WHITEPAPER

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PoC TO PRODUCTION

WHY INGRES SHOULD POWER YOUR NEXT APPLICATION

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About the Author

Christine Normile has more than 20 years of IT experience in engineering, consulting and marketing in top-tier companies. An accomplished product strategist and marketer, her vision and expertise in relational database management systems have driven notable revenue growth and cost savings for a number of products and companies. Christine is currently Senior Product Manager for Ingres Corporation where she is responsible for driving the future direction of the Ingres Database. Christine began her career as an software engineer in Sunnyvale, CA focused on performance management and spent many years consulting with clients worldwide helping them improve data server performance and implement solid IT architectures. Prior to joining Ingres, she was product manager for IBM's Informix Dynamic Server.

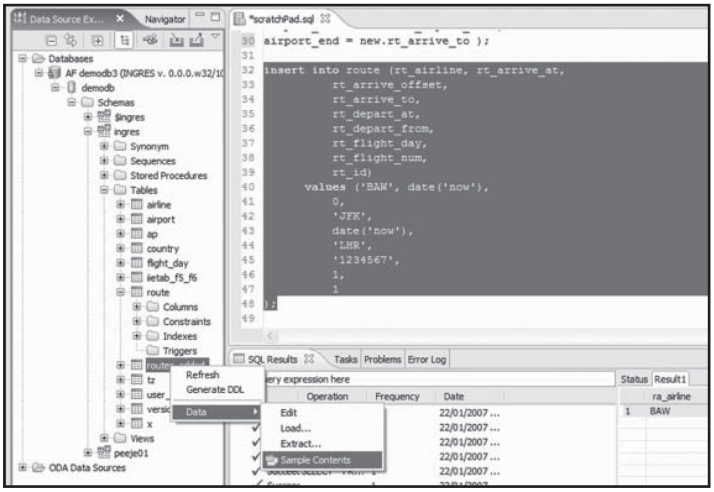
FROM POC TO PRODUCTION:
Why Ingres Should Power Your Next Application

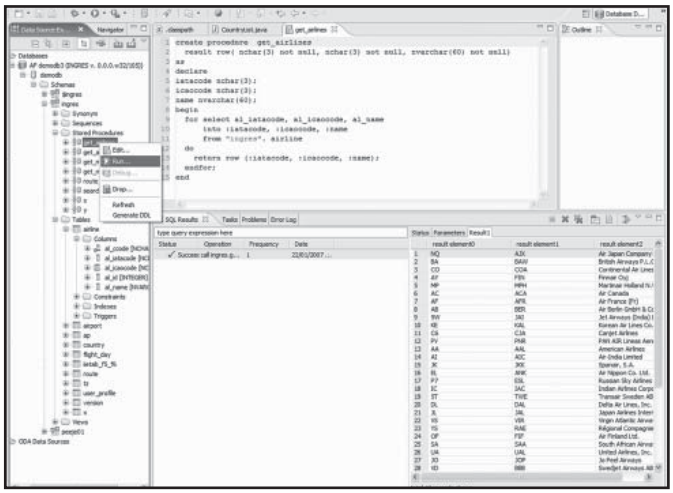
Many people have proclaimed that the database sector is now a commodity market. They say that feature-set and functionality differences between data management systems are generally insignificant to the end user. While this statement seems true on the surface, in practice nearly every enterprise-class open source solution stack still has an Oracle® database behind it. This paper will discuss why Ingres is uniquely positioned to change this, powering either a fully open source solution stack, a turnkey ISV solution or custom application throughout the product lifecycle, from proof-of-concept to a robust, scalable production deployment.

GETTING STARTED

In the beginning, most developers want a data server that will simply stay out of the way. With Ingres Icebreaker™, a developer can have an Ingres-based "database service" running in minutes by downloading our virtual machine. The data server is immediately accessible via popular interfaces such as JDBC, ODBC, Python and PHP, and with little or no database administration needed in the early stages of a project.

Ingres also has a full-featured Data Tools Platform (DTP) Plug-in for Eclipse, allowing a developer a simple interface for manipulating tables and testing database procedures within a familiar development environment. We also recently introduced Ingres CAFÉ, a fully integrated stack based on Eclipse that can have developers building applications on Ingres with a single click of the mouse.





EMPOWERING DEVELOPERS

Application development can be tedious and time-consuming, especially if your database platform doesn't provide developer-friendly features and functionality. For cost-effective development, the database platform you choose needs to keep pace with emerging standards and technology without abandoning features and syntax that you build into your applications today. At Ingres, we understand this.

- Ingres is SQL-92 compliant and supports over 90% of SQL-2003 core requirements as well as many non-standard but commonly used SQL constructs that speed and simplify application development such as sequences. Standards compliance ensures that the features you need are available, that developers can quickly adapt to Ingres if they have experience with other compliant RDBMS systems and that your application can be more easily ported from another RDBMS system.
- Ingres supports Distributed (XA) transactions that provide concurrent execution of applications on shared resources, coordination of transactions across applications and autonomy of transactions.
- Ingres supports a wide variety of development paradigms including: JDBC, .NET, and ODBC as well as Rapid Application Development with Ingres OpenROAD®. An Ingres plug-in is also available for the Eclipse Integrated Development Environment. Ingres also supports the latest development languages such as PHP, Python and Ruby.
- Ingres supports scrollable cursors to make navigating through SQL result sets much easier.
- Ingres supports role-based access controls in addition to users and groups for more fine grained security of applications and information.
- Ingres provides built-in connection pooling so you know your application will be able to scale to support thousands of concurrent users if needed.
- Ingres is committed to providing backward compatibility so that applications written on older versions of Ingres will run on our latest versions without modification.
- Ingres provides a robust procedure language. Procedures can be executed via SQL calls or from triggers, unlike some open source database systems.
- Ingres supports work-flow development with database events. Developers can define an event which can then be raised from an application and, in turn, received by all applications connected to the data server and registered to receive the event. The receiving application can then act on the event as needed.
- Ingres provides built in functions for complex logic such as prediction and classification algorithms and analytic functions you can use out of the box to speed development of Business Intelligence solutions.

THINKING BIGGER – DESIGN MATTERS

In the development of a data-driven application, the database schema design is one of the most important tasks, but often this task is oversimplified either due to aggressive project schedules or because a developer simply does not know how to approach the problem. Ingres helps to resolve this in three ways:

- Ingres includes a sophisticated set of performance monitoring, analysis, and tuning utilities. Examining scenarios such as lock contention and expensive queries can be done real-time, so finding performance bottlenecks is easy.
- The Ingres support team has an average of 10 years experience, and is ready to assist with data base design challenges and DBMS configuration tips.
- Ingres has a superior training program where you can learn everything from the basics of table structures to complex analysis of query execution plans, page cache tuning, and other topics.

Even with exceptional designs, one thing is certain in every developer's world: requirements change. Because they do, Ingres's reorganization utilities (Alter Table, Create Index) operate online to minimize downtime. In addition, Alter Table operates in place whenever possible to conserve both time and storage space. Some RDBMS systems alter by copying the data. This is time consuming and doubles the amount of disk required during the alter. End users are often reluctant to upgrade to newer versions of software if the upgrade requires extensive downtime or is costly to implement. Selecting Ingres as your RDBMS can help minimize the impediments for upgrading.

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GOING TO MARKET, ENTERPRISE-READY

Taking an application into production is about more than just the front-end. It's about the whole solution stack's reliability, scalability, manageability, and security. Ingres proves to be a leader in the data server layer.

- Ingres is easy to manage. ISV's bundle and embed Ingres in their solutions so their end customers do not need dedicated DBA's to support the solution.
- Ingres supports auditing for compliance with government standards such as Sarbanes-Oxley, HIPAA and Europe's harmonizing laws.
- Customers and ISV's have been deploying Ingres in 24x7, mission critical situations for over two decades.
- Ingres supports on-line backups of a database without locking tables, so even in a single-server deployment your database can keep working for you around the clock.
- Ingres supports Point-in-Time Restore, so that, in the event of a system failure, you can recover with minimal data loss.
- Ingres has a mature, robust implementation of asynchronous multi-master replication, as well as cascading replication, allowing for highly-available and geographically dispersed configurations.

- Ingres was built to scale. While replication enables horizontally scaled solutions, Ingres can also scale up on commodity servers with dozens of CPU cores, offering all the horsepower without the complexity and increased administrative cost of a scaled-out design.
- Ingres provides broad platform support. Ingres is available for Windows® as well as a broad spectrum of Linux® and UNIX® implementations for both 32- and 64-bit systems. In addition, Ingres also runs on OpenVMS.
- Ingres integrates seamlessly into existing environments. Most IT environments today support multiple RDBMS platforms across a number of OS platforms. Ingres can integrate easily into the most complex environments with our Ingres Star® distributed capabilities and Enterprise Access solutions.

BUILDING ON A STRONG FOUNDATION

High performance, availability, reliability and security are the price of admission for an enterprise caliber data server. Ingres has proven itself many times over in mission critical implementations for government, telecommunications, retail, financial services and manufacturing. Ingres has a number of key features that are critical to developers and end users. Ingres has a strong focus on these core competencies and has developed a number of key features to benefit users for many years. Listed below are some of the features that Ingres clients and business partners have found to be of most value in their solutions.

Performance

High performance is of prime importance for most customers and, at Ingres, we are committed to continually focusing on performance with a dedicated performance management engineering team. This team conducts both internal and external benchmarks and provides feedback to engineering on how to improve the performance of Ingres. Several key factors affect performance and the ability to scale from relatively small implementations to multi-terabyte implementations effectively.

Query Optimizer: Having a robust, efficient query optimizer is key to solutions that demand performance. Ingres uses a customizable, robust statistic collection that provides extremely accurate statistics in a fraction of the time as other solutions. Ingres gathers histogram information showing data distribution for index columns along with other key information such as the number of unique values for a column, the percentage of nulls, and the repetition factor for a column. This provides for better execution path selection than simple histogram statistics alone.

Partition Support: Partition support in Ingres provides faster responses to queries by allowing parallel processing and partition elimination or pruning. Ingres takes advantage of a multitude of partition capabilities such as range, hash, composite and list, all of which are supported natively. Partitioning and parallel query execution individually provide significant performance benefits, but combine to provide even better performance. Partition support without parallel processing and pruning is much less effective.

Threading Support: Ingres utilizes a multi-threaded model for processing queries. This allows parallel query execution which benefits complex, long-running queries by reducing execution time. OLTP style queries benefit by Ingres' ability to execute more queries concurrently increasing throughput. Multi-user, multi-threaded benefits both style of query. This architecture can be significantly enhanced when paired with multicore CPUs and a well designed partition database model.

Data Loading: Ingres understands the importance of getting information in and out of the application quickly and robustly. Ingres has a very mature bulk load utility that is configurable by the end user and supports a multitude of load types.

Availability

High performance is of prime importance for most customers and, at Ingres, we are committed to continually focusing on performance with a dedicated performance management engineering team.

Customers who are looking for high availability of their data can use a variety of features within Ingres to support this requirement such as:

Disaster Recovery: Ingres has a robust way of recovering data. Ingres supports logs and journals recovery models as well as granular recovery by table to improve performance of large table space recoveries.

Storage Reclamation: Most Open Source data servers were originally designed for read-only production operation. Because of this, they have inefficient or supplementary means of dealing with tuples that are deleted or obsoleted by an update. This "garbage" wastes disk space and processor cycles running clean-up processes to eliminate them. Ingres was designed from the beginning for Online Transaction Processing (OLTP) and manages space internally.

Online Backups: Ingres supports natively, without the requirement of 3rd party tools, the ability to backup the database while online, reducing downtime. Some backup tools lock tables during "online" backups causing unpredictable behavior and limited availability during backups.

Dual Log Support: In case of an outage or failure that requires a refresh of the database from a log file, Ingres has redundant log files to improve the recovery. Some data servers only support one log file which exposes risk in recovery during an outage.

Multi-Master Replication: Within Ingres Replicator, objects that are updated on one Ingres server are then replicated to other servers whether local or remote through multi-master replication. If one server fails, client connections can be re-directed to another server. It is not required for all Ingres servers in an environment to replicate with each other as this could cause excessive network traffic in large implementations. Instead, Ingres Replicator provides an elegant and sophisticated design. Appropriate data can be replicated to the appropriate servers without excessive replication traffic. This means that some servers in the environment can serve as failover candidates while other servers can meet other requirements. Some servers may manage a subset of columns or tables for a departmental solution, a subset of rows for a geographical region or one-way replication for a reporting server.

In the event of a source, target, or network failure, data integrity is enforced through this two-phase commit protocol by ensuring that either the whole transaction is replicated, or none of it is. In addition, if your systems operate over a number of different RDBMS's, you can use Ingres Replicator to connect them. Our solution works with non-Ingres data servers through our Enterprise Access products. Designed as a layer that sits between the database and an application, Ingres Replicator is transparent to users and developers.

Reliability

Lifecycle management is another factor in deciding on a data server platform. Once an application has made it into production, it is apt to live many years. Overtime, requirements may change demanding modification to the solution. Also, the underlying infrastructure will need to be replaced as hardware ages or upgraded as vendors supply new versions of middleware with features you or your customers want to take advantage of. At Ingres, we have a long history of minimizing the pain and cost of staying current for our clients.

Backward Compatibility: Ingres rarely deprecates features, functionality or syntax. To do so would force our clients to do extensive testing and, perhaps, modify their solutions in order to run on the latest version. This adds unnecessary costs to maintaining your solutions.

Ease of Upgrade: As databases grow and uptime requirements increase, it becomes impractical to require an unload and reload of a database in order to upgrade the RDBMS. At Ingres, our upgrades run in place usually only requiring a few minutes for the actual upgrade.

Data Integrity: Ensuring that the data that was input into the database is the same as the data that is retrieved from the database should be the top priority of your RDBMS. Closely related to this is data validity. Data types must provide strong typing to ensure that, when used, the data input meets the criteria for that type. With Ingres, environment variables and data server upgrades do not change the value of the data returned to the user or stored on disk. In addition, data submitted for insert or update to numeric, date and time columns are validated by the RDBMS to ensure the data matches the column type.

Security

Enterprise customers require their data to be secure. Customers want peace of mind when running their business on a data server platform. Some key security features include:

Role Based Access: Ingres supports user, group, and role based access. This flexible model gives the end user the choice based on their requirements and simplifies administration. When multiple users require the same access levels to the same functions, a role can be defined with those privileges. The role is then assigned to each user significantly reducing the time required to add new users to a system.

Authentication: Ingres supports operating system and database authentication, Kerberos, and several built-in mechanisms; additionally, it is easy to plug in alternative authentication mechanisms. In addition, Ingres supports both IP and IPv6 Internet access.

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PLANNING FOR THE LONG HAUL

Choosing Ingres for your application's database means choosing not only an enterprise caliber data server but also experienced, talented engineering and support teams with some of the highest customer satisfaction ratings in the industry. It's a choice of time-tested technology which has proven itself over and over again. Ingres can meet the stringent requirements of today's most demanding developers and of enterprise customers. Most of all, Ingres is a choice to remain free of more costly, proprietary data servers for the life of your application.

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About Ingres Corporation

Ingres Corporation is a leading provider of open source database management software. Built on over 25 years of technology investment, Ingres is a leader in software and service innovation, providing the enterprise with proven reliability combined with the value and flexibility of open source. The company's partnerships with leading open source providers further enhance the Ingres value proposition. Ingres has major development, sales and support centers throughout the world, supporting thousands of customers in the United States and internationally.

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