

## Oracle TimesTen<sup>®</sup> In-Memory Database for Communications Industry

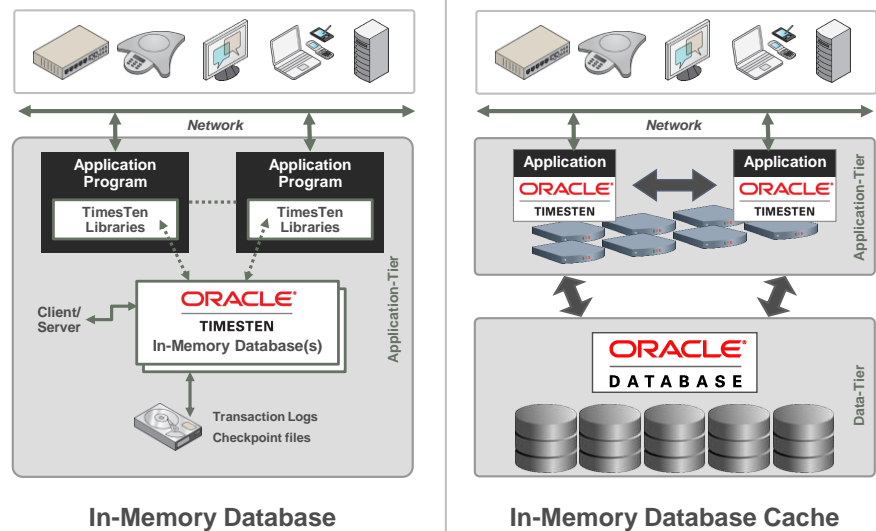
**INDUSTRY LEADING FAST AND RELIABLE SQL IN-MEMORY DATABASE**

Communications applications operate under stringent requirements for always-on, fault-tolerant processes. To compete, these applications must be built to provide scalability to handle a growing number of concurrent users, ensure minimal latency associated with the retrieval of mission-critical data, and provide robustness to ensure non-stop operation

Oracle TimesTen In-Memory Database (TimesTen) is a memory-optimized relational database that provides applications with extremely fast response time and very high throughput as required by networking appliances and OSS/BSS solutions including, subscriber and policy management, session and state management, location services, and real-time billing. Deployed in the application tier, TimesTen databases reside entirely in physical memory with persistence to disk storage for recoverability. Applications access the in-memory database using standard SQL interfaces. High availability is provided through real-time transaction replication.

### Key Advantages

- Low latency
- Multi-user concurrency
- Durability and Persistence
- Transactional Replication
- Automated database failover
- Near-zero administration
- Supports SQL via ODBC, JDBC, OCI, Pro\*C/C++, and Oracle PL/SQL



TimesTen can be deployed as either a fully stand-alone in-memory relational database with full persistence and recoverability, or as a Database Cache integrated with the Oracle infrastructure software stack including Oracle Database, Oracle Real Application Clusters, Oracle Enterprise Manager, Oracle SQL Developer, and components of Oracle Fusion Middleware.

**Real-time data management for performance-critical applications**

- Subscriber data management
- Policy control
- Location services
- Presence and availability
- Real time usage and billing
- Call/session state management
- Routing

**Real-Time Performance**

TimesTen 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 disk-based RDBMS. TimesTen is designed as an embeddable database within an application to further improve performance of database operations by eliminating inter-process communication and network overheads.

Real-time data management has two performance dimensions – response time and throughput. With TimesTen, a transaction that reads a database record can take less than 5 microseconds (measured on Oracle Enterprise Linux running AMD Opteron 1.8GHz processor). Consequently, throughput is measured in tens to hundreds of thousands of transactions per second, running on commodity hardware, or Oracle Sun Netra carrier-grade servers.

The extremely low latency and predictable response time enables TimesTen to provide real-time access to data for highly time sensitive operations such as real-time call processing and fast-growing call volumes for subscriber bases ranging from thousands to millions.

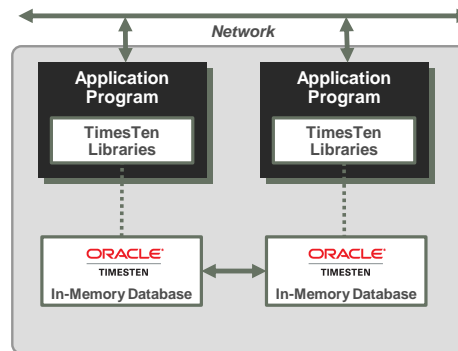
**Multi-User Concurrency, Persistence and Durability**

Oracle TimesTen In-memory Database is commonly deployed with multi-user and multi-threaded applications using row level locking and committed-read isolation. Applications access TimesTen databases using standard SQL via JDBC, ODBC, Oracle Call Interface (OCI), Pro \*C/C++, and Oracle PL/SQL programming interfaces. While the best response time is achieved with TimesTen running in-process with the application, conventional client/server access is used when a database is shared by several applications running on a number of servers.

Oracle TimesTen databases are persistent and recoverable. Durability is achieved through a combination of transaction logging and database checkpointing to disk.

**High Availability**

Availability is an essential requirement for most real-time applications, communications as well as many other industries that operate 24x7 cannot tolerate service downtime. For example solutions that manage session and call information need to ensure that even in the event of a hardware failure, applications will continue uninterrupted



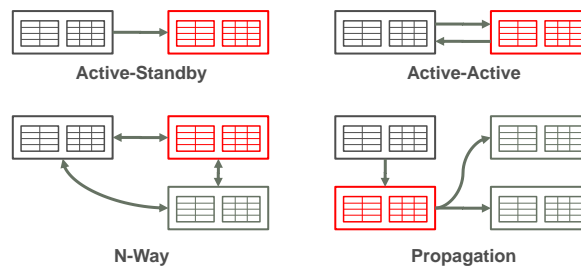
**Replication TimesTen to TimesTen**

### Flexible Replication

- Active Standby
- Active Standby with Read-only Subscribers
- Asynchronous and Synchronous replication
- Streaming TCP/IP for optimized LAN and WAN support

The TimesTen transaction-log based replication scheme enables high efficiency and low overhead real-time transaction data replication between TimesTen databases. Asynchronous replication provides maximum performance, and the application is completely decoupled from the receipt process of the replicated elements on the subscriber. For applications where transactional integrity is of the highest importance on fail over, synchronous replication provides higher level of confidence for data consistency between the active and standby database; the application is blocked until the transaction has been both received and committed on the standby database

The flexible deployment architecture supports a range of configuration options over LAN and WAN for active-standby, active-active and N-way replication. The standby database is always available for reads; additional read capacity can be provided by configuring additional read-only subscribers.



Failure detection and failover to the standby database is achieved by seamless integration with Oracle Clusterware. Online upgrade allows individual servers to be taken offline for software upgrades, while other servers continue uninterrupted

### Oracle In-Memory Database Cache

For applications with existing data already residing in an Oracle database, caching a performance-critical subset of the data into the In-Memory Database Cache is a practical solution to improve application transaction response time. Applications perform read/write operations on the cache tables with automatic persistence, transactional consistency, and data synchronization with the Oracle database. The In-Memory Database Cache option enables incremental scale-out of in-memory database caching with online addition/removal of cache grid nodes without service interruption. It also provides data location transparency so that applications need not know where the data resides; each cache grid node can access data from its local memory, from another cache grid node, or from the backend Oracle Database. Oracle In-Memory Database Cache is a database option for the Oracle Database Enterprise Edition.

### Summary

Particularly for applications in the call path, the communications environment is a challenging one. The twin needs for low latency and carrier grade reliability are not easily met, particularly during times of peak load. Oracle TimesTen is proven in the communications industry, embedded in solutions used by hundreds of millions of consumers worldwide. Leading communications companies today rely upon Oracle TimesTen to deliver both low latency and carrier grade reliability in their most demanding environments.

### CONTACT US

To learn more, please visit our website at [www.oracle.com/database/timesten.html](http://www.oracle.com/database/timesten.html) or [www.oracle.com/embedded](http://www.oracle.com/embedded) or call 1.800.ORACLE1 to speak to an Oracle representative.

**ORACLE®**