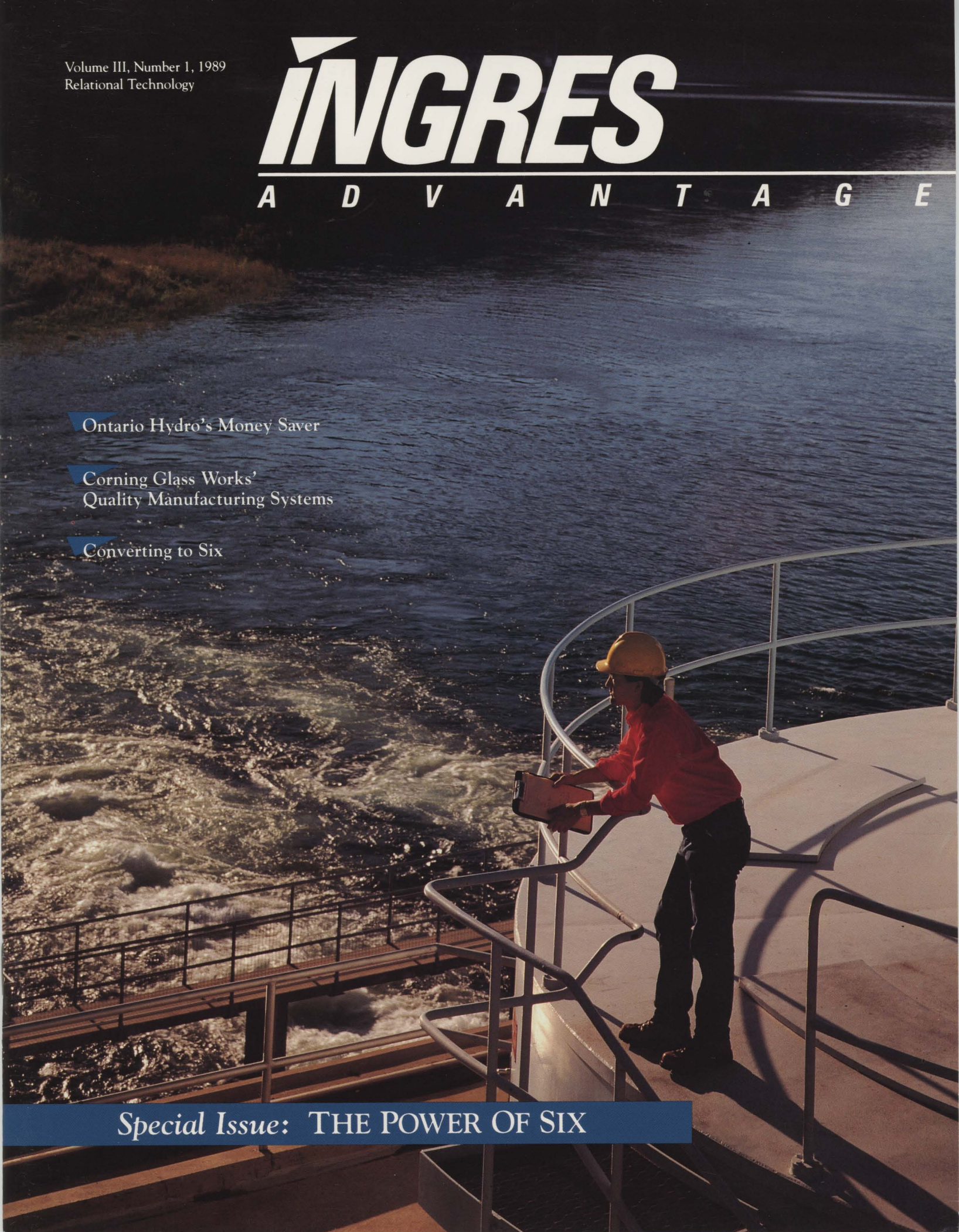
Volume III, Number 1, 1989
Relational Technology

INGRES ADVANTAGE

Ontario Hydro's Money Saver

Corning Glass Works' Quality Manufacturing Systems

Converting to Six



Special Issue: THE POWER OF SIX

LETTER FROM THE PRESIDENT

The last few months have been very exciting at Relational Technology. As a result of our Initial Public Offering last May, we benefit from greater financial resources and rapid growth. We now employ over 1,000 of the best professionals in the industry. Our annual revenues stand at well over $100 million, while the company and our INGRES product enjoy increasingly wide acceptance.

In this issue of the *INGRES Advantage*, we focus on INGRES Release 6, the result of years of design and development effort and months of testing. Release 6 is a product which will take our customers well into the 1990s, and one which all of us at Relational Technology are proud to stand behind.

Release 6 incorporates a new modular, multi-server design, plus major new frontend functionality and networking improvements. These improvements promise increased performance and productivity for more users than ever before. More importantly, the enormous investment we have made in perfecting the design of INGRES will mean that our customers can ultimately expect their products to come to market more quickly.

Our cover article is by Brian Worth, Senior Engineer at Ontario Hydro, Canada's second largest power company. Using INGRES, Ontario Hydro has developed an application which is saving the company over $150,000 annually. We also include a feature story about the sophisticated manufacturing systems of the "Granddaddy of Glass," Corning Glass Works. In addition to these are application profiles and comments from customers on the success of their Release 6 applications.

In the "News Briefs" section, we outline the key strategic relationships we have formed over the last several months. We are particularly excited about our exclusive Digital Distributed Software (DDS) agreement, which allows both Digital Equipment Corporation and Relational Technology sales personnel to sell INGRES Tools for Rdb. Cadre Technologies, Information Associates and others have strongly endorsed Relational Technology by selecting our products to make their computers and software more effective.

We look back with pride at the accomplishments of 1988 — but our real excitement comes from reaping the fruits of these accomplishments in 1989 and for many years to come.

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INGRES ADVANTAGE

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Leading The Next Generation

After more than 100 person years of development effort, INGRES Release 6 made its debut. The powerful new RDBMS has made headlines in news, business and trade publications around the world. Industry watchers have found INGRES Release 6 to represent not just another improved software product, but a revolution in information processing capability — a revolution that will extend well into the 1990s.

Morrison-Knudsen, Inc.: Improved Throughput

At Morrison-Knudsen, Inc. of Boise, Idaho, there's a lot of interest in Release 6. The 20,000-person firm specializes in shipbuilding, road and bridge construction, as well as hazardous waste management, mining and manufacturing systems. Morrison-Knudsen is excited about INGRES's scalable performance in multiprocessor environments and its ability to take full advantage of new multiprocessor machines such as DEC's PolarStar and Sequent's UNIX systems.

According to Don Bott, Manager of Integrated Technologies at Morrison-Knudsen, "Once we were out of the initial learning curve with Release 6, we were quite positive about it. Efficiency has been enhanced, the table creation and menu items are improved, the documentation is excellent and the forms editor is much better."

The new release, which runs on the company's VAX 8600, is used for a variety of purposes. It serves as the foundation of an engineering/geologic information service called Eagles, which Morrison-Knudsen sells to various mining concerns. The company also relies on Release 6 to manage various facets of hazardous waste projects. Bott says he's surprised at the improved throughput rate of Release 6 on the 8600. He expects its performance in a multiprocessor environment — which Morrison-Knudsen will have when a new data center utilizing Eclipse computers is completed — to be even better.

"INGRES Release 6 features a new architecture, a modular design, enhancements to the premier INGRES toolset and much more," says Ed Horst, core technology product marketing manager. "INGRES users will benefit immediately from the new capabilities and, at the same time, will have a foundation for the growth of their future information systems."

Multi-Server Architecture

Second generation RDBMSs feature a single server that processes user queries; multiple users share this server for all their requests, limiting database performance and flexibility.

Unlike these, Release 6 features a new Multi-Server RDBMS architecture. With this next generation approach, multiple servers share a database, resulting in maximum performance, configurability and flexibility.

Scott Williams, database group manager at the electronic publishing systems house, ATEX, attests to the benefits of the new release. "The multithreaded server of INGRES Release 6 increases throughput," says Williams. "This lowers per-user overhead, enhances local caching and reduces I/O and CPU utilization." Williams also notes that the auto-recovery feature in Release 6 "will improve uptime for the ATEX customer base and complements our own high-availability features in our networked database environment."

Just in Time for Multiprocessors

Multiple processors, arranged in either loosely or tightly coupled configurations, are an emerging trend in hardware development. The INGRES Multi-Server architecture is uniquely designed to take full advantage of this technology. With Release 6, servers can be spread across the available processors without restriction, taking full advantage of all available CPU power.

"Efficiency has been enhanced, the table creation and menu items are improved, the documentation is excellent and the forms editor is much better."

– Don Bott, Morrison-Knudsen, Inc.

"Relational Technology seems to have timed perfectly the introduction of INGRES Release 6," writes *InformationWEEK* editor Scott Liebs. "The Multi-Server RDBMS appears just as DEC has graced the world with multiprocessor machines PolarStar and Eclipse, and VMS 5.0, the upgraded operating system that takes advantage of multiprocessors."

By installing advanced operating systems and hardware such as these, companies running Release 6

can achieve the high performance needed for on-line transaction processing (OLTP) applications — with larger databases, at lower cost and for more users than ever before. In fact, Release 6 now far surpasses other DBMSs in cost/performance. As *Digital Review* editor Michael Vizard notes, "The cost/performance ratio [of INGRES Release 6]. . . is only $6,000 per TPS, which compares with a ratio of $195,000 per TPS running on IBM Model 400 systems."

The Next Step in Productivity

Industry observers and customers have long recognized the INGRES toolset as the finest on the market. "Release 6 extends the capabilities of the toolset even further," says Horst. "Developers now have the ability to integrate pop-up windows into their applications; end users will appreciate a system that is more attractive and easier to use. A new menu system further enhances both developer and end-user productivity. INGRES development languages (both 4GL and embedded 3GLs) have a host of exciting new capabilities to improve performance, speed applications development and enhance ease-of-use."

In addition to its new architecture, INGRES Release 6 features a modular design. This foundation enables Relational Technology to respond quickly to customer needs for new features and capabilities. As a result, customers can expect to see INGRES enhanced more rapidly.

Created to Lead the Next Generation

Because of its premier toolset, its unparalleled ability to access information and its power to handle core production applications, INGRES is the information foundation for all industries — from higher education to manufacturing, from scientific and government research to agriculture. The new capabilities and next generation architecture of Release 6 make INGRES a product that will take these industries into the future.

– by Carol Realini, Director of Product Marketing

"With Release 6, it's much easier to grow."

– Dr. Richard Weiland, Princeton Plasma Physics Lab

Princeton Plasma Physics Laboratory: Easy Conversion

Dr. Stan Kaye, a researcher at Princeton Plasma Physics Laboratory in Plainsboro, New Jersey, says, "We're really impressed with INGRES's performance in general. And we've noticed that with each release of the product, performance gets better and better."

His colleague, Dr. Richard Weiland, agrees, noting that the new multi-server architecture of INGRES Release 6 makes it easier to start up applications. "With our older system, our backend node was saturated, but with Release 6, it's much easier to grow."

Princeton Plasma Physics Laboratory (PPPL) is one of the world's leading centers for magnetic fusion research and development. The Laboratory's Tokamak Fusion Test Reactor (TFTR), the largest fusion experiment in the U.S., confines gasses that can get hotter than the sun itself — up to 300 million degrees centigrade. The TFTR is used by physicists to create the physical conditions necessary to fuse, or join, light atoms which, in turn, can produce useful fusion energy.

Using a system called MINGL ("Mighty INGRES Locus System"), scientists at the laboratory are able to store and analyze data collected from more than forty separate diagnostic systems generating data during a tokamak discharge (or "shot"). With up to 100 shots occurring per day, the TFTR experiments generate an enormous amount of information. Every day, 1 to 1.5 gigabytes of

[Continued on pg. 27]

POWER TO THE PEOPLE:

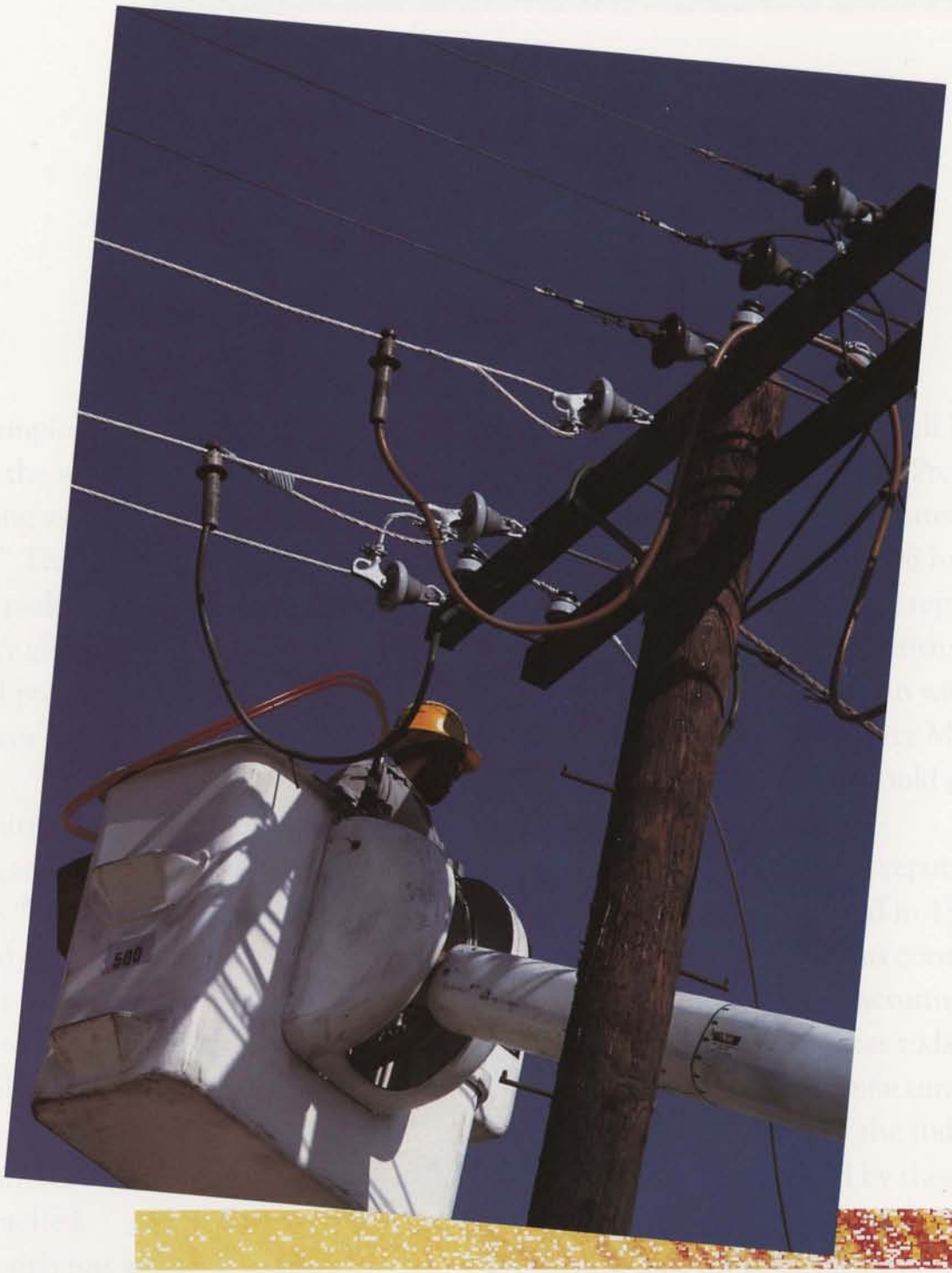
Ontario Hydro Revolutionizes Transmission Scheduling System with INGRES

By Brian Worth
Senior Engineer, Ontario Hydro

If you think your electricity bills are high, try three million dollars a day. That's how much it costs us at Ontario Hydro, Canada's second largest, publicly owned power company, to keep the lights on and the motors running for an entire province. But without TUDOS (Transmission Utilization Department Outage System), it would cost us millions more to meet the electricity requirements of our 3,344,000 customers.

Ontario Hydro is committed to supplying the people of Ontario with electricity while maintaining high standards of safety, environmental protection and customer service. To that end, we operate 80 hydraulic, fossil and nuclear generating stations that feed an extensive power grid designed to meet the demand for electricity. In 1987, our 25,000-employee company delivered a total of 133 billion kilowatt hours of electricity to primary and secondary customers in Canada and the United States.

Transmission system outages usually require shifts in generation to more costly stations. With TUDOS, our sophisticated transmission outage planning system, Ontario Hydro schedules and coordinates the required outages. Since some outages can cost Ontario Hydro thousands of dollars an hour while power is generated from more expensive sources, the 5,000 planned outages that occur annually must be very carefully coordinated. When you're dealing with an annual fuel budget of over a billion dollars, you can't afford to do anything inefficiently. Without TUDOS, Ontario Hydro would be spending an estimated ten million dollars more per year — a cost that we, and our customers, would rather not have to pay. [Continued on pg. 24]




pyrex DESIGNS

CORNING GLASS WORKS:

Where Quality is King

For the employees of Corning Glass Works, the word "Quality" carries the same meaning as the words "Mom" and "Apple Pie." This is not surprising: over the years, these makers of consumer, scientific and specialty glass and ceramics, fiber optics and medical products have made a name for themselves that is synonymous with The Big Q.

Corning's reputation for quality is due to its near-fanatical zeal in achieving what it calls "Total Quality" in every product it makes and every service it provides. Not long ago, for example, a slight tinting error was discovered in a large order of ready-for-shipment television glass. Even though the customer declared the glass useable, the Corning plant manager ordered the whole lot to be remelted.

Although just about anyone but Corning might find such zeal amusing, Total Quality, as the company well knows, ultimately translates into "Total Profit." In 1987, the company's consolidated sales reached an all-time high of $2.08 billion. The same banner year saw Corning's reputation for outstanding quality reach its zenith: Chairman of the Board James R. Houghton was selected as Chairman of National Quality Month. That's an honor most CEOs would give a year's salary to have.

Corning didn't gain its reputation for quality overnight. Founded in 1853, the 28,000-employee company has continually refined its meticulous manufacturing processes. This long experience has today resulted in computer integrated manufacturing (CIM) systems that are the pride of the industry. The quality of the data produced by these systems, Corning insists, must be as pristine as the white sand used for its Steuben crystal.

[Continued on pg. 22]

INGRES USER ASSOCIATION

IUA

A RED-HOT EVENT FOR INGRES USERS!

Mark your calendar now for April 23–27. That's when the 1989 Annual INGRES User Association conference will heat up in New Orleans, Louisiana. Plan now to join us in Cajun country – and see what fellow users are cooking up with INGRES!

The 1987 conference was so good, we've decided to add an extra day to spice up this year's!

Watch for your registration packet. See you there!

CONVERSION TO RELEASE 6

Release 6 revolutionizes the capabilities of INGRES in more ways than one. To participate in that revolution, users must convert existing Release 5 applications and databases to Release 6. Conversion raises many questions for database administrators and system managers. Therefore, we are devoting this "INGRES Users Ask" to conversion issues.

Q: How do I plan a conversion?
A: When you plan your conversion — and we heartily recommend that you do — there are four important things that you can do to guarantee success:

- Absorb as much information in advance as you can.
- Test, test, test, to avoid surprises.
- Decide whether to add new features during conversion, or do a straight conversion and then add new features.
- Get help if you feel unsure.

Q: Is Relational Technology providing any special documentation?
A: We have given a tremendous amount of thought to the conversion process and have designed several sources of information to help you understand it completely.

A first reference for database conversion is the *Installation and Operations Guide (I&O Guide)*. In addition to providing valuable tips on installation, tuning and troubleshooting, it is a complete guide to running the conversion utility (CONVTO60).

A second reference, *The Release 6 Conversion Guide*, provided by Relational Technology's Technical Support group, covers planning issues — including changes to SQL-based applications — for Release 6 conversion. The *Guide* includes well-thought out scenarios for completing a conversion project with minimum effort and impact on your user community.

Some developers, users and database administrators prefer self-training to classroom training. For these users, a document called *Getting to Release 6* offers an alternative to the "conversion class" (given by the Relational Technology Customer Education Department). *Getting to Release 6* identifies all of the differences between Release 5 and Release 6, and will be extremely useful to existing INGRES users.

Finally, the Release 6 technical documentation is the definitive reference on Release 6. In addition to discussing the new features and "look" of Release 6, it provides both VMS and UNIX reference guides in a single volume. It also includes a new master index for all volumes and a significant new document, the *Error Message Manual*, which contains detailed instructions for solving error conditions.

Naturally, Relational Technology's Customer Support and Services will help you as you prepare for and execute your conversion. Call them for help with specific problems or with any suggestions for making the conversion smoother for others.

Q: Is consulting help available?
A: If you feel overwhelmed by the size of the conversion task, you may want to consider getting additional help. Consulting help is recommended if you are converting a large database accessed by many users, or if you wish to enhance the new features in both the server architecture and user interfaces. Relational Technology offers direct consulting and references to other consulting resources, according to your needs.

Q: How do I go about converting?
A: Database conversion can be simple or complex, depending on the demands of your application environment.

First, test-convert copies of your production databases in a separate installation, if possible. Most of the estimating procedures require at least some actual conversion work on existing

[Continued on pg. 26]

Get Up To Speed Fast With INGRES Release 6!

No matter where you leave the starting blocks, Relational Technology has the appropriate Release 6 training for you.

Written Training

Experienced Users:

Sprint into the conversion process. Shortcut your way through the INGRES documentation set. *Getting to Release 6* is a 200-page book that introduces INGRES' powerful new functionality to application developers and database administrators. Bring training to your own desk, at your own convenience, at a cost far below that of instructor-led training.

Getting to Release 6 is available now for only $125/copy. Multi-copy discounts also available.

Computer-Based Training

New Users and Experienced End Users:

Accelerate learning of INGRES Release 6 applications and interfaces with hands-on training that won't let you stray off course. Work out at your own desk, creating INGRES tables and manipulating data. Use the *INGRES Tutor* CBT (Computer-Based Training) program and accompanying workbook to come up to speed quickly with the INGRES forms system.

Train at your site, at your convenience for $250/copy. Available February, 1989.

Instructor-Led Training

New Technical Users:

Get on the fast track to Release 6. Build an INGRES application from scratch, write your own SQL queries and embed them into 4GL and Embedded SQL programs. Learn basic performance tuning and database administration. Spend an hour in a lab for each hour of lecture with qualified instructors available to answer your questions.

Attend *INGRES for Applications Developers*, a five-day course that begins where the *INGRES Tutor* leaves off. Available in January, 1989 at our training centers or your site.

To finish a winner, order *Getting to Release 6* or the *INGRES Tutor* by calling Telesales at: 1-800-4-INGRES or 1-800-446-4737.

To register for a class, call Educational Services at: 415-748-3535.

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Relational Technology Training Courses January–March 1989

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	ALAMEDA CALIFORNIA	ROSEMONT ILLINOIS	ROCKVILLE MARYLAND	TORONTO CANADA	BOSTON MASSACHUSETTS
INGRES for Application Developers SQL	Jan 2-6 Jan16-20 Jan 23-27 Feb 6-10 Feb 27-Mar 3 Mar 6-10 Mar 13-17 Mar 27-31	Jan 16-20 Feb 6-10 Mar 13-17	Jan 2-6 Jan 9-13 Jan 23-27 Jan 30-Feb 3 Feb 13-17 Mar 6-10 Mar 13-17	Jan 16-20 Jan 30-Feb 3 Feb 13-17 Feb 27-Mar 3 Mar 20-24	Jan 9-13 Jan 23-27 Feb 6-10 Feb 27-Mar 3 Mar 6-10 Mar 27-31
Introduction to INGRES QUEL	Jan 9-10 Feb 13-14 Mar 20-21		Feb 27-28 Mar 27-28		Jan 30-31
INGRES for Application Developers QUEL	Jan 11-13 Feb 15-17 Mar 22-24		Mar 1-3 Mar 29-31		Feb 1-3
Advanced Performance	Feb 1-2	Feb 23-24			Mar 22-23
Advanced ABF/4GL	Jan 30-31	Feb 21-22		Mar 27-28	
Embedded Query Language	Feb 3				
Database Design	Feb 21-22		Jan 17-18		Mar 20-21
Database Administration	Feb 23-24		Jan 19-20		

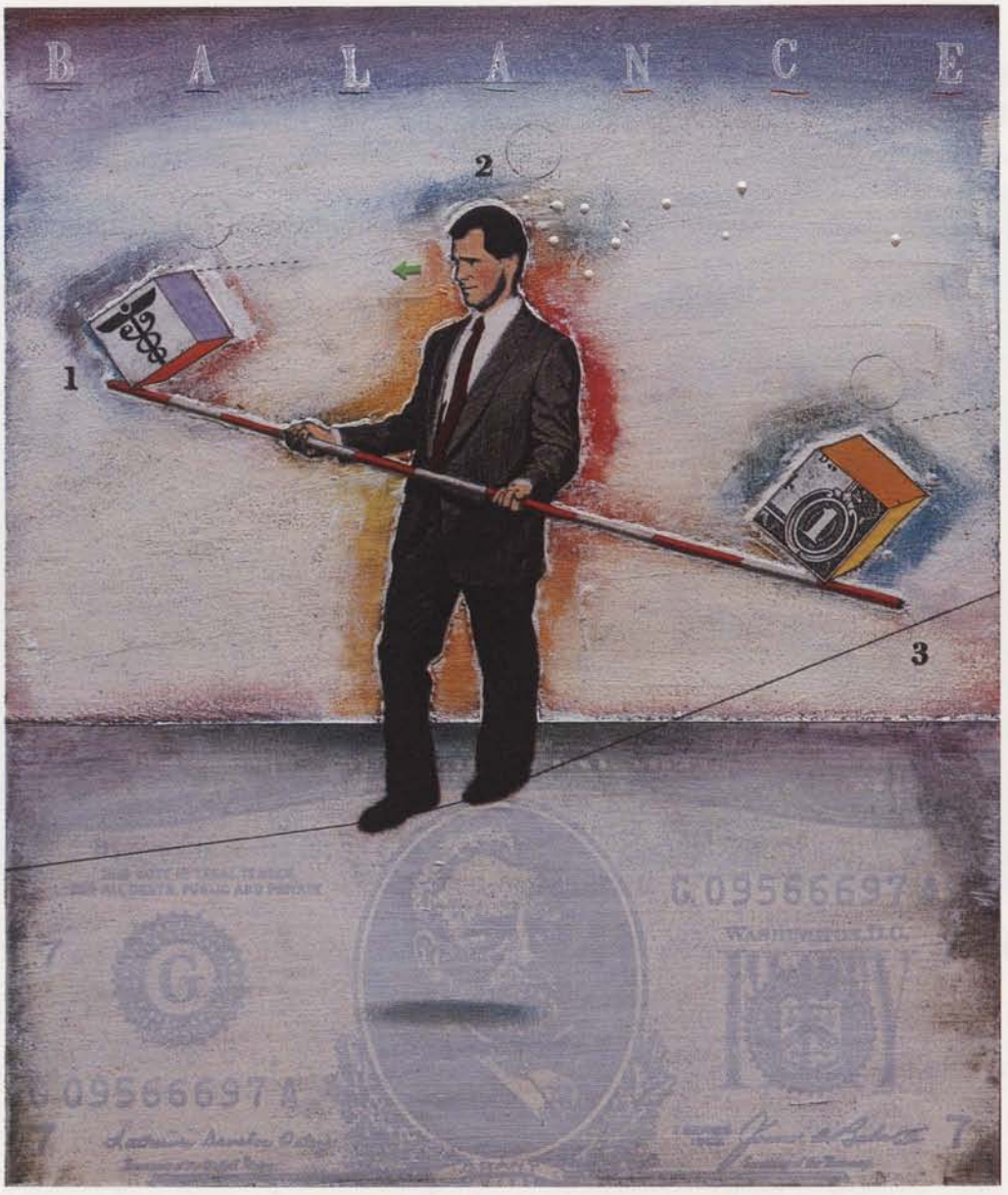
Fees:

Training Center Classes
Introduction to INGRES QUEL - $500
Application Developers QUEL - $750
Application Developers SQL - $1,350
Advanced Seminars - $400/day

INGRES Tutor (CBT) - $225
Getting to Release 6 (Tutorial) - $125

On-site Classes
Introduction to INGRES and
Application Developers - $3,000/day
Advanced Seminars - $4,000/day

For more information or to register for a class call: **(415) 748-3535**



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SQL IS NOT ENOUGH

MARK HANNER
Manager, Product Marketing Application Development and End-User Interfaces

Not long ago, managers in business schools were told that by using "simple, English-like" SQL, they would be able to track all corporate information. Since then, SQL has become a universal language for accessing data from a variety of hardware and operating system sources. With this standard, users can build applications that are portable across virtually all systems.

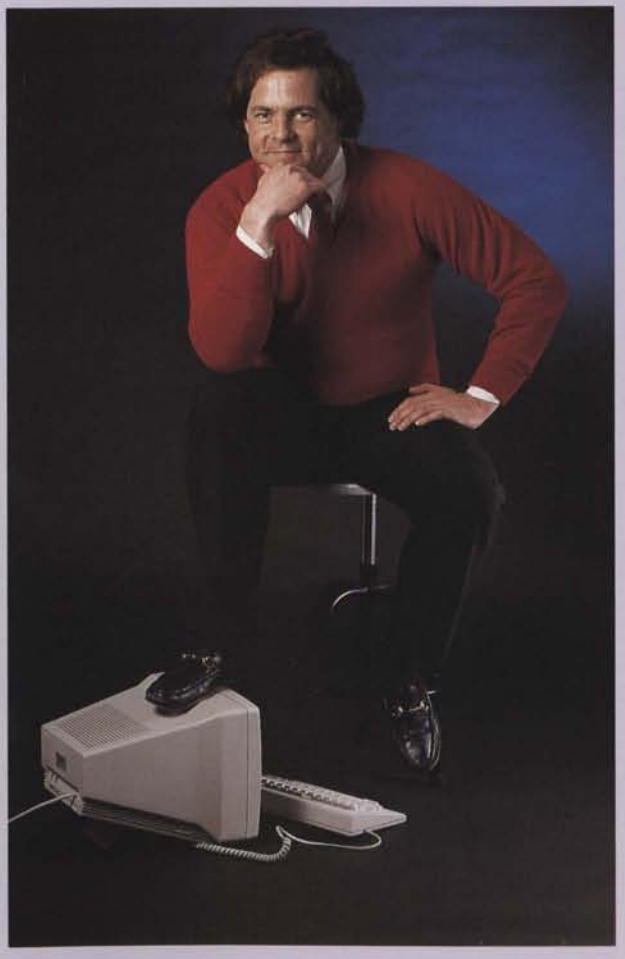
In practice, though, people have found that SQL, by itself, is neither simple nor English-like. They have found that SQL is not enough.

In response to the need for more useable systems, most database products now provide a sophisticated set of tools for querying, reporting and developing applications interactively. These products have allowed end users to perform many tasks themselves, making programmers more productive. Such productivity is achieved through high-level 4GL for controlling applications, using a common user interface of screen forms and menus.

To leverage this productivity, these tools must be portable across the same environments as the available database managers. The first generation of these portable tools met the challenge of implementing the same look and feel across ASCII terminals, block-mode terminals and PCs. With these tools, end users have vastly increased access to data.

In looking to the future, however, we find that there is a need to develop portable tools that take advantage of the newest display technology for workstations and PCs. These more powerful systems, with their graphics interfaces, make life easier on the end user; but, due to the multitasking, object-oriented window managers that control the sophisticated displays of such systems, it is also difficult for programmers to develop applications for them.

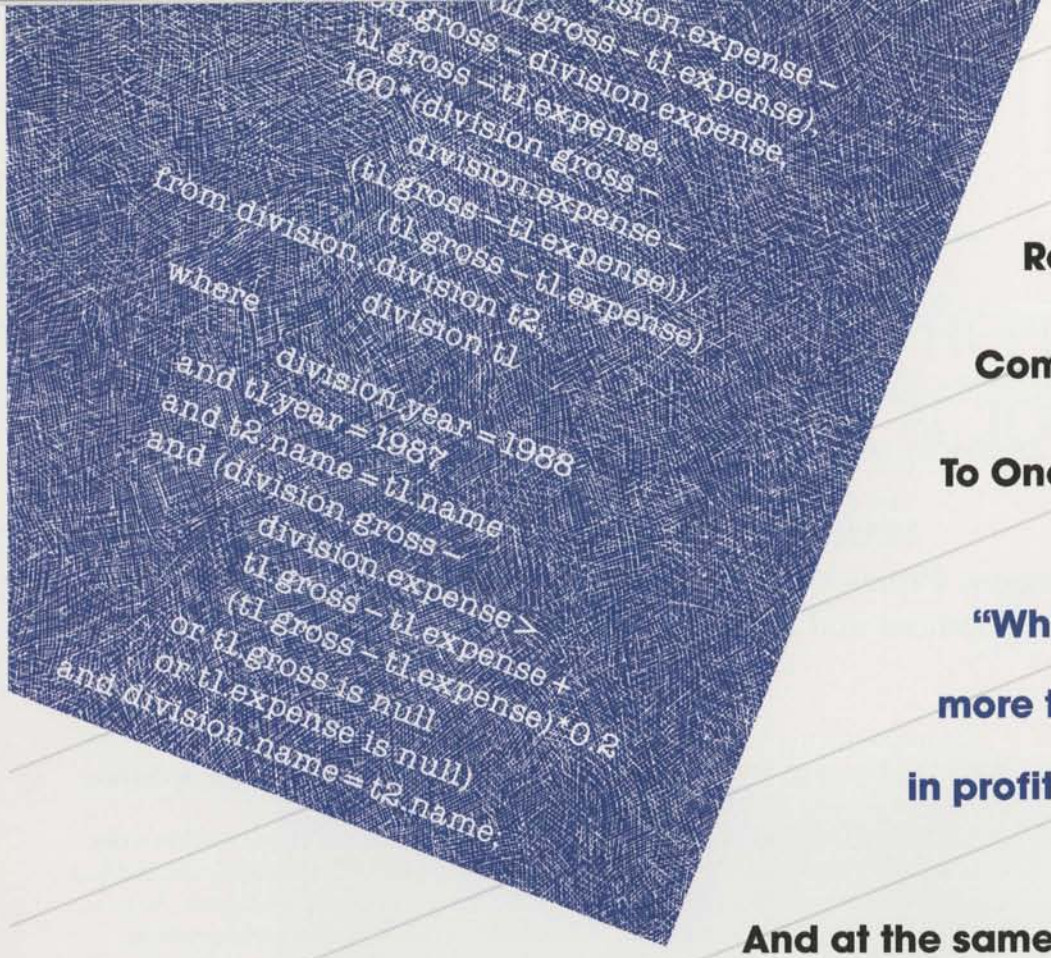
The challenge facing vendors today is to provide tools to simplify the building of applications on workstations. As new tools are developed for these systems, we will see an increase in the number of workstations in use.



And since these systems have more power, users will increasingly do much of their own "programming" with completely interactive systems. This heralds a change in the programmer's role. As we make it easier for end users to develop their own applications independently, programmers will be concentrating on building large, complex, customized applications. In the future, satisfying end user requests will consist primarily of setting up access to the corporate database and letting the tools do the rest.

Mark Hanner, Relational Technology's product marketing manager in charge of application development and end-user interfaces, has been in the relational DBMS industry since its inception. In 1981, he worked with Relational Technology's founder, Dr. Larry Rowe, on user interfaces for the original INGRES project under development at the University of California, Berkeley.

Mr. Hanner holds a B.S. in Computer Science from the University of California, Berkeley, and an MBA from the University of California, Los Angeles.



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What differentiates *Natural Language* is its large vocabulary—1100 concepts—ability to understand the meaning of the user's request in context as well as the words themselves—and flexibility to expand your existing interfaces. The system even handles misspelled words and ambiguities, while tracking your conversation so that you can refer back to previous questions or package them into a formatted report. It's like talking to a knowledgeable associate . . .

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NEWS BRIEFS

Announcing INGRES Tools for Rdb

October 17, 1988 — Digital Equipment Corporation and Relational Technology announced an agreement to sell and distribute INGRES end-user and development tools for use with Digital's strategic relational database management solution — Rdb.

The exclusive agreement with Digital's Database Systems Group allows both Digital and Relational Technology to sell the new product, "INGRES Tools for Rdb." Shipping begins in the U.S. in December. Future INGRES end-user and development tools are also covered by the agreement.

"Digital's VAX Rdb forms the core of Digital's strategic database management solution. Relational Technology offers the premier third-party toolset and it will make a superb complement to the power of Rdb," said Grant Saviers, vice president of Digital's Storage and Information Management Group.

According to Saviers, the combination of Digital's Rdb/VMS and INGRES tools further complements the recent DECtp announcement and is consistent with Digital's overall data management strategy. "We were impressed by the completeness and quality of the INGRES toolset," said Saviers. "We feel the new product team of Rdb and INGRES tools will be very attractive to customers who need a common interface across a variety of operating environments."

Relational Technology President Paul Newton noted that this selection by Digital helps position INGRES tools as an application development standard in the database arena, opening new markets for both companies. "Combining INGRES production-quality tools with the power of Rdb provides an industrial strength system to enable applications development in the VAX environment," Newton said.

Relational Technology Enters CASE Market

August 15, 1988 — Relational Technology entered the computer-aided software engineering (CASE) market by announcing the signing of an exclusive joint development and distribution agreement with Providence, R.I.-based Cadre Technologies.

Relational Technology's INGRES family of database products will be tightly integrated with Cadre's team*work* family of industry-standard CASE tools and targeted at application developers in government, manufacturing, engineering and DP/MIS. This move will leapfrog competition by providing workstation-based solutions for high-end, multiuser technology.

Cadre is the leading supplier of workstation-based CASE tools, with approximately 3,000 systems installed worldwide. Cadre is available on all leading workstation platforms including Apollo, DEC, HP, IBM and SUN. The team*work* family of software development tools helps solve complex systems development problems and improves development team productivity.

Cadre and Relational Technology will work jointly to integrate INGRES and team*work* tools and facilities, market the integrated solution and coordinate sales activities.

Information Associates, Relational Technology Join Forces

November 29, 1988 — Relational Technology and Information Associates (IA), of Rochester, N.Y., a wholly owned subsidiary of Management Science America (MSA), announced a three-year partnership agreement allowing IA to distribute all of Relational Technology's INGRES products, including INGRES Gateways, to administrative customers in higher education. Information Associates is a major supplier of software and services to the higher education market.

Information Associates currently plans to conduct product development with the INGRES toolset. INGRES appeals to IA clients because of its powerful capability to access and communicate among many hardware environments, particularly Digital and IBM. INGRES is already a popular relational database management system in higher education, with 750 multiuser licenses installed.

Information Associates' sales force will be the primary distributor of the INGRES products. Relational Technology will provide technical and consulting support for its RDBMS products.

INGRES to be Installed at All Massachusetts Public Higher Education Campuses

October 31, 1988 — Relational Technology announced an agreement with the Massachusetts Public Higher Education System to install INGRES at all 29 campuses. This state-wide agreement includes 100 INGRES licenses for DEC VAX and IBM mainframes and hundreds of INGRES PC licenses to be installed over a five-year period.

Under the agreement, signed as part of Relational Technology's Educational Grant Program, institutions of public higher education have the opportunity to install the entire family of INGRES products across all campuses at significant cost savings.

The multicampus installation of INGRES means that the universities, state colleges and community colleges of Massachusetts Public Higher Education make INGRES their standard for developing local and system-wide administrative and reporting applications, according to Stephen Kelley, associate vice chancellor for computing policy and resources at the Massachusetts Board of Regents.

"INGRES will improve the productivity of programmers and administrators, and will make departmental users less dependent on the data processing center," said Kelley. "Faculty and students should find INGRES a valuable tool in the instruction of database concepts and design."

Relational Technology Joins Transaction Processing Performance Council (TPC)

September 26, 1988 — Relational Technology joined the Transaction Processing Performance Council (TPC) — an organization founded to develop standard benchmarks for measuring performance capabilities of database management systems. According to Relational Technology, INGRES already meets the preliminary standard benchmark criteria proposed by the TPC.

The proposed benchmark standard, modeled around the well-known DebitCredit test, was coauthored by Tom Sawyer, senior consultant of San Jose, Calif.-based Codd and Date Consulting Group, and Omri Serlin, TPC administrator. It will eliminate many of the ambiguities in the current specifications surrounding on-line transaction processing (OLTP) benchmarks by establishing set standards for testing and measuring database performance.

The industry-first INGRES Silver Bullet benchmark test provided an independently verified performance rate of over 100 DebitCredit transactions per second (TPS). According to Relational Technology, INGRES currently provides the highest-audited, true DebitCredit TPS rates under UNIX for an independent software vendor.

INGRES Ported to the Macintosh II

November 7, 1988 — INGRES is now available for A/UX, Apple Computer's UNIX operating system for the Macintosh II computer. A/UX users can now integrate their data with information stored in INGRES files on other micro, mini and mainframe computers. When used with INGRES Gateway products and INGRES/STAR, Relational Technology's distributed data manager, INGRES on the Macintosh II gives users throughout the corporation access to data.

The development of the INGRES port to the Macintosh II computer was initiated by Brown University (Providence, R.I.). The port is part of a series of products that Relational Technology is planning to bring to market to provide database integration in the workstation market.

Relational Technology Introduces INGRES/386 for the UNIX Environment

November 7, 1988 — The INGRES relational DBMS is now available for the Compaq/386 (and compatibles) running Interactive Systems 386/ix. INGRES/386 is a complete port of the key INGRES development tools, database manager and frontend user facilities, including the INGRES 4GL, Visual-Forms-Editor, Report-Writer, C-language interface and Query-By-Forms.

INGRES on the Compaq/386 provides UNIX/386 users with the tools, power and access they need for rapid application prototyping. Future connectivity products give the developer of small systems access to corporate data in a completely transparent manner. According to Mitch Bishop, Relational Technology's group manager of UNIX product marketing, "INGRES/386 puts all of the functionality and high power of INGRES's mainframe RDBMS into the hands of developers for the low-end multiuser market."

Relational Technology's Symposia Attract Large Attendance

November 7, 1988 — Relational Technology's series of three symposia on the use of INGRES in the UNIX operating environment, held in San Jose, CA., Washington, D.C., and New York, N.Y., attracted a combined attendance of 1,090. The Washington, D.C. symposium, attended by 580 MIS and data processing professionals, was the largest and most successful seminar conducted in the software industry, according to Michael Braude, vice president, software management strategies at the Gartner Group, Inc.

The symposia were designed to introduce the INGRES product line and to discuss the product's role in the UNIX marketplace. They served as forums for coverage of future trends in the UNIX industry. At the meetings, Relational Technology also demonstrated Simplify, a window-based 4GL (fourth generation language) developed with Sun Microsystems and based on the UNIX user interface.

INTERNATIONAL NEWS BRIEFS

Interlife Chooses INGRES

Interlife Assurance Company Limited, a rapidly expanding life insurance company, placed a 55,000 (pound sterling) order for the INGRES RDBMS with Relational Technology. The company will use INGRES to develop a complete and integrated suite of insurance application software covering all aspects of Interlife's operations, including policy administration and financial accounting in its head office and ten UK branches.

Interlife will develop its system on a centrally sited Hewlett-Packard HP9000/825S minicomputer running under UNIX. The production version of the system will operate on an HP9000/850. The order also includes a PC version of INGRES, which will allow the company to develop local branch databases on HP Vectra personal computers. When completed, the system will handle all the issuing and administration of life insurance policies generated from a network of branches.

Hampshire Constabulary Selects INGRES for Polnet Project

The Hampshire Constabulary, one of the largest county police forces in Great Britain, has selected the INGRES RDBMS for its multimillion (pound sterling) Polnet project. The Constabulary will use INGRES and INGRES/STAR as the central software for the county-wide distributed database, which will greatly improve the effectiveness of its operational police officers.

The Constabulary's Polnet project will operate as a network, with terminals in each police station. The system will give officers instant access to information on current crimes, criminal records, lost and found property and revisions to police procedures. INGRES will be used to provide access to other county and national police databases, and to allow officers to collate information and easily incorporate data in their reports. The Polnet network will employ at least 22 DEC MicroVAX II systems — one for each subdivision — and will incorporate the force's existing Honeywell and McDonnell Douglas hardware.

INGRES Ported to ICL's Series 39

INGRES is now being ported to the International Computers Limited (ICL) VME-based Series 39 mainframe system. The porting will enable ICL users to combine the fast access and processing power of their mainframe systems with INGRES's flexible development capabilities.

The announcement follows the signing of a strategic agreement under which ICL will market INGRES on all its products. With the porting to Series 39, INGRES will now run on all of ICL's networked product line, UNIX-based minicomputer systems and DRS professional workstations.

NEW EXECUTIVES

Martin Sprinzen
Vice President, Engineering

Relational Technology is delighted to welcome back Martin J. Sprinzen as vice president of engineering and customer services. Sprinzen was vice president of engineering at Relational Technology from October 1984 to June 1986, when he left to become president of NASTEC, a computer-aided software engineering (CASE) tools company located in Southfield, Mich.

Sprinzen reports to President Paul Newton and is responsible for managing and coordinating Relational Technology's INGRES product engineering and customer services efforts.

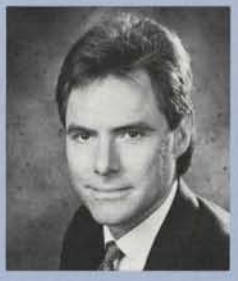
Prior to joining Relational Technology in 1984, Sprinzen was vice president, technical services at Candle Corporation, West Los Angeles. He managed and designed various scientific application programs for electric utility companies in Los Angeles and New York, and has also written numerous technical papers and articles for engineering-specific industry publications and newsletters.

Marilyn Bohl
Vice President, Product Development

Relational Technology is proud to welcome a brilliant new member to its staff. Marilyn Bohl joins us as vice president, product development. Bohl was most recently vice president, product development, at Digital Research, Inc. (DRI), in Monterey, Calif. From 1968 to 1987, she was with International Business Machines (IBM), in San Jose, Calif., where she managed IBM's DB2 development effort from its inception in 1979.

At Relational Technology, Bohl is responsible for INGRES product development and maintenance including networking and distributed database development. She will report to Martin Sprinzen, Relational Technology's vice president of engineering.

Paul Wiefels
Director, Marketing Communications



Relational Technology welcomes Paul Wiefels as director of marketing communications. Formerly a group marketing manager with Apple Computer Inc., in Cupertino, Calif., Wiefels brings more than ten years of domestic and international experience in marketing and advertising to the company. Wiefels will report to Vice President Robert Healy and will be responsible for the coordination and management of a wide range of marketing development and communications functions within Relational Technology's growing marketing department.

[CORNING, continued from pg. 9]

A System For Everything

According to a *Computerworld* special supplement on the top 100 companies investing most effectively in information systems (September 12, 1988), Corning has one of the most seamless information management systems around. To gather, analyze, share and transmit its manufacturing data, Corning relies on hundreds of DEC VAX computers and thousands of terminals and PCs installed in many of its more than 50 plants worldwide. Most of these machines operate under VMS and run a variety of custom-built and commercial software packages, including SAS, RS-1, Minitab, DPICT and others.

"INGRES," says Mayall, "was the only system that met all our criteria."

INGRES is one of the fundamental parts of Corning's information management systems. Since the first installation of INGRES at Corning in 1986, the company has purchased the relational DBMS for five of its manufacturing plants, as well as for engineering, research and development and information services organizations; more installations of INGRES are planned at other locations.

At one plant, the database contains nearly a million records. This data is retrieved from machines on the plant floor. The consistently current, accurate plant-floor database enables operators to improve the quality of the manufactured product by allowing them to analyze the data and take corrective action, if necessary, during the product manufacturing cycle. The data is also used for analysis by process engineers and statisticians.

INGRES is also the chief data storage and analysis engine for most of the new systems being developed by two of Corning's major software development organizations — Manufacturing Management Information Systems (MMIS) and Information Services.

One such system developed by MMIS, an Integrated Process Analysis System (IPAS), is used by technicians to analyze data collected from each segment of the manufacturing process, from raw materials to finishing. Up to 4,000 data variables are collected and fed into the DBMS. This data is collected by sensors, gauges and other measurement devices on the plant floor, then sent to MicroVAXes in RMS files and finally to INGRES residing on VAX computers.

By virtue of the INGRES Gateway to RMS, Corning is able to translate RMS files into INGRES and store the data in tables containing information about actual production conditions and materials, including temperature, pressure, specifications and chemical content. This data can be combined in an ad hoc manner with other information residing in the database, such as batch number, date and time of production, materials used and product type. Corning's technicians, few of whom have specific computer software expertise, can then trace through the production process and make correlations — increasing their understanding of the manufacturing process and reducing the number of defective products.

According to Sat Mayall, Corning's manager of MMIS, the implementation of the distributed relational DBMS for the IPAS system has provided a flexibility which was not previously available to company users. "It's important for our users to be able to get to their data quickly and easily," Mayall explains. "With this system, they are able to combine their data in ways they couldn't before. If, for example, they want to locate the possible cause of a defect, they can compare the variables and come up with a correlation in under two hours. Before we implemented this system, it took up to four months to do the same thing."

The relational DBMS is also at the heart of a Plant Floor Reporting System which collects and summarizes key information for an entire plant. The system incorporates information about ware produced, ware defect count, quality checks, production machine down time and other data associated with production performance.

Other INGRES-based systems include a Type Equipment Control System, an analysis tool which gathers equipment readings and reports out-of-tolerance conditions before equipment is used on the plant floor; a Parts Master Catalog System for ordering parts and filling out requisitions; and a Hazardous Material Analysis and Reporting System.

A Do-All DBMS

Prior to implementing its relational DBMS, the company kept all its manufacturing information in custom-built RMS databases. The chief problem with this mode of operation, Mayall recalls, was lack of flexibility. Users couldn't access and analyze data themselves, and it took too long to get information they needed.

Before selecting a database engine, Mayall recalls, Corning put together a 60-page document listing criteria for a DBMS. The system had to allow data collected on the plant floor to be translated into the database. It had to be highly flexible — a quality only a relational database could provide. The DBMS needed to have a sophisticated

query language for ad hoc querying by nontechnical users. It would also have a complete set of fourth generation tools.

Corning didn't want to rely on a single centralized location for the database. The DBMS had to tie together distributed data, because employees had to be able to access data regardless of location. Finally, the vendor had to have a good reputation for providing powerful software and excellent technical support. "INGRES," says Mayall, "was the only system that met all our criteria."

"Using ABF, we can develop a prototype of what a user needs in less than a day. If we need to change the system's requirements, we can do it very fast. This ability has saved us a lot of time and money."

– Sat Mayall, Corning Glass Works

Once the new DBMS was purchased in October of 1986, Mayall recalls, Corning quickly discovered some of its chief benefits. One of the most important aspects of the new relational system is its ability to prototype systems quickly and easily. One fourth generation tool, called Applications-By-Forms (ABF), allows the company's application developers to put together a visual model of the actual application quickly and change it as needed without doing a lot of programming. "Using ABF, we can develop a prototype of what a user needs in less than a day," he says. "If we need to change the system's requirements, we can do it very fast. This ability has saved us a lot of time and money."

Another important benefit is the DBMS's ability to read from RMS files. "All our old databases were stored in RMS files," says Mayall. "We absolutely had to have a database that provided a gateway to RMS, since we couldn't rewrite all our systems. It's fortunate that INGRES has such a gateway."

PC Links to Germany

Today, Corning is running the DBMS on its VAX systems in five production plants. Three of the five plants manufacture ceramics for automobile emission control systems and cellular products; two of these are located in the United States and one in Kaiserslautern, West Germany. These plants, which currently share common data via electronic mail, will soon be using INGRES/STAR to access manufacturing data transparently.

At the Corning plant in Kaiserslautern, users do most of their work on personal computers linked to DEC VAX computers. With INGRES/PCLINK, users are able to extract data from the database as needed without adding more expensive computers or PC database programs.

In for the Long Haul

As Corning's distributed computing capabilities advance, the multiprocessing power offered by INGRES Release 6 and other tools will command increasing attention. As Mike Foster, an engineer in the MIS department at Corning explains, "We handle manufacturing across several platforms in various sites, so we have a real interest in anything that enhances distributed data processing."

For the present, however, Corning maintains four goals: to simplify its processes, to design for manufacturing, to bring its processes under statistical control and to continuously improve its products and services. By adhering to these, says Mayall, Corning will achieve its overall goal of Total Quality. Its technical and production professionals now have quick and easy access to production data, and by implementing a distributed system, Corning is able to have on-line, accurate production information wherever and whenever it is needed.

Of course, one truth about perfectionism is that nothing's ever perfect. "Total Quality" remains an evanescent, if tantalizingly close, goal for the Granddaddy of Glass. For this reason, says Mayall, Corning will continue its commitment to excellence in database technology. "We're going to be using INGRES for a long time, because we're happy with it and because both Relational Technology and Corning are committed to producing quality products," says Mayall. "We want our information systems to reflect that quality, and INGRES does that for us."

– by Bronwyn Fryer

[ONTARIO HYDRO, continued from pg. 6]

Founded on the INGRES relational database management system running on a DEC VAX minicomputer, TUDOS receives and stores information which assists Ontario Hydro's Power Systems Operations Division in scheduling the planned outages. The database contains information such as code numbers, dates, times, outage locations, affected equipment, previous outage history, special instructions and operating strategies, personnel contacts and job status. Despite the large amount and diversity of information stored in the database, it is so user friendly that we can take people off the street and have them using it in minutes.

In 1987, the Division replaced its old COBOL-based version of TUDOS — which had been used to assist the company's outage coordinators in scheduling transmission outages since 1979 — with a new INGRES-based version. The new version was implemented to meet the need for a system that would better accommodate the volume and complexity of outages as well as the related needs of an increasing number of users.

The new version is not only a vast improvement over the old system, but it allows Ontario Hydro to save large amounts of money in computing costs alone. We are able to save $150,000 a year just by coordinating outages with a relational DBMS. When it came to choosing among these, INGRES was the clear winner.

Before switching TUDOS to INGRES, the company used an outage system built on a COBOL database running on a UNISYS mainframe computer in the Computer Services Division. Because the entire company relied on that Division for its computer support, it was difficult for the Transmission Utilization Department to satisfy its needs. The old TUDOS was a single-user system which was unbearably slow. We couldn't add a one-character field without paying $70,000 to change the entire database.

Here in the Transmission Utilization Department, we came up with a list of 16 points we didn't like about the old system and 21 points which, we insisted, a new system would have to include. In addition to providing multiuser capabilities, the new system had to be highly functional, flexible, fast and secure. It had to be easy to use, prototype, alter and run on personal computers. It had to have good documentation, a full 4GL (fourth generation language) and good user support.

After evaluating a number of software packages closely, we chose INGRES because it fulfilled all requirements. A product demonstration clinched the deal. One of the people from Relational Technology in Toronto came in and gave us a demonstration, and he showed us how to add new fields. Any relational DBMS can do that, but some are better than others. With INGRES, he did it in minutes. It was incredible. We knew that once we got to his level of knowledge we could be really productive in a very short period of time.

As soon as the new TUDOS was placed in service on the VAX in early 1987, the department realized substantial savings in labor. Our productivity improvements amounted to about 250 hours per user, per year. That adds up. By switching to INGRES, we have been able to save 2,500 person-hours a year of user labor, plus 1,500 person-hours a year of programming labor.

"We are able to save $150,000 a year just by coordinating outages with a relational DBMS. When it came to choosing among these, INGRES was the clear winner."

– Brian Worth, Ontario Hydro

Productivity was enhanced through the use of INGRES's 4GL tools, all of which are based on easy-to-use visual forms. These tools sped up our program development by a factor of five. We were able to develop applications and have them running in a short period of time. The developer compiled and tested the application without leaving INGRES's Applications-By-Forms (ABF).

The forms-based applications developed using ABF allow department users to enter, retrieve and update data and to produce specialized reports without any knowledge of computer programming. The users themselves can select various data manipulation functions and control the whole scheduling application. ABF also improves performance by allowing developers to compile the application into an on-screen image for easy execution.

Our staff was impressed by many features of the new RDBMS, including its data security. The old system used a password for security; you could either access all data, or none of it. With INGRES, we are not only able to restrict access to certain data, but we can restrict functionality. For example, we can provide read-only privileges right down to the field level. This allows staff in other departments to use TUDOS while we maintain a high level of security in the database.

We are likewise pleased with INGRES's performance. With INGRES, it doesn't matter if you have three records or three thousand records: the response time is very fast.

This is because the DBMS engine and application development tools are so good. It's also helpful to have INGRES's query optimizer and well-designed tables. Ontario Hydro is currently testing DEFT, a Computer-Aided Software Engineering (CASE) tool, to streamline the design of their databases further [see sidebar].

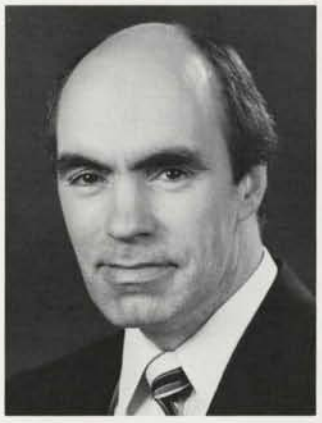
In the future, the Transmission Utilization Department plans to use INGRES to develop a project tracking system and a work management system. We just keep adding functionality. The big advantage of a relational DBMS like INGRES is that you can put a new program together very quickly.

Due to its success in the Transmission Utilization Department, INGRES is also being adopted in a number of other divisions throughout the company. As the number of users grows, the company will consider taking advantage of the INGRES/NET networking capabilities in order to share data.

In short, we're very happy with our selection of INGRES. We conducted a very thorough search for the right relational DBMS, and we found the best one for the job. It has lived up to all our expectations. ►

About the author:

Brian Worth is the supervising engineer for computer development support at Ontario Hydro, where he provides support for the Outage Coordination staff in the Transmission Utilization Department. Mr. Worth holds a B.S. in Electrical Engineering from Queens University and a Master's degree in Business Administration from York University.



DEFT'S C-A-S-E FOR INGRES

As if Ontario Hydro weren't saving enough money by switching to INGRES, the company's Power Systems Operations Division is using a CASE (Computer-Aided Software Engineering) tool to cut system development costs even further. The CASE tool, DEFT, streamlines the design of power system applications and integrates them with INGRES. Ontario Hydro's software developers believe that the combination of DEFT and the 4GL tools in INGRES will help them shorten the analysis and design phases of the Division's database development cycle.

Using the CASE tool, the company's programmers and end users work as a team to create a visual model of power system applications. The model can be built using a nonlinguistic, symbolic "language" that everyone – from expert engineers to nontechnical users – can understand. When all those involved in the development of an application agree about what it should do, the data model can be translated, via the DEFT gateway, to INGRES running on the VAX. This "modus operandi" circumvents the communication difficulties frequently faced when application developers attempt to build a sophisticated system based on verbal or written descriptions.

DEFT, which runs on a Macintosh network for software developers, consists of four integrated design modules: a data flow editor; an entity editor which draws entity relationship and program structure diagrams; a formatter for laying out forms and reports and for compiling the design; and a translator to SQL, INGRES's standard language. According to Victor Wong, supervising engineer of applications in the Power Systems Operations Division, "DEFT would force our programmers and application developers to put their emphasis on system design rather than instant coding." This would ultimately reduce the cost of a project over the entire software development life cycle.

Eric Goldman, President of Deft, Inc., says that his company originally chose INGRES as its relational DBMS model on which to build what has become a best-selling CASE product. "We found ourselves favoring INGRES when we were doing benchmarks," he recalls, "and we chose it for its outstanding performance as well as for the richness of its development tools." The company also chose INGRES for its own in-house operations because, Goldman adds, "It is a better and more well-rounded product than other relational DBMSs. So, from a technical perspective, INGRES is a natural choice." ►

[INGRES USERS ASK, continued from pg. 11]

databases. This is especially important if you have an unusually large database. Monitor the size of temporary files used for sorting user interface objects, the size of the transaction log file during your tests and the time required for conversion.

Once you've done a test conversion of your databases, begin the application conversion. Using the documentation, make application modifications as needed and bring them up against the converted database. Exercise all of the features, including batch operations needed to complete the cycle of an application's processes.

Q: Is there anything I should be particularly careful about?

A: It's important to learn the capabilities and limitations of server architecture. The Release 6 server architecture offers some new tuning capabilities, including the ability to spread the processing load between multiple servers and across multiple processors. If you take advantage of these features in a production environment, test first to avoid surprises later.

All applications — especially heavily used applications — should undergo concurrency testing that approximates what can be expected under production circumstances. Never bring up a converted application for a large community of users until you test at the level of concurrency you expect.

You should also watch for the correct behavior of your application under test, paying special attention to locking issues.

Q: Can users take advantage of Release 6 features right away?

A: The new release offers many features that your user community can use now. New features like the pop-up windows could strongly affect performance or user perception of the application. They can provide additional benefits at the same time the conversion takes place. However, you will need to decide whether you want to introduce the new features to a well-understood application environment while you are converting. You might want to wait to do this until after conversion.

If your conversion is complex, it is best to adopt a more conservative step-at-a-time approach, breaking the overall process into manageable task sets. A series of smaller incremental changes are often better accepted by a user community.

Q: Is there anything I can do before converting?

A: You can prepare now for conversion to Release 6. Divide the work up into database conversion and application conversion tasks. Then examine each area as it now exists on your system and get a feel for what the conversion is going to take. Remember that, in most cases, you should test your ideas on the real thing once you have it installed.

Conversion is a great opportunity for some database housecleaning. For example, you can eliminate obsolete objects from the system catalogs. Of course, you can handle this chore yourself. You should also examine each database carefully to avoid unnecessary conversion work.

Release 6 requires more system catalogs, so you will need more disk space. (If you use these catalogs, you will have to modify your applications accordingly.) Naturally, you have the option of copying a production database to another installation and test-converting it there to save space. Plan to make complete backups of both database and applications and make preparations to bring your user community back up on the Release 5 version in case of an unexpected barrier to conversion.

Q: What about converting from QUEL to SQL?

A: With Release 6, INGRES moves from the QUEL model (in which transactions are a single statement unless explicitly declared) to the ANSI standard SQL model (in which all statements in a session are considered to be part of a single transaction unless explicitly committed). Most of the QUEL changes are upwardly compatible and do not require application changes. Because of ANSI standards, however, the changes made in SQL will require changes in the application. You will need to decide for yourself how this should change your application. The conversion documentation addresses the implications of this change in detail. ◤

— by George Loyer, Manager, VMS Support

[PRINCETON, continued from pg. 5]

data are collected, stored and analyzed.

MINGL, as its name suggests, mingles three components — the powerful INGRES DBMS; LOCUS, a specially designed graphics and statistical analysis interface with a powerful plotting facility; and a QUEL/FORTRAN library. Raw data from an experiment is collected by diagnostic devices and passed into a DEC VAXcluster via fiber optic links. The real-time data — including shot duration, plasma temperature, density and other physical characteristics of a plasma discharge — are written to VMS files, a subset of which is collected and written to the INGRES DBMS.

Because of its flexibility and adaptability, INGRES was able to fit into a real-time application without sacrificing performance time. Although the process of gathering enormous amounts of data through the devices on various tokamaks can take several minutes, loading them into INGRES takes no time at all, notes Kaye.

Weiland finds that the catalogue system in Release 6 is "much improved." He also says that converting applications written under Release 5 to Release 6 was not difficult (see "INGRES Users Ask" page 11).

He adds that INGRES's performance is optimized by the network configuration of INGRES/NET, which allows users throughout the facility to share experimental information without having to know the location of the data.

Thanks to the dynamic restructuring capabilities of INGRES, he says, "it's possible to retrieve data subsets from multilayered views built on tables as large as a hundred thousand rows in less than a minute."

Kaye summarizes: "INGRES not only satisfies our requirements, but we are very happy with the way it satisfies them." ►

Resources, Inc: New Release 6 Features

Melvyn Schwartz, vice president for planning and development at Resources, Inc., of Northbrook, Illinois, says he likes the new forms features in Release 6, including the pop-up menus. He also notes that "although data integrity was never a problem with INGRES, database corruption hasn't occurred at all with Release 6. The automatic recovery seems to work just fine."

Schwartz's company develops specialized software for a variety of clients, including the 13,000-member American Academy of Orthopaedic Surgeons (AAOS), headquartered in Park Ridge, Illinois. To meet its wide-ranging needs, AAOS relies on a brand-new, INGRES-based association management system called the Resources Association Management System, or RAMS.

Currently running on a Digital Equipment VAX 8530 minicomputer, RAMS is used by as many as 30 people to organize all the details of running the Academy, from conference planning and marketing to membership tracking.

An INGRES expert, Schwartz welcomes the improvements in Release 6 of INGRES. "First of all, the new implementation of SQL makes it easier for users to create and execute SQL commands," he says. "The stored procedures are improved, too. And the datatypes correspond exactly to those in the database. That's nice."

David Hennage, director of finance and administration for the Academy, says that INGRES provides several advantages. "We have powerful software, but it's also very easy to use. We're very excited about using INGRES to a larger extent. It will allow us to plan and expand our services in all kinds of new ways."

The AAOS system has worked so well that Resources, Inc. has decided to make RAMS available to any organization that needs high-powered association management software. "While INGRES gives AAOS a high-performance processing environment," says Schwartz, "it gives us the means to develop what we believe is a completely new kind of association management system." ►

Digital NEWS

MAY 30, 1988 DIGITAL NEWS

Digital Business

JOHN GANTZ

DEC's Path To Parallel Processing

Four years ago, when I first delved into the arcane subject of parallel processing on a custom market-research project, I discovered two things: first, that the technology was well-researched, with more than 20 years of academic study devoted to the subject; and, second, that almost nobody was doing it.

In that initial cut at a market yet to be born -- this was before Alliant and Encore had come out with a product -- it looked as if there were three major areas of computing out of which parallel processing would draw revenues: supercomputers, midrange technical systems and their fault-tolerant look-alikes in commerical systems, and board-level products.

And, at a minimum, to siphon revenues away from established players -- like Cray Research and Digital -- would-be vendors of parallelism would have to offer price-performance improvements of at least 2-to-1.

The reason for such a steep requirement is the lack of underlying parallel infrastructure -- compilers, software tools, application packages, trained programmers and system analysts -- and the pain of conversion or integration. I recall pointing out back in 1984 that it would be half a decade before the collection of vendors offering parallel processing would, in aggregate, make a profit.

Driving that analysis were some overall life-of-their-own trends that 20 years of shipment data for mainframes and minicomputers seemed to exhibit:

- A tenfold increase in performance is required to drive a twofold to threefold increase in units shipped.
- A 10-year lead time is required to get a new architecture into production shipments of significance.
- Entrenched suppliers retain 80 percent or better of a market over any five-year period.
- For every dollar of profit made by successful companies in a new technology, there is an almost equivalent amount lost by others.

Permeating all the arguments in favor of parallelism back then was the contention that, for many applications, parallel processing would be the only way to extend performance limits to what was needed. Thus, today, for instance, we have Cray computers linked in tightly coupled multiprocessing systems.

Well, some recent events indicate that we are well on the path in that decade long migration to things parallel, and maybe we'd better start getting used to the trek. In addition, it turns out that parallelism can actually reduce cost, not just increase performance.

This latter point may be worth talking about. The funny thing about parallel processing is that it comes in many flavors -- almost none suited to all applications. Fine-grained, massively parallel systems -- ones with thousands of processors, like Goodyear's MPP and Thinking Machines' Connection Machine -- may be really good at image processing but terrible at flight simulation. Small-node systems, like those multiple Crays or the VAX 8800s, may be great at large number-crunching tasks but not so good at supplying graphics output that requires the kind of processing done by Thinking Machines. And so on.

But as we go on, we'll see that the applications suite suitable for parallel processing seems to be growing and, in some cases, is begging for parallelism.

One of the recent events I'll use to make my point is the May 17 initial public offering of Relational Technology Inc. (RTI), purveyor of the Ingres relational database with which many of you should be familiar. Actually, the IPO in this case is not the issue; rather, it is some of the homework RTI has done in order to attract the millions of dollars invested in it by the public and by institutional investors -- to wit, benchmarks of its "Silver Bullet" transaction-processing database system.

The Silver Bullet project was designed to show that a relational-database system running on a parallel minicomputer can compete in the very-high-performance, online-transaction-processing market where IBM and Tandem Computer rule. Relational systems aren't supposed to have the kind of transaction horsepower that proprietary systems do.

To come up with the system, RTI took its Release 5.0 of Ingres and added four major online-transaction-processing features: compiled transactions, group commit, fast commit and multivolume tables. The hardware platform was the Sequent S81 running with four, then eight, then 12, then 16 processors.

The results: A top range with 16 processors of 104.4 transactions/sec. With only four processors, the top range was 36.8 transactions/sec., with eight, 67.8 transactions/sec., and with 12, 88.0 transactions/sec.

The results illustrate both that a relational database, when coupled with parallel hardware, can compete in the rarified world of 100 transactions/sec. and that the speed-up with additional processors is practically linear. This, as you parallel-processing buffs already know, is the crucial question in parallel processing: How much incremental power can you get by adding processors, and when does system overhead begin to eat into speed-up?

Significant implications

The implications are actually fairly significant. If parallel-computer manufacturers can team up with enough relational-database companies, they can create a whole new type of commerical computer -- the database transaction-processing system.

If the RTI example shows you what parallelism can do for an existing application, the recent announcements by Stellar Computer and Ardent Computer, purveyors of those new "graphics supercomputers," illustrate how new applications can be born of parallelism.

Both companies are offering high-end, stand-alone workstations optimized for technical applications that, through graphics, can migrate from batch to interactive functions -- such as molecular modeling, computational chemistry, solids modeling and animation. The systems balance floating-point operations (measured in megaflops) and scalar operations (measured in MIPS) and come with sophisticated and high-speed graphics. Their intent is to provide -- for $100,000 to $150,000 -- interactivity for scientists and engineers involved in the applications.

The ability to actually produce these systems stems from advances in semiconductor technology that allow for very fast chip design and the economies in design time and system performance that parallelism allows. But the usefulness of the systems will depend on how well their compilers, operating-system optimizers and other software tools make use of the parallel processors.

In short, these systems are not only bringing the power of a Cray to the desk but are making it more accessible through interactivity and graphics.

A third event that should be considered a milestone on our journey into parallel lands is the recent announcement by Evans & Sutherland that it is developing a modeling and simulation supercomputer. By optimizing its design to fit what most supercomputers do, anyway, and limiting it to an application that has long suffered from the lack of interactivity and graphics, the company will blow away Cray's price performance.

Although there isn't that much software out there for parallel systems, there is a proliferation of parallel architectures. If parallelism can be applied to high-payoff applications, the market will go through the conversion process.

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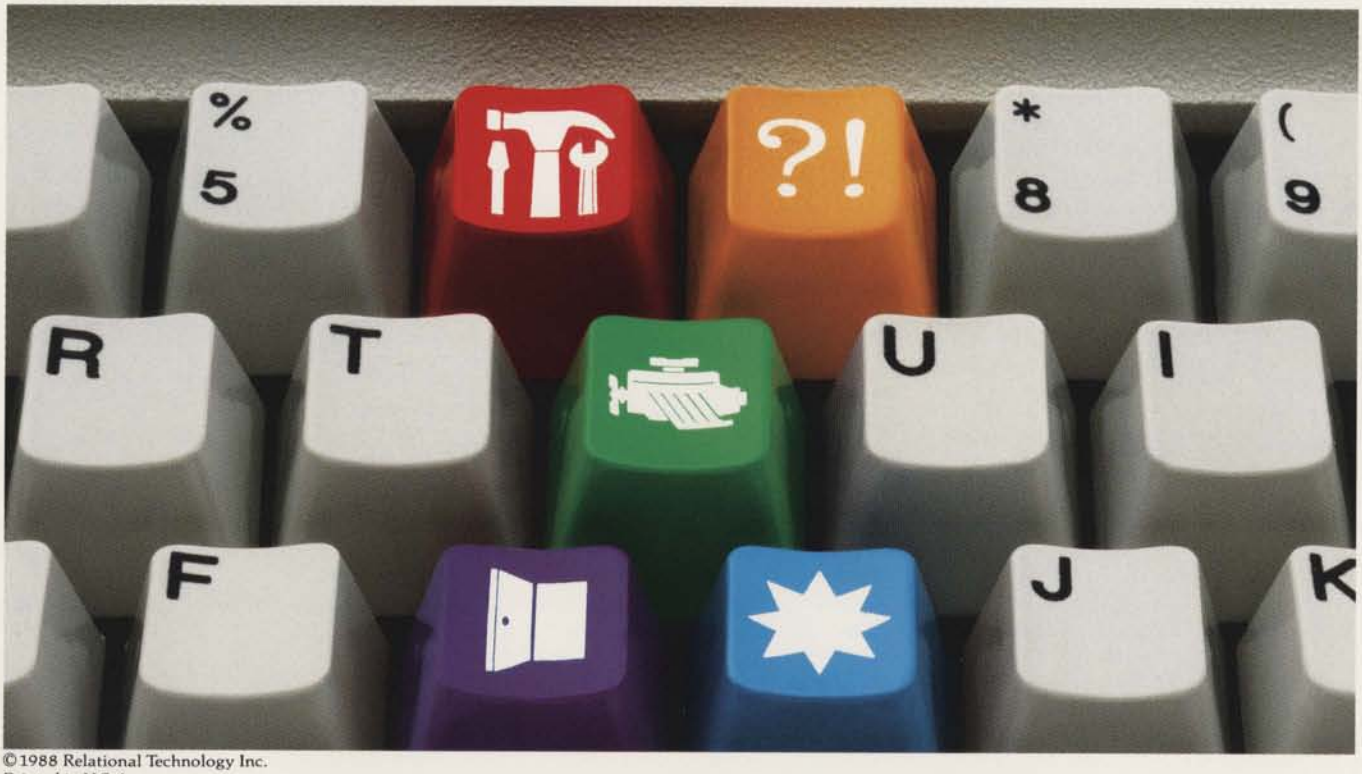

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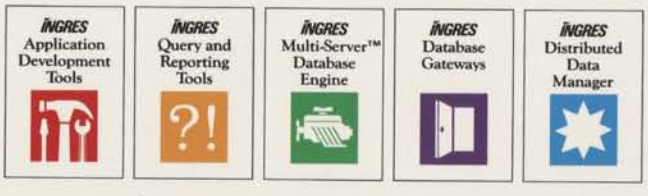

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