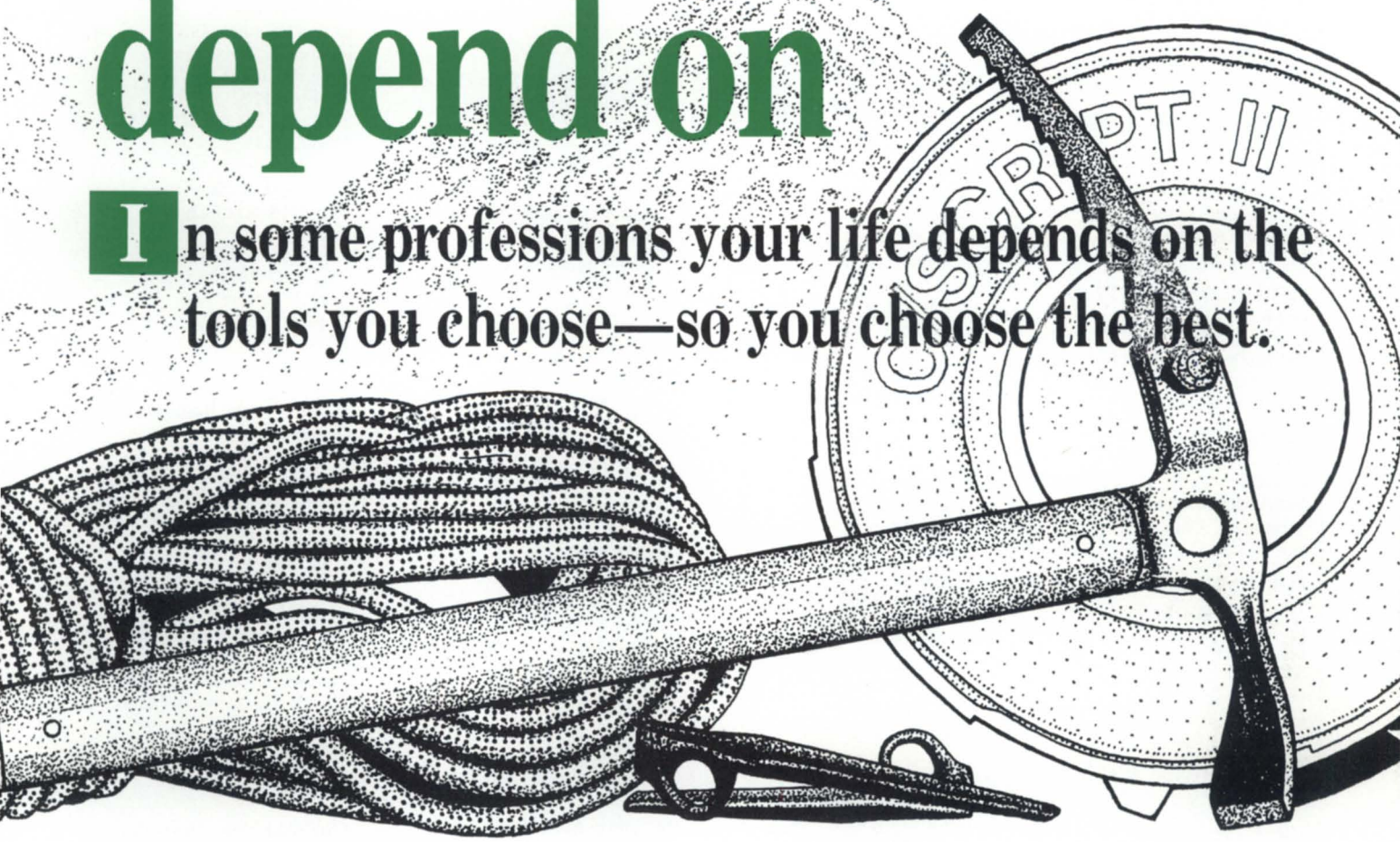

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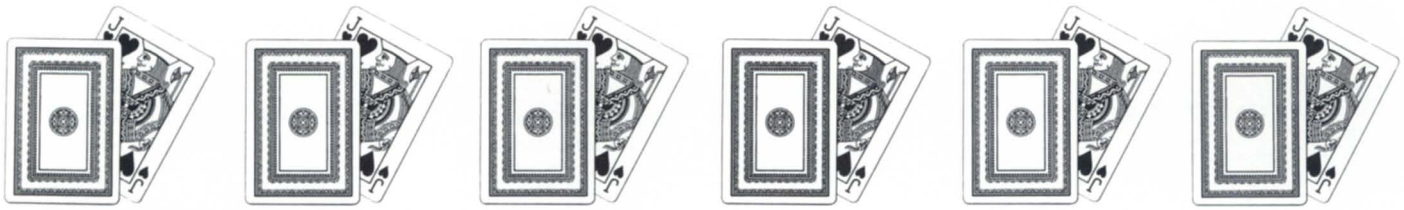
HOW TO WIN AT BLACKJACK



It's worth a gamble

by Kim L. Medlin
Special to Focus

Editor's note: This article is quite different from anything Focus would usually print. It barely mentions Data General systems, and the techniques it describes are not what you would expect to hear DG users talking about over coffee. However, the subject matter seemed appropriate for the issue of Focus that is going to Las Vegas for NADGUG's Conference 87—especially since the author developed the blackjack simulation that will be running at the NADGUG booth in the exhibit hall. (Medlin says he's willing to arrange for users to get a copy of the program for their own research purposes.) We hope this article will help readers win—or at least avoid losing—enough that they will be able to afford to make the trip to next year's conference in Philadelphia.

As much fun as gambling can be, there are two major problems with it: it costs money to play, and the odds are stacked in favor of the house.

Except in blackjack. You can win money playing blackjack. And I'm going to tell you how.

On my first trip to Las Vegas, I noticed that most games required very little input from the player. The lemons and oranges decided my fate with slot machines, the spinning wheel and rolling ball did the same in roulette, animals decided the winner in dog and horse races. I wanted to be in control of whether I won or lost money.

Then I saw the blackjack tables, where players make their own decisions, which directly influence the outcome of the game.

Although blackjack has existed for hundreds of years, it wasn't until the 1960s that the computer revolution made exhaustive studies of the game possible. From this research, it was determined that the house could be beaten legitimately. However, the research was inconclusive. This article will bring the research data full circle. (My research was accomplished on an MV/10000 with a program called BJ that consists of more than 6,000 lines of VS/COBOL, PL/1, C, and assembly code.)

As I explore blackjack concepts, I am assuming you are familiar with the basic rules of the game. If you're not, please refer to Figure 1.

Let's start with some background principles. The dealer's up-card is *the most important card on the table.* Why? Consider the composition of a deck of cards. About 62 percent of the cards have a value of 7 or greater (7, 8, 9, 10, jack, queen, king, ace). To illustrate the importance of the up-card, consider the following two examples:

- The dealer has a 10 as an up-card. There is a 62 percent chance the hole card also has a high value, thus the dealer has a strong hand. In general, a dealer with a high-valued up-card usually has a strong position.
- On the other hand, if the dealer's up-card has a low value, like a 6, the odds are that the hole card will still be high. If the hole card is a 10, the dealer is forced to hit again, and he'll probably bust. All players who haven't already busted automatically win the hand. Every play you make is directly influenced by the dealer's up-card.

The house advantage

If the dealer and player both use the same deck, why does the house have an advantage—especially when the player has options like doubling down and splitting pairs, and the dealer doesn't? The key is in how the dealer controls the game. For example,

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if you bust on your hand and then the dealer busts on his hand, you and the dealer have tied, right? Wrong. Because you were "allowed" to play first, the dealer took your bet when you busted. Even though you both busted, you lost the hand.

Strategies of blackjack

There are three major areas of strategy in blackjack: strategies that determine your play of cards, strategies that determine the size of your bet, and strategies for counting cards. (Don't get scared. Card counting isn't as complex as you probably think it is. I'll cover it in more detail a little later.)

Strategies that determine your play of cards

1. **Intuition**—If you feel lucky, play a slot machine with a jackpot of a few million dollars. The most you can lose is a few dollars. When you are at the blackjack table, depend only on a winning strategy, not intuition.
2. **Never go bust**—In an attempt to thwart the house advantage, some players never hit a count of 12 or more. This strategy is extremely inefficient and is a consistent loser.
3. **Mimic the dealer**—Other people try to mimic the dealer's actions. This is better than "never bust," but it's still monetary suicide.
4. **Basic strategy**—Developed in the early 1960s, the basic strategy unquestionably gives you the optimum play by taking all guesswork out of the game. It can be learned in an hour or two by memorizing the table in Figure 2. This basic strategy makes blackjack essentially an even game between house and player, but that's not good enough! I don't want to play the dealer even. I want to win. This basic strategy is the cornerstone of my overall strategy, but it must be augmented in order to profit.

Strategies that determine the size of your bet

1. **Intuition**—See #1 above.
2. **Flat bets**—When every bet you make is equal, you are making flat bets. Flat bets lose in the long run, because our basic strategy gives the house a slight statistical advantage.
3. **Parlaying**—A parlay is when your next bet is equal to the previous bet plus its winnings. Parlaying amplifies the results of a strategy. Since our basic strategy gives the house a small advantage, parlaying weakens your position.
4. **Double your bet after consecutive losses**—This strategy involves making flat bets after each consecutive winning hand and doubling your bets after each consecutive loss. This strategy would work if no maximum bet limit was imposed at each table (now you know why there are maximum bet limits). This is a possible short-term success, but a guaranteed long-term failure.
5. **Raise bets when the deck is "rich"**—This profitable betting strategy involves a simple card-counting system. The counting system tells you

Figure 1: Blackjack rules summary

The object of the game is to obtain a total of points greater than the dealer's, but no more than 21. All players and the dealer are dealt two cards. One of the dealer's cards is face up (the upcard), the other face down (the hole card). The dealer works from left to right, giving each player an opportunity for a better hand. If the player busts (the card total is more than 21), the hand is automatically lost. After all players have taken their turns, the dealer takes a turn. The dealer must hit a point total of 16 or less and stand otherwise. If the dealer busts, all players who haven't already busted win their hands. All wins are paid even money, except for natural blackjacks, which are paid 3 to 2. A natural blackjack is when your first two cards are an ace and a card with a value of 10.

Card values—All cards have point values equal to the number on the card. Face cards count 10. The ace counts either 1 or 11 at the player's discretion. If your hand has an ace that is counted as 1, the hand is called "soft." Otherwise, it is "hard."

Hit—You take a hit when you signal the dealer to give you another card.

Stand—You stand when you are satisfied with your point total.

Double down—This option is available only on your first play after receiving your initial two cards. When you signal a double down, you double your bet, and the dealer will give you only one more card.

Split pairs—This option is available only on your first play after receiving your initial two cards. Your first two cards must have the same point value (e.g., two 3s or two 10s). When you split pairs, you double your bet and turn over and separate each card on the table. You then play each hand individually as if you were playing two hands.

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when the deck is "rich." The deck is rich when there are more high-value cards than low-value cards remaining in the deck. A rich deck favors the player because there will be more good hands (e.g., blackjacks and double downs) for you, and more bad hands (e.g., busts) for the dealer.

Figure 2: Basic strategy cheat sheet

	Stand		Double down		Split pairs
Dealer's up-cord	H	S	Hard	Soft	Always A&8
A	17	19			
F			11		
9			11		9
8		18	10		
7					2,3,7
6	12	19	11	13-18	2,3
5			10		6,7,9
4			9	15-18	
3	13			17-18	6,7,9
2		18	10 11		7,9

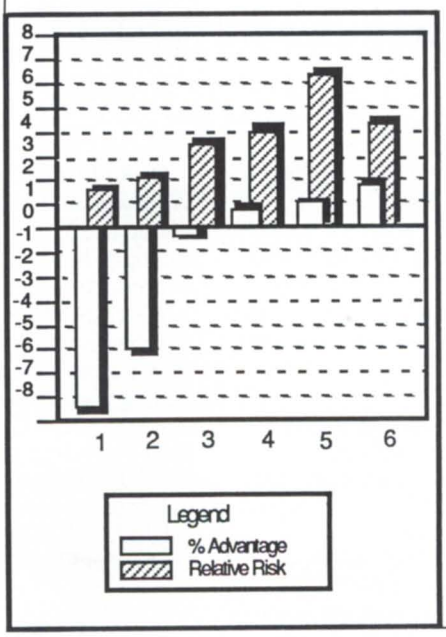
1. Find the entry in the left-most column that matches the dealer's up-card for a particular hand of blackjack.

2. **Split pairs**—You may split pairs only on your first play. Look in the right-most column on the row corresponding to the dealer's up-card entry to determine if you should split your pair. If you find the value of your pair, then split the hand. For example, if the dealer shows a 3 and you have a pair of 7s, split them. If the dealer shows a 9 and you have a pair of 7s, don't split them. Remember to always split aces and 8s.

3. **Double down**—You can double down only on your first play. Find the dealer's value in the left column. Follow that row to the double down column. If you have an ace in your hand, look under "soft," otherwise, look in the "hard" column. If the position you isolate has the value of your hand, then double down. For example, if the dealer has an 8, and you have a total of 10, then double down. If the dealer has a 4, and you have a total of 8, then don't.

4. **Hit/stand**—Find the dealer's value in the left column. Follow that row to the "stand" column. Look under the "H" or "S" column, depending on whether your hand is hard or soft. If your total is greater than the value you isolated, stand. Otherwise, hit.

Figure 3: Win/loss rate for blackjack strategies



Percent advantage—average win/loss rate for a particular strategy.

Relative risk—the amount of variance encountered for a particular strategy. For example, the "never bust" strategy loses money on average, and there is little chance of making money. On the other hand, the basic strategy with varying bets makes money, but with more fluctuations while playing. Blackjack is no different from the stock market: the higher the potential profit, the higher the risk.

Strategy/description

1. Never bust—Flat bets. Two decks.
2. Mimic the dealer—Flat bets. Two decks.
3. Basic strategy—Flat bets. Two decks.
4. Basic strategy—Vary bets with count as described in article. Four decks.
5. Basic strategy—Vary bets with count as described in article. Two decks.
6. Basic strategy—Vary bets with count as described in article. One deck.

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FOCUS ON: BLACKJACK

Strategy for counting cards

The purpose of counting cards is to know when the remaining pack is rich in 10s and aces. (A "pack" of cards is the one or more decks that the dealer uses during a game.) The most commonly accepted counting strategy assigns every card a numerical value, as listed below:

Rank of card	Card-counting value
2,3,4,5,6	+1
7,8,9	0
10,J,Q,K,Ace	-1

You keep a running count of the cards during the play of a pack of cards. As you see each card played, you adjust the running count. For example, before any cards are played, the running count is 0. Suppose the first card played is a 4. The running count becomes +1. The next card is a 6. The running count becomes +2. The next card is an 8. The count remains +2. The next three cards are kings. The running count is now -1.

Don't use the running count to vary your bets. Use the "true count." The true count is obtained by dividing the running count by the number of remaining decks in the pack (approximations will do). This division isn't hard to do if you're using only two decks, and is only slightly more difficult with four decks. For example, if the running count is +6, and there are about two decks left in the pack, the true count is 3. The higher the true count, the richer the pack is. Most people agree that bets should be raised when the true count is greater than about 2 or 3.

Putting it all together

Enough theory. What are the best strategies for you to use? That depends on how much time you're willing to spend to learn the techniques. If you're willing to spend one or two hours, then memorize the basic strategy table in Figure 2. If you're willing to practice the counting technique and concentrate while playing, you can use the basic strategy and increase your bets when the deck is rich.

What kind of results can you expect?. Basic strategy alone plays the house about even. With increased bets when the deck is rich, you have an advantage of somewhere between .5 percent and 2 percent. (Figure 3 summarizes the major strategies discussed so far.) Your advantage varies depending on the following:

1. Your advantage over the house decreases as the number of decks in the pack increases. Also, your risk generally decreases as the number of decks increases.

2. When you count cards, your knowledge of the pack's remaining composition increases as the cards are played. It is to your advantage to choose dealers that play many cards between shuffling. And what about the best method of altering your bet with the count? This is an area of great debate, but here are some methods that work pretty well:

One deck
- One-unit bets when the true count is less than -1.
- Two-unit bets when the count is between -1 and 1.
- Four-unit bets when the count is more than 1. (A "unit" equals the minimum bet you will ever make.)

Two or four decks
- One-unit bets when count is less than 1. Otherwise, bet one more unit than the current count (e.g., when the count is 4, bet five units.)

Warning: Casinos don't like card counters. You must not act like you're counting cards, or they will tell you to stop playing. Therefore, you must act like a blackjack-ignorant tourist. Don't stack your chips neatly. Don't look like you're concentrating. Talk to the people around you. Act carefree. Play a maximum of 30 minutes at a table. Don't vary your bets too much. If you bet one unit 10 times in a row and then make a 10-unit bet, you will rouse attention.

So there you have it. Now you know more about winning blackjack techniques than many dealers do. Follow these instructions and you'll have the odds on your side. But don't forget, you'll need luck too. So . . . good luck!

P.S. If you are going to the NADGUG conference, it might be fun to get some feedback on how much money *Focus* readers won (or lost) playing blackjack. Just drop me a card and let me know how you did. Make sure you tell me what strategies you used, the size of your betting unit, and how much you played. Depending on the response, I'll publish the results in a future issue. Δ

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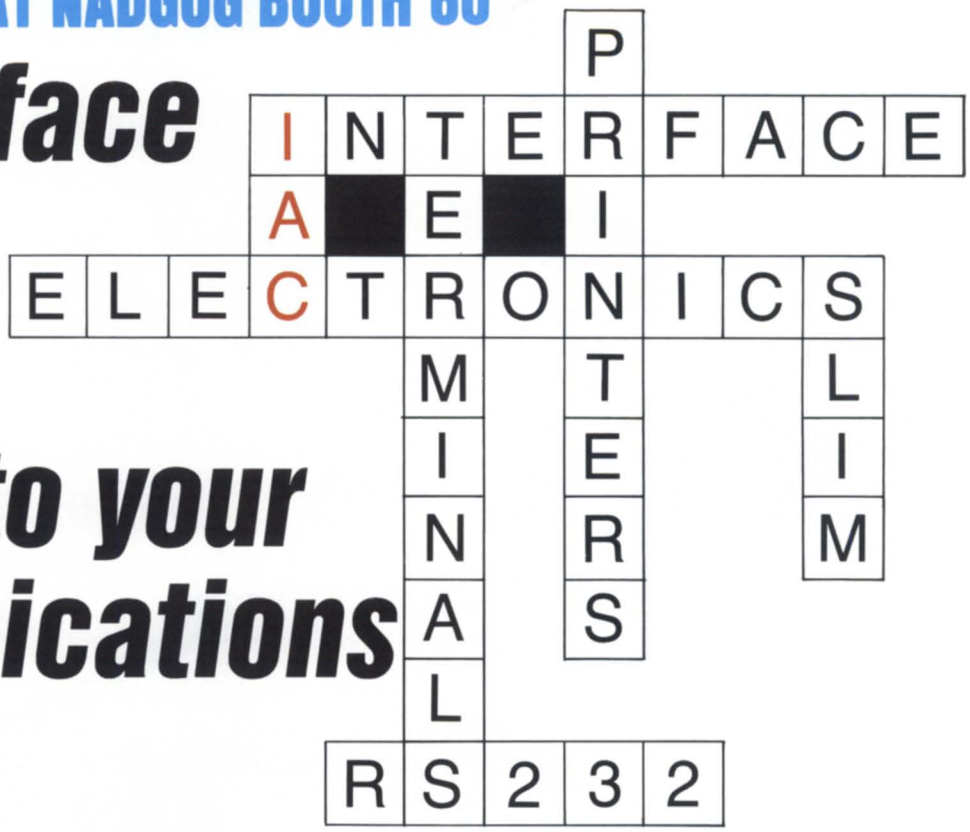

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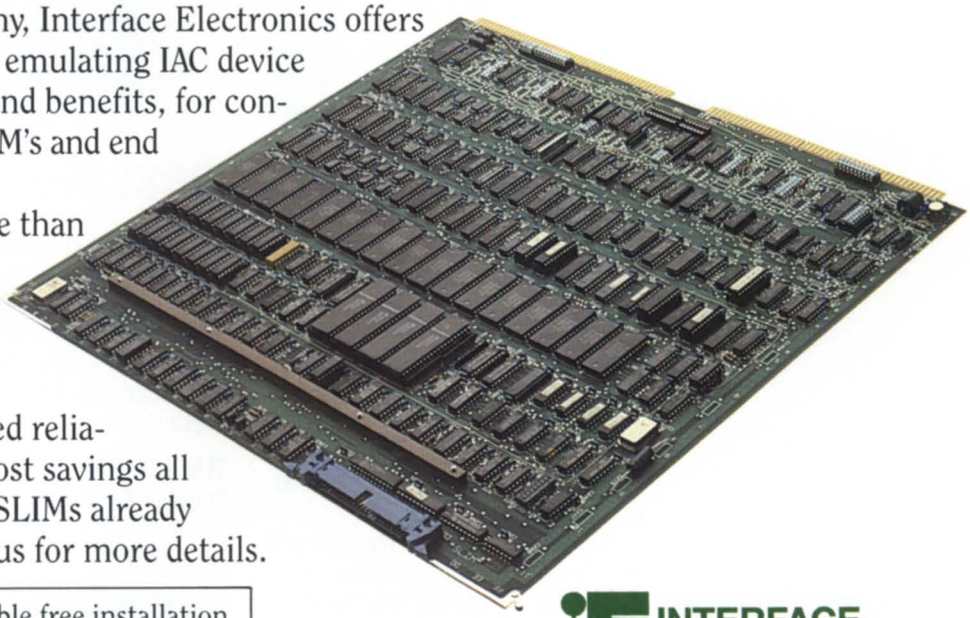

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THE EMERGENCE OF INFORMATION LAW

Strategies for limiting legal risks stemming from the competitive use of information technology

by Peter Marx
Special to Focus

The use of information systems to gain competitive advantage is a topic that generates intense interest among practitioners and researchers alike. Consider the following cases:

• To gain competitive advantages in the airline industry, American Airlines developed a computerized reservation system (CRS). American agreed to display the flight and fare information of other carriers on its CRS for a fee. The system was successful in increasing bookings and in generating additional profits (totaling approximately $100 million in 1985).

• American Hospital Supply Corp., now a subsidiary of Baxter Travenol Laboratories, Inc., dramatically increased its market share when it developed a computer-based order entry system. The system, called ASAP, enabled the firm to electronically link to its suppliers and customers—more than 100,000 health care providers. As a by-product of handling the orders, the company accumulated valuable competitive information on industry trends and customer needs. As a result, American Hospital Supply Corp. outmaneuvers its competitors, provides better consumer service, secures more favorable terms from its vendors because of volume buying, and more efficiently controls inventories. Consumers also like the system because they benefit from electronically placing orders directly to the company, eliminating unnecessary delays in order processing and merchandise delivery.

Competitive use of information technology is raising important new legal issues that merit the attention of CIOs and IS managers. This article explores the issues surrounding information technology used for competitive purposes—an area emerging as a field termed information law. It reviews the other side of commonly discussed IS "classics" and presents a series of legal questions based on current law and, in some cases, the absence of law. Finally, strategies are suggested to limit an organization's legal exposure to the risks of using information technology in a competitive arena.

The basis of information law

When information systems give a firm a strategic advantage, competitors are likely to look to the courts and regulatory agencies for intervention. Consider the predicament of American Airlines: Its successful development and use of a computerized reservation system has precipitated an ongoing legal dispute that could cost the firm more than $1 billion. At issue are the rights and obligations of CRS owners and users. Should the airline allow other airlines to access its system on equal terms (thus reducing competitive gains substantially), even though it developed the system properly using private corporate resources?

The suit will force the courts to address other fundamental questions:

• Does American Airlines' utilization of other carriers' fare, service, and booking information for competitive strategy development constitute unfair competition?

• Must all carriers have access to the same information on a timely basis?

• Can American Airlines legally program the system so that its flight information is given preference on the display screens in travel agent offices?

At stake is the basic definition of competition. The manner in which the courts eventually provide answers may alter current systems development strategies.

In addition, other areas of information law go beyond the *development* of computer-based systems and focus on the *reliance* of systems developed by others, as this example demonstrates:

Relying on information provided in a forecast from the National Weather Service, later proven to be inaccurate, eight fishermen in two 50-foot lobster boats left Hyannis, Massachusetts, for Georges Bank. While at sea, they met 100 mph gusts and 60-foot waves. Four crew members lost their lives. The families of the men filed suit against the government and recovered $1.25 million.

The federal government had negligently failed to repair an electronic data buoy that would have increased the accuracy of the forecast. Although the fishermen had not paid for the faulty forecast, they were induced to rely on it. Since weather prediction is an imprecise science, should the government have been held liable for this flawed information?

These examples demonstrate the widening scope of information law. Like other bodies of law, information law is composed of rules, principles, and policies developed by the courts, legislatures, and administrative agencies responsible for resolving disputes and guiding conduct.

However, the legal system has yet to generate a body of law that will resolve the legion of questions posed by the generation and use of information.

Legal risks for users

Legal standards that hold users of information and information systems responsible are likely to have a profound effect in business. Therefore, it is essential that the courts frame a definition that describes legal and illegal uses of information systems. Similarly, laws are needed to clearly delineate when and on what basis a user of inaccurate information will be held liable for undesirable results. There are at least four relevant legal areas (shown in Figure 1) that could influence the competitive use of information and its systems, including antitrust, product liability, negligent systems maintenance, and libel.

Figure 1: Potential legal risks of competitive information systems

Can information technology be deployed in such a way that:

• opponents charge unfair competition in violation of antitrust laws
• product liability results, even from using purchased data
• inadequate maintenance of data constitutes negligence
• inaccurate information is deemed libel?

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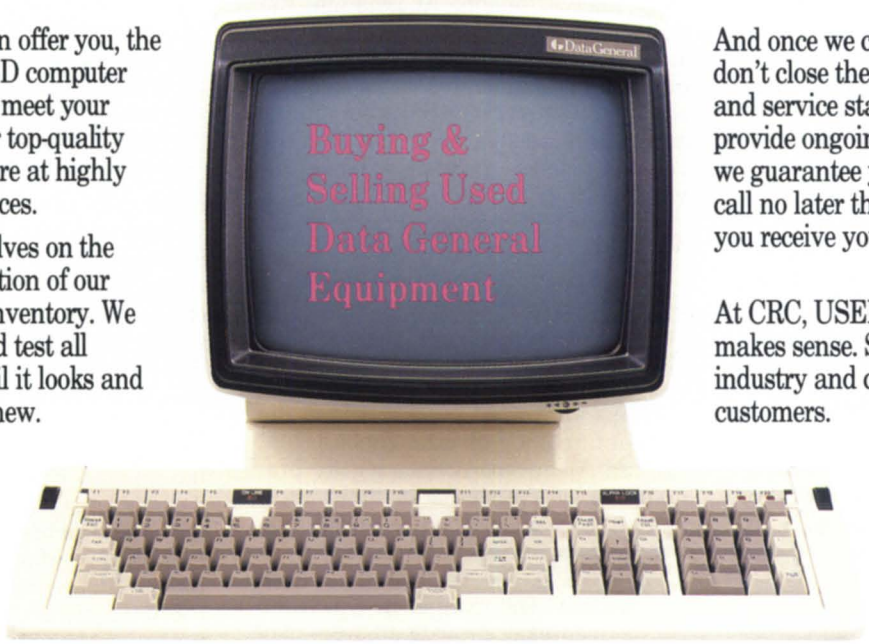

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Unfair competition and antitrust violation

Returning to the airline industry, two airline reservation systems dominate four others in the marketplace: American Airlines' Sabre systems and United Airlines' Apollo system. These, like all CRS systems, provide a vital network of information between the airline and travel agencies. Travel agents gain immediate access to the latest information on available services, fares, seats, and special services. And CRS owners (i.e., host carriers) have instantaneous knowledge of bookings as well as capacity. They can immediately notify agents of new competitive services and fares.

Because most travel agents have only one CRS, for which they pay the operator a sizable fee, these reservation systems are designed to provide on-line access to the flight information of other airlines for a fee. Otherwise, the reservation system would be of much less benefit to the travel agent. And because travel agents are an essential source of ticket sales, few airlines can forego the opportunity to make their information accessible through these systems.

After a flood of complaints from travel agents and airlines who do not operate their own reservation system, both the Civil Aeronautics Board (CAB) and the Justice Department's Antitrust Division conducted an investigation into the alleged misuses of CRS systems. Among accusations triggering the investigation were:

1. CRS vendors, particularly American and United Airlines, "biased" their primary displays (the first screen called up by the keyboard operator) to favor their own flight, even if they were not at the most convenient times.
2. CRS owners failed to load information concerning participating carriers in a timely fashion.
3. Airlines relying on the systems of major carriers were not given equal access to sales, marketing, and booking data generated by these systems. (Airlines having that information, it was argued, could unfairly gain an edge over user airlines by competitively adjusting fares and services.)

As a result of the investigation, CAB concluded the charges were well-founded and issued two rules prohibiting these practices and other unfair methods of competition. The legality of the rules was subsequently upheld by the U.S. Court of Appeals.

Although CAB's rules eliminated some practices, it did not resolve the dispute. Since then, 13 airlines lacking such systems initiated legal proceedings, seeking damages and injunctive and equitable relief. According to the variously filed complaints, both American and United Airlines:

- violated Sections 1 and 2 of the Sherman Antitrust Act by conspiring to monopolize the CRS industry
- abused their monopoly power in violation of Section 2 of the Sherman Act
- denied access to their respective systems on fair, reasonable, and nondiscriminatory terms.

Should American and United Airlines be found guilty of these and other charges, they may be required to pay trebled damages well in excess of $2 billion. They may even be forced to divest their systems or separate management of their CRS operations from their other corporate affairs.

Consider also the American Hospital Supply Corp. case. Suppose electronic information and order systems, like the ASAP, become the primary mode of distributing health care and other products. If one system, or even a small number of systems, become dominant—and in effect create a substantial entry barrier—the system itself might be classified as an "essential facility" (a legal term for a facility required for a firm to engage in commerce). Under such a ruling, the system owner might be compelled to give its competitors (other distributors or manufacturers) access to the systems on fair, reasonable, and nondiscriminatory terms. An acceptable definition of "fair and reasonable" will most likely depend on the facts of the particular case.

There is also concern among business and legal experts regarding the extent to which the Federal Trade Commission Act will be applied to those using information technologies for competitive advantage. Section 5 of this law prohibits unfair or deceptive practices as well as unfair methods of competition (i.e., deceptive sales approaches, price fixing, unfair arrangements between suppliers and distributors).

Section 411 of the Federal Aviation Act, modeled after Section 5 of the Federal Trade Commission Act, served as the legal basis for CAB's rules prohibiting CRS owners from biasing their systems. Biasing, CAB concluded, results in substantial injury to consumers.

On what basis will a practice be considered "unfair and deceptive?" In its ruling, CAB noted, ". . . we may consider public values beyond those enshrined in the letter or encompassed in the spirit of the antitrust laws. We may be guided as well by the pronouncements of public embodiment in other statutes, the common law, as well as common perceptions of what constitutes moral and ethical business conduct."

Product liability and negligent use of information as a corporate asset and competitive weapon

Corporations may not only be held liable for how they use information systems, but how they use (or misuse) information. And because information is an important corporate asset and competitive tool, managers cannot lightly consider their potential liability. Users of information may be held liable for using inaccurate information produced by others, misusing information, not ensuring that others understand how to use information, and using erroneous information where the user is responsible for the inaccuracy.

Liability for inaccurate information can be very costly. Consider the following case:

In late 1973, a World Airways aircraft crashed into an Alaskan mountain killing all six crew members. The cause was an instrument approach chart, produced by Jeppensen & Co., which graphically portrayed flawed information published by the Federal Aviation Administration (FAA). The families of the victims sued both the government and Jeppensen. They recovered nearly $13 million.

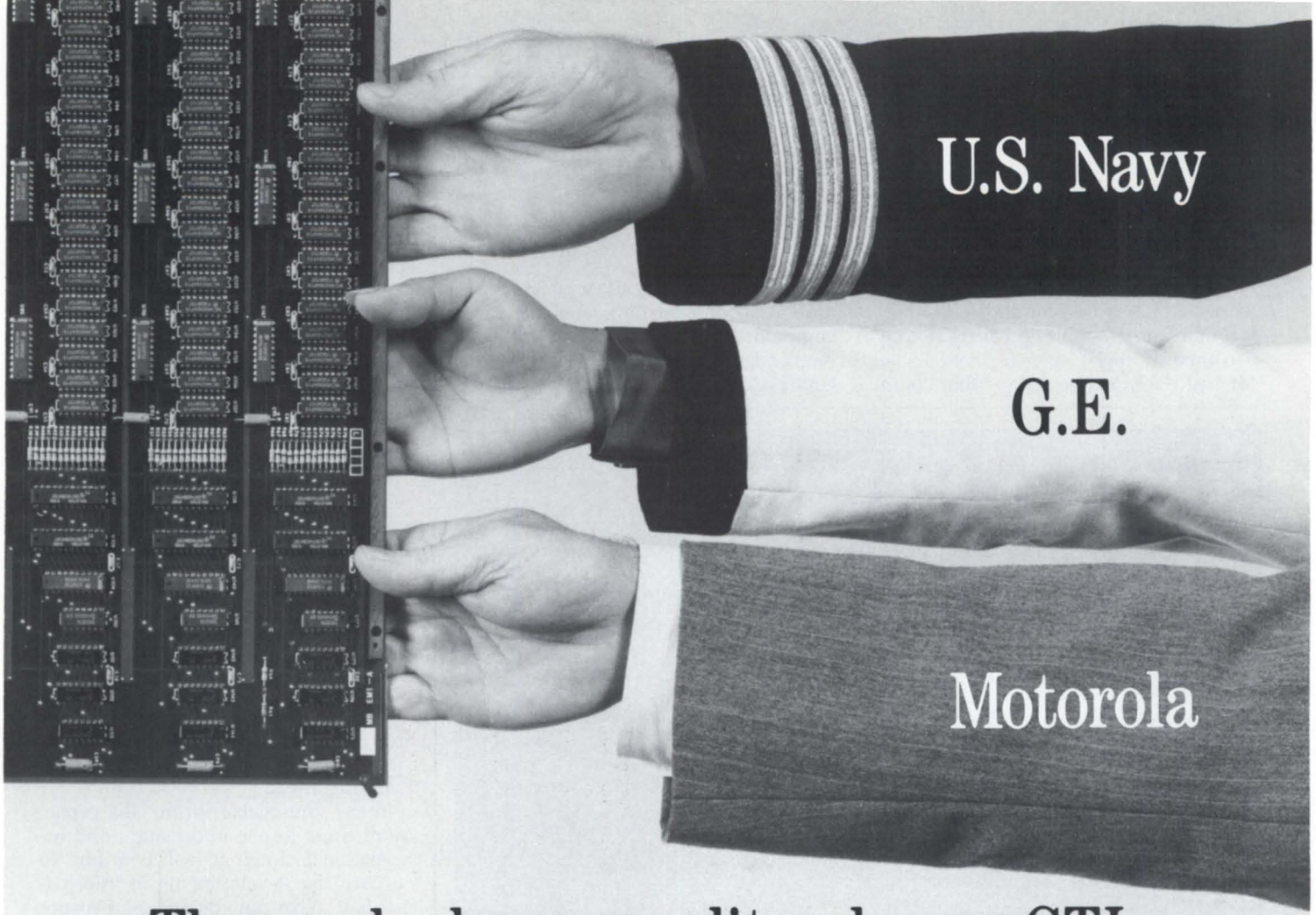
Although existing case law provides some insight into the possible basis and extent of potential liability for inaccurate information, many questions remain unanswered:

- Who may submit claims for damages suffered because of inaccurate information? The purchaser of the information or anyone who uses it?
- What duty does a corporate user of information have to independently verify its accuracy?
- When will information be classified as a service (where liability would be based on negligence) as it was in the National Weather Service case?
- When will information be classified as a "product," providing strict liability, when information is inaccurate regardless of fault, as it was in the Jeppensen cases?

Without case law or legislation that specifically addresses these questions point by point, answers will probably only be available on a case-by-case basis.

Negligent maintenance and use of information systems

Companies that use information systems to improve the decision-making process may at some point in the future be held liable for negligent maintenance and use of those systems. Suppose, for example, a company is alleged to maintain its information systems in a fashion whereby crucial information is either not properly communicated or never entered into the



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system. If actions (or inaction) taken by decision-makers are based on flawed information and result in injury, then a court may reason the company should be held liable on the basis of what it ought to have known. Further, as information systems become indispensable, it is not unreasonable to conclude that a company might even be held liable for bad decisions or actions that could have been avoided had the company installed an information system.

Libel standards for inaccurate information

For business persons who generate and pass information about critics, competitors, customers, and ex-employees, the recent U.S. Supreme Court case of *Dun & Bradstreet vs. Greenmoss Builders, Inc.* has added a new layer of unpredictability. In that case, involving an erroneous credit report on Greenmoss produced by Dun & Bradstreet, the court held:

- Speech will only be privileged (given special protection to promote vigorous debate) when it is of "public concern" (the court declined to clearly define this).
- When speech is not privileged, punitive damages may be awarded without a showing of actual malice.

This ruling has greatly complicated libel standards by leaving many questions unanswered. It also may result in increased liability for businesses.

The potential significance of these cases may be concisely stated: Use (or misuse) of information and information technologies may result in increased corporate liability. Given the dearth of case laws and statutes, however, one can only speculate the scope and degree of potential liability.

Planning ahead

In the foreseeable future, the capacity of firms to use information and information technology will continue to outpace the developments in information law. What can you and your corporation do to decrease your legal risks during this time of uncertainty? The following general actions are suggested:

- Be aware of potential legal risks resulting from your use of information and information systems; take the necessary steps to reduce or eliminate them. This process of assessing risks (such as who might be harmed, to what extent will they be harmed, and what are the cost consequences) and developing risk-reducing strategies should begin before introducing a new information service.
- Develop quality control standards for use of information and information systems. When developing internal standards (i.e., cross-checks and redundancies) it may be helpful, if not essential, to look to external sources.
- Where outside standards exist—and in many cases they may not—it is important to independently evaluate them: Are the standards merely suggested guidelines from a private body, or do they have the force of law? Does the standard-setting body have the strength and credibility to stand behind its standards? Don't assume that you may rely on outdated standards.
- When developing contractual relationships with customers, suppliers,

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and distributors, draft each contract to clearly and fairly allocate risks and responsibility.

• Develop controls over marketing, sales, and promotional activities. Controls are important, because a firm may be held liable for statements by sales personnel or advertisements (for example, those that can't be substantiated).

• If something does go wrong, it is important to have in place a plan of action. Firms should implement procedures, for example, to notify customers or third parties of errors and to recall faulty information-based products.

• Establish a reliable and complete system of record retention. Structure flow of information so the decision-making process is thoroughly documented. This way, should the firm be involved in a legal dispute, managers may better defend your chosen course of action.

• Reassess insurance coverage. Some traditional policies may not cover newer types of liability. If an insurance policy covers only service liability, and a judge regards an information service as a product, the firm may suffer grave consequences.

• Consult with legal counsel prospectively. Overall, such legal advice is most cost-effective. Due to the imprecision of legal rules, principles, and policies, however, don't expect "black and white" answers; aim for general legal guidelines.

Because law and society are intermixed, the development of information law will most likely reflect prevailing values. Therefore, when planning for the future, consider the many economic, political, and social implications of using information and information technologies. Although something may be lawful today, because the legal system has yet to react, it could be illegal tomorrow. Your challenge will be to plan accordingly. Users of information and information systems as competitive weapons are in the difficult position of having to develop business strategies for the 21st century within a 19th century legal system. Δ

Peter Marx is the chairman of The Marx Group in Wellesley, MA. He also serves as legal counsel to NADGUG.

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PERIPHERAL VISIONS

Providing the right printers for users takes planning—and luck

by Frank Perry
Special to Focus

The Rhode Island Department of Transportation (RIDOT) has had a computer system for the past 23 years, but it wasn't until 1980 that we moved from a small system used to support our engineering operations to a large-scale transaction processing system for motor vehicle registrations.

This was our introduction both to Data General and to the "real world" of data processing. Prior to this, the only peripherals we had to worry about were a card reader and a simple line printer. The engineers had always been content to fill out forms and get back large, green-striped listings, as long as they didn't have to do those long tedious calculations by hand.

Then we got into general data processing. Suddenly, we were printing for 80 or more hours per week. Our first big print job actually took three weeks—six days a week, 18 hours a day. It was time to start thinking about line printers and special forms. Instead of two types of paper, we now had three sizes that came in one, two, four, and six parts, as well as special forms.

Now we have four MV systems in our shop, with more than 300 terminals of various types, 100 printers, four large line printers, and a few special application devices. To give you an idea of how quickly our needs have grown and changed, consider the following:

- Our motor vehicle registration system has eight remote locations, and processes 125,000 on-line transactions per month. It also processes another 100,000 batch transactions per month and handles 60,000 remote inquiries from police departments across the country. This system has a data base consisting of 1.5 to 2 million 256-byte records.
- We are in the process of installing a driver's license and records system that will approximate the size of the motor vehicle system.
- We provide office automation applications (mostly word processing and spreadsheet) to the 1,350 employees in the department. We also have a series of specially tailored programs for many of the general applications found in a governmental agency.
- We still support the technical applications of our planning, design, and engineering staff. This includes everything from geometry calculations, quantity calculations, and estimations to air quality analysis and noise analysis for the airport.
- Our applications development staff includes 12 programmers who support program development in a variety of languages, as well as testing, documentation, and backup.

Looking back on the last seven years of dramatic growth, I can assure you that if there was a mistake to be made, we probably made it. Our approach to growth was somewhat conservative, because we weren't in a position to be trailblazers. Even so, I often felt the sharp point of that "leading edge."

In our agency, we operate on a fiscal year basis, with the preparation of the next year's budget beginning at the start of the current year. This calls for a bit of crystal-balling, and I have yet to get it right. It seems that every item I put into next year's budget needs to be done this year.

Our conservative approach led us to use a single vendor, buying all of our hardware and maintenance from DG. This worked well for the first few years, but then we found ourselves making our needs fit the available hardware. We also became a *little* more sophisticated as users, noticing some of the gaps in our needs and finding ways to fill them.

Therefore, we had to learn about attaching peripheral devices to our DG systems and making them work. First, we noticed that some of our equipment was expensive to run. Then we realized that, although the equipment was very good, we were misusing it, specifically underusing it. Case in point: When we started, we installed DG TP-2 printers in our motor vehicle locations for printing registration certificates. These worked very well, but printing 300 lines per hour, eight hours per day, isn't much of a workload, and the maintenance cost began to outstrip their value to us.

When small printers capable of doing the same job became available in the $300 price range, it was time to switch. These printers cost less than the annual cost of maintaining the older ones.

This illustrates how important it is to search the market for equipment that meets your needs the least expensive way. You have to consider all the costs, not just capital cost. These new printers are so economical that I can replace them on an annual basis and still spend less than with the old system. As a matter of fact, we aren't putting them on a maintenance contract; instead, we stock a few spares as another cost-cutting measure.

We now use this approach for all of our peripheral purchases, but it is going to take us a while before we can overcome all of our previous bad starts.

Since we aren't particularly sophisticated when it comes to hardware, compatibility is a big issue. When we got our first bunch of small printers, they wouldn't work. They needed an additional board in order to use the XON/XOFF protocol. Although the problem was resolved at a minor cost, the delay in installing them was substantial, as was the troubleshooting involved.

DG doesn't make most of their peripherals, but instead buys them from other manufacturers, sometimes with custom modifications. Buying directly from the manufacturers can save you money, but you have to make sure the products will work. We now always try to buy one unit to make sure it will work before we commit to a big purchase order—or even better, we get an on-site demo.

Meeting users' needs is crucial. We developed an OCR application to reduce

our data entry needs and speed up the processing of registration renewals. But when we put it into use, we couldn't get sufficient print quality. After trying everything, we found that we were operating our printer beyond its rated capacity, and it was unable to produce the level of quality we needed, no matter what we adjusted.

Since the DG line printer is from Dataproducts, we talked to them. The final solution was the purchase of a Dataproducts BP2000 line printer (2,000 lines per minute), which has a much higher rated capacity and was capable of the quality levels required. While this applications problem involved a combination of forms, printer hardware, and scanning hardware, it illustrates the hazard of assuming that existing hardware will do the job. The B600 does quite well in an OCR application on standard forms, but when combined with our special mailer form, it just couldn't cut it.

We have also found it necessary to work with the end-users on a continuing basis to make sure that the hardware is still appropriate for their intended use. Intended uses have a way of changing as they are implemented, and a piece of hardware that may have been appropriate originally may not be appropriate when the user gets going.

This point became clear to me recently when one of my relatives asked me a question about some correspondence he had received from RIDOT. I was shocked to see how our system was being used. I wasn't shocked at how the end-users had solved their problem, but rather that we didn't even know such a problem existed.

Because their letter-quality printers don't have dual-bin sheetfeeders, they were typing only the first page (which contained the changeable information) and using the copy machine to do the following pages. The difference was quite noticeable, and it defeated our efforts to make the document look good. This was a practical solution by the users to a real problem. However, it was our fault for not maintaining close enough contact with the users to find that their needs had changed. We had evidently so overpowered some of our users that they didn't come to us with problems, but developed their own workarounds instead. The users weren't aware that a dual-bin sheetfeeder existed, or that our word processor would support it.

We also learned the hard way that applying a strictly analytical approach to determining what hardware a user should have isn't always the best approach. Often, satisfying the users' perception of a need is more important than meeting what we determine to be the actual need. When users feel shortchanged in hardware, they shy away from the system and look for alternative ways to solve the problem.

We tended to ignore our users' requests for laser printers, because we didn't feel they had a real need for them. We feared the higher operating costs, but when we factor in the additional sheetfeeders and acoustical cabinets we are investing in now, I'm no longer sure the laser printers wouldn't have been justified on a cost basis.

On the other hand, we have to be concerned about our ability to support these devices. My staff is stretched pretty thin, and we are kept busy enough installing the standard equipment we have on order without installing new types of devices. Last month, a large manufacturer of laser printers held a demonstration, and I won a month of free use of a large, production laser printer. I haven't been able to take advantage of it yet because it will require space, supplies, and temporary adjustments to some of our programs. Also, we will have to duplicate production on many reports because the material from the new machine won't fit into our existing formats. Talk about an embarrassment of riches. How do you think I felt when I had to refuse the free use of a $60,000 machine?

I've been concentrating on the problems we have had as we expanded our applications, but it hasn't been all bad. I've had the opportunity to look at some exciting equipment and participate in some advanced applications design.

Our work with other users has made me look at some of their problems and give them credit for the ability to define their needs. I'm more willing to look ahead with my peripherals acquisition program and maybe overbuy at present in anticipation of future growth. This may eliminate the problem of upgrading hardware that hasn't outlived its usefulness. Δ

Frank Perry is the chief of data operations for the Rhode Island Department of Transportation. He can be reached at the Rhode Island Department of Transportation, 338 State Office Bldg., Providence, RI 02903; 401/277-2558.

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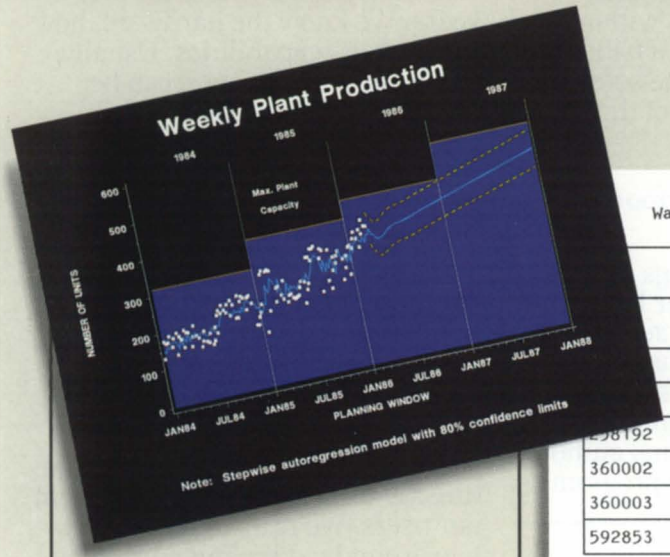

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	Quantity on Hand	Quantity on Order	Projected Reorder Date
	123980	10000	THU, FEB 12, 87
	89450	5000	FRI, FEB 20, 87
258192	20110	1000	MON, MAR 30, 87
360002	8585	0	TUE, FEB 10, 87
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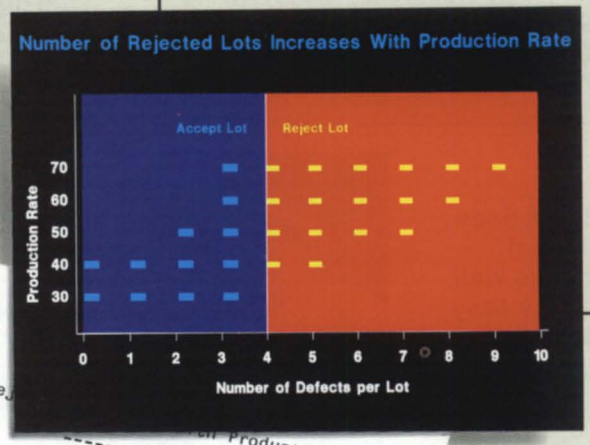

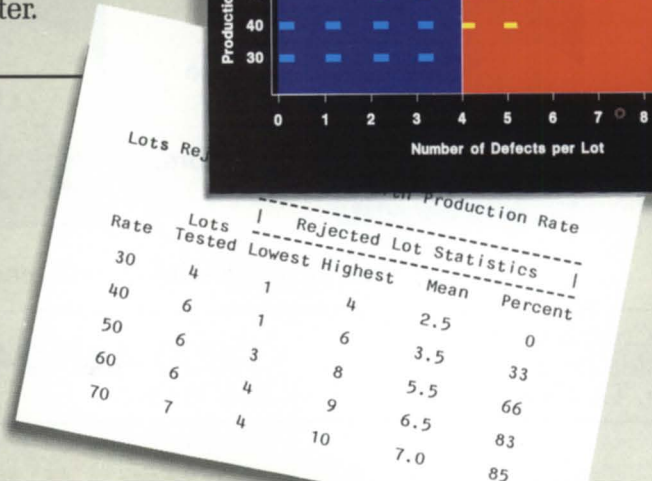
Lots Re... Production Rate

Rate	Lots Tested	Rejected Lot Statistics			
		Lowest	Highest	Mean	Percent
30	4	1	4	2.5	0
40	6	1	6	3.5	33
50	6	3	8	5.5	66
60	6	4	9	6.5	83
70	7	4	10	7.0	85

* Computer Intelligence, January 1986.

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Right. A couple of things are important to remember here. First of all, since we are the authors of the software, we can customize a program with ease. Many packages marketed today are not supported by the original authors, making changes to the programs difficult and expensive. Second, we have been a DG VAR for over 13 years. We know the hardware, how it works, its capabilities. Usually, any problems that arise can be handled with just a phone call. Last but not least, we have been in the business a long time, which gives the customer assurance that we'll be there when we're needed.

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MIRROR,MIRROR

Taking the mystery out of the new disk mirroring facility

by Tom Gutnick
Special to Focus

Evolutionary changes to the product line have made Data General systems increasingly reliable and available for users. Features such as dyadic processors and dual-ported disks now provide redundancy to minimize the system disruption that used to be the normal result of hardware problems.

Recently, I had the opportunity to experiment with the new disk mirroring feature introduced in AOS/VS rev 7.50. As I tried to come up with various ways of outsmarting the system ("Surely the developers didn't think of. . ."), it turned out I was the one outsmarted. The implementation is well thought-out and cleanly anticipates everything I could come up with. Although the use of mirroring is documented (in the *How to Generate and Run Your AOS/VS System* manual, 93-243-7), there's a lot of information to be digested. This article is a quick summary of how mirroring works.

Why mirroring?

When I was a system manager planning system backup procedures, I felt that there was no such thing as too much paranoia. I would have loved mirroring. The primary benefit of disk mirroring is to protect vital and highly volatile data against loss caused by a disk head crash. With mirroring, two identical copies of a Logical Disk Unit (LDU) are maintained; if one copy is destroyed because of hardware problems, the other copy remains available.

Another benefit of mirroring is the ability to run PCOPY or MSCOPY against an active LDU by removing one of the mirror images.

What you need

Disk mirroring was introduced in AOS/VS rev 7.50, so if you're still loitering around rev 6, you now have a good reason to upgrade your system.

In this implementation of mirroring, most of the actual work is done by the Argus disk (354 MB or 592 MB) controller. So in order to mirror any disk, an add-on drive on the same controller is necessary. The standard installation of two drives on one controller does the job—no special cables, installation, or hardware components are needed to use mirroring. (Other disk drives are not currently supported for mirroring.)

Did you know that your Argus disk drive controllers are microcoded? Thanks to the microcode, Data General has been able to more easily implement new features, such as the incremental backup capabilities of MSCOPY. To run mirroring, you need Argus microcode rev 7.06 or later. Your local field engineer can run something called the Peripheral Microcode Installer (PMI) to bring your system up to snuff.

Getting started

The first step to set up mirroring is to let the system know that an LDU is to be mirrored with the disk formatter, DFMTR. (You can do this with the partial formatter—the full format is not required.) Note that both disks must be identical in terms of bit-map position, re-map area size, diagnostic area size, etc. When prompted for the disk unit name, give the names of both drives that will constitute the "mirror":

```
DISK UNIT NAME: DPJ0!DPJ1
```

The LDU name must be the same for both disks, but the LDU unique ID must be different.

Booting it

Let's assume that you've decided to mirror the system disk on an existing system. (Mirroring other disks is also straightforward.) After you've run the partial formatter, you will boot the system. As AOS/VS is booting, you'll get a couple of warnings that the master LDU mirror isn't synchronized. This is because the two disks that are supposed to make up the mirror don't match yet. In our example, the system will come up using DPJ0 as the system disk; mirroring is not taking place yet.

Establishing the mirror

From the CLI, issue the command:

```
MIRROR/SYNC : @DPJ1
```

This tells the system to establish a mirror between drives DPJ0 and DPJ1. (If you get an error message "Controller does not support mirroring," you're either not on an Argus disk drive, or you haven't installed the proper Argus microcode.) Since the drives aren't yet synchronized, the controller will now start copying sectors from drive 0 to drive 1 until both drives are mirror images. (You can see this happen by watching the cylinder number display on the drives.)

The synchronization process is essentially a background operation. You

can unleash your users now because the system can handle normal I/O requests concurrently with synchronization, or you can make them wait. (You could have used the command MIRROR/SYNC/WAIT. . ., which doesn't return until synchronization is complete.) This process of synchronization will take a while, depending on how full the disk is and whether users are working on the system at the same time. On my Eclipse MV/7800 with a 354 MB drive about 50 percent full, it takes more than an hour.

When synchronization is complete, you'll get a message at the master console. At this point, normal mirroring will occur; any disk output requests are written to both disks. Fortunately, this is done by the controller, so AOS/VS only concerns itself with the normal, single I/O requests. However, AOS/VS doesn't see the write operation as complete until the controller has updated both disks (which means waiting on seek time and rotational latency on both drives), so performance on write operations is likely to degrade a little.

On the other hand, when AOS/VS makes a read request, it doesn't really make any difference what drive is used, since they are supposed to be identical. The controller can divide the read requests between both drives, trying to optimize head movement, etc. As a result, performance on read requests can be somewhat enhanced.

Let's assume that you take the system down now. Both drives are fully synchronized, so it establishes the mirror right away the next time you bring the system up. (Again, you can see this by looking at the cylinder number display.) No special action is needed.

If you had run emergency shutdown (ESD) for some reason, your drives would remain synchronized in this case also.

What about other disks?

For disks other than the system disk, you still have to tell DFMTR that there are two disks involved. (When you specify something like DPJ2!DPJ3, the formatter is ORing the bad block tables together.)

If the disks are synchronized, the command is something like:

```
INITIALIZE @DPJ2!@DPJ3
```

If you try this and they're not synchronized, you'll get an error message. So do this:

```
INITIALIZE/NOMIRROR @DPJ2
```

(assuming that drive 2 is the preferred image)

```
MIRROR/SYNC ldu name @DPJ3
```

and several hours later, everything should be just peachy.

Breaking the mirror

No, you don't get seven years of bad luck for breaking this mirror. In my testing, I simply powered off drive0. A process that was reading from the disk hung for a little while until the request timed out. Then the system generated a message to the console indicating that one image had been removed, and we were now running unmirrored. My process picked up where it left off, and aside from the delay, the whole affair was transparent. (With a head crash or other major problem, there would have

been an immediate error return, instead of waiting on a time-out.) Everything continued running against drive1.

If you take the system down and then bring it back up, the system is smart enough to realize that 1) the disks are out of synch, and 2) drive1, rather than drive0, is now the "preferred image," so the system boots from drive1. Once up, issue a MIRROR/SYNC : @DPJ0 command to reestablish synchronization.

You can also break the mirror intentionally for backup purposes. For example, you might leave one disk in use while running PCOPY or MSCOPY against the other disk. It would be nice if there was a MIRROR/REMOVE command, but this would leave the removed disk in a potentially inconsistent state. The two ways you can break the mirror are to power off one drive (you'll need to run FIXUP on it before you can back it up), or release the entire mirrored LDU (just use the standard RELEASE command unless of course it's the system disk) and then INITIALIZE/NOMIRROR the disk that you want to keep running with. Once your backup is complete, you'll need to reestablish synchronization.

Keeping track of things

The MIRRORINFO utility will tell you what LDUs are currently being mirrored on your system and whether synchronization is complete or in progress.

Performance issues

DISCO will show a line of statistics for one of the units being mirrored; for the other unit, it will just indicate that it's a mirror. DISCO will accurately show you the disk service and response times. Since AOS/VS just measures the time from when it passes an I/O request to the disk controller until the request completes, AOS/VS doesn't need to worry about whether or not mirroring is taking place. However, you won't be able to see how the controller is splitting read requests between drives because this is handled by the controller, and AOS/VS knows nothing about it.

My inclination is to think twice before mirroring the system disk in most situations. If all the updating of page and swap files (and INFOS.VM and EXEC's queues and a lot of IPC files) is mirrored, it could be detrimental to performance. But then again, the system disk shouldn't be where your volatile user files reside anyway.

As a general rule, mirroring will probably hurt performance slightly when most of the disk I/O involves write requests, but it should help performance somewhat when read requests predominate. However, I haven't done any timing tests yet.

Disk mirroring is available today, and it works. You don't need any exotic hardware or software to use it. If you are concerned about the safety of volatile data, this may be just what you are looking for. Δ

Tom Gutnick is a regional systems engineering consultant in Data General's Washington, D.C., commercial branch. He specializes in issues relating to system performance and security. For several years, he was the editor of the AOS & AOS/VS Special Interest Group newsletter. He can be reached at 703/827-9600.

DATA BASE DICTIONARY

The hardest thing about buying a 4GL/DBMS is mastering the terminology

by Sue Dintelman
Special to Focus

If you are looking for software to help you get control of your information processing needs—whether it's to develop a major new application or to clean up some of the backlog of smaller applications—you may be puzzled by the options facing you. All software packages today seem to be user-friendly, 4GL relational systems using artificial intelligence techniques. Buzzwords abound, and because many of the concepts are new, some of these popular terms are overused—and occasionally misused. This article is intended to define some of the terms that describe features of 4GLs and data base management systems.

An *application generator* allows the fast development of new applications, and can be considered the "fourth" generation of communication with computers. Originally, all programs were developed using machine code. The second generation of computing was done using assembler language, which allowed operations and storage locations to be given names. The third-generation languages, called "high-level" languages, used single statements to represent several machine language instructions. A programmer could use a statement like: PAY = HOURS X WAGE, instead of moving values from storage locations to accumulators. Each of these advances brought improvements for producing applications. One measure of a fourth-generation tool is that it should improve productivity by at least a factor of ten compared to similar development done with COBOL or PL/1.

The user interface to an application generator is sometimes called a *fourth-generation language*. Almost all new software packages are labeled 4GL, so the term itself isn't that useful. A 4GL could be anything from a full-function language that can be used to produce any application, to a simple query language used for retrieving data from INFOS files. What all these software packages have in common is that they are productivity tools. That is, they are intended to make the implementation of an application, or part of an application, easier and faster than writing it in a third-generation language.

Most fourth-generation tools provide one or more of the following features:

- data base definition
- query facility
- screen painter
- report generator
- office automation tools such as electronic mail and text manipulation
- decision support software such as spreadsheet manipulation and financial analysis
- graphics.

The heart of any fourth-generation tool is the *data base system*. The purpose of a data base system is to maintain information and to make that information available on demand. All data base systems must provide some mechanism for users to keep track of entities (e.g., customers, orders, books) and relationships (e.g., which customers made what orders, which publishers publish what books). One of the major differences among data base systems is how they represent entities and relationships, or what data model they use. The three basic data models are hierarchical, network, and relational.

Systems that use the *hierarchical* and *network* models of data are generally older and have an interface intended for programmers rather than end-users. The development of the *relational* model, based on the mathematical theory of sets and relations, revolutionized the data base field. Almost all of the data base systems developed recently are relational, and even most nonrelational systems now provide some type of relational interface for users.

The relational model of data is so important because it uses simple tables (with rows and columns) to represent both entities and relationships. This simple concept allows the development of new interfaces for use by nonprogrammers and greatly increases the availability of data base tools. The user of a relational system can use single operators to generate new tables from existing ones, where operations in other systems were record-at-a-time oriented and much more complex. For example, if you were using a record-at-a-time interface to find all of the customers in a file who are from California, you would need statements to initialize the search, some type of loop statement to step through each record, a conditional statement to test whether a particular record met the criteria, and action statements for success and failure of the condition. A relational operation to find the same set of customers is:

```
SELECT customer-name
FROM customers
WHERE state = "California"
```

There may be variations in how the actual query is made, but the result will be obtained using one operation.

A data base system provides facilities for data definition, data access, and data presentation. The *data definition* facilities provide a way to define new files (the tables in a relational system) and the fields in the files. Such things as data type (will the field contain a number, date, or text), default labels (hourly wage), and consistency constraints (wage is between $3.75 and $25.00) are specified. If all of this information is collected in a *data dictionary*, it can be used by the other components of the system, so that it is not necessary, for example, to respecify a constraint when building a data entry form, or decide on a heading for a re-

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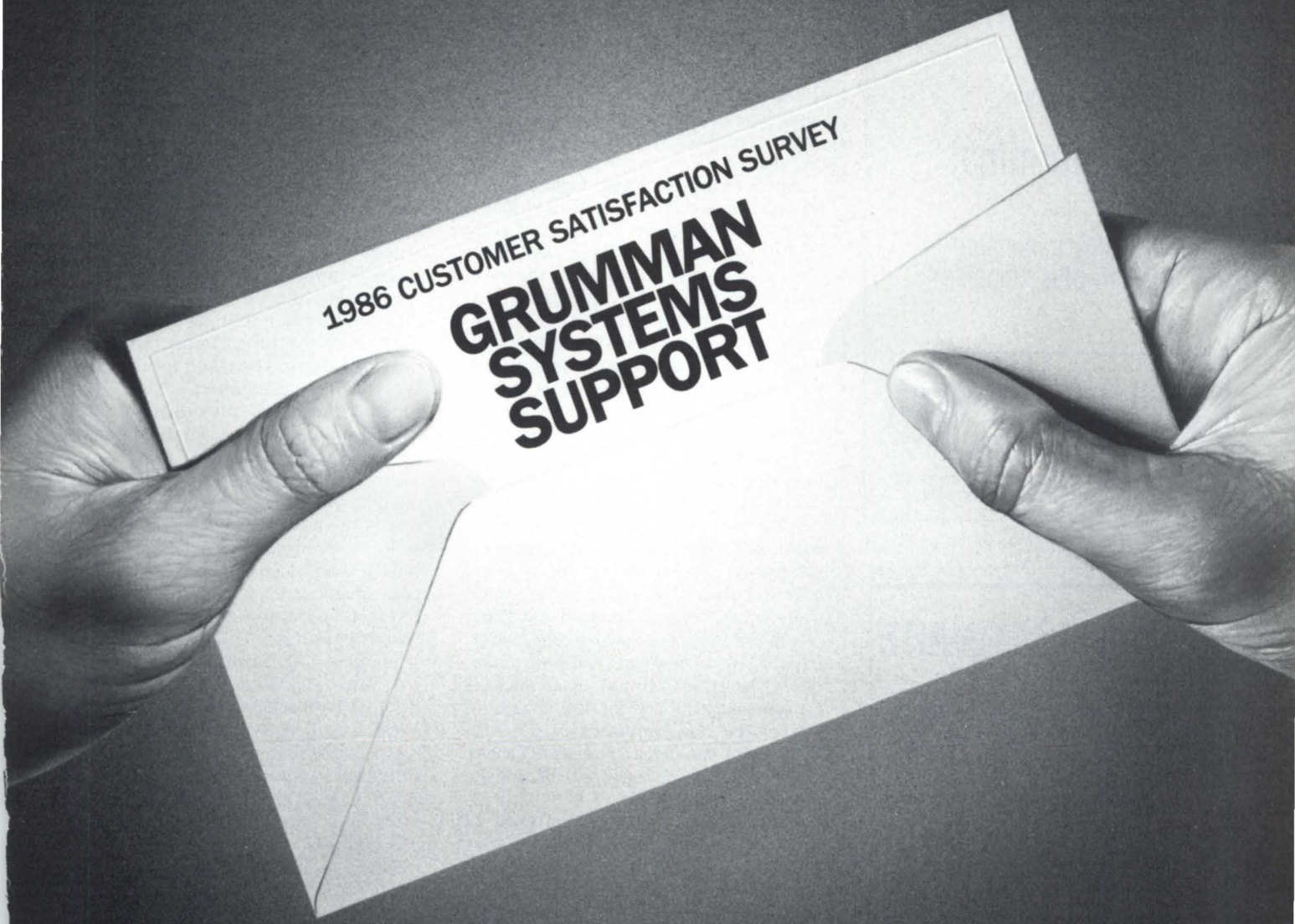

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port. A *data base administrator* (DBA) is a person or committee charged with managing the design and implementation of a data base.

The *data access* facilities of a data base system locate and retrieve some subset of the data base and often include initial data entry and update operations. The *data presentation* facilities of a data base system may include a *report writer* to format printed reports or *graphics* capabilities to produce graphs, bar charts, or other visual representations of data.

The interface to these facilities may be *command-driven* or *menu- and forms-driven*. Some systems are even starting to provide *natural language* interfaces that allow users to phrase their requests in free-format "natural" sentences. End-users without data processing experience usually find that it's easier to learn and use an interface in which they choose from menus and fill in forms. However, a command-driven interface, although more difficult to learn and use, can provide more functionality than a menu- and forms-driven interface.

SQL is probably the best-known of the command-driven data base languages. Originally developed at the IBM Research Laboratory and now commercially available from IBM and a number of other vendors, it has become widely used. The American National Standards Database Committee has released a proposed standard for SQL, making it one of the first standards in the relational data base area. The SELECT statement above is an example of an SQL data access statement.

There are basically three types of users who are supported by data base facilities: users with *ad hoc* requests, users who need *parameterized* access (in which only pre-specified operations may be done), and *programmers*. For example, order entry clerks may have only one type of interaction with the data base: filling in new orders. They need parameterized access. Managers, on the other hand, may want to know about orders that are not filled as of today, or orders that included a certain item. As an ad hoc user, they don't know specifically what information will be required tomorrow, and they need to have the flexibility to develop new queries and reports as required.

The type of facility used by end-users for ad hoc access to a data base is usually *nonprocedural*. This means that the user specifies *what* is wanted, rather than *how* to get what is wanted. This is like telling a cab driver to take you to the airport and letting him choose how to get there. And like giving a cab driver complete freedom to choose the route, one of the dangers of nonprocedural languages is that it is possible to make requests that are very expensive to process. It's useful to have some type of feedback process in nonprocedural languages that tells a user about the cost or consequence of a request.

No matter how powerful a nonprocedural language is, there will always be a certain number of complex queries, consistency constraints, and reports that require a *procedural* language to specify. Procedural languages are almost always directed toward programmers rather than end-users, and they allow the programmer to specify the exact steps to be taken for data base access or presentation. Most full-function 4GL tools provide both nonprocedural and procedural languages for application generation.

In conclusion, it's important to remember that the key issue is not what words the advertising copy uses to describe a product, but whether it will satisfy your needs. You must analyze your needs and survey the available products with these needs in mind. Some important things to consider when choosing a productivity tool are:

1. What jobs do you want to do? Will the tool be used for commercial or scientific computing? Will it be used for batch processing or on-line operations? Will the applications be pre-specified (i.e., a few particular jobs), or will there be ad hoc, dynamically changing processing?
2. Who will be doing the jobs—end-users or data processing professionals?
3. What other software does the tool need to interface with office automation packages or existing data base systems?

When considering your needs, there is probably not going to be a single package available that will satisfy all of your application development needs. The key to successful application implementation is the selection of the correct tool for the job at hand. If you have a wide variety of jobs, this may mean having more than one productivity tool available. Δ

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

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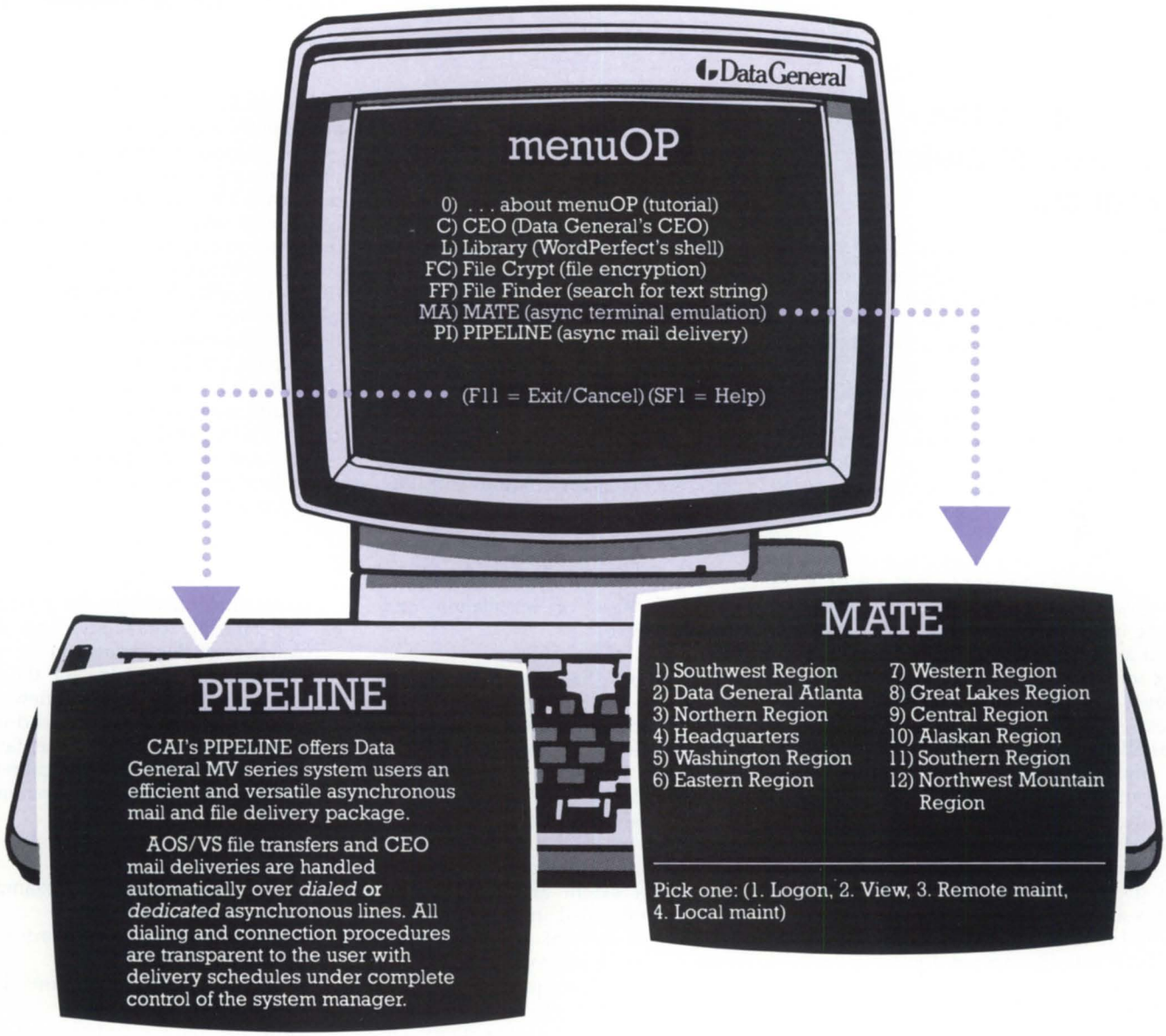

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THE DATA BASE

Comparing the features of major products

Perhaps only a DP professional can truly understand the challenge of managing a growing, evolving data base. It's not just a matter of storing data for retrieval later. The data base administrator also has to be concerned with controlling access to the data, ensuring its integrity and security, allowing for new types of information, and—always—responding to one-of-a-kind requests for information. ("Why *can't* I get this report by tomorrow? I know you have the data!)

Considering the magnitude of the challenge, it's no surprise that a variety of products are being marketed to make data base management faster, easier, and more productive. Each has its own set of strengths—but it's up to the buyer to determine which would best suit the needs of a particular installation.

Another challenge for prospective buyers is to consider all aspects of competing products as they make their decisions. The information on the following pages concentrates on the features of the products—not on performance or subjective criteria that are important, but impossible to measure. Figure 1 is a list of some of these "other" considerations.

The information that follows is based on a questionnaire devised by Jim Phillips, director of Information Services for the Health and Tennis Corporation of America. *Focus* sent a mailing to more than 150 companies advising them of our "Data Base Challenge" project and inviting them to contact the editors if they wished to participate. The *Focus* staff mailed the six-page questionnaire to 16 vendors known to have data base management products. By deadline, 11 of the companies had returned completed questionnaires.

In addition to the questionnaire, *Focus* also sent out a 15-page "scenario" describing a fictitious company—World Wide Temporary Technical Employment Exchange—and its data base management problem along with record layouts and screen and report formats. Seven companies responded by deadline with coded examples of how their products could be used to solve the scenario problem. (The seven were: 3CI, Cognos, Commercial Data Systems, Computer Representatives Inc., DMS Systems, Exact Systems and Programming, Threshold, and Williams Automated Management Services. The solutions ranged from a few pages of description and a few printed reports to a bound volume of more than 100 pages describing the solution and how it was developed. Copies of both the questionnaire and the scenario are available by writing *Focus*.)

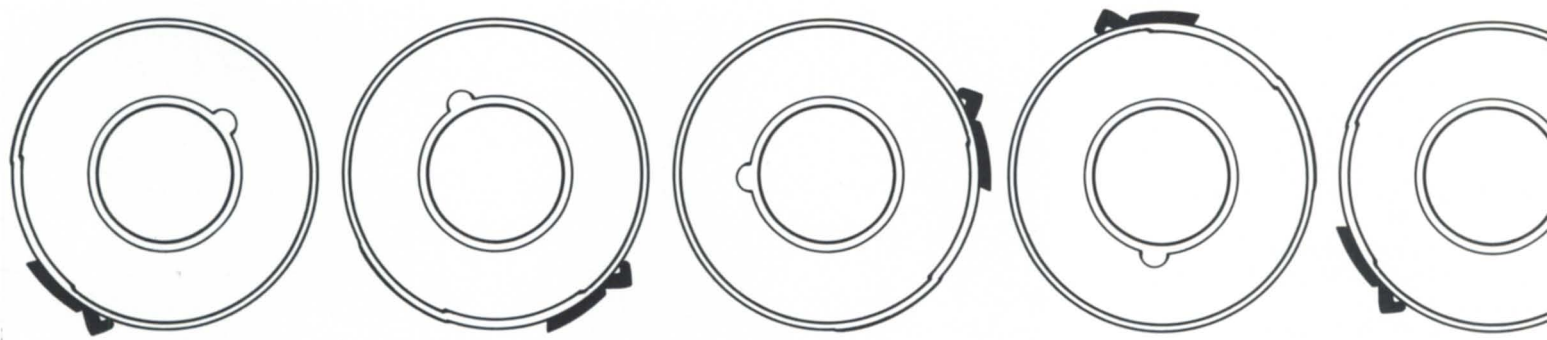
This process is fairly typical of the preliminaries a company should go through while deciding on the tools it will use to help meet the challenge of data base management. The remaining step is to actually get some hands-on experience with the products.

Conference 87 offers an unprecedented opportunity for users to see these products in action. A Data Base Roundtable is scheduled at the conference, and many of the vendors will be demonstrating their products. In fact, several will demonstrate the systems they developed for the scenario mentioned above.

Figure 1: Subjective factors to consider

A. Relative ease of installation and maintenance
B. Data base administration
   - Ease of data base definition, modification, and generation
   - Ease and speed of file reorganization
   - Readability of the DDL
C. Evaluate the degree of program/data independence:
   - As elements are added, changed, or deleted
   - As files and data bases are linked
   - To what extent are data relationships embedded in program code?
   - Is stored element format independent of program code?
D. Application development
   - Relative system efficiency for screen development, interactive query, etc.
   - Readability of the source code produced by the report generator
E. General ease of use
   - Skill level required for application programming
   - Skill level required for end-user query
   - How much like English is the syntax for procedural programming and queries?
   - Similarity of the package's human interface to DG's CEO standards. How well-integrated are the tools?
   - Is there a strong screen-oriented editor integrated into the product?
F. Appearance, readability, and completeness of documentation
   - Are materials available for the following levels: general overview, application design tutorials, end-user tutorials, technical documentation for data base design, technical reference guide, or pocket programmers guide?
   - Is there a good index for all materials?
   - Are realistic, well-coded examples provided?
   - Are command and keyword summaries provided?
   - Is good, complete on-line help provided?
   - How are training courses and consulting organized, and at what level? CBI, video, in-person, self-paced independent study?
   - Is there a formal user group?
   - How available is technical support (phone-in, on-site, hours)?
   - How many sites have installed this product?
   - How long has it been on the market?
   - How long has it been available on Data General systems?
   - How frequently has the vendor made enhancements to the product?

CHALLENGE



C/SCRIPT II plus DBAM and C/SCRIPT II plus ISAM

Threshold, Inc., P.O. Box 831, Auburn, AL 36831–0831; 205/821-0075. Contact: Bob Head.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary provides the following defaults: screen prompts, report headings, and edit mask.

Data types supported. Strings/character, numeric/integer, dates, money.

File/record restrictions are based on INFOS.

Physical data structures. C/SCRIPT II plus DBAM generates programs that make full use of INFOS II's COBOL interface. C/SCRIPT II plus ISAM generates programs that handle files using an ISAM interface. C/SCRIPT II plus ISAM can also generate programs for compilation using ICOBOL, which would use ICOBOL's built-in ISAM. Disk space management tools, data compression capabilities, and record indexing are INFOS-based.

Simultaneous read/write access. The user may specify record locking, which would cause the WITH LOCK phrase to be added to READ statements.

Multivolume data bases are supported.

Data base reorganization and distributed data base capabilities are INFOS-based.

Logical data structure is hierarchical.

Integrity and error processing, transaction processing recovery, and backup and restore procedures. All are INFOS-based. The data base must be closed while backing up data.

Data import and export facilities include INFOS interface.

Data base access control includes data access auditing.

4GL programming capabilities

General features. As a COBOL source code generator, C/SCRIPT uses or can generate many language features. Users may enter their own COBOL code (called USER CODE) for insertion in the generated program.

Interactive editing and debugging provided.

Interactive query facilities. As a program generator, C/SCRIPT II is not really an "interactive query" product. C/SCRIPT II itself is interactive, and the programs it generates are interactive.

Interactive update facilities. Full screen orientation; capabilities include add with prompts, delete/confirm, and change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities and supports all Data General and compatible terminals.

Multiple records displayed can be on the same screen. Maximum field size that can be displayed is 80 characters.

Windowing capabilities and default prompts from the data dictionary provided.

Report Generator

General features. Page headings, automatic subtotals, subheadings, footnotes (legends appear at top of page), defaults for column positioning and headings.

Automatic settings for page numbers, etc. can be suppressed or overridden.

Standard mailing label reports are provided.

Applications generator is provided.

System considerations

Memory recommendation. The minimum memory recommended for running the product on a Data General system is 2 MB. The code for each module is compiled.

Central system overhead is the same as required for INFOS.

Price. C/SCRIPT II plus DBAM(development system) ranges from $10,000 (DS/7500) to $26,000 (MV/20000). Threshold, Inc. does not require the purchase of a runtime license for the use of generated programs. Users may purchase additional copies of the manager module (menu and security) if required for their application. The manager module price ranges from $1,000 to $2,000. Software support ranges from $1,500 to $3,000. C/SCRIPT II plus ISAM (development system) ranges from $8,000 (DS/7500) to $18,000 (MV/20000). The manager module ranges from $1,000 to $1,500. Software support ranges from $1,080 to $2,040. Lease rates and quantity discounts are available. Δ

CQCS

Cybertek Software, Inc., 3025 South Parker Road, #109, Aurora, CO 80014; 800/451-1544 or 303/745-3900. Contact: Steve Roy.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary provides user security authorization, defines relations for inquiry and reporting, and includes the following defaults: screen prompts, report headings, data entry validation, and edit mask.

Data types supported. Strings/character, numeric/integer, dates, money, Boolean.

File/record restrictions. No restrictions on maximum number of files or maximum records per file. Maximum fields per record is 999, and the maximum number of files open simultaneously is 14.

Physical data structures supported. They are indexed sequential. Disk space management is accomplished via the AOS/VS and INFOS utilities. INFOS data compression capabilities are provided. INFOS ISAM and DBAM indexing mechanisms are used.

Logical data structures include network, hierarchical, and relational with inner and outer join.

Simultaneous read/write access is provided at the record level.

Multivolume data bases are supported.

Data base reorganization is not required.

Distributed data base capabilities. INFOS data bases may be distributed over INFOS and PC*I networks.

Integrity and error processing. Standard INFOS features.

Transaction processing recovery process is user-defined transaction roll back.

Backup and restore procedures are DDUMP and DLOAD INFOS utilities. The data base must be closed while backing up data.

Host language interfaces include COBOL, Fortran, PL1, C, and VS/BASIC.

Data import and export facilities include INFOS interface, ASCII/EBCDIC conversion (through Sort/Merge), and interfaces to SQL, CEO, Trendview, Xodiac, and PC*I.

Data base access can be selectively granted and denied at the field read and field write level. Data access auditing is supported.

4GL programming capabilities

General features. If, then, else with nesting; loop, end loop, escape, next; subroutines (internal and external); functions (internal and external).

Character and string handling. Concatenate, substring, trim, upper/lowercase; string functions for parsing.

Numeric capabilities. Money handled with proper precision and rounding; date arithmetic; a variety of formats for time. Numeric functions include: check, day, month, year, date-

add, and a full set of all 3GL numeric functions through 3GL interface.

Code produced. Produces compiled, optimized code.

Spawn to subprocess is supported.

Interactive query facilities. Command driven.

Interactive update facilities. Full screen orientation supports add with prompts, delete/confirm, and change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities and supports all Data General terminals.

Multiple records displayed on one screen. Maximum size field that can be displayed is 80 characters.

Windowing capabilities and screen "painter" included.

Standard screen generated with default prompts and validation criteria from data dictionary. Code is available for customization.

Report generator

General features. Page headings, automatic subtotals, subheadings, footnotes, defaults for column positioning and headings.

Standard form letter and mailing label reports are available.

Automatic settings for page numbers, etc. can be suppressed or overridden.

Additional development tools. Preprogrammed applications and graphics.

System considerations

Memory recommendation. The minimum memory recommended for running on a Data General system is 250 KB. Code is shared for each module.

Central system overhead. None required for supporting processes—only INFOS overhead.

Independent application benchmarks are available.

Price. MV/2000—$12,000; MV/4000—$30,000; MV/8000—$36,0000; MV/10000—$40,000; MV/20000—$60,000. Runtime license is 25 percent of initial license. Price for ongoing, yearly maintenance is 15 percent of initial license price. Lease rates are available, as well as quantity and government/educational discounts. Δ

DG/SQL

Data General Corporation, 4400 Computer Drive, Westboro, MA 01581; 617/366-8911.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary provides user security authorization.

Data types supported. Strings/character, numeric/integer.

File/record restrictions. No limit on data base size, rows per table, or number of files open simultaneously. Maxi-

mum fields per record is 128.

Physical data structure is B-tree.

Logical data structure is relational with inner join.

Simultaneous read/write access is provided.

Multivolume data bases are supported.

Data base reorganization is not necessary.

Distributed data base capabilities. RQA capabilities are available. Provides distributed access via Xodiac.

Integrity and error processing. Controls built into the system include: entity integrity, referential integrity, and required columns.

Transaction processing recovery process includes both roll back and roll forward to transaction boundary.

Backup and restore procedures. All data base tables are backed up/restored via simple DDU commands. The data base must be closed while backing up data.

Host language interfaces. Precompilers—COBOL, Fortran 77, PLI, C. Host language interface—COBOL, Fortran 77, PLI, C, Pascal, BASIC.

Data import and export facilities (with Present and Sort/Merge). Provides interface to INFOS, ASCII/EBCDIC conversion and interfaces to Present (information presentation facility) and PowerHouse (4GL from Cognos, Inc.).

Data base access can be selectively granted and denied at the record, field, table, view, and data base levels.

4GL programming capabilities. Provided through independent software vendor (ISV) products.

System considerations

Memory recommendation. Minimum memory recommended for running on a Data General system is 3 MB. For each module, the code is shared.

Central system overhead required for supporting processes is estimated as 1 MB of memory per six user processes.

Price. Product pricing and (runtime license) for machine classes as follows: MV/2000—$2,900 ($960); MV/7800—$5,800 ($1,925); MV/15000 model 8—$11,600 ($3,850); MV/15000 model 10—$15,080 ($5005); MV/20000—$17,400 ($7,315). Discounts available for government or educational institutions. Δ

Dimension

Commercial Data Systems Corporation, 1000 South Pioneer Drive, Smyrna, GA 30080; 404/799-1000. Contact: Wilson Andress.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary provides user security authorization, defines relations for inquiry and reporting, produces reference lists or "where used" listings, and includes the following defaults: screen prompts, report headings, data entry validation, and edit mask.

Data types supported. Strings/character, numeric/integer, dates, money, Boolean, user-defined types.

File/record restrictions. Maximum number of files or records per file is limited only by disk capacity. Maximum fields per record is 1,500 (but can be increased). Maximum number of files open simultaneously is 99 (but can be increased).

Physical data structures. Standard Data General Business BASIC data files, including ISAM support with multiple indexes per data file. Generated programs automatically optimize the use of disk space. The data dictionary automatically defines field disk storage as small as possible. Dimension utilities allow optional repacking of data files to compress them.

Simultaneous read/write access is supported with record locking at the record level.

Multivolume data bases are supported.

Data base reorganization. There are no special requirements.

Distributed data base capabilities are standard Data General features.

Integrity and error processing. Automatic error logging to error file. Saves "snapshot" of failed program in its failed state for detailed examination later.

Transaction processing recovery. Optional transaction logging capability allows reprocessing of lost transactions.

Backup and restore procedures are standard utilities. The data base must be closed while backing up data.

Host language interfaces. Generates standard Data General Business BASIC source code. Optional use of INFOS II data file structure allows interface to COBOL. Fortran and most other DG language interfaces available.

Data import and export facilities. Interfaces to INFOS and provides for ASCII/EBCDIC conversion.

Data base access control. Field access

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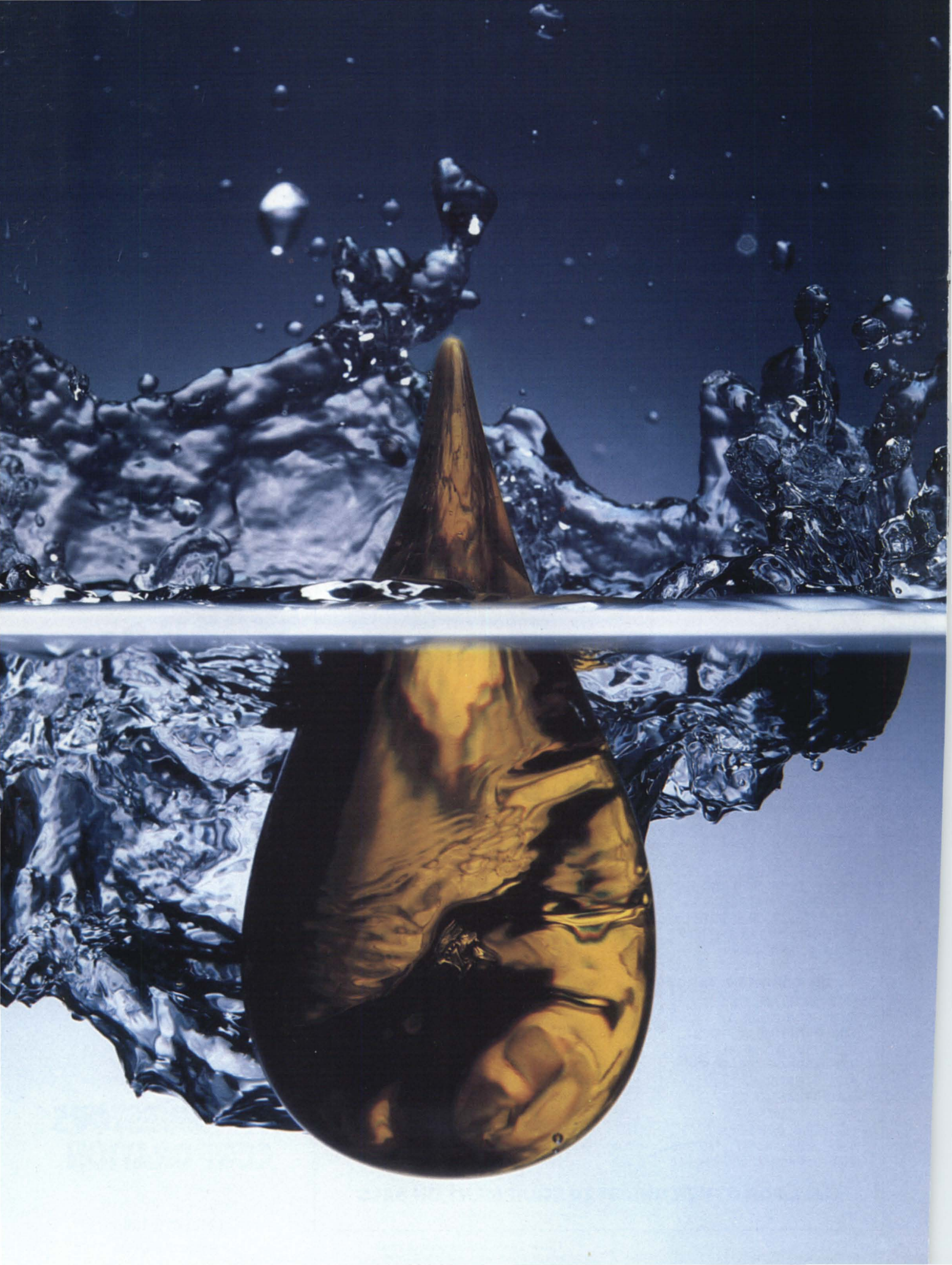

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is defined in the data dictionary.

4GL programming capabilities

General features. If, then, else with nesting; loop, end loop, escape, next; execute; subroutines (internal and external); functions (internal and external).

Character and string handling. Concatenate, substring, upper/lowercase; string functions for parsing.

Numeric capabilities. Money handled with proper precision and rounding; date arithmetic; a variety of formats for time. Custom numeric functions defined by the user are cataloged in the Dimension utilities library.

Interactive editing and debugging and language-sensitive editor featured.

Code produced. Produces compiled, optimized code.

Spawn to subprocess is supported.

Interactive query facilities. Standard utilities for either displaying on a CRT or printing (Dataprint and Indexprint).

Interactive update facilities. Capabilities include add with prompts, delete/confirm, and change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX and can be easily modified to support any ASCII terminal.

Multiple records displayed on one screen. Maximum field size displayed is limited by screen size.

Windowing capabilities and screen "painter" included.

Standard screen from data dictionary. Default prompts and validation criteria supplied from the data dictionary. Code is available for customization.

Report generator

General features. Page headings, automatic subtotals, subheadings, default column positioning, default headings from the data dictionary.

Additional development tools. Applications generator, data communications facilities, system and data base design tools, preprogrammed applications.

System considerations

Memory recommendation. The minimum memory recommended for an RDOS machine is 256 KB; for AOS, AOS/VS—2 MB. Code for each module is interpreted.

Central system overhead required for supporting processes is 30 KB user space in a Business BASIC task.

Price. License fee range is $12,500 to $20,000. License for runtime utilities is $750 per copy. Quantity, government, and educational discounts. Δ

DNA-4

Exact Systems and Programming Corporation, P.O. Box 115, Thornwood, NY 10594; 914/285-9444, telex—551929 EXACTSYSPROGRM. Contact: Henry Oswald.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary produces reference lists or

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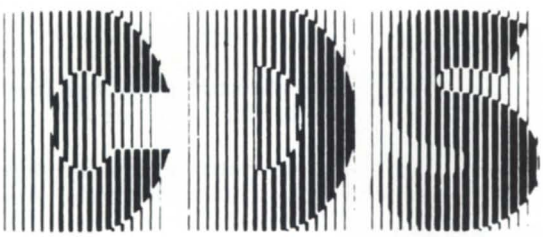

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"where used" listings, provides default validation for data entry, and defines relations for inquiry and reporting.

Data types supported. Strings/character, numeric/integer, Boolean.

File/record restrictions. Maximum number of files is 5,000+. Maximum records per file is 4 million. Maximum fields per record is 99. An unlimited number of files can be open simultaneously.

Physical data structures supported are proprietary B-tree indexing with random storage of data. Disk space management tools include INIT-4 to allocate storage space (contiguous). Data compression is automatic for more than 3 bytes, independent of type. Record indexing mechanisms are B-tree, 32 indexes per file.

Logical data structures are relational with inner and outer join.

Simultaneous read/write access is provided at the record level.

Multivolume data bases are supported.

Data base reorganization is not required.

Distributed data base capabilities are user-determined. No specific ones built in, but tools are available.

Integrity and error processing controls built into the system include integral error processing. Data base change logging by transaction.

Transaction processing recovery used is to post log file to a checkpointed data base.

Backup and restore procedures. All data base changes may be logged. All logical files are automatically backed up when backup is done. The data base does not need to be closed while backing up data.

Host language interface is general-purpose—not language-specific.

Data import and export facilities. Interfaces to any flat file, WordPerfect, CEO. Provides for ASCII/EBCDIC conversion.

Data base access controls. Access to records, fields, menus, menu lines, and screens can be selectively granted and denied. Data access auditing and security alarms are supported.

4GL programming capabilities

General features. If, then, else with nesting; loop, end loop, escape, next; execute; subroutines (internal and external); functions (internal and external).

Character and string handling. Concatenate, substring, trim, upper/lowercase; string functions for parsing.

Numeric capabilities. Automatic rounding, with money handled with proper precision and rounding; date arithmetic; a variety of formats for time; user-determined numeric functions.

Language-sensitive editor provided.

Spawn to subprocess is supported.

Interactive query facilities. Full screen-specific query methods.

Interactive update facilities. Full screen orientation; capabilities include add with prompts, delete/confirm, and change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities and supports DG-compatible and TTY-type terminals.

Multiple records displayed on one

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screen. Maximum size field displayed is 80 characters (can be overridden).

Windowing capabilities and a screen "painter" included.

Standard screen generated from data dictionary. Code is available for customization.

Report generator

General features. Page headings, subheadings, footnotes, default headings from data dictionary.

Standard form letter and mailing label reports are available.

Automatic settings for page numbers, etc. can be suppressed or overridden.

Additional development tools. Applications generator, data communications facilities, system and data base design tools.

System considerations

Memory recommendation. The minimum memory recommendation is 256 KB. Code is shared for each module.

Independent application benchmarks are available.

Price. Desktop—$1,250; Eclipse—$8,000; MV—$4,000-$32,000. Runtime license price—10 percent. Ongoing, yearly maintenance—$150–$6,000. Lease rates available. Quantity, government, and educational discounts. Δ

Genisys I

DMS Systems, Inc, 1111 Brickyard Road, Salt Lake City, UT 84106; 801/484-3333. Contact: Eric R. Fredrickson.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary provides user security authorization, defines relations for inquiry and reporting, produces reference lists or "where used" listings, and includes the following defaults: screen prompts, report headings, data entry validation, and edit mask.

Data types supported. Strings/character, numeric/integer, dates, money, Boolean.

File/record restrictions. Maximum number of files is 64 per application. There is no limit to maximum records per file. Maximum fields per record is 4,096, and the maximum number of files open simultaneously is 64 per application.

Physical data structures. Hashing, imbedded and external pointers, and indexed sequential. Utilities for disk space usage monitoring, recapturing space from deleted records, and rebuilding indexes are provided. Record indexing mechanisms include hashing and indexed sequential.

Logical data structures are relational (inner and outer join).

Simultaneous read/write access is provided at the record level.

Data base reorganization. The data base is automatically reorganized when attributes are added or deleted, and for some types of changes to existing attributes.

Integrity and error processing. All files used by an application are time stamped. Warning messages are issued

if all required files are not consistent.

Transaction processing recovery process used is before-image logging.

Backup and restore procedures. Normal system backup utilities. DBR (the DMS disk backup and recovery) is recommended.

Data import and export facilities. Interfaces to WordPerfect Library, WordPerfect, MathPlan, and CEO. Extensive import facility for fixed- or variable-length ASCII files.

Data base access control. Application, record, and field level access can be defined. Data access auditing is supported.

4GL programming capabilities. Genisys I does not have a 4GL procedural programming language, but does provide the indicated facilities as part of the derived field capabilities.

Character and string handling. Concatenate, substring, trim, upper/lowercase; string functions for parsing.

Numeric capabilities. Automatic rounding, with money handled with proper precision and rounding; date arithmetic; a variety of formats for time. Numeric functions include: +, -, *, /, (), count, sum, average, maximum, minimum, first, last, standard deviation, variance, future value, present value, and payment.

Interactive query facilities include forms-based query facility.

Interactive update facilities. Full screen orientation; capabilities include add with prompts, delete/confirm, and change with prompts.

Screen design and management

Terminal types supported. Supports all terminal types.

Screen "painter" included.

Standard screen generated from data dictionary. Default prompts and validation criteria supplied from data dictionary.

Multiple records displayed on one screen. Maximum size field that can be displayed is 32,768 bytes (variable-length strings).

Report generator

General features. Page headings, automatic subtotals, subheadings, footnotes, default column positioning, default headings from the data dictionary.

Automatic settings for page numbers, etc. can be suppressed or overridden.

Standard form letter and mailing label reports are provided.

Preprogrammed applications are available.

System considerations

Memory recommendation. Minimum memory recommended is .25 MB to .5 MB per user, depending on the complexity and size of the data base and the intensity of usage. Multiple users share compiled code.

Central system overhead required for supporting processes is one global server.

Price. Genisys I licenses are for individual CPUs. Subsequent CPU licenses are available at a 30 percent disount when applied to the same or lower CPU classification. Prices range from $4,900 (MV/2000, MV/4000 DC) to $29,900 (MV/20000,

MV/15000 model 20). Ongoing, yearly maintenance is 10 percent of license fee. Lease rates and quantity discounts are available. Δ

InFoCen

3CI, 155 West Harvard, Fort Collins, CO 80525; 303/223-2722. Contact: Robin Ollivier.

Data base management

Data dictionary. All subsystems use an automatic or manual interface to a common data dictionary managed by a central data base administrator. The data dictionary provides user security authorization, produces reference lists or "where used" listings, defines relations for inquiry and reporting, and provides the following defaults: screen prompts, report headings, data entry validation, and edit mask.

Data types supported. Strings/character, numeric/integer, dates, money, Boolean.

File/record restrictions. No limit to number of files, records per file, or maximum number of files open simultaneously. Maximum fields per record—3,000.

Physical data structures supported. Primary key hashing, bit-mapped cross-reference tables, threaded binary trees, and blocked sequential. Blocks of space are allocated and deallocated depending on operations being performed. Utilities are provided for compaction of data bases and compression of index vectors. Record indexing mechanisms include bit-mapped and cross-reference tables (may be partially or completely cross-referenced).

Logical data structure is relational/inverted with inner join.

Simultaneous read/write access is allowed at any level.

Data base reorganization shouldn't be needed. However, if the disk were to become very fragmented, the process to reorganize would be: rebuild, offload, destroy, build external, load.

Multivolume data bases are supported.

Distributed data base capabilities are provided through Xodiac.

Integrity and error processing. Autorecovery, record locking, edit mask, edit check, redo, and checkpoint assure integrity. Logfile is provided in case of fatal error; DBA type message is displayed and software stops. Error processing controls for privilege violations, syntax non-fatal software errors, and fatal software errors.

Transaction processing recovery process is redo, checkpoint, logfile (before image, roll forward).

Backup and restore procedure for logically related file structures is autorecovery. The data base must be closed while backing up data, but can be open for offload.

Host language interfaces. InFoCen subroutines may be called from any high-level language (common calling sequence) supported by the host operating system.

Data import and export facilities. Interfaces to INFOS through InFos output format. Handles incoming data files in user-defined formats. Export data can be passed to external processes

such as SAS, SPSS, MOSS, and IMSL. Direct interface provided to WordPerfect. Provides for ASCII/EBCDIC conversion.

Data base access can be selectively granted and denied for the operating system, data base, data sets, data items, system data sets (family name, applications), and software engineer (system data sets, macro programmable). Data access auditing and security alarms are supported.

4GL programming capabilities

General features. If, then, else with nesting; loop, end loop, escape, next; execute; subroutines (internal and external); functions (internal and external).

Character and string handling. Concatenate, substring, trim, upper/lowercase; string functions for parsing.

Numeric capabilities. Automatic rounding, with money handled with proper precision and rounding; date arithmetic. Includes more than 50 trigonometric, statistical, mathematical, and date/time functions.

Code produced. Produces compiled, optimized code, with interactive editing and debugging.

Language-sensitive editor featured.

Spawn to subprocess is supported.

Interactive query facilities. Query by forms, subroutine level.

Interactive update facilities. Full screen orientation; capabilities include add with prompts, delete/confirm, and change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities and supports UTIXX series, Tektronix (Lear Siegler), 4XXX series, WYSE, and any dumb ASCII terminal.

Multiple records displayed at one time. No limit to maximum field size that can be displayed through scrolling.

Windowing capabilities and screen "painter" included.

Standard screen generated with default prompts and validation criteria supplied from the data dictionary. Code is available for customization.

Report generator

General features. Page headings, automatic subtotals, subheadings, footnotes, default column positioning, default headings from data dictionary.

Standard form letter and mailing label reports are available. Reports can be designed with a "paint" interface.

Automatic settings for page numbers, etc. can be suppressed or overridden.

Additional development tools. Data communications facilities, system and data base design tools, preprogrammed applications, graphics.

System considerations

Memory recommendation. Minimum memory recommendation is 4 MB system memory. Code is shared and compiled for each module.

Central system overhead for supporting processes is 100 KB for lock server.

Independent application benchmarks are available.

Price. Available on request. Δ

Oracle Relational Database Management System

Oracle Corporation, 20 Davis Drive, Belmont, CA 94002; 415/598-8000 or 800/345-DBMS (within U.S.); 415/598-8290 (international). Contacts: Bob Gref or Jenny Kaye.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary. Relations are defined for inquiry and reporting. A central data base administrator grants rights and privileges, but users can create their own tables (since the data dictionary is a set of tables automatically created and updated). The data dictionary provides user security authorization, produces reference lists or "where used" listings, and includes the following defaults: screen prompts, report headings, data entry validation, and edit mask.

Data types supported. Strings/character, numeric/integer, dates, money.

File/record restrictions. No hard-coded limit to number of files, records per file, or number of files open simultaneously. Maximum fields per record is 254.

Physical data structures. Supports B-tree data structures. Provides clustering disk space management tools. Data is stored in compressed form when the data type is numeric and has trailing zeros or when data is of character type and has trailing blanks. All indexes are stored in B-tree structures. Oracle has single, concatenated, compressed, and noncompressed indexes.

Logical data structures are relational with inner and outer join.

Simultaneous read/write access. Users can read data at any level, while at the same time, others can update that data.

Multivolume data bases are supported.

Data base reorganization needed only when data base is fragmented. Can be accomplished by a full data base export/import or by selectively copying and dropping (or archiving) tables.

Distributed data base capabilities. Users can log on to data base running on a remote host and execute SQL commands against that data base. SQL*Net supports location transparency (the user does not have to know whether a table is located at the local node or a remote node). SQL*Net also supports joins and unions across two or more nodes.

Integrity and error processing. Automatically ensures that any data being inserted or updated is of the proper data type, that it does not exceed the maximum length of field, that all mandatory fields are specified (not null), and that record uniqueness (based on columns) is maintained when specified. SQL*Forms permits additional validation.

Transaction processing recovery. After-image journaling (AIJ) provides recovery in the event of a secondary storage failure. A separate record (journal) of each block written to the data base is kept. The journal may be applied to a backup copy to produce an exact copy of the lost data base.

Backup and restore procedures. The Export utility provides a way to copy data in a data base to a backup file. The Import utility restores exported data. The data base must be closed while backing up data.

Host language interfaces. COBOL, Fortran, Pascal, C, PL/I, Ada.

Data import and export facilities. Interfaces to ASCII, WKS (Lotus products), DIF (Visicalc), PRN (dBase), Sylk (Microsoft), DR2. Provides for ASCII/EBCDIC conversion.

Data base access control. Security can be controlled at table, user ID, column, value, library, or terminal ID levels. Data access auditing and security alarms are supported.

4GL programming capabilities

General features. If, then, else with nesting; loop, end loop, escape, next (via programmic interfaces in Oracle 5.0 or PL/SQL under TPS); execute; subroutines (internal and external); functions (internal and external).

Character and string handling. Concatenate, substring, trim, upper/lowercase; string functions for parsing.

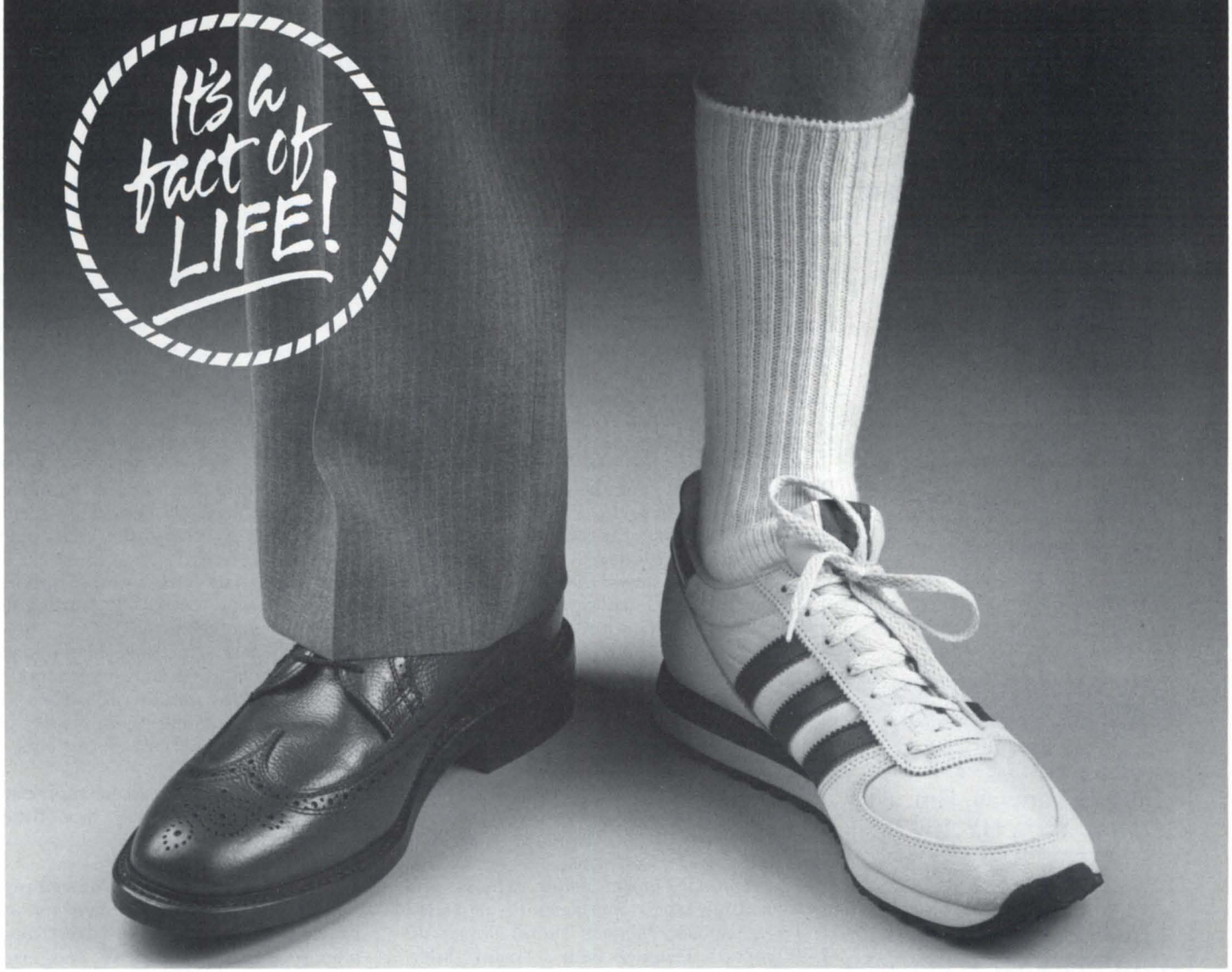
Numeric capabilities. Automatic rounding, with money handled with proper precision and rounding; date arithmetic; a variety of formats for time; absolute value (ABS); greatest (Max); Least (Min); Round; Trunc, AVG, Count, Sum, Convert character to numeric (to number).

Code produced. Produces compiled, optimized code.

Interactive editing and debugging provided.

Spawn to subprocess is supported.

Interactive query facilities. SQL com-



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patible. Supports full screen query via SQL*Forms.

Interactive update facilities, Full screen orientation (SQL*Forms); capabilities include add with prompts (SQL*Forms), delete/confirm, change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities. Products are device-independent and thus run similarly regardless of terminal type.

Multiple records displayed on one screen. Maximum field size displayed is 240 characters.

Windowing capabilities and screen "painter" included.

Standard screen generated from data dictionary. Default prompts and validation criteria supplied from the data dictionary. Code is available for customization via Triggers. Source code is not available.

Report generator

General features. Page headings, automatic subtotals, subheadings, footnotes, default column positioning (SQL*Plus), default headings from data dictionary (SQL*Forms).

Standard form letter reports and mailing label reports can be generated by using SQL*Report. These, along with reports designed with a "paint" interface, will be available in Oracle's /Report product.

Automatic settings for page numbers, etc. can be suppressed or overridden.

Additional development tools. Applications generator (SQL*Forms); data communications facilities (SQL*Net) system; data base design tools, preprogrammed applications, and graphics.

System considerations

Memory recommendation. Minimum memory recommendation is 1 MB for Oracle servers and two to five active users per MB, depending on the application. For each module, the code is shared.

Independent application benchmarks are available.

Price. Variable by country. Contact Oracle sales office. Δ

PowerHouse

Cognos Incorporated, P.O.Box 9707, 3755 Riverside Drive, Ottawa, Ontario, Canada K1G 3Z4; 613/738-1440. Contact: Bob Stanley.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary provides user security authorization, produces reference lists or "where used" listings, and includes the following defaults: screen prompts, report headings, data entry validation, and edit mask.

Data types supported. Strings/character, numeric/integer, dates, money.

File/record restrictions. 255 maximum files in Quick. No maximum records per file. 1,023 maximum fields per record. 31 maximum files open simultaneously.

Physical data structures. Supports DG's INFOS and DG/SQL file structures and access methods.

Logical data structures. Hierarchical and relational (inner and outer join).

Simultaneous read/write access is supported. Granularity depends on which of the vendors' file systems is being used.

Multivolume data bases are supported.

Distributed data base capabilities are provided through full support of DG/SQL.

Backup and restore procedures. Backup, journaling, and recovery are provided through INFOS or DG/SQL capabilities. (Includes integrity and error processing controls, backup and restore processes, and transaction processing recovery).

Host language interfaces include all non-interpretive 3GL languages.

Data import and export facilities interface to INFOS and DG/SQL.

Data base access control. Record and field level access can be selectively granted and denied. Data access auditing is supported.

4GL programming capabilities

General features. If, then, else with nesting; loop, end loop, escape, next; execute; subroutines (internal and external); functions (internal and external).

Character and string handling. Concatenate, substring, trim, upper/lowercase; string functions for parsing.

Numeric capabilities. Date arithmetic; a variety of time formats; ceiling, floor, and modulo numeric functions.

Interactive editing and debugging are not needed.

Spawn to subprocess is supported.

Interactive update facilities. Full screen orientation; capabilities include add with

prompts, delete/confirm, and change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities and supports approximately 120 other terminal types including HP, DEC, and ADM.

Multiple records displayed on one screen. Maximum size field for reports—264 bytes; for screens—80 bytes. Standard screen can be generated from data dictionary.

Report generator

General features. Page headings, automatic subtotals, subheadings, footnotes, default column positioning, default headings from data dictionary.

Automatic settings for page numbers, etc. can be suppressed or overridden.

System considerations

Memory recommendation. Minimum for PowerHouse is an MV class machine with 2 MB of memory (includes AOS/VS). Code for each module is shared and compiled.

Price. Available on request. Discounts are available for government or educational institutions. Δ

Relate/DB

Computer Representatives, Inc. (CRI), 5333 Betsy Ross Drive, P.O Box 58004, Santa Clara, CA 95052; 408/980-9898. Contact: Pamela Crowley.

Data base management

Data dictionary. Relate/DB does not use a data dictionary. Instead, each file has its own structure contained within the physical file. Each file's structure is readily available via the SHOW STRUCTURE command. Defaults are provided for report headings (the field name is the default column heading), data entry validation (numeric/alpha, dates, decimal precision, length), and edit mask (dollar signs, commas, sign choices, date formats). Provides user security authorization. Relations are defined for inquiry and reporting by creating views.

Data types supported. Strings/character; numeric/integer; dates, including century; money; Boolean.

File/record restrictions. No restrictions on number of files or number of records per file, except for operating system limits. Maximum fields per record is 127. Maximum number of files

open simultaneously varies based on number of fields per file opened, number of aggregates, views active, etc. Usually 20–30 files per user. No limit system-wide.

Physical data structure. A flat file with B-tree indexing and relative record access. Disk space management tools include SHOW CURRENT command for analyzing file limits and REORGANIZE FILE command for increasing file limits. Data compression capabilities are provided, selectable by file. Record indexing mechanisms are B-tree, with distribution data for query optimization.

Logical data structure is relational with inner and semi-outer join.

Simultaneous read/write access is supported at the record level.

Multivolume data bases are supported if the operating system allows a logical file to span multiple volumes.

Data base reorganization. It must be reorganized if the file is full—logically (predefined record limit) or physically. Logically deleted records need to be purged (records can be physical or logical deletes, selectable by file). Each file is reorganized separately—there is no physical data base to reorganize. Reorganizing is done with REORGANIZE FILE filename; reserve=number.

Integrity and error processing. Files can be defined as "crash proof," which forces every change to be written immediately to the physical disk and keeps users from "breaking" a process that is updating indexes. Files can be opened in shared or exclusive mode with choices of update, modify, or read access. Either user-defined locking and/or a checksum algorithm prevent a record from being updated/deleted if another user has changed/deleted the record since originally read. An error message catalog describes each error.

Transaction processing recovery process is forward recovery.

Backup and restore procedures. Files can be backed up and restored using standard operating system utilities. The data base does not need to be closed while backing up data. However, to ensure a clean backup, they should be closed.

Host language interface includes Ada.

Data import and export facilities include complete access to variable- or fixed-length AOS/VS files.

Data base access can be selectively granted and denied at the file, field, and record level. Read only, modify (can't add or delete), and update privileges, as well as control over who can create files, execute commands, run jobs, etc. Data access auditing is supported.

4GL programming capabilities

General features. If, then, else with nesting; loop, end loop, escape, next; execute; subroutines (internal and external).

Character and string handling. Concatenate, substring, trim, upper/lowercase.

Numeric capabilities. Automatic rounding, with money handled with proper precision and rounding; date arithmetic; a variety of formats for time. Numeric functions include absolute, exponential, factorial, log, maximum, minimum, remainder, pi, round-

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ing, square root, trigonometric, and running total.

Code produced. Produces compiled, optimized code, and provides interactive debugging capabilities, including TRACE, script files, access to the relational command interpreter, and exit to editor of choice.

Spawn to subprocess is supported.

Interactive query facilities. Similar to SQL in syntax. Includes more commands than SQL, including UPDATE, CONSOLIDATE, assignments during COPY.

Interactive update facilities. Command rather than full screen orientation; capabilities include add with prompts and change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities and supports any terminal that knows where its cursor is. Terminal configurations are maintainable by the user.

Multiple records displayed on one screen. Maximum size field that can be displayed is 78 characters.

Windowing capabilities and a screen "painter" included. Code is available for customization.

Report Generator

General features. Page headings, automatic subtotals, subheadings, footnotes, default column positioning.

Standard mailing label and form letter reports completed by using the LABEL command.

Automatic settings for page numbers, etc. can be suppressed or overridden.

Additional development tool. Applications generator, preprogrammed applications, and a graphics option (GRAF). Will interface with any standard data communication facilities.

System considerations

Memory recommendation. Minimum memory is 2 MB, with 4 MB recommended. The command language is interpreted. The 4GL is interpreted and compiled. Report writer is integrated with the command language. Graphics are integrated with the command language.

Central system overhead. Depends on what Relate/DB is asked to do. Complex jobs with index creation or sorting require considerable resources. Simple jobs require very little.

Independent application benchmarks are available.

Price. Available on request. Lease rates available. Quantity and educational discounts. For government discounts, contact vendor. Δ

SIR/DBMS

SIR, a division of ISI, 707 Lake Cook Road, Suite 120; Deerfield, IL 60015; 312/480-9270. Contact: Jeff Polz.

Data base management

Data dictionary. All subsystems use an automatic interface to a common data dictionary managed by a central data base administrator. The data dictionary provides user security authorization, defines relations for inquiry and reporting, produces reference lists or "where used" listings, and includes the following defaults: screen prompts, report headings, data entry validation, and edit mask.

Data types supported. Strings/character, numeric/integer, dates.

File/record restrictions. Maximum number of files is 4,095. Maximum records per file is more than 2 billion. Maximum fields per record is 4,095. Maximum number of files open simultaneously is 4,095.

Physical data structures support inverted list, external pointers, sequential, keyed and relative access. Disk space management is provided through internal space management. Data compression capabilities are provided through optimized, internal storage. Record indexing is modified B-tree.

Logical data structures. Network, hierarchical, and relational with inner and outer join.

Simultaneous read/write access is provided at the field or higher level (the DBA can set level).

Data base reorganization can be carried out when data base characteristics exceed current settings. To reorganize: modify characteristics, unload, purge, and reload data base.

Distributed data base capabilities include concurrent read/write access with master. Upload/download data base changes across different machines.

Integrity and error processing. All access to data base is through data dictionary. Verify utility checks integrity.

Transaction processing recovery. Automatic journaling of all data base changes.

Backup and restore procedure is to unload/reload; subset/merge.

Host language interface to any language capable of Fortran subroutine calls.

Data import and export facilities interface to SAS, BMDP, SPSS, DIF, and SYSTAT Save files.

Data base access can be selectively granted and denied at the field, record, and data base levels. Views in SQL. Data access auditing and security alarms are supported.

4GL programming capabilities

General features. If, then, else with nesting; loop, end loop, escape, next; execute; subroutines (internal and external); functions (internal and external).

Character and string handling. Concatenate, substring, trim, upper/lowercase; string functions for parsing.

Numeric capabilities. Automatic rounding, with money handled with proper precision and rounding; date arithmetic; a variety of formats for time. Numeric functions include trigonometric, math (ABS, RND, SQRT, LOG, etc.), summary (mean, Stdev, Min, Max, etc.), across-record, input, string conversion, and many others.

Code produced. Produces compiled, optimized code.

Language-sensitive editor provided.

Interactive editing and debugging provided.

Spawn to subprocess is supported.

Interactive query facilities. SQL-compatible, supports procedural language and full screen-query methods.

Interactive update facilities. Full screen orientation; capabilities include add with prompts, delete/confirm, change with prompts.

Screen design and management

Terminal types supported. Utilizes DXXX terminal capabilities and supports 78 other terminal definitions. Others can be added.

Multiple records displayed. Maximum field size displayed is 79 or 131, depending on terminal.

Standard screen generated from data dictionary.

Report generator

General features. Page headings, automatic subtotals, subheadings, footnotes, default column positioning, default headings from data dictionary.

Automatic settings for page numbers, etc. can be suppressed or overridden.

Additional development tools. Applications generator, data communications facilities, system and data base design tools, graphics.

System considerations

Memory recommendation. The minimum memory recommendation is a working set of 400 pages. For each module, the code is compiled.

Central system overhead not required for supporting processes.

Price. Class B machines (MV/20000, MV15000 model 20)—$80,000; Class C (MV/10000)—$66,000; Class D (MV/8000)—$40,000; Class E (MV/2000, MV/4000)—$13,500; Class F (MV/2000 DC, MV4000 DC)—$3,000. Ongoing, yearly maintenance ranges from $360-$9,600. Lease rates available. Quantity, government, and educational discounts available. Δ

PRESENTING...

Data General's information presentation facility

by Dennis J. Berman
Special to Focus

I am asked more questions about Present, Data General's reporting package, than almost any other data processing topic. This is probably because it does so many things for so many people. Designed for taking raw data and formatting it into useful information, Present can be used by end-users as an ad hoc report creator, by executives as a "canned routine" facility, or by systems people as a prototyping tool.

The input data can be any of the following types: sequential list or text flat files, INFOS-II data-base-oriented files, DG/DBMS network-type data bases, DG/SQL relational data bases, and CEO data files. You can create output in the form of reports, bar and pie charts (in conjunction with DG's Trendview graphics charting package), or another file (an extract).

Present is designed like most other 4GLs (fourth-generation languages). Similar to IBM's RAMIS II by On-line Software, Present is easy to learn and easy to use. I've seen some decent Present reports created in no more than five minutes—and with as few as three lines of code (known as a macro). Anybody can learn how to get started in less than an hour. DG also offers computer-based training (CBT) for Present.

My user community started using Present as an afterthought. While developing some new systems a few years ago, our OEM and I needed a quick-and-dirty way to look at the new data we were producing. DG's Inquire utility was fine for looking at single, unpacked records; however, we needed to see the big picture. The report writer facility in DG's Sort/Merge utility was cryptic and limited. Writing and recompiling COBOL programs was also no fun. (DG could have made that almost bearable if they hadn't left the report writer out of their AOS/VS COBOL.) By process of elimination, we selected Present. Shortly thereafter, I caught a couple of execs (of the corporate persuasion) staring over my shoulder. They were duly impressed with Present's "what if" power and speed. Not wanting to confine the use of Present to just development, they asked me to begin training the rest of the users. So much for my empire-building.

There are a few ways to set up Present in your shop: you can have CEO call it, you can batch process it, and you can call it directly from CLI. If your

Figure 1: "EMPLOYEE_NAME.DF" Present description file

```
*  This is the PRESENT file description for the "EMPLOYEE_NAME" file.

01  EMPLOYEE_NAME_RECORD DATA SENSITIVE LENGTH 60,
    05  ENAME_EMP_NUMBER                  UNPACKED DECIMAL UNSIGNED (4)
        HEADER CENTER "Employee" "Number",
    05  ENAME_LAST_NAME                   CHARACTER (20)
        HEADER CENTER "Last" "Name",
    05  ENAME_FIRST_NAME                  CHARACTER (20)
        HEADER CENTER "First" "Name",
    05  ENAME_TERRITORY_CODES OCCURS 3,
        10  ENAME_TERRITORY               CHARACTER (1)
            HEADER CENTER "Territory" "Codes",
    05  ENAME_FILLER                      CHARACTER (13).
```

Figure 2: "EMPLOYEE_SALES.DF" Present description file

```
*  This is the PRESENT file description for the "EMPLOYEE_SALES" file.
01  EMPLOYEE_SALES_RECORD DATA SENSITIVE LENGTH 30,
    05  ESALES_EMP_NUMBER                 UNPACKED DECIMAL UNSIGNED (4)
        HEADER CENTER "Employee" "Number",
    05  ESALES_PERIOD_DATE
        HEADER CENTER "Sales" "YYMM",
        10  ESALES_PERIOD_DATE_YY         UNPACKED DECIMAL UNSIGNED (2)
            HEADER CENTER "Sales" "Year",
        10  ESALES_PERIOD_DATE_MM         UNPACKED DECIMAL UNSIGNED (2)
            HEADER CENTER "Sales" "Month",
    05  ESALES_PERIOD_DATE_RD REDEFINES ESALES_PERIOD_DATE
        HEADER CENTER "Sales" "YYMM",
        10  ESALES_PERIOD_DATE_YY_RD      CHARACTER (2)
            HEADER CENTER "Sales" "Year",
        10  ESALES_PERIOD_DATE_MM_RD      CHARACTER (2)
            HEADER CENTER "Sales" "Month",
    05  ESALES_AMOUNT                     UNPACKED DECIMAL UNSIGNED (6,2)
        HEADER CENTER "Sales" "Amount",
    05  ESALES_FILLER                     CHARACTER (14).
```

Figure 3: "ENAME_ESALES.VF" Present VIEW file

```
VIEW ENAME_ESALES
SELECT * FROM FILE EMPLOYEE_NAME, FILE EMPLOYEE_SALES
WHERE ENAME_EMP_NUMBER = ESALES_EMP_NUMBER
```

Figure 4: "DJB_FOCUS_VIEW.PR.MAC" Present macro

```
INPUT VIEW ENAME_ESALES
PAGESIZE 70 COLUMNS
TITLE 1 "(MACRO DJB_FOCUS_VIEW)"  DATE CENTER  PAGE RIGHT
TITLE 3 '"BOYS-OF-SUMMER" COMPANY -- 1987 SALES VOLUMES' CENTER
SELECT ESALES_PERIOD_DATE_YY = "87"
TABLE @QUARTER
   "01" "1ST"  "02" "1ST"  "03" "1ST"  "04" "2ND"  "05" "2ND"  "06" "2ND"
   "07" "3RD"  "08" "3RD"  "09" "3RD"  "10" "4TH"  "11" "4TH"  "12" "4TH"
COMPUTE NICE_NAME =
   ( TRIMR(ENAME_LAST_NAME) !! ", " !! TRIMR(ENAME_FIRST_NAME) )
COMPUTE DATE_RD = ESALES_PERIOD_DATE
SORT ESALES_PERIOD_DATE NICE_NAME
BREAK AFTER @QUARTER(ESALES_PERIOD_DATE_MM_RD)
   1 UNDERLINE(ESALES_AMOUNT)
     @QUARTER(ESALES_PERIOD_DATE_MM_RD) "QUARTER TOTAL:"
     SUM(ESALES_AMOUNT) PICTURE $$$,$$$,$$$.99 RIGHT
   3
REPORT
   ENAME_EMP_NUMBER    PICTURE 9(4)
   NICE_NAME           PICTURE X(30)
   DATE_RD             PICTURE 99/99
   ESALES_AMOUNT       PICTURE ZZZ,ZZZ,ZZZ.99 RIGHT
HEADER NICE_NAME CENTER "Employee" "Name"
HEADER DATE_RD   CENTER "Sales"    "YY/MM"
TOTAL 3 "REPORT TOTAL (" COUNT PIC ZZ9 COLUMN+0 " ITEMS):" COLUMN+0
   SUM(ESALES_AMOUNT) PICTURE $$$,$$$,$$$.99 RIGHT
TOTAL 4 "REPORT MONTHLY AVERAGE:"
   AVG(ESALES_AMOUNT) PICTURE $$$,$$$,$$$.99 RIGHT
```

Figure 5: Sample output from "DJB_FOCUS_VIEW. PR.MAC" Present macro

```
(MACRO DJB_FOCUS_VIEW)          8/27/87                              1

          BOYS OF SUMMER COMPANY -- 1987 SALES VOLUMES

Employee              Employee                Sales            Sales
 Number                 Name                  YY/MM           Amount
-------------------------------------------------------------------
    0578  RIPKEN, CAL                        87/01          34,343.43
    0005  ROBINSON, BROOKS                   87/01          10,057.88
    0600  MURRAY, EDDIE                      87/02              23.43
    0005  ROBINSON, BROOKS                   87/02          20,010.00

1ST  QUARTER TOTAL:                                        $64,434.74


    0578  RIPKEN, CAL                        87/05          66,785.70
    0005  ROBINSON, BROOKS                   87/05          50,023.99
    0600  MURRAY, EDDIE                      87/06         100,324.00

2ND  QUARTER TOTAL:                                       $217,133.69


    0600  MURRAY, EDDIE                      87/08           3,453.33
    0578  RIPKEN, CAL                        87/09             234.28
    0005  ROBINSON, BROOKS                   87/09          12,388.88

3RD  QUARTER TOTAL:                                        $16,076.49


    0578  RIPKEN, CAL                        87/10          11,199.95
    0005  ROBINSON, BROOKS                   87/10          54,545.45
    0600  MURRAY, EDDIE                      87/11           9,898.95
    0005  ROBINSON, BROOKS                   87/12          20,000.00

4TH  QUARTER TOTAL:                                        $95,644.35


REPORT TOTAL (14 ITEMS):                                  $393,289.27
REPORT MONTHLY AVERAGE:                                    $28,092.09
```

shop is "promptless" like mine, you can have it called by a CLI or application language menu.

The first thing you should do is familiarize yourself with the product. The documentation manual (#093-000168) is well-written—even considering the four typos I found on the first page (January 1985 printing, 1-1). The documentation change files (i.e., #093-000168-03) are also very valuable. If you didn't receive these files, find a copy.

Next, you will need to define who will be using Present and how they will be using it. The beauty of this product is that unsophisticated users can use it by having someone else write the Present macros for them.

Present comes with a utility called PRUSER that lets you establish Present user profiles with their associated privileges. It is much like the AOS/VS PREDITOR utility. Next, you will need to define what data the users will be able to query against. This is done by creating description files (.DF) similar to COBOL record layouts. Although somewhat time-consuming, this process proved valuable to my shop: it became the beginning of our data dictionary. I also found the definition process much simpler than the other reporting packages.

When considering Present for your shop, be very conscious of performance. Like all other user-friendly packages, Present is a resource hog. It is advisable to establish its system priority lower (but with a higher number) than the other user processes. When purchasing Present, be sure to include at least one extra 2 MB memory board with your order. Let no one claim DG is without a sense of humor. When I asked about the extra memory module I had ordered, they told me, "the cache is in the mail."

After working with Present for a while, you will discover new uses for it. Basically, Present can handle any file that you can make conform to a predictable detail record format. For example, if you weren't fortunate enough to attend Tom Gutnick's seminar at Conference 87 on writing application programs against the SYSLOG file (to extract system usage information)—fear not—Present can do it. Simply run DG's Report utility against SYSLOG using the /CT and /L switches in order to write a console connect-time report to disk. Create a report detail line description file for Present. Then write a Present macro against this disk file. Be sure to SELECT "records" (actually lines of the disk re-

port) that have valid data. In other words, leave out page headings, blank lines, and the like. It took me only 15 minutes to develop, test, and produce a detailed listing of how much each person used each CPU console port. The macro was only seven lines long. It was kind of a kludge, but it worked. One general hint is to pre-create and define your output list files as /DATASENSITIVE to Present. If there is an interest, I'll print the details in another article.

A relatively new feature of Present is its ability to handle more than one input file at a time. It will be easier to explain how this works with an example. Imagine that the fictitious Boys of Summer Company has two sequential files: EMPLOYEE_NAME, with all the company's employee names, and EMPLOYEE_SALES, with—you guessed it—the company's sales volumes by employee. Both files key on unique employee numbers (see description files in Figures 1 and 2).

Your mission is to produce a quarterly sales report that shows the employee name and number. You do this by creating what is known as a VIEW file (.VF). Figure 3 lists the ENAME_ESALES.VF view file I created to associate the two files for Present based on their matching employee number fields. You must use unique field names in all your .DF description files. If I was using INFOS-II files instead of the sample sequential files, all I would have to do is change the VIEW references of FILE to INDEX. To use more files as input, simply extend the VIEW SELECT and WHERE lines. The "*" in the VIEW tells it to use all the fields from each file description. It's a lot more efficient to write your VIEWs to SELECT only the fields you really need. Now write the macro using the INPUT VIEW command.

Take a look at the sample Present macro shown in Figure 4, which illustrates some of my favorite Present macro coding techniques. Keep in mind that most of it is fluff to make the sample report shown in Figure 5 look more presentable; most of the macros you will write will be much simpler. Since our users have several hundred Present macros, I always include the macro name on the printed output. That way, if users see a particular Present report that they like, the output will direct them to the macro name they need to run.

Present is lacking direct IF-THEN-ELSE logic abilities. You can try to get around this by using the powerful TABLE command. In the sample, I was able to produce quarterly sales volumes by associating each month with a quarter and then doing a control break on it.

Present has a lot of new string manipulation commands. In my sample macro, TRIMR removes trailing (right) blanks from the employee names. The "!!" joins (concatenates) the names together. There are a couple of ways to redefine data fields. You can do it in the description file (see ESALES_PERIOD_DATE_RD in Figure 2) or in the Present macro by using the COMPUTE command. I also recommend you predefine each field's report column heading inside the description file by using the HEADER command. This keeps ill-informed users from labeling it incorrectly inside their macros. Also, this keeps output consistent and saves countless keystrokes during macro programming.

As mentioned above, Present does

have a few limitations. It doesn't handle complex logical expressions very well. Because of this, it has a problem handling multiple fields that occur more than once within a file description. For example, my sample employee description file has a reccurring group item called "ENAME_TERRITORY_CODES." In your macro, you would refer to the elements as "ENAME_TERRITORY(1)" through "ENAME_TERRITORY(3)." This allows each employee to be assigned up to three different territories. I haven't figured out an easy way to both search for *and* report on a particular element value. Present may know your value is in the group by using a compound SELECT command, but it can't feed back what element "occurs slot" it is in without regurgitating all the other element values. Present also doesn't have a way to call in value tables unless you either include them in every macro that uses them, or you treat them as files and use a VIEW. Since most of my STRs have been answered, these few limitations are bearable for now.

In summary, I am a firm believer in the single-vendor shop. If you are running DG equipment, your best bet is to stick with DG for the software. When you need help, you can call the same 1-800-DG-HELPS number you use for all your other questions and problems. Present is well-integrated into DG's product line. This includes tie-ins to CEO, SED (screen editor), Sort/Merge, Trendview, CLI, and all their file management systems. The Present interactive commands are very "CLI-like." DG appears to be devoting a lot of personpower to keep Present a viable offering. Good ol' Atlanta came out with add-ons like PRMENU that help you keep track of your macros. Ask your DG rep for details.

Present's product installation and maintenance is very simple, and it's relatively easy to learn to use. As of this printing, DG charged as little as $1,050 for the one-time, per-CPU, right-to-use license (model #30039 for an MV/2000 without data base support). It costs $18,240 for the same license on an MV/20000 with data base support (model #3926). Support Plus software assistance runs between $45 and $70 per month. This does not include any applicable contract discounts and/or add-ons. Ask your DG rep for the latest product pricing structures. In the first year alone, it would cost you far less to get Present than it would to hire one additional clerical number-cruncher or programmer (now I know why nobody will go to lunch with me).

I want to thank you *Focus* readers for your many calls and letters (preferred method) on my previous articles. I feel this magazine is the best thing to happen to DG users since LOOK.PR and FIND.PR. (Who wrote those gems anyway?) I encourage others to contribute articles and patronize the advertisers. Finally, to any of the Conference 87 attendees who were kind enough to lend me slot money: "The cash is in the mail." Δ

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BY JOHN GRANT

SPEED AND STYLE, ALACRITY AND GRACE

Your programs reflect the editor you use—and the way you use it. Part II

Last month, I talked about the different editing capabilities and relative strengths of Data General's SPEED and SED editors. In this issue, I will show how they affect or are affected by programming style. As in the last article, I will use the "$" character for "escape," "^D" for "control-D," and "#" for "newline" in the examples.

Programming style

My program development and editing style is characterized by an almost complete distrust of any hard copy of the code (it is *never* current!). I rarely QPRINT any source files (making me particularly vulnerable to system crashes); however, I do exit and re-enter the editors quite frequently when entering new code. (I compose code on the fly and never write it out first using analogue writing devices.) I'm sure classically trained programmers are abhorred by all of this, but "it works for me." Anyway, the reason I can get by without ever printing any files is that I know how to make SPEED do my work for me. If I'm having a problem with a program, I use SPEED to find and list all occurrences of a particular variable name, subroutine call, format statement, etc. If the problem is spread across several modules, then I can COPY all of the source files together in one huge temporary file and use SPEED to scan it.

```
DELETE/2=IGNORE =?CODE.TMP
COPY/V =?CODE.TMP [!FILES,%1%]
X SPEED/D =?CODE.TMP
DELETE/2=IGNORE =?CODE.TMP =?CODE.TMP.TM
```

With SPEED, I can search for all occurrences of a variable name or subroutine name. Calling sequences can be checked by finding all occurrences of CALL FRED and SUBROUTINE FRED.

With SED, you simply cannot do this without using SUBSTITUTE and without having a lot of patience. Also, if the file is very large, then SED will insert page breaks, and if you use "SUB FRED FOR FRED IN PA ALL," SED will list the lines, but it will also clear the screen each time it starts a new page. You have to be quick!

My programming style is closely tied to the capabilities of the editors. Because I make such frequent use of the search and list feature of SPEED, I'm very careful to choose variable names and subroutine names that can take advantage of it. Grant's first and second rules of variable name selection are:

1. Make all variable names sufficiently dissimilar so that you can search for and list all occurrences of a single variable name without also listing other variables.
2. Variables that represent similar entities should have a portion of their names common to all variables in the group. This will enable you to find and list all variables that are related to a particular function of the program.

For example, while scanning the C-Kermit code, I was continually frustrated in my attempts to cross-reference a pair of variables called "SEOL" and "EOL." It was easy to find all occurrences of both of these variables, but it was impossible to find EOL without also finding SEOL. A better choice for EOL would have been REOL, especially since SEOL was related to send and EOL was related to receive.

In a second example, RTIMO and TIMINT were used for send/receive timeout intervals. While it was possible to search for each variable independent of the other, it was impossible to use TIM to find all occurrences of both variables in one pass, because TIMEOUT appeared in the comments, and there was a procedure called RTIMER. A better choice for RTIMO/TIMINT would have been STIMINT/RTIMINT, which would make the code much easier to maintain (and read). Both variables can be referenced by TIMINT, and each can be found by searching for STIM or RTIM.

These are good examples of the fact that unreadable code can be written in any language, including the almighty C.

I mentioned that you can find all subroutine calls (but not function calls) in a Fortran program by searching for CALL. With proper selection of subroutine names, you can make it very easy to further distinguish different types of subroutines. There are three types of subroutines or functions that are used in a program:

1. runtime routines supplied with the product (DATE, TIME)
2. your routines that are specific to the program
3. routines from your toolbox library that are used by many different programs.

You can't do anything about the names of the runtime routines; however, you can be clever with your choice of names of your own procedures. Let's say you are writing a program called PLOT_MY_DATA that uses some utility routines from your toolbox library (DELETE_FILE, RENAME_FILE, GET_USERNAME, etc.). In addition, you have several subroutines that are only used by this specific program: INIT, SELECT, NEXTVALUE, etc. If you use a character such as "Z" or "X" as the first character of the names of the utility routines and a prefix such as PMD_ (Plot My Data) on the names of the other routines, then you have

created an environment that works nicely with the SPEED editor:

```
call PMD_INIT
call ZDELETE_FILE("fred")
call ZRENAME_FILE("joe","fred")
call PMD_SELECT
value=PMD_NEXTVALUE(1)
username=ZGET_USERNAME(3)
```

You can search for PMD_ and find all of the references to subroutines *and* functions that are specific to this program. You can also search for Z and find all occurrences of library routines and functions. In the latter case, you will probably get other Z references, but you can restrict your use of Z in variable names to make it easier to find just the utilities. Of course, you can always search for CALL Z, which will just find all of the utility *subroutine* calls, but not *function* references. This will also work with SED, but as I have stated, it requires the slow and unnecessary and case-dependent SUBSTITUTE command.

SED has good features, too!

SED is not entirely without redeeming features, and one of the best is the programmable function keys. My "compose as you go" programming style often finds me creating code on the fly as I enter it with SED. I use variables as I need them and insert declaration statements within the code. Then when I am finished, I move them all to the top of the module and rearrange them in logical groups. As I write the code, it might look like:

```
  DO I=1,NPT
INTEGER I,NPT
  XYZ(I)=0. 0
  END DO
REAL XYZ(NPT)
PARAMETER (NPT=1000)
  CALL GET_USERNAME(USERNAME)
CHARACTER*15 USERNAME
  L_NAME=INDEX(USERNAME," ")-1
  WRITE(SCREEN,*)"USERNAME=",USERNAME(1:L_USERNAME)
INTEGER L_NAME,SCREEN
PARAMETER (SCREEN=10)
  . . .
```

Then I define function key 4 in SED:

```
SET FUNCTION 4 "MOVE CURRENT AFTER LAS"
```

and go to the top of the file, positioning down through the code and moving all of the declarations to the bottom of the file. Then I go to the bottom of the file and move all of the clustered declarations to the appropriate section near the top of the module, rearrange them, and add cosmetics. The final product then looks like:

```
C)))CONSTANTS
C--) ARRAY DIMENSIONS
      INTEGER NPT
      PARAMETER (NPT=100)

C--) I/O CHANNELS
      INTEGER SCREEN
      PARAMETER (SCREEN=10)

C)))VARIABLES
C--) BUFFERS
      REAL XYZ(NPT)
      CHARACTER*15 USERNAME

C--) MISCELLANEOUS
      INTEGER L_NAME,I

C)))BEGIN
      DO I=1,NPT
            XYZ(I)=0.0
      END DO
      CALL GET_USERNAME(USERNAME)
      L_NAME=INDEX(USERNAME," ")-1
      WRITE(SCREEN,*)"USERNAME=",USERNAME(1:L_USERNAME)
      . . .
```

This example clearly demonstrates how the choice of editors affects your programming style. Of course, the technique will work for any programming language.

F77: Playing with fire?

While I am on the subject, let me offer a few words of caution about Fortran 77, at least Data General's version. Pascal programmers will be pleased to know I use IMPLICIT NONE in every Fortran 77 module I write—this forces me to declare every single variable. I know all of you old Fortran programmers will balk at it, but if you declare the variables as you reference them when you are entering new code (as in the above example), you will find it isn't much of an additional burden. If that isn't enough to convince you, consider the following program:

```
PROGRAM NONSENSE
Y=X
Z=WORDADDR(STUFF)
WRITE(SCREEN,*)"HELLO"
END
```

If you compile that code with Data General's F77 compiler, you will not receive a single compile error, and of course, LINK won't say "boo" either. However, when you execute the program, all of the variables will contain garbage, and the program will eventually blow up on "fixed point overflow," because SCREEN is undefined. I hope somebody at Data General is listening. Why can't F77 cross-reference the variables by "use count" and report compile errors for those that have never been assigned a value, like X, STUFF, and SCREEN, in the example? Fortran 5 was much better at detecting these types of errors. When I switched to F77, I wasted many hours tracking down errors caused by undefined variables. My solution was to alter dramatically my programming style by writing every single line of code under the IMPLICIT NONE umbrella.

One final comment: when you're working on several projects at once, it sure is nice to have the UNLIMITED SONS privilege. I tend to be very prolific in this sense. I use SPEED's X command and SED's DO and CLI commands to pop out to the CLI and start another SED or SPEED editing session or application program. Since all of my applications also have the ability to pop out to the CLI at key points in the program, it can get confusing. Sometimes it takes a dozen or so BYE and FUH commands before I finally log off the system (really!). The only problem is that after pulling out of several SED or SPEED sessions and getting back to the first file that I started out to edit several hours earlier, I sometimes forget what I was doing there in the first place! Δ

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SYSTEM MANAGER'S LOG

BY BRIAN JOHNSON

BENCHMARKS AND BULLETIN BOARDS

B.J. talks about both

:BBS

As I hope you already know, a free, computerized Bulletin Board System (BBS) is maintained for NADGUG by Rational Data Systems in Corte Madera, California. Unlike most of the traditional microcomputer BBSs, the NADGUG board doesn't support up/downloading of software. Instead, it specializes in information exchange and gossip.

DG also maintains a bulletin board for NADGUG within the On-line Information Service (OIS), but you have to provide a credit card number or open purchase order number to cover any bills you might run up if you take advantage of the chargeable areas of OIS. OIS does offer downloading (i.e., board to user), but the only files available for downloading are patch files, and you have to use DG/Gate to accomplish the transfer.

Lately, there has been some discussion of adding up/download capability to the NADGUG board. Whether or not that happens depends at least partly on some funding issues that are unresolved as of this date (Labor Day weekend).

Well, I'm going to throw another hat into the ring. :SYSMGR maintains a BBS for customers who want to obtain the latest software updates via downloading. As you read this, the :SYSMGR BBS is open without charge to anybody who wants to access it. The specifics are listed in Figure 1.

The :SYSMGR BBS differs from the NADGUG and OIS bulletin boards in one major respect: it has no connection with Data General Corporation or with the North American Data General Users Group.

There are also some minor differences: no message facility is provided. The primary purpose of the board is to encourage the exchange of worthwhile documentation and *supported* software for DG users. By supported, I mean that either the sources are packaged with the program, or the author has committed to support the program, perhaps for a fee.

The complete guidelines are the *Contributor's Guide* and the *User's Guide*, included in two text files you can "capture" from the board.

Access to the board can be accomplished in one of two ways: you can use a dial-out modem on your DG system to dial the board and download files directly, or you can use a PC to download the files and then upload them from the PC to your DG system.

For those of you who choose the direct route, the assembly source code (16 bit) of an X/YMODEM file transfer package is available on the board with my compliments, but you will need something on your end to download it *with*. There's always a catch.

If you access the board via a PC, you will need a terminal emulator/file transfer package on the PC that is capable of emulating a DG terminal. It will also have to support text file capture with one of the error-free file transfer protocols that the board supports (currently XMODEM, YMODEM, and BLAST). The AOS[/VS] X/YMODEM program mentioned above completes the package by allowing files captured on the PC to be uploaded onto your AOS[/VS] system. I hope that some RDOS hacker will produce a variant of the X/YMODEM package for RDOS users.

Figure 1: BBS details

```
Phone:    415-391-6531 (San Francisco, CA)
Modem:    1,200 baud (212A or Vadic 3400 mode)
System:   MV/4000 running AOS/VS and QADBBS.PR
Config:   CHARACTERISTICS/605X/BAUD=1200/CHARLEN=8/PARITY=NONE/
          STOPBITS=1
Xfers:    XMODEM, YMODEM, YMODEM Batch, BLAST
Access:   Nominally 24 hours a day
Flavor:   Up/downloading of user-contributed files related
          to DG hardware and software systems
```

:BBS:GOTCHAS

Because the size of the average high-level language AOS/VS .PR file is substantially larger than the average MS-DOS .EXE file, I foresee some problems downloading the bulkier items, especially using relatively inefficient protocols like XMODEM. There are file compression programs available that can knock the size of some files down by 50 percent. As soon as I get the source to one, I'll put it on the board and compress all the packages. However, as an alternative to those of you who are sensitive about your phone bill, copies of the files will also be available on mag tape for the cost of the tape reel, shipping, and handling fee. Ordering details are on the board.

At this point, only one dial-up port is allocated to the board. Depending on the usage and revenues, more ports and faster modems may be added.

:UPDATE:IACS

In the June 1986 issue of *Focus*, I wrote a column on IAC performance. Since that time, I've received a handful of calls from users who attempted to duplicate the results without any luck. I haven't had any need to redo the tests, plus I had lost track of my test notes, so I just noted the problems and pressed on. Last week, I got a call from a DG systems engineer in Los Angeles who was also trying to duplicate the results without much luck. In this case, however, I knew the SE to be one of the better ones. He had used a fairly sophisticated, multitask test program to do minimal-overhead binary I/O, and he had used a patch to IACRS.PR developed by the late (and sorely missed) Jim Cramer to monitor the IAC idle time. His results showed that the IAC idle time goes to zero at around 4,000 characters per second on an MV/10000. Obviously, it was time for me to do some retesting.

Just to refresh your memory, the original test results were obtained on an MV/10000 (AOS/VS rev unknown) in the DG Education Center at McLean, Virginia. I was doing a performance semi-

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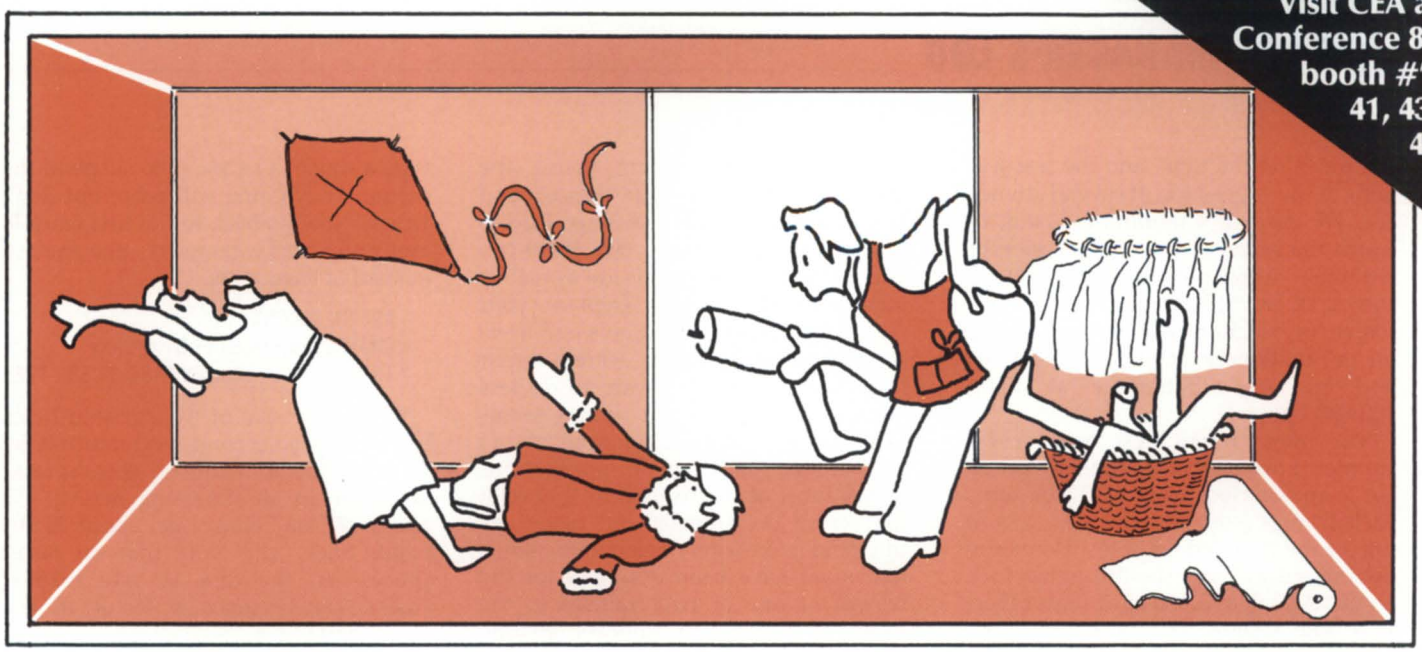

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Circle 10 on reader service card.

nar for DG at the time, and the test was done at the suggestion of several attendees. We used DG's monitor program to watch the system while a succession of terminals were put to work TYPEing PARU.32.SR at 9600 baud. The PMGR screen in monitor supposedly showed an IAC bottleneck at about 30,000 cps and an AOS/VS bottleneck at about 100,000 cps.

My most recent test was a bit simpler: I disabled eight consoles on an IAC-16 and started firing up batch jobs, each doing COPY/B @CONXX PARU.32.SR to one of the disabled consoles. Using my own monitor, I saw the throughput for an IAC-16 peak at 3,600 cps on an otherwise idle MV/4000. The host CPU usage was just a small percent of capacity. The IAC throughput depends slightly on the speed of the host, so my result was not inconsistent with that of the DG SE. Obviously my original IAC bottleneck results were off by almost a factor of 10! I suspect that some of the hurried conversions back and forth between baud rate and cps (at 10 bits per character), along with poor recording of the raw data, may have been at fault.

In any event, my sincere apologies to the previous callers whose results I doubted.

OK, so how does this new number affect my overall feelings about IACs and their potential to become bottlenecks? Obviously, it's impossible to drive all the lines on an IAC-8 constantly at anything above 4800 baud (480 cps x 8 = 3840 cps), or an IAC-16 at 2400 baud (240 cps x 16 = 3840).

For the average system with humans at the terminals, does this matter? Probably not. The chance of all terminals repainting the screen at the same time is low, and even if that does happen, the only effect will be a fairly uniform reduction in output baud rates until the bottleneck clears. On an IAC-8, the humans will probably never notice. On an IAC-16, they might. However, one thing I've noticed watching my performance monitor on a variety of systems in the past few years is that the total system character I/O load is usually far below the 4,000-cps-per-IAC limit. The aggregate input load rarely exceeds a few hundred cps, so that's not an issue either.

For a dedicated data collection system, or a system subjected to heavy file transfer activity (like a multiline BBS), a limit of 4,000 cps will probably be a problem.

Suppose you measure the character I/O load on your system (using the monitor program of your choice), and you discover that your average load is more than 3,000 cps per IAC. What can you do? Only two options are available: increase your capacity (replace your IAC-16s with IAC-8s or add IACs and leave some ports unused), or decrease your load (change your software to do less screen I/O). The second option seems extreme, but I'm always amazed when I see on-line data entry applications where most of the users only glance at the screen occasionally and never see the rapid succession of elaborate menus that must have been designed for the benefit of one or two trainees in the shop, or maybe to impress visiting dignitaries.

Will rearranging the ports on the IAC to move the high-traffic terminals to the lower port numbers do anything? Below the bottleneck, the effect is barely measurable. At or above the bottleneck, the effect can be dramatic, but who are you going to get to take the higher port numbers? You would be far better advised to distribute the high-traffic terminals across multiple IACs, interspersing them with low-speed printers and low-traffic ports, than to fiddle with the order within an IAC. The real solution is simply to get rid of the bottleneck, thereby eliminating the effect of the port position.

If you're trying to build a dedicated data collection system, I'm afraid the only alternative is to write your own IACRS program. Don't laugh; this has actually been done in several cases that I'm aware of and seems to work quite well. It is probably unreasonable to assume that a general-purpose IACRS.PR that supports fancy screenedit I/O will be able to sustain the maximum throughput that the IAC hardware is capable of. Writing your own IACRS program may also be a winner in that much of your particular protocol (especially idle polling, retransmission, and CRC checking) could be offloaded from the host and made immune to host-loading considerations.

:CHAR_IO:POSTSCRIPT

So what is the maximum baud rate of AOS[/VS] itself? In other words, how fast could AOS[/VS], AGENT.PR, and [L]PMGR.PR transfer characters if they didn't have to talk to the terminal at all? Here's a test you can try on your system:

Log on as OP and disable some console (let's call it @CONx), preferably a nearby one. Now go over to @CONx and type a single ^O (CTRL-O) to suspend the screen I/O. Nothing will echo, but don't worry. Now go back to the first console and enter this (AOS users: use PARU.SR instead of PARU.32.SR):

```
) ASSIGN @CONX
) CHARACTERISTICS/OFF/ST @CONx
) TIME ; TYPE/L=@CONX PARU.32.SR ; TIME
```

Divide the size of PARU.32.SR in bytes by the elapsed seconds and multiply by 10 to get the approximate AOS[/VS] baud rate. On an MV/4000 using AOS/VS 7.57 and a 277 MB Zebra, I get about 50,000 baud. Slick, eh? Note that on faster processors, the disk I/O rate reading PARU.[32.].SR becomes a factor in the baud limit.

Don't forget to DEASSIGN @CONx and re-enable it when you're done.

:MACROS:REVISITED

A couple of months ago, I wrote a column on a few of my favorite macros, followed by a column on the design of a specific macro. One of the things I omitted was a discussion of the performance considerations, specifically when to use a macro and when to write a utility program instead.

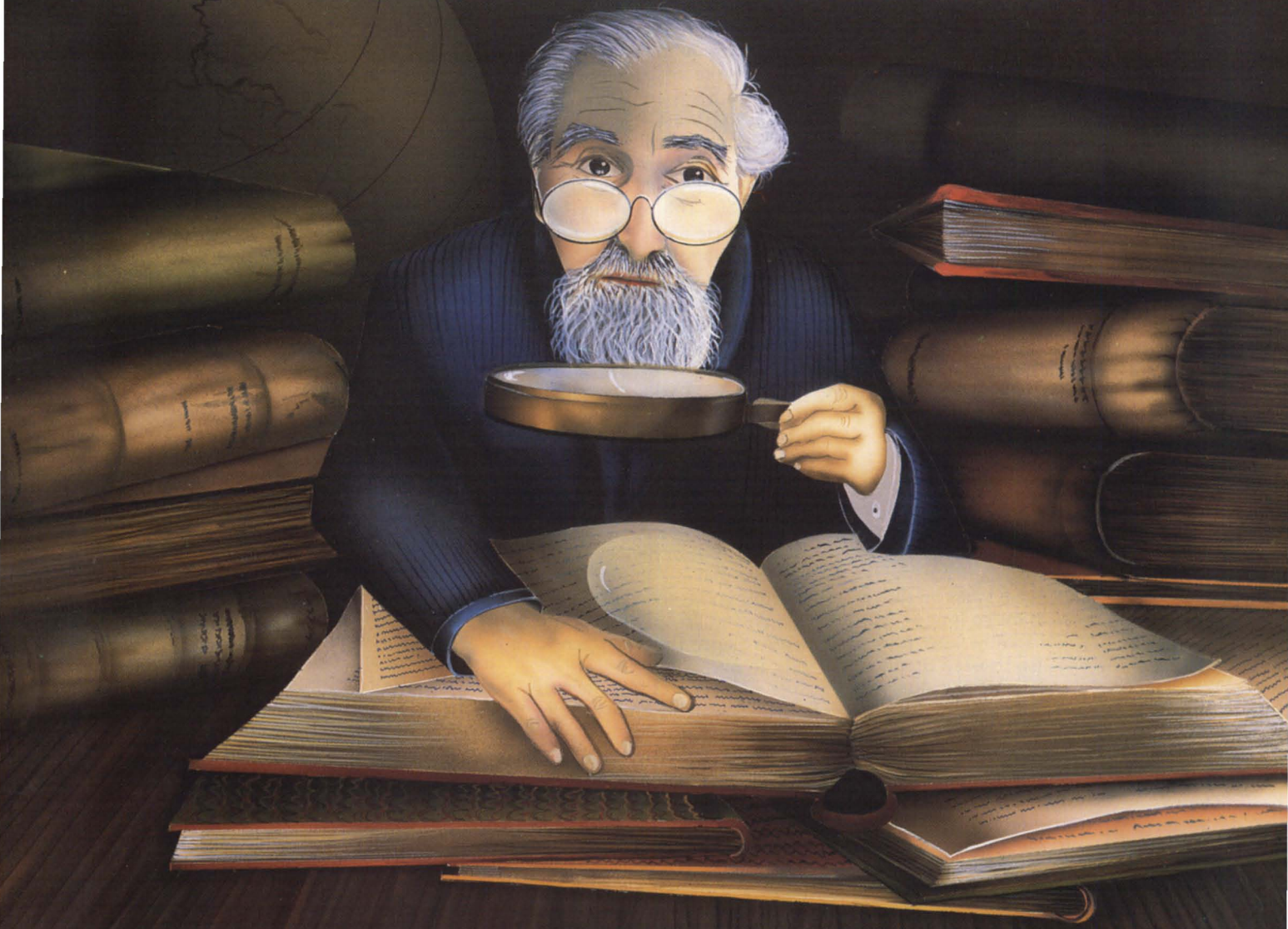
Last weekend, a classic example of when *not* to write a macro came to light. On Friday, I received AOS/VS Update 07 in the mail, so I decided to install it during the weekend. I read the update notice and discovered that the :PATCH directory and the dreaded AUTOPATCH.CLI macro had been superseded by a new :UPDATE directory and a new UPDATE.CLI macro.

I loaded the update tape, DIRed to :UPDATE, and looked around. Nice and clean. All the patch files and update files are in subdirectories (CPDs even!) whose name is the revision number. This means old patch files will not be overwritten by new ones when an update is loaded, and when I list the contents of the directory, I won't see the 6.09 patch files mixed in with the 7.57 files. I can even delete the unnecessary 6.09 stuff easily by just typing DELETE/V 6.09. Wonderful. Then I typed the UPDATE/REV=7.57 :SYSGEN:SYS.PR command.

An hour later, the macro finished. That's not a typo. *One hour*! Luckily, I had only done one of the MV/4000s. So when I did the second one, I preceded and followed it with RUNTIME commands. Here are the results:

```
00:46:57.047:   CPU after
00:01:08.206:   CPU before
-------------------------
45 mins 49 secs: net CPU time
```

Would You Read The Whole Dictionary To Find The Definition Of One Word?



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STATUS

You Have It Or You Don't

Circle 17 on reader service card.

So what exactly did this macro do that was worth 46 minutes of MV/4000 processor time? Well, it moved some files to the root, UTIL, HELP, and SYSGEN directories, and it applied some patches to a few .PR files. Hardly worth 46 minutes of processor time just to execute the macro.

Can you picture the guy in the software development lab testing this macro? He must have used several CPU-days' worth of processor time! Even on an MV/20000, this thing must take around 5 CPU-minutes.

This is either a classic case of "When To Write A Program Instead Of A Macro" (WTWAPIOAM), or it's a case of "A Design Inappropriate For Implementation Using Macros" (ADIFIUM).

And you wonder why software gets bigger and slower as time goes on. . . .

:BENCHMARKS

Every year at the NADGUG conference, the subject of benchmarks comes up. This year will probably be no different.

In the past, I've always resisted the notion of publishing benchmark results, primarily because I was on the receiving end of them for so long when I worked at DG, and I know how easy it is to bias them. I also resisted them because they are absolutely the dumbest way that I've ever come across to pick one manufacturer's computer system over another manufacturer's (see the ":KNEENOTE" below). Only an incompetent chooses something as complex as a general-purpose computer system based solely on the time it takes to sort a million records, or how many CPU-seconds it takes to run a favorite Fortran program. For example, how do you compare DG's COBOL Screen Section with IBM's CICS? How do you compare the approaches used by different operating systems to manage a virtual environment? How do you attach a weight to the AOS[/VS] input line-editing facilities. Understandably, every manufacturer of general-purpose computers loathes benchmarks for exactly these reasons. Purveyors of "engines" love them (e.g., Alliant, Convex, and Cray).

However, the user of DG equipment has a right to depend on something other than published MIPS and Whetstone ratings when it comes to judging the relative speed of offerings *within* the DG product line. The recent problems with the disappointing speed of the MV/7800 relative to the MV/4000 using the published Whetstone ratings is a case in point.

So how do we solve this problem in a way that's fair to DG, and that reliably measures various aspects of relative system speed?

Here's my proposal: I'm going to develop a suite of benchmark programs and make them and their results available on the :SYSMGR BBS to anyone who wants to run them. However, I'm going to keep the source code as secret as possible. This will keep the programs from being run on anything except AOS[/VS] systems. It should also help to foil any attempt to analyze the benchmark with a view toward changing system parameters to accelerate the benchmark. If at any time an individual program within the suite produces anomalous results compared to the other programs in the suite, the program will be re-analyzed to ensure that it hasn't inadvertently stumbled into a particular quirk in the hardware design (like an instruction cache curio that an early version of my memory-cycle time benchmark fell victim to).

The output of the CPU benchmark is a number that expresses the integer and floating-point speeds of the processor relative to an arbitrary processor (an MV/4000, since I just happen to have access to one).

The output of the memory benchmark is the memory-cycle time in nanoseconds.

The output of the disk benchmarks is expressed in accesses per second for transfer sizes of 1, 4, and a track's worth of sectors per transfer (disk dependent). The results provide comparisons for sequential versus random access, and for zero and 1.0 queue lengths (to give the Argus queue processor a chance).

If anybody has any input for this scenario or wants to contribute a program to the benchmark suite, please let me know.

:KNEENOTE

A kneenote is a footnote that is not quite at the bottom. While I was berating benchmarks, a couple of anecdotes came to mind.

I used to tell salespeople that they ought to dissuade their prospects from using benchmarks. The following analogy actually convinced some of them to see it my way: "Choosing among competing manufacturers' computer systems with a benchmark is like picking a wife by visiting all the bordellos in town and applying every test you can dream up; it's a fun exercise, but it has little to do with how well your final choice works out."

If anybody needs more convincing, there's the story about a benchmark we ran when I worked at DG. It was composed of a big Fortran program, and it required that "the program be compiled and run in batch, with the compile time and execution time results supplied in the form of the batch output on a continuous, unbroken printout." At the time, I had to use Fortran 5 (not the world's fastest compiler) and RDOS to do the benchmark.

The competition was Interdata, and I knew they had a fast compile time but poor execution time. I borrowed a system with a small (2 MB) 4 ms average access, head-per-track disk to run the compile (the prospect didn't specify a configuration). The compile time still stunk, so I edited the batch output file (he didn't say "unedited") to adjust the compile times before printing it, and then printed it on "an unbroken printout." We got the order, and the guy never said a word after the system was delivered. If I ever felt guilty about cheating on the benchmark, I think I would have felt even more guilty if we had lost the benchmark, and the customer had chosen to buy the inferior operating system software that Interdata was supplying at the time.

:CONTEST_RESULTS

The winner of the BUILD/ENAME macro contest mentioned in my column in the August 1987 issue of *Focus* is Aaron Langevin of Mortgage Computer Applications in Ogden, Utah.

A close second place went to Bob Head and Alan Reed of Threshold, Inc. in Auburn, Louisiana. They were the only entrants to use SPEED commands to mimic the removal of the directory prefix on the pathnames the way the !ENAME does. I hadn't intended for BUILD/ENAME to work that way, but it could be argued that it should work that way, given how stated the problem, even though it would produce a less useful output file.

The winning macro will be published next month.

Δ

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

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NEW TOOLS, NEW RULES

An informal survey shows how 32-bit BBASIC is influencing programming techniques

Well, 32-bit Business BASIC has been a fact of life now for more than a year, so I thought it would be a good time to gauge the effect the product has had on the BBASIC community. I spent a few hours calling around and talking to users to find out if it had changed anybody's approach to programming.

The results were interesting. There were considerable variations in techniques people are now using, which will probably result in heated discussions at the NADGUG conference. Some of these may even be of interest to non-BBASIC users.

Space won't permit me to discuss all the ideas people shared over the phone. I'd still like to thank those not mentioned here for their time.

Richard Koenig, of Plantrol Systems in Buffalo, New York, was one of the first persons I spoke with. Plantrol is an OEM specializing in systems for printers. The single most important issue to him was the greatly expanded program size. He's been able to combine modules, resulting in fewer CHAINs and, therefore, better response time on interactive applications.

For the past few years, he's had to discourage users wanting modifications to certain key modules of his systems. There wasn't any space to do them! Now he can do them again, which has resulted in added revenue from existing customers and improved chances at winning new ones.

With some help from an enhancement he requested to the language (and got), he was able to tackle an unusual application for Kodak in Rochester. Kodak has approximately 890,000 names on about 150 mailing lists, all contained on an MV/4000 with about 2 gigabytes of disk. About 30 terminals are operating WordPerfect on the system at all times as well.

They needed to be able to do high-speed selections without bringing the system to its knees. The selections they needed to do were quite complex, using multiple conditions with ANDs, ORs, etc.

The conventional approach is for the user to enter a Boolean expression containing all these conditions, and then a program must parse it. A fancy algorithm will store all these conditions in Reverse Polish Notation for fast evaluation as each record is read in during the selection process. Clearly, this method was going to be too slow.

The new statement Koenig dreamed up is called $PARSE. It evaluates an expression to see if it is a valid BBASIC statement. He asks users to input their expressions according to the BBASIC syntax, which is fairly straightforward.

Once this statement passes $PARSE, it can have a line number stuck at the beginning of it, and be written out to a file. Then, by using the ENTER statement, it can be made part of the actual program logic. The result is a program that runs 4 to 30 times faster than before. As a side benefit, the user has access to all of the BBASIC built-in functions.

I can already hear the objections. Yes, in fact, I *did* list the use of the ENTER statement during runtime in the BBASIC Hall of Shame a couple of columns ago. However, I left room for just this one exception.

Koenig also said that B32 doing all calculations in quad precision mode helped a lot. While the answers are the same, ERROR 16s are far less likely to occur. This has apparently prevented a lot of support calls he would have had otherwise.

I also spoke to Frank Baker of Monitoring Automation Systems (MAS) in Irvine, California. MAS specializes in systems for alarm-monitoring companies. Once again, program size was a key consideration—almost the first thing he mentioned.

Program readability is also of prime importance. MAS uses the longer variable names to make the names clearer. They also use the option to turn off the automatic reformatting. Normally, Business BASIC converts all lowercase letters to uppercase letters and reformats the statement with a fixed number of spaces.

By turning off REFORMAT, the statement will stay exactly as input by the programmer. (I agree that this is controversial: considering their typing skills, most BBASIC programmers *need* to have their programs reformatted.)

Another feature used by MAS is string arrays. They make it much easier for programmers to implement table look-ups within programs.

But ultimately, performance is what has excited MAS. In several cases, customers have not had to go through with significant upgrades they had thought were necessary. (What do you do if you have two MV/8000s, and they aren't fast enough, and you don't have a big budget?)

While it's always nice (if you're Data General or a VAR) to sell a nice, big, new computer, customers aren't always so enthusiastic. However, if you can help a customer delay the need for an upgrade for a while, you often end up with a loyal customer. B32 has allowed MAS to stretch the existing hardware to the point that it did not have to be replaced.

Baker also noted that 32-bit BBASIC has made it easier to predict a machine's performance from the statistics released by Data General. Their new machines seem to be developed with 32-bit products in mind, making the performance of 16-bit software somewhat erratic. The MV/7800 is a good example of this. Baker's benchmarks of B32 applications are more consistent with the Whetstone ratings DG gives out.

CMS/Data of Tallahassee, Florida, provides systems to law firms. One of their largest installations is an MV/20000 located in Boston. Initially, the system was a model 1, but for more speed, it had to be updated to a model 2. Since the MV/20000 model 2 is Data General's largest machine, when they ran out of horsepower, they ran out of options.

Converting the system to B32 seems to be just what was needed. However, I understand the firm is now looking at

adding more terminals because the system is faster.

Maxon is also pioneering new techniques. One of the most interesting new features is the SCREEN SAVE option. When turned on, B32 keeps an internal buffer (about 4 KB in size) for each user that records the current screen contents in memory. The additional memory requirement isn't much, and there doesn't seem to be any noticeable CPU overhead. Programmers can get at their buffers, which has resulted in some interesting new techniques.

Like many other companies, we program reports that have a variety of different options. In many cases, though, we don't bother printing out the options that were requested along with the rest of the report.

To reprogram all the reports we've ever written to list the selected options would be a monumental task. SCREEN SAVE gave us an easy way out. All reports pass through a common front-end: it was easy to add code to it to access the screen buffer and print it out as the first page of the report.

Expanding on this idea, we were able to provide a hardcopy option for every screen on the system at any time, which allows the user to direct the output to any printer.

Another use for SCREEN SAVE is programming a "perfect SWAP." When a program returns from a SWAP statement, all variables and counters remain intact, but the screen may have been altered. Having the ability to put it back intact is useful if you want to SWAP to CEO, WordPerfect, or a lookup screen in the middle of another application.

(Note to Data General: if this were implemented in AOS/VS, everybody could do these tricks, not just BBASIC users!)

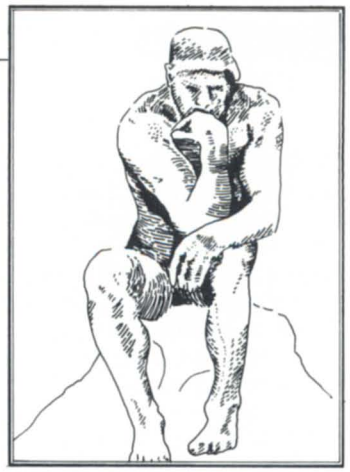
If one message comes out from this survey of users, it is that a significant amount of software is being developed that only runs under B32. At first, users were understandably cautious, wanting to retain backward compatibility with 16-bit Business BASIC. Increasingly, they are deciding that the only way they can do new applications practically is to use the new features. ■

In other news, Data General has finally announced the MV/1400. This low-end machine appears to be properly designed as the replacement to the extremely successful Desktop series. It features up to 10 ports and claims 80 percent of the CPU speed of the MV/2000. Maximum disk storage is 160 megabytes, half that of the MV/2000.

If you are currently running Business BASIC on a Nova with less than 10 terminals and a 20 MB disk, you should run, not walk, to look at this machine. You'll probably save a bundle on hardware maintenance and amaze your users with the increased speed. Δ

George Henne, a contributing editor to Focus, has worked with Business BASIC users for nearly a decade. He is the vice president of Maxon Computer Systems, and can be reached at 575 Madison Ave., Suite 1006, New York, NY 10022; 416/445-4823.

BY JIM SIEGMAN



I THINK, THEREFORE I COBOL

COBOL or not ICOBOL? That is the question. . .

Back at the 1985 NADGUG conference in San Diego, Data General made a presentation (available from NADGUG in the videotape library) of their benchmarks comparing ICOBOL under RDOS, AOS, and AOS/VS to 16-bit and 32-bit COBOL under AOS/VS. The most surprising result was that, with fewer than six terminals, COBOL could usually outperform ICOBOL, but the higher the terminal count, the faster ICOBOL ran in relation to COBOL. With terminal counts as low as 30, ICOBOL ran several times faster than 32-bit COBOL doing the same type of processing.

During the last three years, subsequent revisions of ICOBOL under AOS/VS have served to widen this gap even further—to the point that I usually recommend that anyone running ICOBOL under RDOS should stay with ICOBOL if they outgrow their hardware and decide to move to AOS/VS.

I have also talked with a great many users about this anomaly that lets ICOBOL outrun 32-bit COBOL. After all, COBOL compiles down to machine language, and ICOBOL is only an interpreter, or more accurately, a pseudo-code engine. With all the overhead of a pseudo-code interpreter, COBOL ought to be faster.

Well it is. I proved it last month. I wrote three benchmark programs of my own, all of which were heavily biased toward CPU, and none of which had any disk I/O. In all three benchmarks, the 32-bit COBOL left ICOBOL at the starting line.

The first benchmark calculated the LRC (longitudinal redundancy check) byte of an 81-byte packet. (LRC is used for communications error detection in a project I'm working on. It's a completely CPU-bound operation and is not really suited for COBOL, but that was the only language we could use for this project.) The second and third benchmarks were based on the (in)famous Sieve of Eratosthenes, originally published in *Byte* magazine (August 1983, pages 82 and following) for benchmarking a number of C compilers for micros. Over the next few months, *Byte* published versions in every major language. I ran and compiled two versions of the sieve, one as originally published and one modified years ago to run more efficiently under ICOS on our CS/60 system.

Figure 1: Benchmark results (single terminal)

```
Times given are in seconds

          ICOBOL    32-bit COBOL    Wyse 286

Test 1 - LRC calculation          1.21**      023***       N/A
Test 2 - Sieve - Standard         87.0*       2.1*         53.2*
Test 3 - Sieve - "Optimized"      46.0*       3.3*         25.5*

* Total time for 10 iterations of the loop divided by 10
* Total time for 100 iterations of the loop divided by 100
* Total time for 1000 iterations of the loop divided by 1000
```

Figure 1 shows a chart of the actual runtimes in the three different environments tested. The ICOBOL is rev 1.31, the 32-bit COBOL is rev 3.40. Both were run on an MV/4000 under AOS/VS rev 6.06., with 2 MB and no floating point. The Wyse 286 is a 10+ Mh IBM-PC/AT clone running Data General's ICOBOL interpreter rev 1.31 under MS-DOS 3.10. We used the "fast mode" of the dual-speed Wyse system.

This data allows me to make two conclusions about Data General's COBOL products. First, in a CPU-bound program (which isn't typical of most COBOL applications), 32-bit COBOL performs about 60 times as fast as ICOBOL. Second, by making program revisions, I was able to nearly cut in half the time it took ICOBOL to run the program—but those same changes added 60 percent to the execution time of 32-bit COBOL. Therefore, the type of things one does to enhance the ICOBOL performance (CPU-wise) actually degrades the 32-bit COBOL performance severely. Although a number of changes were made in the program, I feel that changing the main array from PIC 9 to PIC X and making all numeric variables COMP had the most effect.

So why do my results say that COBOL is faster? Does that mean that the multitude of tests that show ICOBOL is capable of higher throughput are wrong? Of course not. My tests were strictly CPU-bound, number-crunching programs. Few programmers would consider COBOL the language of choice for those applications. People who have been around a while might pick Fortran, while some of the new breed would pick the "sexier" Pascal or C languages, assuming they were available for that project.

The benchmarks run in the past have usually concentrated on disk I/O to sequential and random access files. ICOBOL has an incredible advantage here because of the design of the

MINISAM file server. Since the global server's main function is to play traffic cop to record locking, it frequently doesn't need to get involved in most ISAM I/O, and the local process can do it all. INFOS, on the other hand, is (or at least used to be) single-threaded, meaning the INFOS process handles every I/O request personally, one at a time. This is the cause of the bottleneck that allows high terminal counts of ICOBOL to outrun COBOL. It's not COBOL that's slower, it's INFOS.

Is there hope? I can think of three ways DG could improve INFOS. The first, which I think is the most promising, would be to make INFOS multi-threaded to the extent that each physical data base would have its own task. This would allow I/O to different data bases to be handled concurrently. Another approach would be to use the new system calls that lock pages of a disk file and let every process do its own I/O to the disk. However, this would lock pages and not records, and other processes could still access the data if they didn't use those system calls. The third way would be to redesign INFOS to allow the local process more freedom. The global server would keep track of locks and perform updates but allow the local processes to handle all input requests. Since most programs are at least 50 percent input (and usually higher), this would also result in performance improvements. Unfortunately, all three of these methods mean a major redesign and reimplementation of INFOS, and I don't expect that to happen unless the numerous INFOS users out there convince DG that is what they really want. (Don't forget that CEO is INFOS-based.)

What can you do? You can get more hardware, improve your software, or reduce the number of users. Most people don't like the third option, and the first option isn't all that attractive to cost-conscious managers. However, there are several ways to implement the second option. You can either change the way your applications handle the data, improve the housekeeping of the various data bases (purging, reloading, etc.), or acquire some accelerator utilities such as those from Eagle software. (I haven't used them myself, but I've heard good things.)

Don't underestimate the power of changing your program: I once spent about four hours rewriting a routine that looked up information from a secondary file and reduced the runtime on that report program by about 20 percent, from four hours to three hours and 15 minutes. Another time, I changed the way the programmer ahead of me was calculating totals and subtotals and reduced the runtime from 105 minutes to 75 minutes. This improvement was made more significant since it was usually run during the day as a background job, and the average elapsed time went from five hours to three-and-a-half hours. However, other than developing good programming habits and using them consistently, you will find that the hardware option is frequently cheaper than the software option.

Changing the subject, let's also take a look at the Wyse 286 system. It is a PC/AT clone running MS-DOS. Using Data General's own MS-ICOBOL interpreter, note that it actually outruns the MV/4000 by a significant factor! The only real problem with the MS-DOS version is that you are limited to one user, whereas the MV/4000 can have dozens of users if your little heart and big budget desire. It is for this reason that several of our smaller clients have us develop their software on an MV/4000 using the sophisticated development tools available to us, but their production systems are all PC-based. I hope to try some disk-based benchmarks in the near future on both systems.

■

Back to the mailbag . . .

Wow! I got my second letter! And it's a good one. Jimmy B. Leonida from the Jeddah Oil Refinery Company in Saudi Arabia has an interesting INFOS question. Although I'll summarize the text, his problem is this:

First, he does a two-level keyed read with the following code:

```
MOVE "AA"              TO DB-KEY-0.
MOVE 2                 TO DB-KEY-LENGTH-0.
MOVE LOW-VALUES        TO DB-KEY-1.
MOVE 4                 TO DB-KEY-LENGTH-1.

READ INFOSFILE         FIX POSITION
                       SUPPRESS DATA
  KEYS ARE
    DB-KEY-0
    DS-KEY-1
    APPROXIMATE.
```

Both the INFOS status and COBOL file status variables show successful completion and contain 0000 and 00, respectively. He then executes:

```
RETRIEVE INFOSFILE KEY
  INTO WS-LEVEL-1-KEY.
```

This also gives successful status codes. He then follows it with the following statement:

```
READ INFOSFILE FIX POSITION DOWN
  FORWARD.
```

He has now moved his file position into the subindex on the second-level key and processes a bunch under that. He is still preserving the value of WS-LEVEL-1-KEY for later. When the time comes, he does the following:

```
MOVE "AA"              TO DB-KEY-0.
MOVE 2                 TO DB-KEY-LENGTH-0.
MOVE WS-LEVEL-1-KEY    TO DB-KEY-1.
MOVE 4                 TO DB-KEY-LENGTH-1.

READ INFOSFILE         FIX POSITION
                       SUPPRESS DATA
  KEYS ARE
    DB-KEY-0
    DB-KEY-1.
```

INFOS-STATUS now contains 7030, and the COBOL file status is 23. He wants to know what could cause this? Well, I can think of several reasons, all having to do with the fact that the first READ was a READ APPROXIMATE, and the second was an exact keyed read. Since the first was an approximate, there is no guarantee that the key length of the key found was two for the top-level index, or four for the first-level subindex. Since it was a READ APPROXIMATE, it would have taken anything higher than that. Therefore, the returned key value could have been KEY23. If retrieved into a PIC XXXX field, it would return a good status code, but if an exact keyed read was made using that same field, "KEY2" would not be found.

Another possibility is that INFOS had to apply the APPROXIMATE clause to the higher level index. Thus, he might have retrieved a 4-byte key, but the top-level key could have been "AB" or even "AA1." Thus, you have almost the same situation.

If the goal is to restore the position to the index level, change the second READ to a READ APPROXIMATE. Also, if you are still in the subindex under the key where you want to be, you could also do a "READ INFOSFILE FIX POSITION UP," which would be the fastest way to get there. Δ

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

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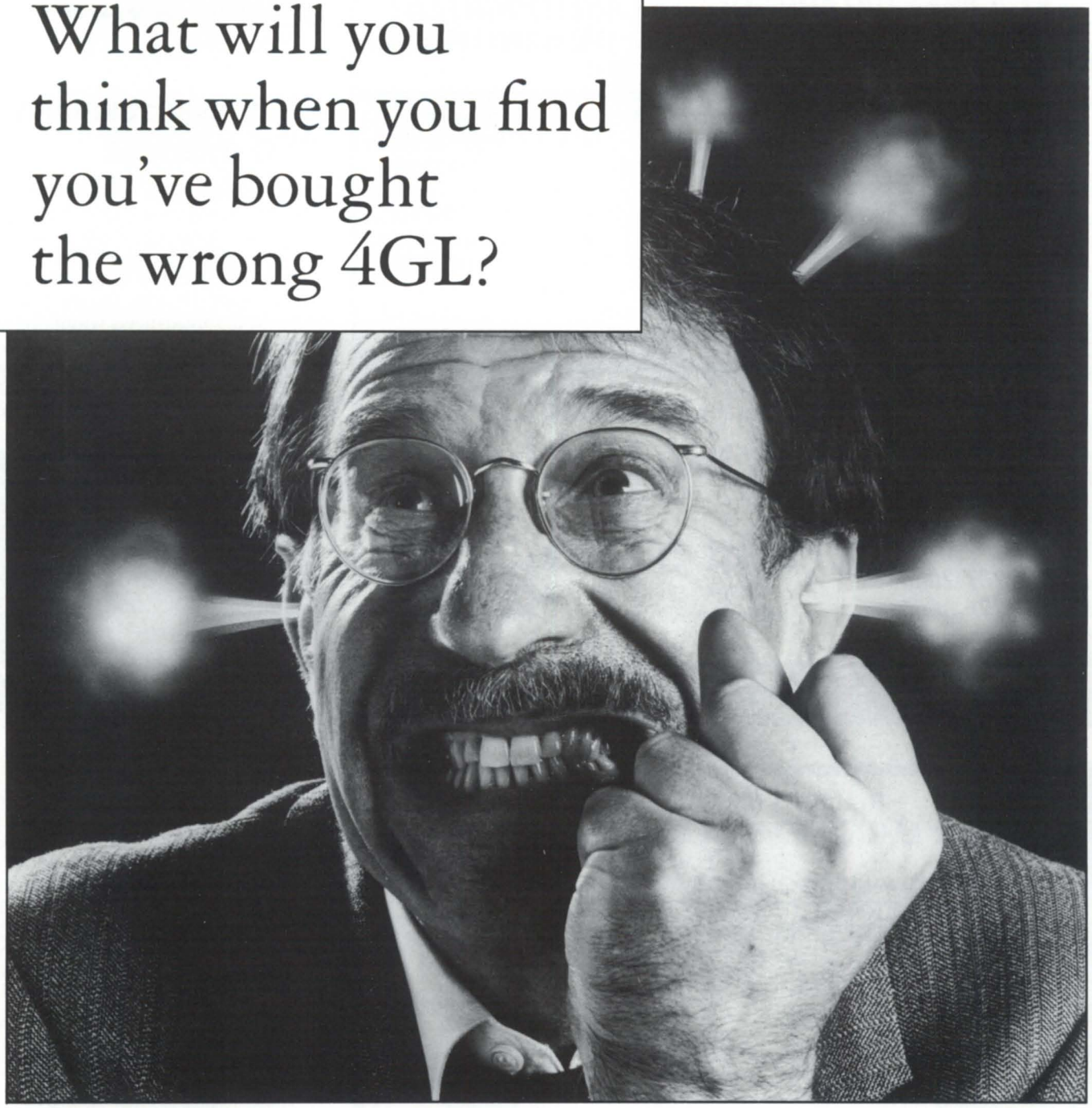

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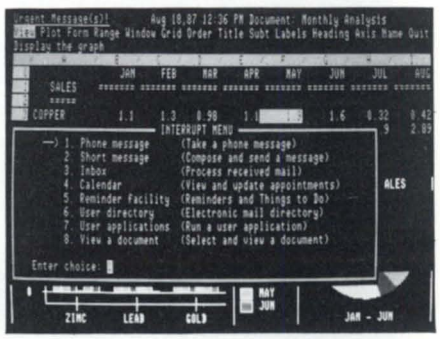
PRODUCT SPOTLIGHT

20/20 available with CEO interface

South Natick, MA—Access Technology, Inc. is shipping a new 20/20 interface that integrates 20/20 with DG's Comprehensive Electronic Office system.

With the 20/20 CEO interface, CEO users are able to store, retrieve, and archive 20/20 spreadsheets within the CEO filing system concepts of drawer, folder, and cabinet. The interface also provides access to CEO's interrupt facility, which can be invoked anytime from within the spreadsheet.



Other features of the interface include access to CEO's electronic mail facility while in 20/20. Users are informed of any CEO activity or mail messages through a status line on the 20/20 screen. CEO's calculator functions also can be accessed while in 20/20.

AOS/VS users have access to 20/20 through the CEO interface as well. The interface will configure itself based on whether it is called from within CEO or AOS/VS. Users also can move between AOS files and CEO documents.

20/20 with the CEO interface ranges in price from $1,050 on the DS/7500 to $10,550 on the MV/20000. CEO version 2.2 or later is required.

Access Technology, Inc., 6 Pleasant St., South Natick, MA 01760; 617/655-9191. Δ

WAMS announces new version of DBMS

Sante Fe Springs, CA—Williams Automated Management Services, Inc. (WAMS) has released a faster 32-bit version of their Data Base Management and Control System (WAMS/DMCS). The new version boosts performance of the DMCS applications by as much as 35 percent.

Additionally, 16 features have been added to the base system, including user-selectable menu styles, a query-

by-example interface, and operator keystroke auditing.

WAMS/DMCS combines a relational data base file manager with an interactive user interface to provide an applications development environment designed for both data processors and nonprogrammers. The system integrates the function of data definition, data entry, report writing, and interactive user dialogues.

WAMS/DMCS supports more than 20 different predefined field types. It can assist the application designer by providing field types such as calculation, logical, text, auto-increment, and indirect. Indirect fields automatically retrieve data from other data bases. New files, fields, menus, and screens can be added to existing applications at any time without restructuring.

Williams Automated Management Services, Inc., 13570 Larwin Circle, Santa Fe Springs, CA 90670; 213/921-3334 or 714/994-2811. Δ

Nemonix announces compatible memory for DG Eclipse

Hopkinton, MA—Nemonix, Inc. has announced the availability of memory products for Data General Eclipse MV series computers. The Nemonix NXMV memory is available in 2, 4, and 8 MB capacities. The NXMV series of memory is compatible with Data General Eclipse MV hardware and software.

The NXMV memory has 32-bit words with 7 bits for ECC, and supports battery backup operation. Pre-tested 150ns 256 KB DRAMs have been incorporated into the board design.

Included with the product is a standalone memory diagnostic that allows the user to verify memory integrity on a routine basis.

The NXMV is supported with a lifetime warranty, 24-hour replacement service, and a trade-in/trade-up program.

Nemonix, Inc., 106 South St., Hopkinton, MA 01748; 617/435-9087. Δ

Eagle announces new disk utilities

Salina, KS—Eagle Software, Inc., has released Disk_Pak, a set of disk-related utilities for Data General's AOS/VS oper-

ating system. Disk_Pak enables a system manager to reorganize and manage disk resources. The Disk_Pak currently consists of the Disk_Organizer, the Disk_Analyzer, the Disk_Detective, and the Disk_Translator.

The Disk_Organizer eliminates fragmentation by reorganizing the disk. The reorganization is performed in place, so there is no need for operator intervention, tape drives, or other auxiliary storage units. The Disk_Organizer reduces average seek distance and improves response time and throughput of the disk. The Disk_Analyzer examines the fragmentation of all or specific files on a disk and reports statistics about those files and their organization. The statistics determine when reorganization with the Disk_Organizer is needed. The Disk_Detective is used to locate the files containing a specific logical block. This enables the system manager to determine which file should be restored from backups when a new bad block is found. The Disk_Translator loads files from an uninitialized disk (AOS/VS rev 7.XX or earlier) onto an initialized disk (AOS/VS rev 8 or later) with differing file system revisions.

The Disk_Pak costs $1,950. Customers will receive additional utilities and enhancements to Disk_Pak at no additional charge during the first year. A software subscription service is available for following years. Trial copies of Disk_Pak are available upon request.

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

Rhintek introduces terminal emulator for PS/2

Columbia, MD—Rhintek, Inc. has announced a Data General terminal emulator, called EMU, that runs on the IBM PS/2 series of microcomputers. EMU will also run on older IBM PCs and 100 percent compatibles.

EMU is able to use all 12 of the function keys on the IBM keyboard and all four of the COM ports available under PC-DOS 3.3. EMU will emulate all of the Dasher D200 series including the D211, D214, D215, and the color D220 terminal. EMU also has much of the functionality of the D400 series, including the line drawing character set and insert delete character.

The EMU executable file is compressed to fewer than 20 KB of optimized assembly language, letting it fit onto most boot disks. It expands when it is brought into memory, but will run in 64 KB. EMU can be left in PC memory while other programs are executed. In this mode, EMU will capture all of the messages sent from the host and display them when the user returns.

A manual is included. The software is copyrighted and single-user licensed, but not copy protected.

EMU can be executed from a LAN server's disk drive. Advanced functionality is included. EMU is capable of automatically dialing the phone and performing log-on functions. A configuration file can be selected in the command line to be used to dial different numbers or to log on to various

Circle 47 on reader service card.

Circle 39 on reader service card.

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Access Technology, 6 Pleasant Street, South Natick, MA 01760-9990 (617) 655-9191
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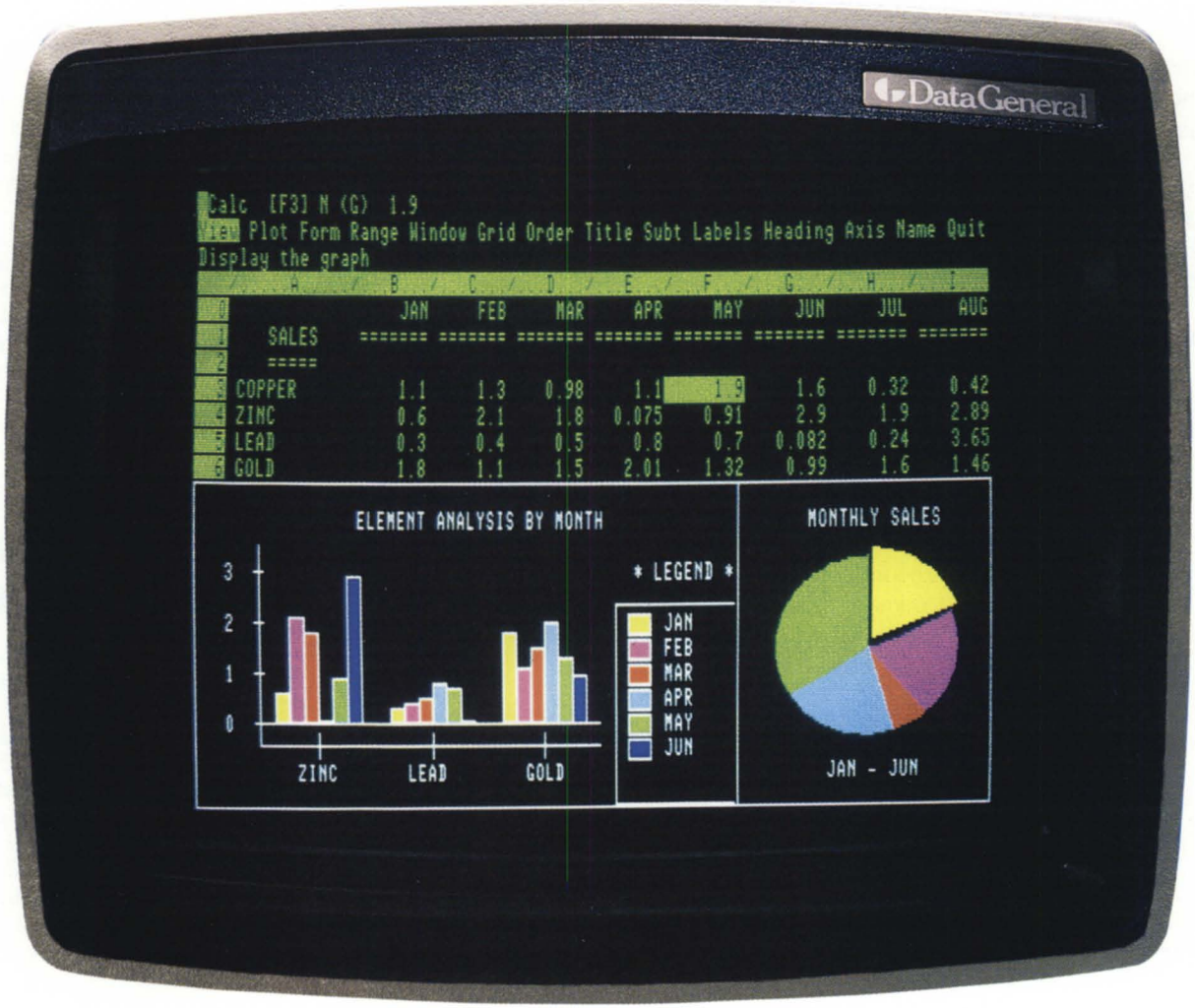


CEO is a registered trademark of Data General.

Circle 1 on reader service card.

computers. A history mode is provided so that the user can recall the previous 32,000 bytes of text sent from the host.

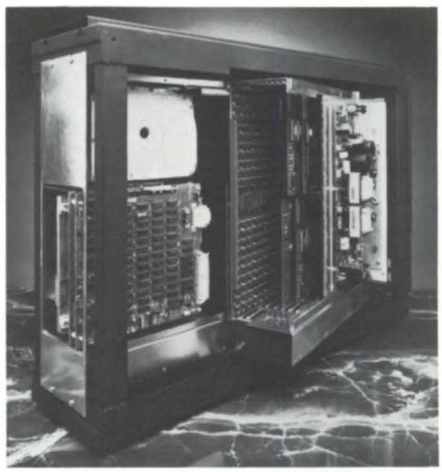
EMU is available immediately at a cost of $95 for pre-paying customers and $115 for purchase orders. For orders outside of the U.S., the price is $149.

Rhintek Inc., P.O. Box 220, Columbia, MD 21045; 301/730-2575. Δ

ICI Chameleon introduced

Placentia, CA—Intelligent Computer Integration, Inc. (ICI) has introduced the DG-compatible ICI Chameleon. Based on DG's Eclipse S/20 CPU card (or the Desktop 20/30 CPU card), the ICI Chameleon comes either as a complete system or in the OEM version.

The prepackaged unit comes in a tower 9 inches by 22 inches by 32 inches.



The OEM version of the ICI Chameleon allows OEM customers to configure the nine-slot unit to meet specific requirements. The chassis/power supply is designed to be either rack mounted or tower mounted. Main memory ranges from 512 KB through 2 MB, dependent on individual needs.

The Chameleon can have up to 32 ports of multiplexor. On larger systems, it can support from 1 MB to 8 MB of cache memory contained on a single printed circuit card.

Prices for the OEM version of the ICI Chameleon vary with customers' needs; however the prepackaged system sells at the quantity 10–24 level for $18,670. The eight-user, entry-level system starts at under $10,000. Delivery is 30 days ARO.

Intelligent Computer Integration, Inc., 1901 Petra Ln., Placentia, CA 92670; 714/579-7575. Δ

Zetaco announces SCSI disk subsystem

Minneapolis, MN—Zetaco has announced a new 600 MB magnetic disk subsystem, model SKS-25. The subsystem integrates an Argus-emulating disk controller with two 5.25-inch, SCSI-interfaced disk drives and may be connected to any DG processor equipped with the high-speed BMC bus.

The subsystem emulates Data General's Argus disk subsystem under standard DG operating systems, AOS and AOS/VS, and interfaces the burst multi-

plexor channel. Data transfer rate is 1.5 MB per second.

The SKS-25 comes with the DG-compatible disk controller, a 3.5-inch high enclosure that houses the two disk drives and power supplies, cabling, technical manual, and software support tape.

Cost per megabyte of the SKS-25 is under $29.

Model SKS-25 is available now, 30 days ARO, from Zetaco's network of authorized stocking distributors.

Zetaco, Inc., 6850 Shady Oak Rd., Eden Prairie, MN 55344; 612/941-9480. Δ

ACS adds features to communications software

Rockford, IL—Applied Computer Solutions has added features to BreakThrough, its DG communications software. Enhancements include user exits, dialing, and command line control.

BreakThrough communicates to PCs and non-DG computers using the international standard XMODEM. Cyclical Redundancy Checking (CRC) error-checking protocol is used to assure error-free transfer of either binary or text files.

Files can be transferred individually or in a batch. In AOS/[VS], transfers can be unattended because the command line feature allows macros to be used. User exits allow VARs or end-users to tailor BreakThrough to existing applications. BreakThrough can be called from other programs/systems as if it were a subroutine.

BreakThrough is available on AOS, AOS/VS, RDOS, ICOS, DOS, and MS-DOS.

Applied Computer Solutions, 2606 Broadway, Rockford, IL 611108; 815/229-0189. Δ

DG announces UPS

Westboro—Data General has introduced a line of uninterruptible power supplies (UPS) for Eclipse and MV systems. The UPS is a continuous duty, on-line peripheral designed to provide conditioned backup power to the computer system in the event of an alternating current power failure or fluctuation in voltage. The UPS provides from six minutes to several hours of continuous power to the entire system.

The full line of single- and three-phase UPS models are priced from $7,400 to $34,000. Δ

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• Fifty word maximum length. • Notices must be legible. Send ads to **Focus** at 5332 Thunder Creek, Suite 105, Austin, TX 78759

The United Kingdom and Ireland Data General Users Group has postponed its autumn meeting to avoid a schedule conflict with NADGUG's Conference 87. At last count, 12 members of the U.K. group were planning to attend Conference 87. Their autumn meeting, to be held at the American Consulate in London, will be an important one for the group, which is considering new bylaws that would constitute the group as a limited liability company.

Westinghouse Communities, a Florida land development subsidiary of Westinghouse Corporation, will be the host when OASIS sponsors its next CEO workshop. Scheduled for February 11–12, 1988 in Fort Lauderdale's Westin Cypress Creek Hotel, the workshop should be a welcome respite from winter weather. Contact Rosalind Miele for information c/o Westinghouse Communities, 3300 University Drive, Coral Springs, Florida 33065. Since it's the peak of the vacation season, she advises making flight and room reservations early. (Note: If you can't get a flight to Ft. Lauderdale, try West Palm Beach or Miami.)

Data General's Team Tyrrell is better than a generation ahead at the 1987 Formula 1 Grand Prix. The team claimed victory even before the finish of the Colin Chapman Cup for constructors of cars with normally aspirated engines, having accrued an unsurpassable 102 points early on. The team drove normally aspirated engines in preparation for next year's season, in which Formula 1 cars won't be allowed to have turbo-charged engines.

Maxon Computer Systems has completed its public offering in Ontario of 400,000 units at $4.00 apiece. Each unit consisted of one Class A non-voting share and one Class A non-voting share purchase warrant of Maxon. The net proceeds of the sale will be approximately $1,355,000. Davidson Partners Ltd. was the underwriter.

Johnson, Mirmiran, and Thompson (JMT), a leading design firm, has installed a CAD system based on Data General's TEO/3D, a three-dimensional modeling and data base system, and AROSE, automated road or site engineering design software. This civil engineering system is part of a network of minicomputers and workstations for road and highway design and drafting.

After a period of inactivity earlier this year, the Northern New England Data General Users Group (NNEDGUG) is back serving users in Data General's own backyard.

According 'to Brad Friedlander, 16 members attended a reorganizational meeting held September 21. Al Siebert of Dataram will serve as interim chairman until elections can be held at the November meeting. The group sheduled meetings for the fourth Tuesday of each month, with informal dinners (pizza or Chinese food).

The next meeting will be held October 27 at 6:30 p.m. They will have a presentation and a question-and-answer session. For more information about NNEDGUG, call Al Siebert at 609/799-0071.

:SYSMGR, a supplier of software for system managers, has announced that the 500th copy of its :PERFMGR performance monitor for AOS/VS was raffled off at the September meeting of the Minnesota Area Data General Users Group.

The winner of the raffle was Kerwin Stenzel of the Minnesota Department of Health.

Additionally, :SYSMGR announced that their Bulletin Board System (BBS) will be made available on a no-charge basis to interested users of Data General hardware and software systems as of October 19th, 1987 (see Brian Johnson's article in this issue). Prior to this date, the BBS had been provided solely for the benefit of users of :PERFMGR .

Copies of the files can also be ordered on tape. Pricing information for tape shipments is available on the BBS. The BBS may be reached by dialing 415/391-6531 using a DG-compatible terminal set to 1200 baud, 1 start bit, 8 data bits, no parity, and 1 stop bit.

For more information, contact Carla Perumean, marketing director, at :SYSMGR, 109 Minna St., Suite 215, San Francisco, California 94105; 415/550-1454, telex 296544. U.K. users should contact John Harwood at Tristar Software Ltd., 17 Nottingham St., London W1M 3RD; 01/486-1342.

The four Data General Area field offices have been combined into an Eastern and a Western operation in a reorganization effort aimed at bettering communication between the Sales and the Field Engineering divisions.

Within the North American Sales Division (NASD), Bob Tway is the director of Eastern Operations, based in Atlanta, and Brian Mellen is the director of Western Operations, based in Manhattan Beach.

Within U.S. Field Engineering (USFE), Jim Foxworthy is the director of Eastern Operations and Jim Wilson is the director of Western Operations, also based out of Atlanta and Manhattan Beach.

Data General and Network General have signed an agreement for both companies to work on the development of a StarLAN version of Network General's Sniffer Protocol Analyzer. The Sniffer is a data collecting, recording, and analysis tool and a performance monitor of local area networks. The product will be made to support DG's PC*I communications platform for StarLAN and Ethernet.

DG will use the Sniffer as a network analysis and diagnostic tool to service customers with integrated computer networks. The Sniffer may be used on the Dasher and the DG/One, as well as a StarLAN option.

Coming in second to Altos, Data General received its highest marks in the price/performance satisfaction category of the *VAR Business 1987 Annual Report Card Review*. Out of 12 companies, DG remained in the mid-range for most of the 16 categories, bottoming out as 11th in VAR support services.

With an overall average of 5.72 (out of 10), the report card's comments read: *DG's products are better than ever, but the company is regressing in marketing support. To improve relations with its resellers, DG must pay greater attention to program administration, channel conflict, marketing, and credit policies.*

Tony Nicoletti holds the new position of vice president of Data General's Sales Support and Planning. Nicoletti was previously vice president of Support Services in Field Engineering for five years. He will now be in charge of systems and programs for administration and communication in Sales.

Other job changes within DG include the additions of Mike Evans as vice president and chief financial officer in Finance and Administration and Jim Ryan as vice president for the Information Management Group. Δ

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