SGI® HIGH-PERFORMANCE ENTERPRISE SOLUTIONS

SOLUTION BRIEF

# SGI® Database Accelerator Solution Delivering Real-Time Transaction Processing

For many enterprises, the ability to access systems fast is key to getting the right information to the right people at the right time. That is why many enterprises seek real-time data management solutions that can deliver services faster, speed data search and analysis capabilities, and improve the decision-making process.

The Need for More Information Faster

- Instantaneous delivery of information for self-service portals and personalized on-line interactions
- Faster results for call center and knowledge base systems
- More effective and rapid identification of new revenue opportunities
- Faster transaction speeds for fraud detection, biometrics, and social networking

## Traditional Solutions Fall Short

Conventional real-time data management solutions store and access information in databases distributed across many small disk drives in an effort to reduce I/O latency during data retrieval. Unfortunately, performance suffers as data sets grow large and users demand faster access to information. In many environments, queries against large data sets often encounter long latencies for disk data retrieval, and cannot complete fast enough for real-time analysis. The crux of the performance problem is the design of the solution architecture — disk-based systems are simply unable to feed data fast enough to CPUs for processing.

## A New Approach — The SGI Database Accelerator Solution

The SGI Database Accelerator Solution is a unique in-memory database solution that delivers the performance, scalability and reliability needed to process massive amounts of data in real time to solve business challenges. Low power, high density, standards-based SGI® Altix® system designs combine with industry-leading Oracle® In-Memory Database Technology to deliver a new way to work with large data sets that improves the economics of rapid transaction processing.

### Real-Time Data Management for Performance-Critical Applications

The SGI Database Accelerator Solution provides the fast access to time-critical information needed by organizations in every industry.

- Government—Military systems, central intelligence, aerospace defense systems, simulations and training, and real-time fraud detection
- Networks—Network security, fraud detection, transaction processing, e-Commerce, Web portals and Web services
- Telecommunications—Service authorization, revenue assurance, network and quality of service (QoS) management
- Financial services—Online trading, smart order routing, position keeping, real-tine analytics, real-time fraud detection
- Commercial enterprises—Call centers, service-oriented architectures, online personalization, business intelligence, business activity monitoring, operations and logistics, information management, customer relationship management, supply chain management

### Experience Real-Time Performance

The ability to access, capture and update information many times faster than ever before can radically change a business. Attracting and retaining customers, sensing and responding to business-critical events in real time, and delivering new and innovative services faster are all possible when the system responds instantaneously.

The SGI Database Accelerator Solution delivers real-time performance by changing the assumptions around where data resides at runtime. By managing data in memory, and optimizing data structures and access algorithms, database operations execute with maximum efficiency. Dramatic gains in throughput and responsiveness are possible, even compared to fully cached relational database management systems. In addition, in-memory database libraries are often embedded within applications, eliminating context switching and unnecessary network operations, further improving performance.

### Take Advantage of Large, Fast Memory Configurations

Fast response times and high throughput are key to the success of real-time data management solutions—and the memory architecture of a server greatly influences the peak scalability and performance of in-memory database solutions. Toward this end, SGI® Altix® 450 and SGI® Altix® 4700 servers based on Intel® Itanium® processors utilize an unique global shared memory architecture to efficiently manage and access very large data sets and execute more instructions faster.

The globally shared memory architecture of SGI Altix servers enables all system processors to directly access memory, regardless of memory location. With up to 128 TB of globally addressable memory, and up to 208 GB of memory available per processor core, flexible SGI Altix servers can scale down to meet the needs of small projects, yet offer unique high-end scalability for applications with very large data sets.

### Access More Data Faster

A system architecture that provides efficient access to the entire address space is key to making effective use of global shared memory. The NUMAflex® architecture couples the large physical address space of the Intel Itanium processor with a system interconnect capable of distributing that address space seamlessly across hundreds or even thousands of nodes. In addition, the NUMAflex architecture demonstrates industry-leading performance with 5,478 GB/second of memory bandwidth, almost seven times faster than the nearest enterprise competitor. In fact, cost-effective SGI Altix servers utilize the high performance NUMAflex architecture to manage larger data sets and move data faster than leading systems from other vendors.

With the ability to work on data stores that fit entirely into physical memory, the SGI Database Accelerator Solution provides instant responsiveness and very high throughput. In fact, the in-memory Database can retrieve a database record in less than 10 microseconds and update or insert a record in less than 30 microseconds (Figure 1). Consequently, throughput is measured in tens to hundreds of thousands of transactions per second, even on systems with a small number of processors.

### Deliver Multiuser Concurrency

In-memory databases are often believed to be limited to single-user applications. Designed with data integrity in mind, the SGI Database Accelerator Solution includes capabilities such as row-level locking with committed-read isolation, making it safe for multiuser, multithreaded applications. In addition, internal record versioning eliminates lock contention between readers and writers, providing consistent response times and supporting high levels of concurrency.

### Eliminate Data Loss

Maintaining data integrity in the face of possible system faults is key to business continuity. In the SGI Database Accelerator Solution, durability is achieved through a combination of transaction logging and periodic refreshes of a disk-resident version of the database. Log records can be written to disk asynchronously or synchronously throughout processing, and specific settings for log records are controlled by the application at the transaction level.

In cases where data integrity must be continuously preserved, organizations can use memory image checkpointing along with synchronous logging to ensure data integrity. As an alternative, the asynchronous logging capabilities of the in-memory database enable extremely fast performance with minimal exposure, providing an option for high-throughput, non-monetary transactions.

# SGI® High-Performance Enterprise Solutions

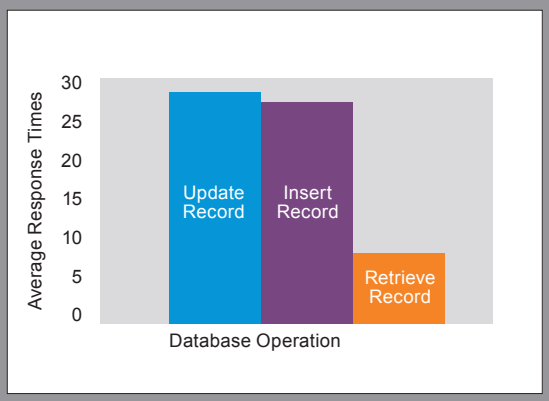


Figure 1. The SGI Database Accelerator Solution provides outstanding average response times for database operations on a four CPU system.

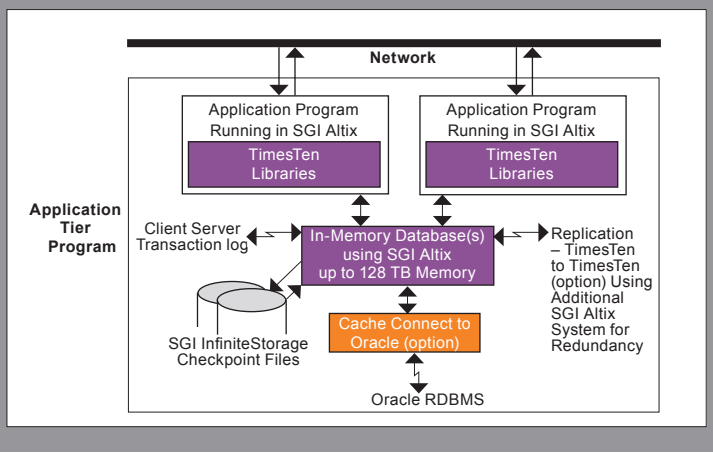


Figure 2. Components of the SGI Database Accelerator Solution

## Reduce Total Cost of Ownership

In today's economic climate, reducing both acquisition costs and ongoing operating expenses is a key priority for IT managers. With SGI Altix servers, enterprises can build entry-level architectures that can scale both compute capacity and capital expenditures incrementally. For example, unique memory-only blades enable architects to configure additional memory on SGI Altix 4700 servers and SGI Altix 450 servers without adding CPUs or I/O devices.

By decoupling processor and memory configuration, SGI servers can help reduce overall hardware expense, minimize software licensing costs, reduce utility charges, and decrease server footprint and associated real estate fees. In fact, SGI Altix server configurations enable enterprises to reduce acquisition costs by up to 75 percent, reclaim over 50 percent of datacenter floor space, and consume 25 percent less power than traditional disk-based solutions from other vendors.

## Feel Secure with Solutions Based on Industry Standards

Most real-time systems require custom development of hard-coded functions, limiting flexibility and adding solution complexity. Even commercial off-the-shelf products for high-performance transaction processing often utilize proprietary application programming interfaces (APIs) and custom data models to achieve performance goals. Built on open, flexible, industry-standard interfaces and technology, the SGI Database Accelerator Solution increases the viability of broader adoption and the implementation of real-time transaction processing. In fact, database administrators and programmers already familiar with Oracle Databases or SQL can immediately start productive development of real-time applications with queries against the in-memory database.

Structured Query Language (SQL92), Java Database Connectivity (JDBC), and Open Database Connectivity (ODBC) technologies are used to access in-memory databases just as with standard relational databases. SQL provides a layer of abstraction between applications and in-memory database internal code, enabling easy extension and alteration of application capabilities. Rapid integration of new services to existing in-memory databases is accomplished by simply adding application modules, tables, and columns. As with any mainstream relational database management system, a cost-based optimizer within the database automatically determines the fastest way to process queries and transactions.

The use of proprietary technology in computing platforms often creates vendor lock-in, increases costs, and limits the longevity, flexibility, and usefulness of a solution. Built on industry-standard components and running the open source Linux® operating system, SGI Altix platforms deliver uncompromised performance and the flexibility to execute thousands of commercial off-the-shelf software applications that are available for the Novell SUSE® Linux Enterprise Server and Red Hat® Enterprise Linux® Advanced Server operating systems. By deploying the standards-based SGI Database Accelerator Solution, organizations can protect technology investments, reduce costs, and simplify solution integration.

Furthermore, by utilizing a standards-based design approach and leveraging advanced technology from innovative industry leaders, SGI Altix servers deliver fast, scalable performance at an affordable price point. SGI collaborates with Intel on design requirements for large scale computing for Intel® Itanium and Intel Xeon® processors, and partners with Novell on Linux environment support for scalability, performance, and certification of SGI servers and storage systems. In addition, SGI works closely with Red Hat on Linux support with a special emphasis on security and adherence to standards, and contributes thousands of lines of code to the Linux community, including code that supports large scale computing, reliability, and system stability.

## Simplify Administration

Reducing complexity and simplifying maintenance and administrative tasks is essential to optimizing solution efficiency. The structure of the SGI Database Accelerator Solution minimizes the effort required for installation, setup, and administration. In fact, the simplicity of the disk structures and relatively small and consistent size of the database obviates the need for most traditional database administration tasks. The SGI Database Accelerator Solution provides command-line utilities for backup, restore, database copy and migration, policy setting, interactive query, and status monitoring functions. For installations that utilize the Oracle Data Replication and Cache Connect to Oracle options, utilities are also available for configuring and monitoring replication and caching functions.

## Utilize Flexible Deployment Options

The SGI Database Accelerator Solution supports a variety of configurations and scenarios, including transient look-up caches, operational data stores, and mission-critical transaction processing systems. While in-memory databases are often embedded inside applications, traditional client-server access is supported. Many organizations find client-server access to an in-memory database advantageous for adjunct functions, such as reporting or speeding transactions when large numbers of application-tier platforms access a common database.

Replication and caching options are also provided to enhance the applicability of the in-memory database in load balancing and multi-tier application architectures. For application tier caching, such as in support of a Service-Oriented Architecture, the Cache Connect to Oracle option expands an in-memory database into an updateable cache, managing data loading and synchronization between Oracle Databases and in-memory databases.

## Oracle TimesTen In-Memory Database

Oracle TimesTen In-Memory Database is a memory-optimized relational database that provides real-time data management for performance-critical applications. Deployed in the application tier as a cache or embedded database, Oracle TimesTen In-Memory Database can help enterprises manage events, transactions, messages, and data with instant response. By operating on data stores that fit entirely in physical memory, Oracle TimesTen In-Memory Database reduces latency, speeds throughput, and shortens response time to give users and applications data on demand.

## SGI Altix 450 and Altix 4700 Servers

SGI Altix 450 and Altix 4700 servers are modular, high-performance blade servers— including interchangeable compute, memory, I/O and special purpose blades—in compact packaging. Based on the innovative NUMAflex system architecture, these servers offer a flexible, pay-as-you-go approach which enables the independent scaling of processors, memory capacity, memory bandwidth, interconnect bandwidth, I/O connectivity, and I/O bandwidth.

Two compute blade configurations are available, each supporting dual-core Intel Itanium 2 Series 9000 processors running the SUSE Linux Enterprise Server or Red Hat Enterprise Linux operating system.

## SGI InfiniteStorage Solutions

Maintaining data integrity is essential when fast access to business-critical data is paramount. SGI InfiniteStorage solutions provide the throughput needed to support the extremely high levels of I/O needed for disk-based logging and checkpointing of in-memory database images to ensure data persistence.

Related Products and Services
- Replication—TimesTen to TimesTen
- Cache Connect to Oracle

Real-Time Hardware Platform
- SGI Altix 450 and SGI Altix 4700 servers
- SGI InfiniteStorage
- Novell SUSE Enterprise Linux Server Version 10
- Red Hat Enterprise Linux Version 5

Corporate Office
1140 E. Arques Avenue
Sunnyvale, CA 94085
(650) 960-1980
www.sgi.com

North America +1 800.800.7441
Latin America +55 11.5185.2860
Europe +44 118.912.7500
Japan +81 3.5488.1811
Asia Pacific +1 650.933.3000


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