

INGRES

OVERVIEW

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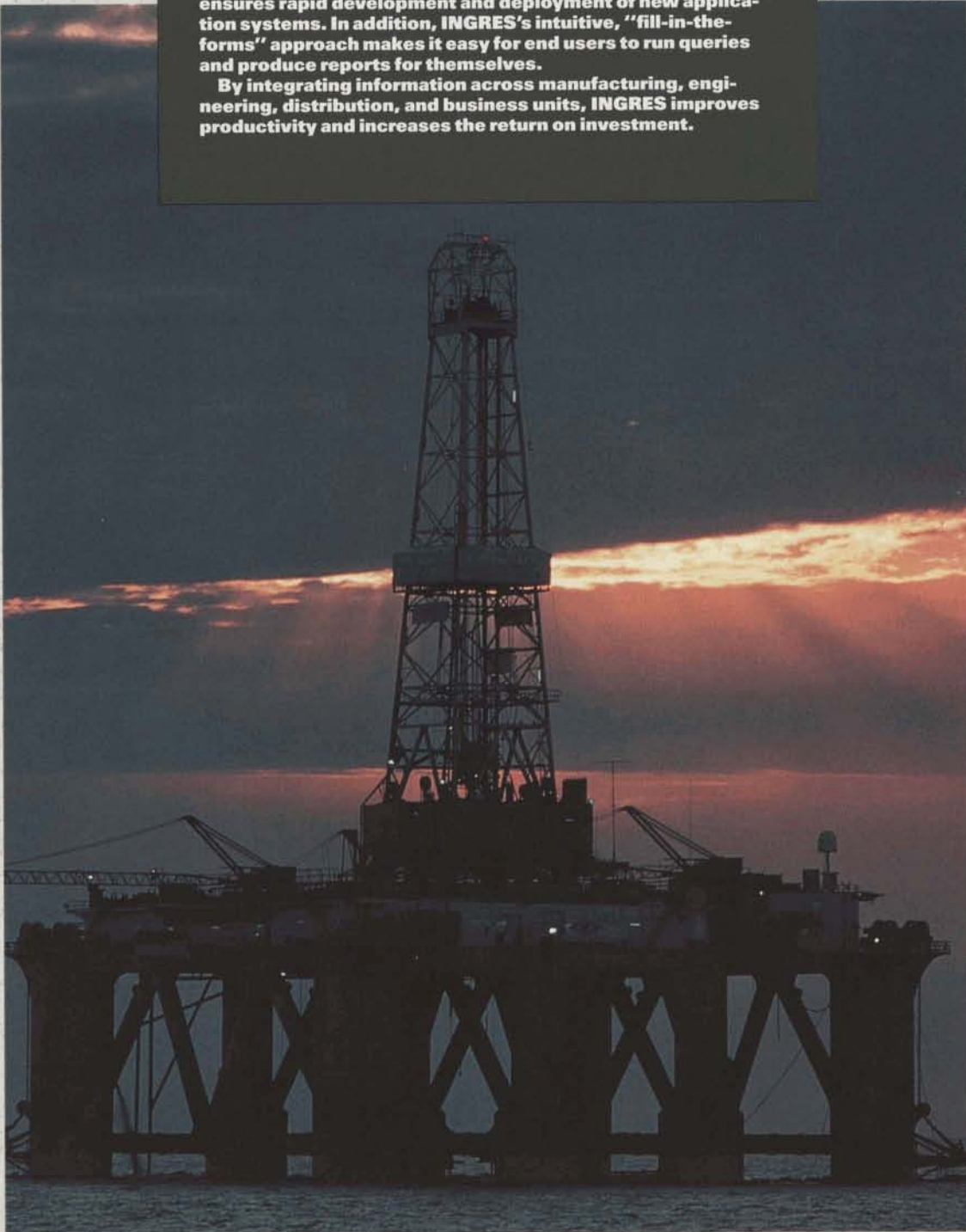
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**MULTINATIONAL COMPANIES EMBRACE INGRES AS
A CORPORATE-WIDE SOLUTION**

Companies like Nestle Canada and British Petroleum have adopted INGRES as a corporate standard to integrate the data resources of the corporation for an enterprise-wide view of corporate data.

INGRES's portability allows applications to run on DEC VAX, IBM, UNIX and PC platforms while the 4GL environment ensures rapid development and deployment of new application systems. In addition, INGRES's intuitive, "fill-in-the-forms" approach makes it easy for end users to run queries and produce reports for themselves.

By integrating information across manufacturing, engineering, distribution, and business units, INGRES improves productivity and increases the return on investment.



Relational Technology—The Leader in Corporate Information Management

Corporate Standard

Relational Technology is the premier developer and supplier of integrated information management software and services to major organizations around the world. The INGRES family of relational database products is the most advanced distributed data management and application development system for all major computers.

INGRES installations number over 7,000 mainframe and mini-computers worldwide. Leading organizations in aerospace, banking, chemicals, education, energy, government, insurance, manufacturing and pharmaceutical industries entrust their data to INGRES. INGRES is the leading relational DBMS for DEC VAX computers. In addition, INGRES has thousands of installations in the IBM, UNIX and IBM PC environments.

The INGRES product family runs across all major computer systems including IBM, Digital Equipment, Sun, Apollo, AT&T, Gould, Data General, Hewlett-Packard, ICL, Pyramid, Sequent, and UNISYS. INGRES can share data among each system as well. Among the operating systems INGRES supports are VAX/VMS, VAX/ULTRIX, MVS, VM/CMS, UNIX, MS-DOS, and other proprietary operating systems.

Applied Innovation

The founders of Relational Technology, a group of world-renowned computer scientists and businessmen, were among a handful of innovators to design what has

become a new standard in relational database management. From the first commercial INGRES product in 1981 until now, Relational Technology has responded to market demand for a portable relational DBMS with application development tools and distributed database technology. INGRES customers have consistently been the first to realize the benefits of flexibility, productivity and profitability offered by advanced relational information management solutions.

Since its inception, INGRES product development has been guided by an architectural blueprint designed to meet your current needs and to anticipate future technological and business trends. For example, early in the development of INGRES, Relational Technology developers foresaw the need to access corporate databases from desktop computers. Implementing this vision into the product line, Relational Technology introduced the first DBMS server architecture for LANs in 1983. The development of INGRES has paralleled the growth of Relational Technology over three periods of time.

1981-1983 Data Flexibility

INGRES was introduced in 1981. One of the first commercial relational systems on the market, INGRES proved the feasibility of a flexible new approach to data management. Relational Technology's annual revenues quickly surpassed ten million dollars as engineers, scientists and other pioneers began realizing the benefits of flexibility, simplicity and productivity offered by relational systems.

1984-1987

Programming Productivity

INGRES use grew dramatically during the next two years following the introduction of INGRES/APPLICATIONS. This new product debuted as the first 4GL application development system integrated with a relational DBMS. Relational Technology's revenues rapidly approached the fifty million dollar mark as INGRES was widely adopted by Fortune 500, multinational and government organizations. Clients soon realized that the tight integration of 4GL development tools and SQL data management enabled them to get a competitive edge by developing production systems much faster than was previously possible.

1988-1990

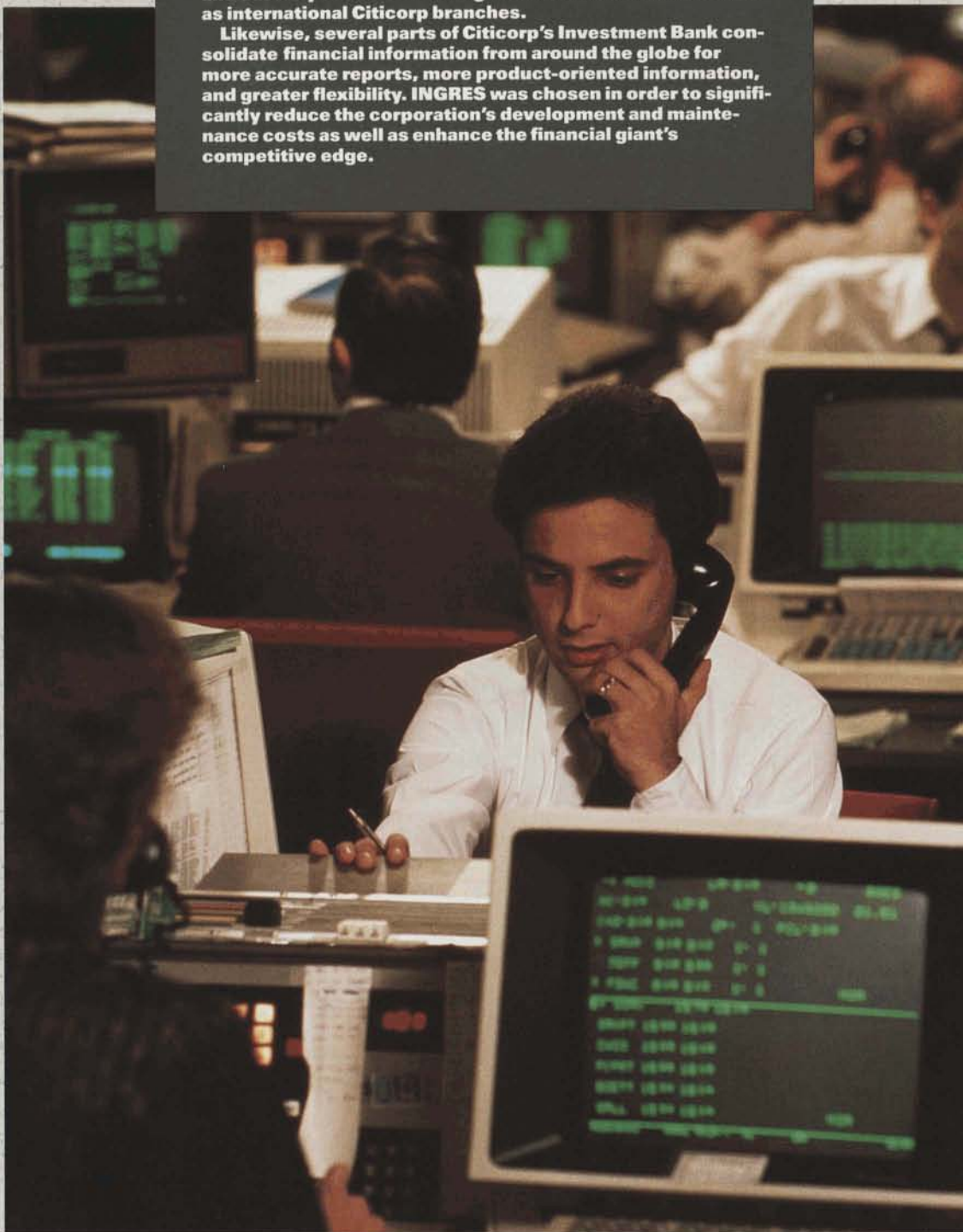
Enterprise-Wide Integration

Information managers are responding enthusiastically to Relational Technology's release of the first commercial distributed relational system. Leading organizations in aerospace, automotive, banking, electronics, government, telecommunications and other areas are adopting INGRES as a corporate standard to integrate information across their entire enterprise. These clients realize that INGRES's combination of integrated development tools and open architecture distributed data management is a strategic corporate advantage in operating today — and in responding to the challenges of tomorrow.

GLOBAL REAL-TIME ACCESS HELPS LINK INTERNATIONAL MONEY CENTERS AND INTEGRATE A DECENTRALIZED BUSINESS

With **INGRES** and its distributed database capabilities, Citicorp's Financial Institutions Group uses **INGRES** to link major money centers in the United States, Europe and Japan. Twenty four hour access to information will help the group provide such services as funds transfer, cash management, trading, global clearing/reconciliation, securities clearing and custody services to foreign and domestic banks as well as international Citicorp branches.

Likewise, several parts of Citicorp's Investment Bank consolidate financial information from around the globe for more accurate reports, more product-oriented information, and greater flexibility. **INGRES** was chosen in order to significantly reduce the corporation's development and maintenance costs as well as enhance the financial giant's competitive edge.



The INGRES Solution for Integrated Information Management For Today's Needs and Tomorrow's Challenges

THE CHALLENGE: Integrating Distributed Data

The economics of today's corporate computing environment favor putting data as close as possible to the end user. This has led to a proliferation of processors and data resources: PCs and workstations on the desktop; multi-user systems for the workgroup, department or plant; and the traditional corporate data center. The result is isolated islands of critical corporate information—distributed over different departments, computers and locations—that you must manage to keep your company competitive.



INGRES provides global access to information for end users and application developers.

Introduction

Today's industrial, service and government organizations face four major challenges in successfully managing information to achieve their goals:

- Integrating Distributed Data
- Bridging Incompatible Systems
- Improving Productivity
- Achieving Optimal Performance

The INGRES family of products enables you to meet these challenges with a highly integrated information management solution that features:

- Open Architecture Distributed Data Management
- Professional Productivity Tools
- High-Performance SQL Transaction Processing

THE INGRES SOLUTION

Integrated Information

INGRES is designed to manage dispersed data and turn it into integrated information. Information you can use to more productively direct your current operations. Information you can use to create profitable new opportunities for your organization.

With INGRES, you can process information throughout your organization as easily as if it were all stored locally. You can integrate data resources without disrupting local operations. The INGRES solution consists of end-user, application development, data management, and connectivity building blocks that can be mixed and matched as necessary to meet your exact requirements. INGRES can turn your isolated pieces of data into a valuable, shared corporate resource.

Integrated Application Solutions

Many of the world's leading application software vendors have selected INGRES as the database foundation for packaged solutions in the areas of financial administration, research and development, engineering, manufacturing and distribution. Using INGRES, you can easily integrate these applications into enterprise-wide systems spanning different offices, divisions and plants.

THE CHALLENGE: Bridging Incompatible Systems

Not only is valuable data dispersed throughout your organization, it's often stored on different computers, using different languages, running different operating systems, and in different formats. Converting data and applications from one computer to another is an expensive process that adds little value. As new and more cost-effective computing systems enter your organization, the challenge of managing incompatible systems intensifies.

THE INGRES SOLUTION

An Open Architecture DBMS

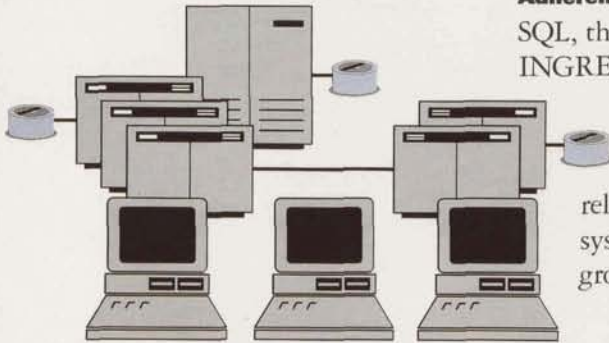
INGRES is specially designed to provide data management and application development capabilities across a network of dissimilar hardware and software systems. Applications can run identically on any system without time-consuming reprogramming. Data can be processed from any number of sites as easily as if it were stored locally. An open architecture system protects your existing investment in databases, computers, and applications by letting you easily integrate them into distributed systems without expensive conversion.

Hardware Independence

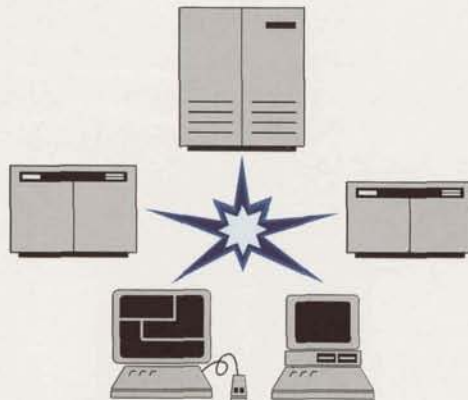
INGRES provides complete portability of applications and data across IBM, Digital Equipment, UNIX and PC DOS computer platforms. You can develop an entire application on one machine — including screens, reports, graphics and 4GL code — and then deploy it on other machines throughout your organization without the expense of additional programming or modification.

Adherence to Industry Standards

SQL, the industry standard relational database language, is at the heart of INGRES. Networking products use the ISO/OSI model to support DECNET, TCP/IP and SNA. Relational Technology is also committed to emerging industry standards such as X-Windows and SAA. Across its product line, Relational Technology has implemented reliable, state-of-the-art industry standard components in the INGRES system. This commitment to standards ensures that your systems can grow without running the risk of becoming obsolete.



INGRES provides complete portability of applications and data across mainframe, mini, workstation and PC platforms.



INGRES also connects heterogeneous systems for a transparent, integrated view of corporate information.

THE CHALLENGE: Improving Productivity

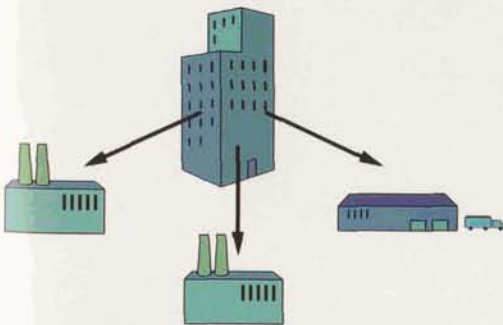
Professionals—executives, researchers, managers, engineers and analysts—are critical to the success of today's organizations. Their productivity and responsiveness to new situations can have a big effect on your bottom line. End users need to easily analyze and interpret information from anywhere in the organization—without worrying about how or where it is stored. Technical professionals require productivity tools to develop new systems more quickly and deliver them on time.

Today's business challenge requires that you improve professional productivity in the face of incompatible data resources scattered throughout your organization.

THE CHALLENGE: Achieving Optimal Performance

The information explosion has created an unprecedented demand for processing increasing amounts of information. Your ability to serve your clients, manage your operations, and quickly respond to changing conditions is tightly linked to the performance and reliability of your information systems.

Your challenge is to build responsive and reliable on-line systems that exploit the cost advantage of distributed computing.



INGRES provides high speed, on-line transaction processing at local sites as well as integrated access from headquarters.

THE INGRES SOLUTION

Seamless Access

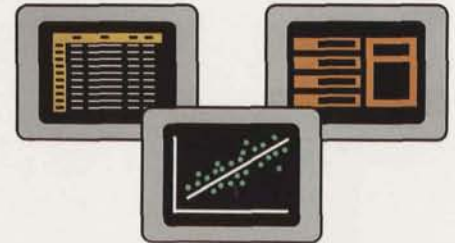
INGRES, with visual interfaces and direct connections to industry standards such as Lotus 1-2-3 and SAS, enables end users to concentrate on analysis and interpretation — rather than wasting valuable time on details. Using INGRES, professionals can easily access information from multiple sources in the organization.

Rapid Development

INGRES is unique among relational systems in providing a complete, integrated 4GL application development system. Its screen-oriented, visual-programming approach enables technical professionals to design and implement systems in far shorter time than with other methods.

Low-Cost Maintenance

INGRES features an active and fully-integrated data dictionary. This greatly reduces life cycle maintenance costs and enables your system professionals to design new applications — rather than spend excessive time repairing old ones.



INGRES's visual interfaces improve productivity for business, technical and MIS professionals.

THE INGRES SOLUTION:

Distributed On-line Transaction Processing

INGRES maximizes the return on your hardware investment by providing optimal performance for both on-line transaction processing and decision-support activities. Using advanced database server and distributed processing technology, INGRES can support hundreds of concurrent users processing gigabytes of data. Its AI-based optimizer automatically selects the fastest access path — freeing you from performance concerns and letting you concentrate on achieving results.

The superior performance of INGRES extends from a single CPU, to multi-processors, to an entire network of distributed workstations and database servers. You can incrementally add processing power as your needs expand — always taking advantage of current cost-effective hardware.

Reliability, Availability and Integrity

INGRES is engineered to keep performing so your production systems stay running. The system architecture minimizes potential failure points while maximizing data consistency and integrity. In certain environments, INGRES continues to operate even when hardware fails. INGRES protects your data so it is always reliable and available when you need it.

Industry Leader

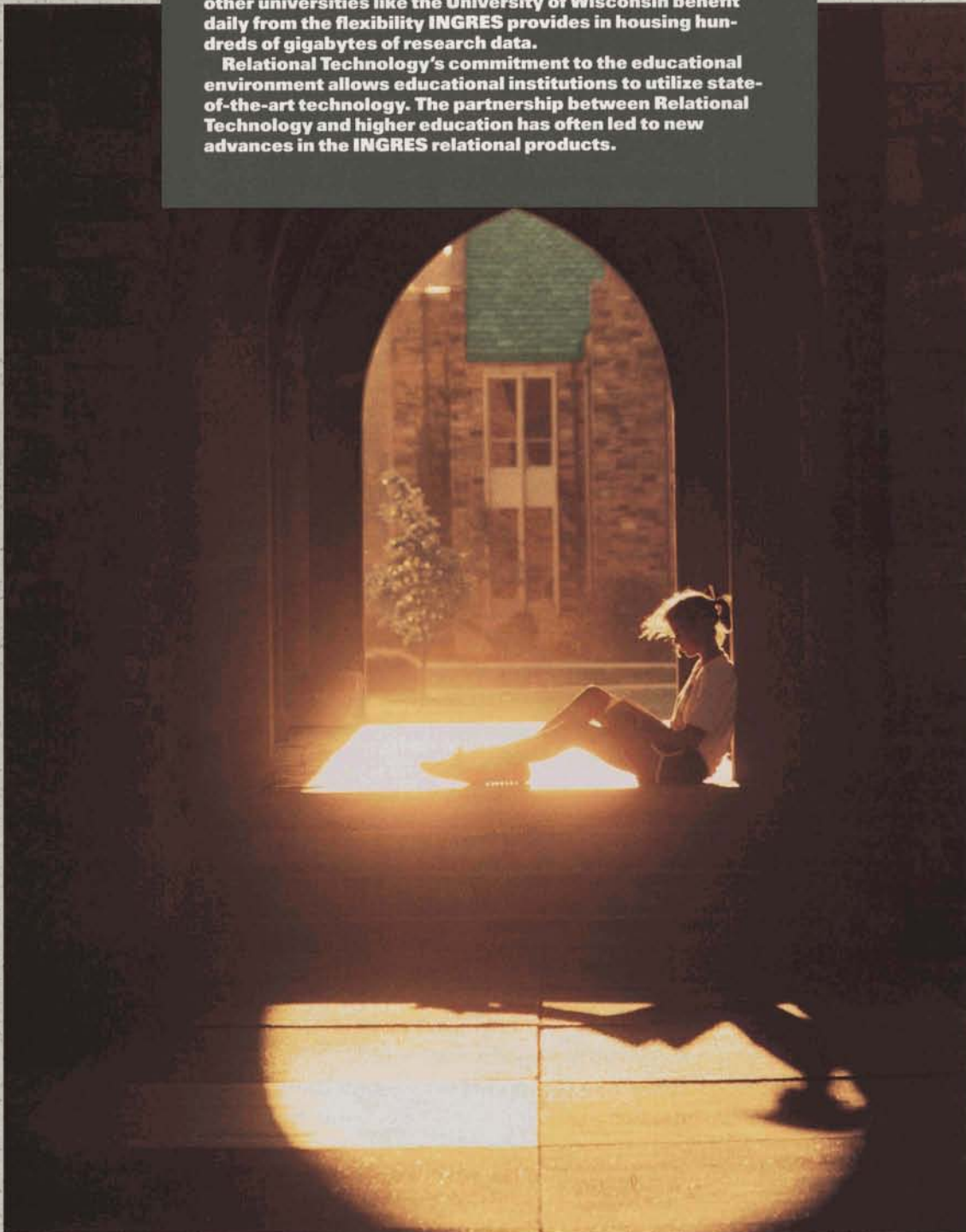
Throughout its history, INGRES has led the relational database industry in performance and reliability. Performance capabilities have typically doubled every two years. With INGRES, you can be sure your critical operational systems will be on-line and on-time.

**PARTNERSHIP WITH HIGHER EDUCATION
STIMULATES TECHNOLOGICAL DEVELOPMENT**

Major universities like MIT, the University of California and Carnegie-Mellon have committed to using INGRES for instruction, research and business administration in campus-wide applications.

While institutions like Carnegie-Mellon have embarked on massive projects to integrate decentralized administrative systems with the INGRES/STAR distributed data manager, other universities like the University of Wisconsin benefit daily from the flexibility INGRES provides in housing hundreds of gigabytes of research data.

Relational Technology's commitment to the educational environment allows educational institutions to utilize state-of-the-art technology. The partnership between Relational Technology and higher education has often led to new advances in the INGRES relational products.



The INGRES Architecture



The INGRES family of products consists of a complete system for integrated information management, represented here by symbols for the INGRES SQL Relational Data Manager, End-User Query and Reporting Products, INGRES/APPLICATIONS 4GL Development System, INGRES Database and File System Gateways and the INGRES Distributed Data Management Products.

An Integrated Architecture

The INGRES architecture starts with you — the end user, application developer, database designer or MIS manager. INGRES provides an integrated set of components that work together so you can build, maintain and use information systems easier and faster than ever before.

The INGRES architecture is designed to meet your current needs and provide a coherent growth path for the future. Relational Technology is well aware of the sizeable investment you make in information systems. INGRES is architected to protect your investment and add significant value in the key areas of productivity and integration.

In this section, we describe the architecture and discuss the special features that encompass the INGRES integrated design. Subsequent sections in this guide describe individual products in greater detail.

Integrated Data Dictionary

One key to the great productivity increases realized by INGRES users lies in the reusable forms, reports, graphs and code modules stored in the integrated INGRES data dictionary. These application components are automatically saved and can be easily used again in different applications.

This promotes standardization and provides a big payback in programmer productivity. New screens and code can be created in a fraction of the usual time by visually editing existing screens and code. User training is minimized by consistency in appearance and operation.

Life cycle maintenance is vastly simplified. Modifications need only be made once and are automatically applied to all relevant applications. Only INGRES provides the benefits of a consistent user interface and reusable application modules across a wide range of popular computer systems.

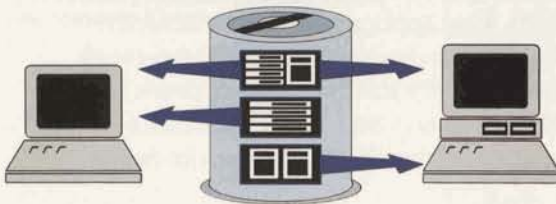
Integrated Tools

In a similar manner, INGRES end-user and development tools are highly integrated with the database, data dictionary and each other. Tools such as the INGRES/QUERY visual query system can be easily called from applications. This shortens development time and increases user confidence.

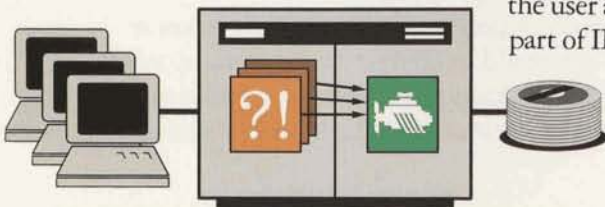
Flexible User/Server Architecture

The INGRES data management architecture consists of two basic elements: the user application and the data manager server. The user application is the part of INGRES that you interact with. It may be:

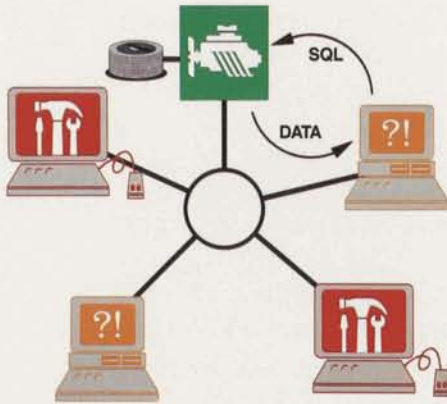
- an INGRES end-user query, reporting or utility tool,
- an application developed in INGRES 4GL,
- an application developed in a host language such as C, COBOL or FORTRAN, or
- an application package (e.g., FOCUS) which interfaces to INGRES.



Reusable application components, stored in the integrated data dictionary, greatly increase development productivity.



The INGRES user/server architecture provides maximum power and flexibility.



Workstations and PC users can easily share data with the INGRES architecture.

The user application does not access the database directly; rather, it sends an SQL query to the data manager server.

The data manager enables multiple applications to share data at the same time. It optimizes the query and accesses the database in the most efficient way possible. It then returns the specified data to the user application for processing. The INGRES data manager is designed to support high-volume processing on large databases by many concurrent users with full security and integrity.

In the simplest implementation, user applications and the data manager are both resident on the same computer.

This portable user/server architecture enables you to make the best possible use of your current computing environment and to easily adjust to changes in the future. Applications are no longer “trapped” on the same machine as the data. They can easily be deployed to other machines and transparently connected to INGRES and non-INGRES data managers.

Distributed Access

INGRES is the first relational system designed from the ground up to take advantage of local and wide area networks. User applications may be located on a PC or desktop workstation and connected to the data manager by a network. In this configuration, the query is automatically sent across the network to the data manager and only the appropriate data is returned. Performance is enhanced by the cooperative processing of two machines to minimize network traffic.

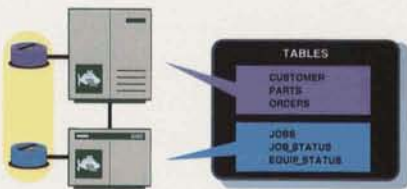
This architecture, pioneered by INGRES, enables users to easily share large databases while retaining the ease of use and performance benefits of their desktop machines.

Distributed Data

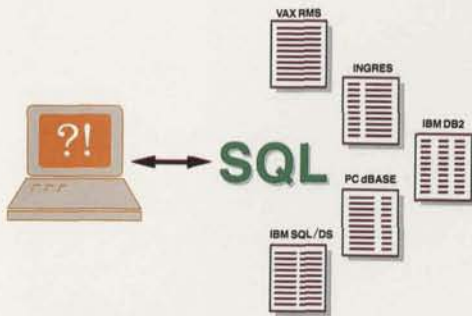
The INGRES architecture also enables you to process data stored on a number of different computers as easily as if all the data were stored on one computer. This is accomplished by introducing a distributed data manager to act as a “traffic controller” and coordinate communication between your application and the local data managers resident on each computer.

Your application “sees” the distributed database as just a standard set of data tables. It sends a query to the distributed data manager. The query is optimized and sub queries are dispatched to all relevant local data managers. The required data is then returned to your application.

As an end user or application developer, you don’t even have to know where the data you need is stored — it could be on your local computer or half-way around the world! INGRES automatically finds the data and efficiently processes it — providing fast response time and saving communications cost.



INGRES can process data stored on different computers as easily as if it were all stored locally.



INGRES Gateways allow you to easily integrate existing files and applications into a comprehensive relational system.

Gateways to Existing Data

INGRES Gateways enable you to easily integrate existing files and databases into an information management system. Using a Gateway, your application can process existing data as if it were actually in an INGRES database. For example, you will be able to use the INGRES 4GL and interactive development system to write applications for IBM's DB2 system. The same application can then run unaltered on an INGRES for VAX, UNIX or PC system. Or you can use SQL to combine INGRES data with data already stored in a Digital VAX RMS data file.

INGRES Gateways protect your current data investment while helping you add value that was never before possible. They ease the migration path to a relational database by enabling you to develop new SQL-based systems without expensive conversion of your current data and applications.

INGRES Family of Products

The INGRES architecture is implemented by four product groups that make up a complete system for integrated information management. These groups are:

- INGRES SQL Relational Database Manager
- INGRES End-User Query and Reporting Products
- INGRES/APPLICATIONS 4GL Development System
- INGRES/STAR Distributed Data Management Products

Each of these INGRES product groups is based on industry standard SQL. Each, in turn, is tightly integrated with other INGRES products through the data dictionary and common user interfaces. You can pick and choose only those products needed to meet your exact requirements.

INGRES products are portable and operate in over 40 different hardware and operating environments. The applications developed in INGRES are also portable — allowing you to develop an application on one machine and then deploy it throughout your organization without the expense of additional programming.

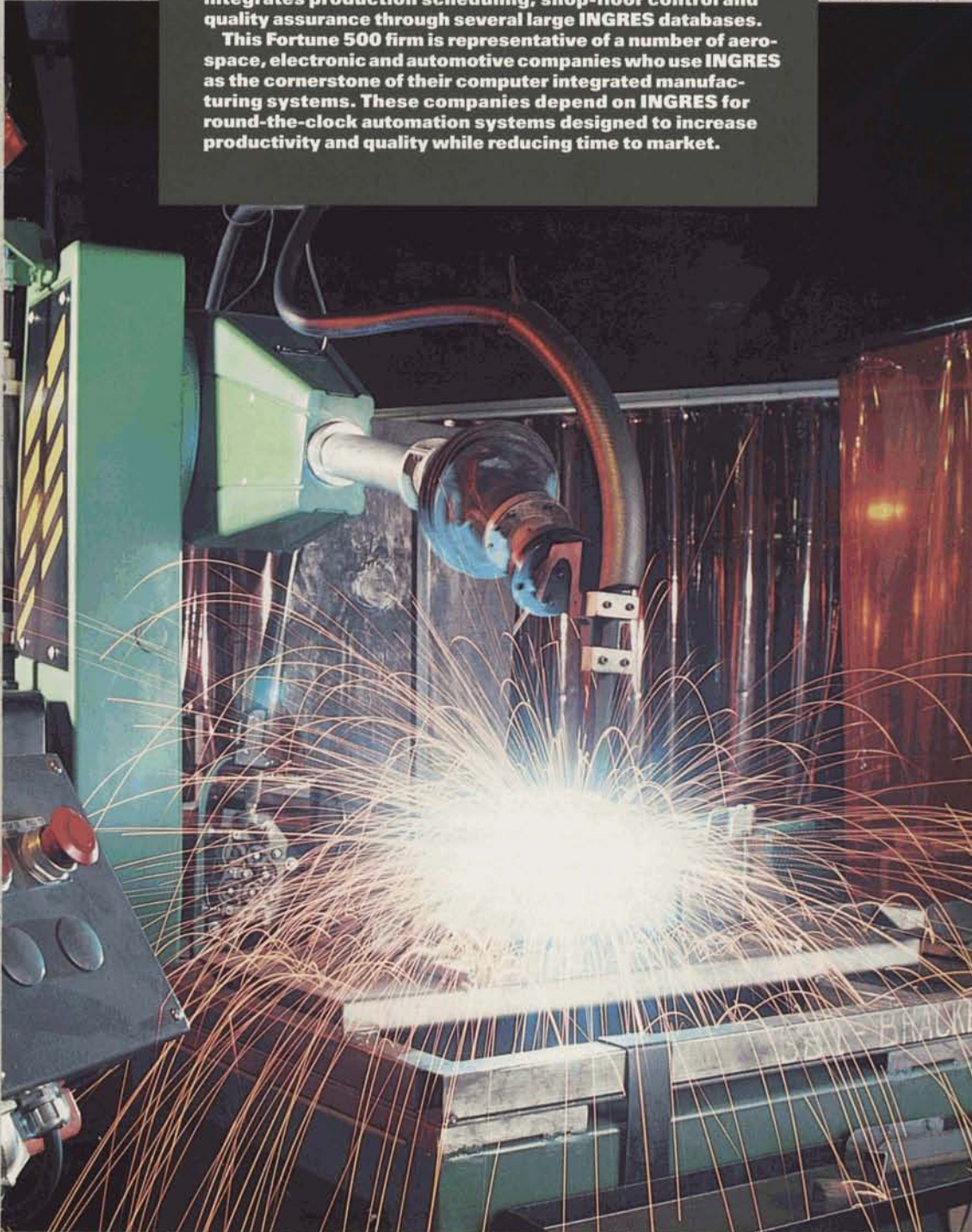
With INGRES, you can implement hardware-independent, integrated solutions.

PERFORMANCE AND AVAILABILITY MAKE FACTORY OF THE FUTURE A REALITY

At a leading aerospace corporation's aircraft engine manufacturing facilities, INGRES plays a key role in orchestrating the operation of a completely automated 55,000 square foot plant—from material movement to part machining to quality testing.

Relying on INGRES's unique ability to provide non-stop VAXcluster transaction processing, the company completely integrates production scheduling, shop-floor control and quality assurance through several large INGRES databases.

This Fortune 500 firm is representative of a number of aerospace, electronic and automotive companies who use INGRES as the cornerstone of their computer integrated manufacturing systems. These companies depend on INGRES for round-the-clock automation systems designed to increase productivity and quality while reducing time to market.





High-Performance Transaction Processing

The heart of INGRES is a high-performance SQL data manager designed especially for production applications. Such applications consist of hundreds of users simultaneously querying and updating gigabytes of data. The data manager is engineered to provide optimal performance for a broad mix of transaction processing and reporting activities.

INGRES uses advanced locking, caching and access techniques to deliver predictable and effective response times. The database designer can adjust parameters to tune the database for the best performance in specific applications. Four different access mechanisms may be specified including hash and B-tree. Frequently-used queries can be stored in the data manager and repeatedly executed with minimum overhead.

In benchmarks measuring overall DBMS performance in typical transaction environments, INGRES is comparable to network DBMS systems and consistently outscores other relational systems.

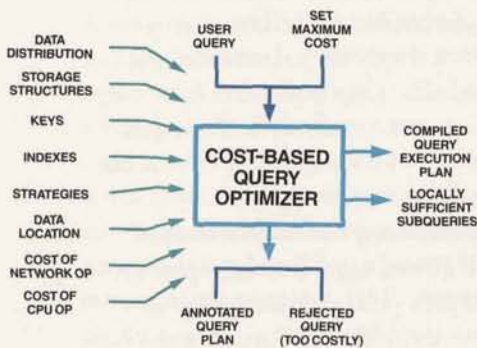
Industry Standard SQL

INGRES uses industry standard SQL to leverage and protect your database application investment. INGRES/SQL supports all popular languages including: C, FORTRAN,

COBOL, ADA, PL/I and PASCAL as well as the INGRES 4GL. Compatible with IBM's DB2 and compliant with ANSI SQL, INGRES enables you to write SQL applications that are portable across a wide range of computer platforms from mainframes to personal computers.

Query Optimizer Ensures Fast Response

INGRES is the only relational DBMS available with an AI-based query optimizer that automatically determines the fastest method in which to satisfy a database request. Using INGRES, your end users and application programmers don't need years of training and experience to obtain good DBMS performance. They are free to concentrate on effective problem-solving while the optimizer automatically ensures fast response.



The INGRES expert query optimizer uses advanced AI techniques to determine the fastest method in which to satisfy information requests.

Multi-Threaded Transaction Processing Server Supports More Users

The INGRES data manager features a multi-threaded transaction processing server architecture that minimizes both memory and CPU resource utilization. In a server, all users share basic system services, buffers and tables. Since each additional user only requires a small increment of memory, INGRES can support large numbers of users on the mid-size computers so widely used for departmental and distributed systems.

The INGRES data manager is designed to take maximum advantage of multiple processor systems like Digital's VAXcluster. The architecture supports multiple, concurrent servers and provides great flexibility in configuring them to meet your performance needs.

Maximum Data Integrity

INGRES provides two strong lines of defense to guard your valuable data — an external system to control user access, and an internal system to protect against database corruption. The external security system is extremely flexible and lets you control authorized access to the database by user, date, time of day, location or a stored data value.

Internally, INGRES is engineered to minimize single points of failure and provide maximum protection for your data. If a hardware failure does occur, INGRES automatically backs out all incomplete operations and returns the database to a consistent state.

Unlike other DBMS products that store everyone's data in one large monolithic file, INGRES enables different databases to be defined as needed. Development work can easily be done on a test database, for example, without risking corruption of the production database.

High Availability and Fault-Tolerance

INGRES is designed to keep performing so your production applications stay running. After a hardware or system failure, your database is up and performing without any operator intervention.

INGRES can take advantage of fault-tolerant capabilities provided by computer vendors. On Digital's VAXcluster, for example, INGRES keeps operating and automatically preserves database consistency even if a CPU fails. You can be confident that your production systems will continue to work with INGRES.

Integrated Data Dictionary

One of the most unique features of INGRES is its integrated data dictionary. This active dictionary combines all of the INGRES components in one place and makes it easy to design, develop and maintain an application throughout its life cycle. As you develop your database and applica-

tions, the data dictionary is automatically updated. In addition to data definitions, it stores application program code as well as screen, report and graphic definitions. Once any of these "objects" are defined, they can be used in any appropriate application. In most other products, such objects must be recreated for each application.

Dictionary information can be directly accessed by authorized users and applications — giving you great power and flexibility in system development. Reusable screen and code modules encourage structured development, promote standardization, and increase programmer productivity. Modifications are automatically applied to all relevant applications — greatly reducing the cost of life cycle maintenance.

Effective Database Administration

INGRES provides a comprehensive set of database administration capabilities you can't find in other products:

- Easy to use, screen-based database administration utilities.
- Performance and tuning monitoring.
- Database, tables and fields can be modified dynamically without interrupting processing.
- Dynamic disk space allocation — INGRES only uses as much disk space as it needs. Space does not have to be estimated and pre-allocated by the database administrator.

- Optional data compression saves disk space.
- Fast bulk data loading from standard data files.
- Flexible journaling and backup of individual tables or the entire database.
- Tables can be individually assigned to disk devices for best I/O performance.

These features simplify administration tasks and enable many INGRES users to maintain databases without the services of a specialized database administrator.

CREATING A NEW TABLE

Enter the name of the new table: suppliers

Enter the column specifications of the new table:

Column Name	Data Type	Key #	Nulls	Defaults
supplier_id	char (5)	1	no	n/a
name	char (20)		no	yes
status	smallint		no	yes
city	char (15)		no	yes
volume	money		yes	n/a

Insert (2) Delete (2) Blank (3) Move (4) GetTable Def (5) >

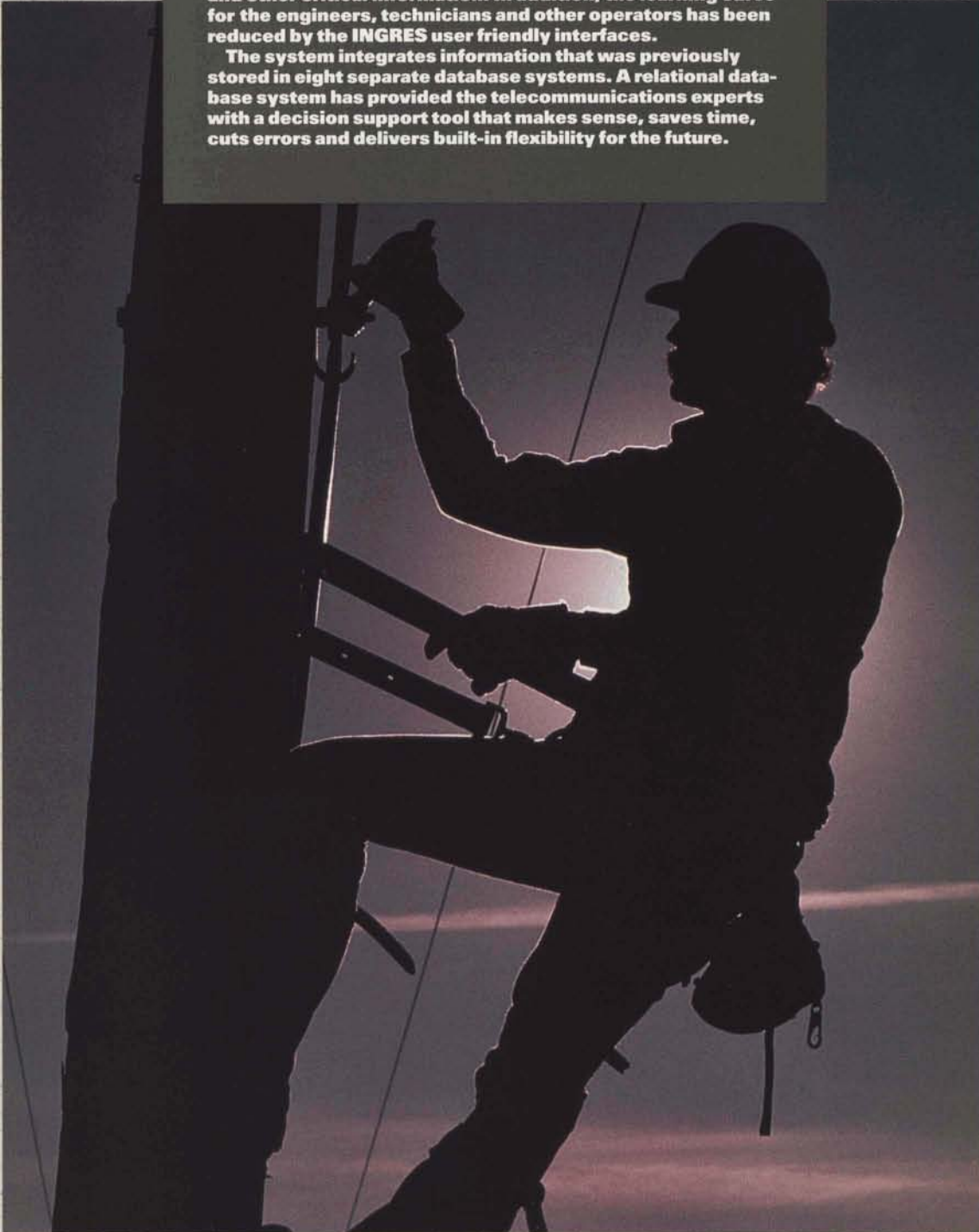
INGRES's visual, screen-oriented utilities enable users to easily perform database administration tasks.

**PORTABLE, EASY TO USE SYSTEM FACILITATES
PLANNING FOR BELL OPERATING COMPANIES**

With hundreds of local telephone exchanges around the country, the Bell Operating companies are faced with a formidable challenge in resource capacity planning and allocation.

By developing and deploying INGRES-based systems on a variety of UNIX computers, engineers now have easier access to information that informs them about new business forecasts, planning requirements, part availability, budgets and other critical information. In addition, the learning curve for the engineers, technicians and other operators has been reduced by the INGRES user friendly interfaces.

The system integrates information that was previously stored in eight separate database systems. A relational database system has provided the telecommunications experts with a decision support tool that makes sense, saves time, cuts errors and delivers built-in flexibility for the future.



Easy Answers to Your Questions

INGRES End-User Query and Reporting Products feature a set of visual interfaces that enable you to easily access data just by filling in the blanks on a screen. Designed to make you productive in minutes, INGRES user interfaces are easy to learn and easy to use, and let you query, update and report data without even having to learn a language like SQL.

Consistent Human Interface

All of the INGRES interfaces have a consistent look and feel. Menu choices are clearly indicated on the screen and function keys work identically throughout the system. Once you've used one component, you can use them all.

Tightly Integrated with DBMS

The INGRES user interfaces are completely integrated with each other and with the DBMS through the data dictionary. For example, your report design can be shared with other users and can be embedded into an application by a programmer.

All of the INGRES user interfaces can access distributed data as easily as local data. Using a consistent, visual interface at your desktop, you can tap into information anywhere in your organization.

Meets a Wide Range of End User Needs

INGRES provides a range of products to meet all your query and reporting needs. INGRES provides easy access to data with:

- INGRES/MENU — Menu access to all INGRES user interfaces.
- INGRES/QUERY — Visual query, display and update of one or more tables.
- INGRES/REPORTS — Report generation from one or more tables.
- VIGRAPH — Color graphics from one or more tables.
- INGRES/PCLINK — PC access to host data for use with Lotus, dBASE, Multiplan and other popular PC products.
- ISQL — Full-screen entry and display of SQL queries.

Extended Power from Interfaces

Our corporate partners extend the power of INGRES by providing access to INGRES databases from natural language queries, statistical systems, AI systems and others. Corporate partners provide direct access to INGRES data through:

- FOCUS — A widely used business reporting and analysis system.
- DataTalker — English language database query and reporting.
- SAS — A reporting, graphics and statistical system.
- RS/1 — An interactive graphics and analysis system.
- KEE — An AI development and inference system.
- ART — An AI development and inference system.



Customer Purchase Order

Customer: _____ P.O. #: _____
Name: _____
Street: _____ State: CA Zip: _____
City: _____ Phone #: _____
Contact: _____

P.O. Items

Item #	Description	Qty	Cost	Total

Total: >\$1,000

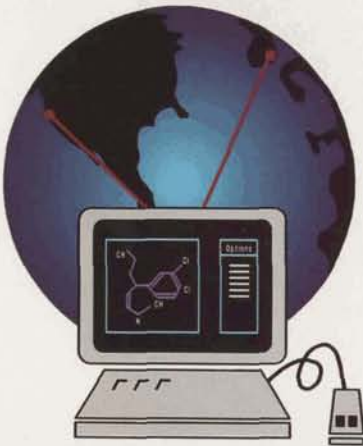
Go (Enter) Blank (2) Last Query (3) Order (4) Help (PF2) >

INGRES/QUERY lets you retrieve data and join tables just by filling in a form on the screen.

Browse Column Window Inquiry Table Database Output Quit
Select, Name, List, Print

MAIN	name	project-id	task	hours
1	Alcott, Scott	Advertise	Design	8
2	Alcott, Scott	Advertise	Implement	5
3	Applegate, Donald	Advertise	Design	8
4	Applegate, Donald	Graphic	Design	16
5	Applegate, Donald	TextProc	Design	18
6	Applegate, Donald	TextProc	Implement	18
7	Bee, Charles	Portfolio	Design	18
8	Bee, Charles	Portfolio	Implement	24
9	Belter, Kris	Advertise	Debug	26
10	Belter, Kris	Advertise	Implement	16

INGRES/PCLINK enables PC users to easily access host data using familiar PC tools.



Industry-leading applications vendors extend the power of **INGRES** by providing specialized interfaces to access **INGRES** data.

INGRES/MENU for Menu-Driven Access

INGRES/MENU provides a simple, self-explanatory menu interface to the **INGRES** end-user query and reporting tools. You can move easily and quickly between the various options without having to remember complicated system commands.

INGRES/QUERY for Query Tools

INGRES/QUERY enables you to retrieve and display data just by filling in a form with simple search criteria. In addition, it can also be used for entering, updating, and deleting data. Information from multiple tables can be viewed and updated simultaneously. Since **INGRES/QUERY** does not require learning a language like **SQL**, you can be productively using **INGRES** within a matter of minutes.

INGRES/REPORTS for Report Generation

INGRES/REPORTS formats the results of a query into presentation-quality reports without requiring you to memorize a single command. The entire report, including headers, titles, sort fields, breaks and totals, is specified visually by just pointing the cursor and selecting the appropriate menu item.

Report definitions are automatically stored in the data dictionary so they can be easily run when needed and can be shared among users, departments and applications. With **INGRES/REPORTS**, you can lay out and produce professional-looking reports in no time without writing code or learning commands.

Integrated Graphics

The **Visual-Graphics-Editor** turns the results of your queries into presentation-quality business graphics. It lets you create bar charts, pie charts, line

charts, text charts and scatter charts, using numerous colors and fonts, and supports a wide range of terminals, printers and plotters. Graph definitions are automatically stored in the database for shared use and can be included in applications.

VIGRAPH's WYSIWYG (What You See Is What You Get) editor lets you customize every detail of your graph. You can easily turn complex data into clear graphics for maximum visual impact.

PC-to-Host Connection

INGRES/PCLINK provides personal computer and laptop users with a bridge from PC productivity tools such as **Lotus 1-2-3** to **INGRES** databases on a host system. Personal computer users can access information in host databases using a visual, menu-driven, query method. **INGRES/PCLINK** automatically reformats data in **Lotus 1-2-3**, **dBASE**, **Wordstar** and **Multiplan** format on the PC.

With **INGRES/PCLINK**, you can browse through host databases, extract data and transfer it to your personal computer without having to know any query or file-transfer commands — **INGRES/PCLINK** looks and feels just like a spreadsheet program.

Interactive Querying

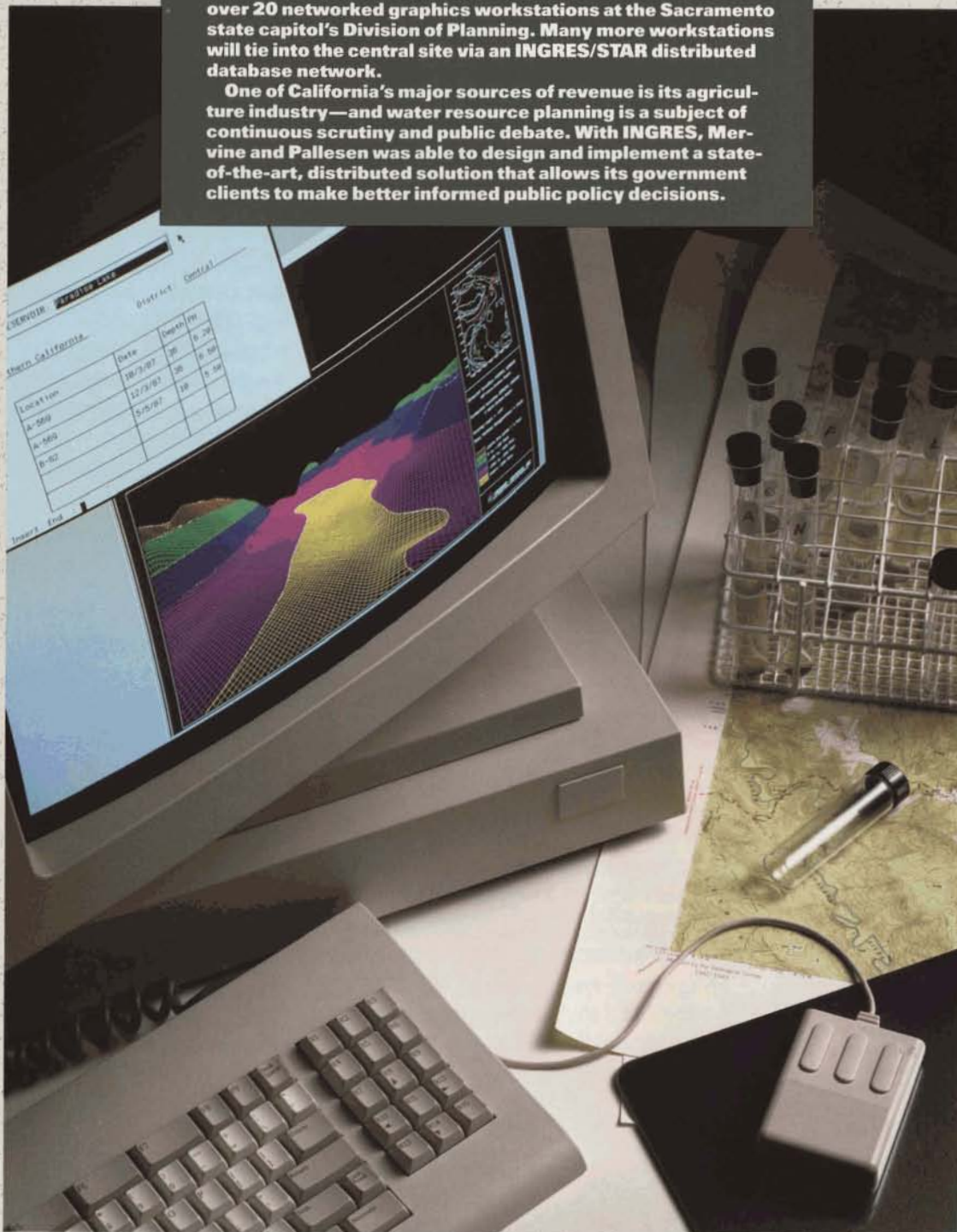
INGRES/ISQL is an interactive, full-screen facility for entering, executing and editing **SQL** queries. You can easily enter a query, run it, and then browse through the results with full horizontal and vertical scrolling. You can then change the query and re-run it with just a few keystrokes. Queries can be saved for later use and results can be printed.

NETWORKED WORKSTATIONS HELP MANAGE CALIFORNIA STATE WATER RESOURCES

Every fifteen minutes, 365 days per year, five thousand measuring devices located in lakes, streams and other bodies of water around the state of California take measurements that must be recorded, stored and analyzed each day.

Using INGRES, the consulting firm of Mervine and Pallesen, Inc. designed the Water Data Information System (WDIS) to house all of the surface and ground water measurements of volume and quality for the state. The system is comprised of over 20 networked graphics workstations at the Sacramento state capitol's Division of Planning. Many more workstations will tie into the central site via an INGRES/STAR distributed database network.

One of California's major sources of revenue is its agriculture industry—and water resource planning is a subject of continuous scrutiny and public debate. With INGRES, Mervine and Pallesen was able to design and implement a state-of-the-art, distributed solution that allows its government clients to make better informed public policy decisions.





Rapid Prototyping for High Productivity

INGRES is the only relational system to combine a full function fourth generation language (4GL) with a powerful interactive development environment. You can design screens and reports, code logic and test your application merely by selecting appropriate menu items. Never again do you have to wait for lengthy edit/compile/link/run cycles. Using INGRES, programmers report productivity increases of five-to-one or greater over conventional development methods.

WYSIWYG Interface

INGRES uses the latest in advanced human interface technology, a WYSIWYG editor that lets you visually "paint" screens and reports. If you don't like something, change it. You'll immediately see the result. You work directly with the same screen the user will see — greatly increasing your productivity. Relational Technology invented this approach to development and has led the market in prototype/development tools.

Full Function 4GL

The INGRES 4GL is a full function, object-oriented language that combines SQL with high-level constructs for terminal interaction and flow control. It features "plug-in" access to the operating system, user programs and INGRES tools to give you maximum power and flexibility.

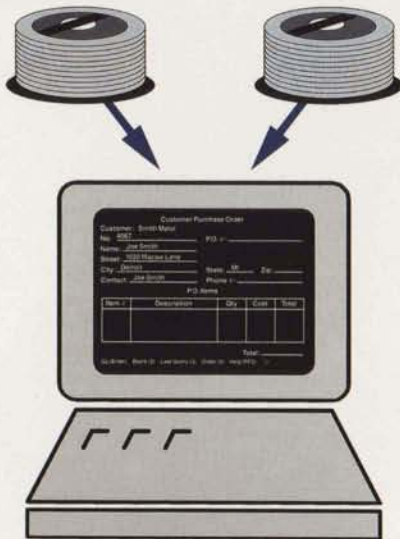
4GL Productivity for Host Languages Like COBOL

INGRES also provides a rich workbench of tools to turn your host language of choice into a powerful 4GL productivity vehicle. Whether your organization uses COBOL, C, FORTRAN, PL/I, ADA, or PASCAL, INGRES shortens your application development cycle while maintaining your current coding standards.

INGRES uses ANSI-standard, embedded SQL to move data between the database and your host language program. To complete the journey — from your program to the user's terminal — INGRES adds embedded form capabilities that greatly enhance the power of SQL. INGRES provides complete control of screens, fields, menu items and function keys from the host language program. High-level, object-oriented commands eliminate the tedium of screen-formatting. It lets you concentrate on the application at hand.

VAX DATA FILE

INGRES



This application, linking a VAX/VMS customer data file with order items from an INGRES database, was developed in minutes without one line of programming code.

Portable Forms and Applications

The INGRES Forms Runtime System (FRS) automatically handles screen operations such as display attributes and scrolling regions without any programming on your part. FRS provides application-independent support of over one hundred different types of terminals including block-mode IBM 3270 devices. It also automatically manages the memory required by the screens, objects and data in the application. You can write your application once and be confident it will run correctly and consistently on a wide range of computers and display devices.

Reusable Application Components

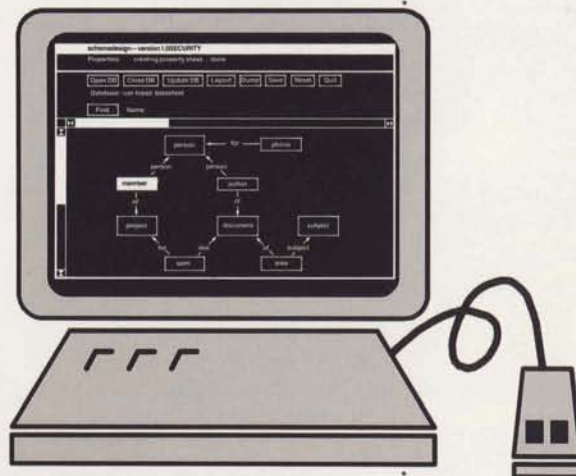
INGRES stores screen, graph and report definitions in the data dictionary. Revisions to screens are automatically applied to all relevant applications. These definitions can be easily shared by different application developers so common screens will have a consistent format throughout all your programs.

Fast Execution

INGRES applications aren't limited in the performance arena either. After prototyping your application, you can generate an installable load module with just a press of a finger. Unlike other systems, INGRES doesn't rely on slow, memory-intensive 4GL interpreters. The result is fast, executable object code direct from your prototype. With INGRES, the prototype *is* the application.

Improved User Satisfaction

With INGRES rapid prototyping, users can see the system being built before their eyes. They become more actively involved in the development process. And you can easily respond to their requests. In addition, users can easily develop screens, queries and reports using visual, menu-oriented tools. These queries and reports can later be embedded into applications without reprogramming. By involving end users earlier in the development cycle, you greatly increase the level of satisfaction with the finished application.



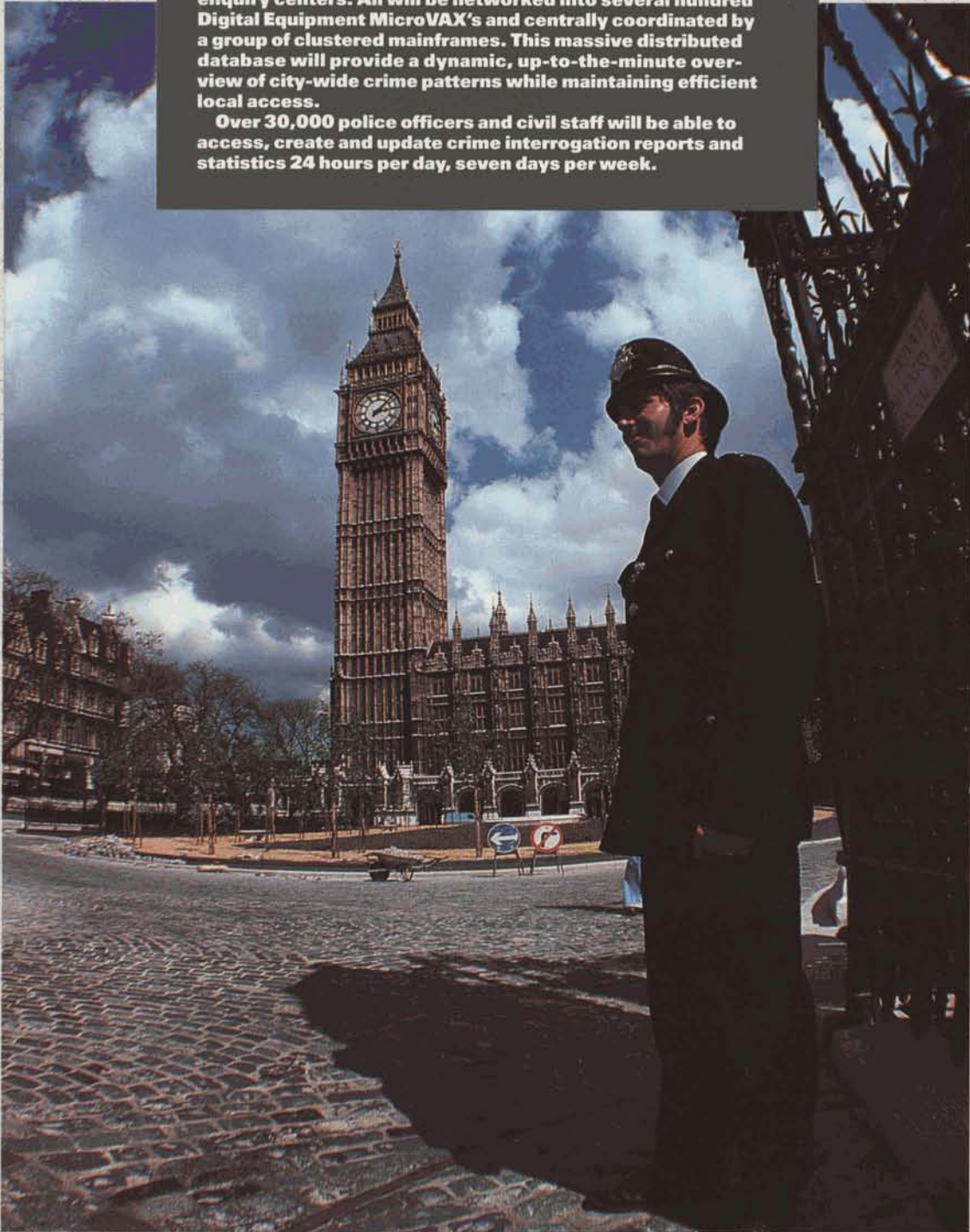
The next generation of INGRES application development tools uses windows, graphics and a mouse for even greater power and ease of use.

METROPOLITAN POLICE FORCE DEPENDS ON INGRES FOR CRIME TRACKING/PREVENTION

Security, integrity and connectivity recently led a major European systems integrator to select INGRES as the foundation for a strategic crime information application. The INGRES database will replace a current paper-based crime reporting system with an integrated computer-based application implemented force-wide.

Using INGRES/STAR, the system will run on over 2,000 workstations in police divisions, sub-divisions, areas and enquiry centers. All will be networked into several hundred Digital Equipment MicroVAX's and centrally coordinated by a group of clustered mainframes. This massive distributed database will provide a dynamic, up-to-the-minute overview of city-wide crime patterns while maintaining efficient local access.

Over 30,000 police officers and civil staff will be able to access, create and update crime interrogation reports and statistics 24 hours per day, seven days per week.





INGRES/STAR distributed data management products work as a team with other INGRES products to create integrated information systems that can span:

- different locations,
- different computers and operating systems, and/or
- different database and file systems.

With INGRES/STAR, end users and application developers can process data distributed over a network of computers as easily as if it were stored locally.

The product family consists of three product groups:

- INGRES/STAR Distributed Data Manager
- INGRES Gateways
- INGRES/NET Network Protocol Support

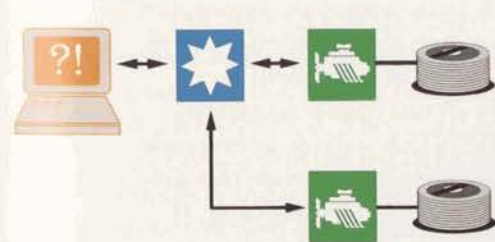
The INGRES/STAR distributed data manager connects an INGRES application with a distributed database. The distributed database can consist of two or more local databases on the same computer or on different computers.

INGRES Gateways enable other types of databases and file systems to be included in a distributed database. They also enable INGRES applications to directly process information stored in other types of formats. INGRES/NET is a transparent layer that provides network protocol support.

The INGRES/STAR product family is unique in providing all the features you need for effective distributed data management.

Location Transparency

INGRES provides complete location transparency. The distributed database appears as a set of local relational tables even though data may be physically dispersed throughout the network. This provides instant migration of existing applications to a distributed environment and enables end users and developers to use the distributed database without additional training.



INGRES/STAR enables an application to transparently process INGRES data residing on two or more different computers.

Local Autonomy

INGRES preserves the full autonomy of local database participants in a distributed database. Permission must be granted from the local level to the distributed level for access. You can define a distributed database without disturbing existing applications running against a local database. This layered approach enables you to incrementally “grow” an integrated system without costly modifications or downtime.

Global Data Dictionary

The INGRES global data dictionary provides a complete set of dictionary services for the distributed database. It automatically stores reusable application components and provides full distributed access to any application at any node. The global data dictionary can be replicated at multiple sites. It provides a global view of all your data and applications throughout the network.

INGRES/STAR Distributed Data Manager

The INGRES/STAR Distributed Data Manager is the nerve center of a distributed database system. It receives an SQL query from an application, breaks it into subqueries, and routes them to the appropriate local data managers and gateways. Each local data manager executes its subquery and the selected data is returned to the application via INGRES/STAR. With INGRES/STAR you can transparently join and combine tables across different sites using any of the INGRES/SQL end-user interfaces or application development tools.

Fast Network Performance

INGRES/STAR includes an advanced optimizer for lightening-fast performance in a network environment. The distributed optimizer automatically picks the best route for satisfying a multi-site request. It minimizes network data traffic and provides the best possible performance for end users and programmers alike — whether across a LAN or across a continent.

In its full implementation, INGRES/STAR will use a two-phase commit protocol to provide true distributed transaction processing. If a site involved in a transaction is suddenly inaccessible, other sites are automatically rolled back. INGRES preserves the integrity and consistency of your distributed data just as it does your local data.

INGRES/NET

INGRES/NET is a transparent software layer that provides INGRES protocol support for DECNET, TCP/IP, SNA and ASYNC. INGRES/NET conducts the “dialogue” between INGRES components running on two different machines joined by a network. It also performs automatic data type conversion — greatly reducing the programming burden in a heterogeneous environment.

dBASE Gateway

The INGRES dBASE Gateway brings the advantages of a fully relational and distributed database to one of the most popular PC-based database systems. dBASE files can be accessed by any of the INGRES user interface and application development tools while providing a much higher level of visual programming for easier use. In addition, users can access files using the standard SQL database language.

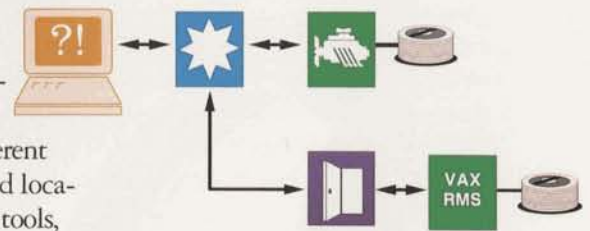
VAX RMS Gateway

The INGRES VAX RMS Gateway enables native VAX/VMS files to appear as if they were tables in an INGRES database. They can then be read by any of the INGRES user interfaces and application development tools and can be combined with INGRES tables in a distributed database. With the RMS Gateway, you can develop new applications with INGRES and avoid the cost of converting your existing data files and applications.

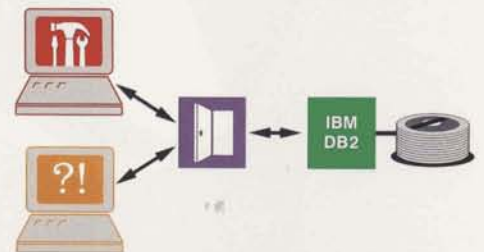
DB2 and SQL/DS

As part of the INGRES Gateway family, the INGRES DB2 and SQL/DS Gateways will provide complete access to IBM DB2 and SQL/DS databases from any INGRES application. The application can be resident on the IBM computer or can be located on any other machine in the network (for example — a PC or a workstation). Both read and write capabilities will be supported.

Combined with the INGRES/STAR Distributed Data Manager, these gateways will enable DB2 and SQL/DS databases to be included in a distributed database spanning different machines, database systems and locations. With these IBM gateway tools, you will be able to leverage the value of your DB2 and SQL/DS data across the entire organization. You can also save application development and training costs by using the highly productive INGRES/APPLICATIONS 4GL development system to develop your IBM applications — as well as your VAX, UNIX and PC applications.



With INGRES Gateways, applications can combine data from INGRES and other DBMS and file managers — maximizing your investment in existing data and providing an easy migration path to a fully integrated relational environment.



The INGRES DB2 Gateway will bring the power of the INGRES end-user products and application development system to the IBM DB2 environment.

FOR SUPPORT THAT MAKES A DIFFERENCE, INGRES PROVIDES THE RELIABLE SOLUTION

Siemens Medical Systems—one of the largest medical equipment manufacturers in the world—uses INGRES for interactive customer support for its medical systems products. One system allows the technical support center to provide real-time diagnosis and monitoring of its customers' magnetic resonance scanners. Magnetic resonance scanning is a new generation in medical imaging technology.

In addition, Siemens' INGRES systems provide bulletin boards for shared user information, training programs and direct access to Siemens' technical libraries.

High reliability and the ability for the customer to easily access local databases led Siemens to entrust their new systems to INGRES.



Customer Support and Services

The true measure of your success is determined by how quickly and reliably INGRES applications can be developed and deployed throughout the organization. Relational Technology's commitment to excellence in customer service helps you achieve this success. In fact, Datapro Research Corporation rates INGRES as one of the best supported products in the industry. From installation through operation, Relational Technology works with you as your business partner in successful application development and INGRES usage.

Technical Support

Expert help is as close as the telephone. Anytime you need assistance, trained specialists are ready to provide you with answers *fast*. All calls are logged in the INGRES Call Tracking System database that flags your problem for immediate attention, references the profile of your account, and links to an active database of similar problems and solutions. For emergency calls, a 7 day a week, 24 hour hotline service helps you keep your production systems running. In North America, two separate support centers — one on the west coast and one on the east coast — are staffed and ready to help you. Support personnel also staff each of the Relational Technology International offices.

On-line Customer Information Service

Relational Technology's on-line customer information database is available to all INGRES users. It provides general information regarding known software anomalies, customer improvement requests and INGRES training schedules. Up-to-the-minute information keeps you on top of every situation.

Comprehensive Training Programs

Relational Technology knows that education is the best investment you can make to guarantee success. The INGRES curriculum of training classes provides a complete education program that spans introductory to advanced level training for end users, application developers and database administrators. INGRES classes can also be customized to suit your particular requirements.

Classroom Training

Regularly scheduled courses are held at Regional Education Centers located across the country and in Europe. If you have your own training facilities, certified INGRES instructors can be scheduled for on-site training providing convenient and efficient education to larger groups. Classes feature hands-on experience and real-world exercises presented by professional software trainers. INGRES classes provide a stimulating and lively forum for information exchange.

Customized Training and Train-the-Trainer Program

Courses can be customized to your specific needs and delivered conveniently at your site. Also, to help you establish

your own curriculum, a "train-the-trainer program" is used by many large organizations to set up ongoing in-house instruction.

Computer-based Training

Computer-based Training (CBT) is available to complement the classroom curriculum. Personal, interactive instruction through CBT allows individuals to quickly gain familiarity with INGRES operations, speeding application deployment, acceptance and development. Users can proceed at their own pace, accommodating personal work schedules and training requirements. Delivered on personal computers, INGRES CBT presents INGRES training for all environments: VAX/VMS, UNIX, VM/CMS, PC and MVS.

Self-paced Tutorials

Self-paced tutorial booklets filled with illustrations and examples guide users through INGRES at their own pace and convenience.



Relational Technology provides the highest level of customer support and services in the DBMS industry.

Consulting Services

Relational Technology provides a full spectrum of consulting services for database and application design, from the initial design phase through implementation and performance tuning. Our consulting staff can assist you with database design, business systems requirements analysis, project management, application design, and data modeling as well as specific technical tasks related to performance tuning and systems analysis. Each consultant has extensive experience relevant to business goals, presentation ability, overall communication skills and project management. A senior consultant works with you to define the scope of effort to ensure that your objectives are met. In addition, Relational Technology provides certified technical training to external consultants to assist you with the application development and implementation phases of your project.

Comprehensive Documentation

INGRES documentation is complete, well organized and well written. Every INGRES product comes with documentation rich in examples and indexed for quick reference. Separate manuals are available for database and system administrators. Quick reference booklets also complement Relational Technology's extensive library of technical publications. In addition, Chris Date's *A Guide to INGRES* and Michael Stonebraker's *The INGRES Papers* offer insights on the INGRES system architecture and product functionality.

Technical Note Series

The technical experience and expertise of both our clients and in-house INGRES experts is regularly condensed and offered to our customers in the form of technical notes. The Technical Note Series provides tips on solving difficult problems, database tuning hints, internal system architecture and answers to questions commonly asked during technical support telephone calls. The notes are updated with every INGRES release.

Regular Product Updates

Relational Technology regularly ships maintenance releases to INGRES product versions. These updates incorporate problem fixes in direct response to feedback from our users. In addition, Relational Technology regularly introduces major releases of its products, which incorporate significant new features and functionality that enhance the value of your investment with Relational Technology.

INGRES User Association

The INGRES User Association (IUA) is a non-profit organization specially formed to bring INGRES users together to share ideas and information. In addition to annual North American and European IUA meetings, local chapters meet regularly to discuss INGRES issues, share applications programming and design techniques and exchange information among professionals with similar interests.

At the annual IUA conferences, attendees are regularly given access to top-level Relational Technology technical developers and management. Throughout the business relationship with Relational Technology, you can be assured of having accurate, honest, up-to-date information about the company's future product plans and customer commitment.

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Applications-By-Forms, INGRES/APPLICATIONS, INGRES dBASE Gateway, INGRES/EQUEL, INGRES/ESQL, INGRES for DEC VAX, INGRES for IBM, INGRES for PCs, INGRES for UNIX, INGRES/FORMS, INGRES/GRAPHICS, INGRES/MENU, INGRES/NET, INGRES Partners, INGRES/PCLINK, INGRES/QUERY, INGRES/STAR, INGRES/REPORTS, INGRES RMS Gateway, Graph-By-Forms, Query-By-Forms, Report-By-Forms, Report Writer, Visual-Forms-Editor (VIFRED), Visual-Graphics-Editor (VIGRAPH), Visual-Query-Language and Visual Programming are trademarks of Relational Technology, Inc. DEC, VAX, VAXcluster, VMS and RMS are registered trademarks of Digital Equipment Corporation. IBM, VM/CMS, MVS, DB2, IMS, SQL/DS and PC DOS are registered trademarks of International Business Machines Corporation. MS-DOS and Multiplan are trademarks of Microsoft Corporation. UNIX is a trademark of AT&T. Lotus 1-2-3, is a trademark of Lotus Development Corporation. dBASE II and dBASE III are trademarks of Ashton-Tate Corporation. MultiMate is a trademark of MultiMate International Corporation. WordStar is a registered trademark of MicroPro International Corporation. Focus is a trademark of Information Builders, Inc. SAS is a trademark of SAS Institute, Inc. RS/1 is a trademark of BBN Software Products. DataTalker is a trademark of Natural Language, Inc. KEE is a trademark of Intellicorp. ART is a trademark of Inference Corporation.

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