Solutions Brief

# SGI® High-Performance Enterprise Solutions


## SGI® Altix® and Oracle® TimesTen In-Memory Database

### Delivering Real-time Enterprise Performance

**TimesTen:**

Oracle TimesTen In-Memory Database is a memory-optimized relational database that empowers applications with the instant responsiveness and very high throughput required by today's real-time enterprises and industries such as telecom, capital markets and defense. Deployed in the application tier as a cache or embedded database, Oracle TimesTen In-Memory Database operates on data stores that fit entirely in physical memory using standard SQL interfaces.

- Real-time performance
- Multi-user concurrency
- No data loss
- Standards-based
- Near-zero administration
- Flexible deployment options
- Replication – TimesTen to TimesTen (option)
- Cache Connect to Oracle (option)

**SGI Altix:**

The SGI Altix family of open standards-based servers offers an outstanding platform for the Oracle TimesTen In-Memory database. The company's world-renowned NUMAflex™ architecture allows very large memory capability with memory-resident databases from 10GB and beyond. The SGI Altix supports up to 24TB of global shared memory and runs SUSE® Linux Enterprise Server or Red Hat® Enterprise Linux®. Complimenting the SGI Altix server, SGI® InfiniteStorage is particularly well-suited to handling extremely high levels of IO for disk-based logging and checkpointing of memory database images to ensure persistence.

- Up to 24TB of global shared memory
- Up to 512 Intel Itanium 2 processors per OS image
- Industry standard components for low TCO

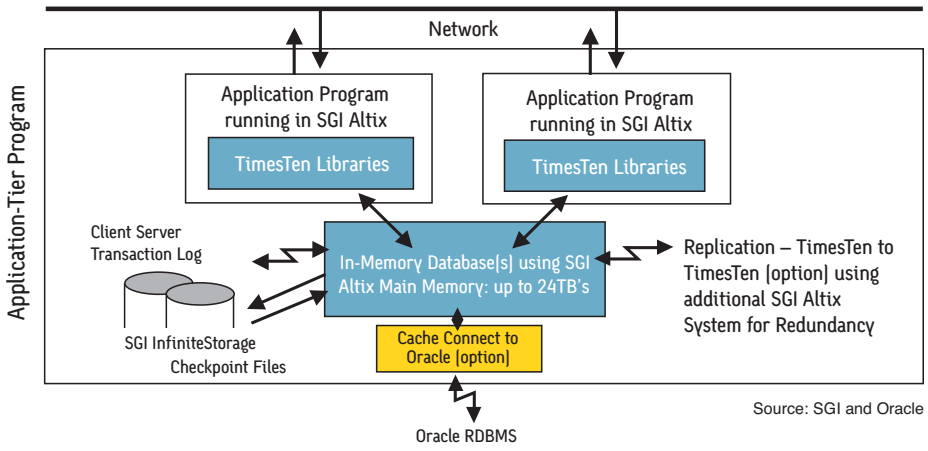


**Figure 1. SGI and TimesTen Components**

- Linux 64-bit open standard operating system
- High-performance SGI InfiniteStorage IO systems

**Real-Time Performance**

How would your business change if applications could access, capture and update information many times faster than before? You can have the power to attract and retain more customers, sense and respond to business-critical events as they happen, and deliver new services that are otherwise impossible – using standard relational database technology and familiar programming interfaces.

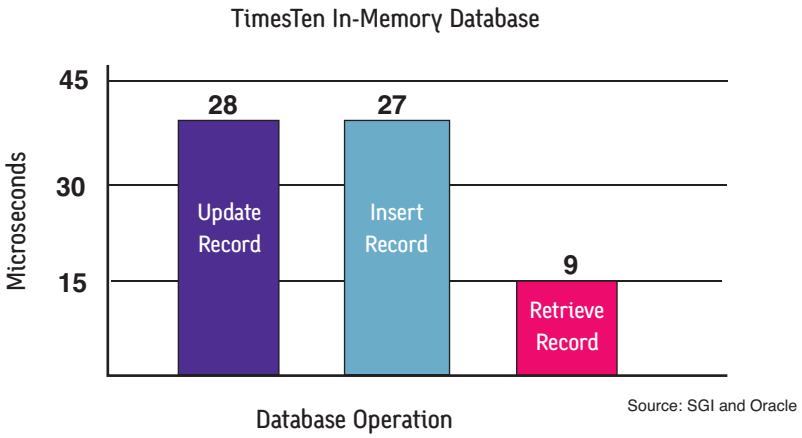


**Figure 2. Oracle TimesTen Average Response Times – 4CPUs**

Oracle TimesTen In-Memory Database 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 accordingly, database operations execute with maximum efficiency, achieving dramatic gains in responsiveness and throughput, even compared to a fully cached RDBMS. Oracle TimesTen In-Memory Database libraries are typically also embedded within applications, eliminating context switching and unnecessary network operations, further improving performance.

With global shared memory capacity of up to 24TB and exceptionally high IO bandwidth, Altix is an open standards based platform uniquely designed for handling arbitrarily large in-memory datasets with persistence.

Real-time data management has two performance dimensions – response time and throughput. With Oracle TimesTen In-Memory Database, a transaction that reads a database record takes less than 10 microseconds (a microsecond is one millionth of a second), and transactions that update or insert a record take less than 30 microseconds. Consequently, throughput is measured in tens to hundreds of thousands of transactions per second, even on systems with a small number of processors.

**Multi-User Concurrency**

In-memory databases are often misperceived as limited to single-user applications and exposed to data loss when a server fails. Neither is true with Oracle TimesTen In-Memory Database. Multiple users and multi-threaded applications are common, using row-level locking with committed-read isolation. Lock contention between readers and writers is eliminated through internal record versioning, providing consistent response times and high levels of concurrency.

**No Data Loss**

Durability is achieved through a combination of transaction logging and periodic refreshes of a disk-resident version of the database. Log records are written to disk asynchronous or synchronous to the completion of the transaction, and controlled by the application at the transaction level. For systems where maximum throughput is paramount, such as non-monetary transactions within network systems, asynchronous logging allows extremely high throughput with minimal exposure. In cases where data integrity must be preserved, such as securities trading, Oracle TimesTen In-Memory Database ensures complete durability, with no loss of data.

**Standards-Based**

Previously, most real-time applications were custom-developed using hard-coded functions specific to the application. Even specialty commercial products designed for high performance require the use of proprietary, “under the covers” APIs and custom data models to achieve performance expectations. In contrast, a primary objective of Oracle TimesTen In-Memory Database has always been the adoption of open industry standards, tuned for a memory-optimized architecture.

Following the standard relational data model, SQL, JDBC and ODBC are used to access Oracle TimesTen In-Memory Databases. The use of SQL to shield applications from system internals allows databases to be altered or extended without impacting existing applications.

New services can be quickly added into a production environment simply by adding application modules, tables and columns.

As with any mainstream RDBMS, a cost-based optimizer automatically determines the fastest way to process queries and transactions. In short, any developer familiar with Oracle Databases or SQL interfaces will be immediately productive developing real-time applications with Oracle TimesTen In-Memory Database.

The SGI Altix family of Linux Servers is also built on industry standard components and open-source operating systems. SGI is a member of the open-standards committee for the advancement of Linux.

**Near-Zero Administration**
Installation, setup and administration of Oracle TimesTen In-Memory Databases requires minimal time and no dedicated administrators. The simplicity of the disk structures and the relatively small and consistent size of an in-memory database obviate most of the traditional DBA's tasks.

Administration tasks are performed primarily through command-line utilities, and often embedded within the applications for unattended operation. Utilities are provided to backup, restore, copy and migrate databases, to set policies and interactively query the database, and to monitor the status of transactions and the overall system. Utilities are also available for configuring and monitoring data replication and caching of Oracle Databases when those options are installed.

**Flexible Deployment Options**
Oracle TimesTen In-Memory Database supports a variety of deployment configurations to accommodate a wide range of scenarios, from transient look-up caches to operational data stores to mission-critical transaction processing systems.

While in-memory databases are usually embedded inside applications, traditional client-server access is also supported for adjunct functions such as reporting, or when a large number of application-tier platforms must share access to a common in-memory database.

Due to the mission-critical nature of the applications, most deployments add the Replication – TimesTen to TimesTen option to implement an active-standby or active-active configuration for high-availability and load balancing. 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 updatable cache, managing data loading and synchronization between Oracle Databases and Oracle TimesTen In-Memory Databases.

The SGI Altix family of open-standards servers provides a flexible "pay-as-you-go" architecture which is particularly suited to the needs of the TimesTen in-memory database system.

## Real-time Data Management for Performance-critical Applications:

- Telecom and networking
- Capital markets
- Defense and intelligence
- Travel and reservations
- Service-Oriented Architectures (SOA)
- Middle-tier data caching
- Operational data stores
- Business intelligence
- Business activity monitoring
- Self-service portals

## Related Products and Services:

- Replication – TimesTen to TimesTen
- Cache Connect to Oracle

## Real-time Hardware Platform:

- SGI Altix Family of Linux Servers
- SGI InfiniteStorage Solutions
- Novell SUSE Enterprise Linux Server Version 9
- Red Hat Enterprise Linux Version 4



sgi

ORACLE PARTNER

intel

Corporate Office
1200 Crittenden Lane
Mountain View, CA 94043
(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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