

Oracle TimesTen Application-Tier Database Cache



Oracle TimesTen Application-Tier Database Cache is an Oracle Database product option ideal for caching performance-critical subsets of an Oracle Database in the application tier for improved response time. Applications perform read/write operations on the cache tables using SQL and PL/SQL with automatic persistence, transactional consistency, and data synchronization with the Oracle Database. Oracle TimesTen Application-Tier Database Cache is built using the Oracle TimesTen In-Memory Database product.

INDUSTRY LEADING FAST AND RELIABLE SQL IN-MEMORY DATABASE CACHE

KEY FEATURES

- In-Memory Database Cache Grid
- Automatic parallel data synchronization with Oracle Database
- Preloaded and on-demand SQL read/write caching
- Online addition/removal of cache nodes
- Transactional parallel replication with automated failover

KEY BENEFITS

- Horizontal Scalability
- Improve application response time
- Real time performance
- Consistent response time in the application tier
- Cache data location transparency
- Transactional consistency across cache grid nodes
- Highly Available

TimesTen Application-Tier Database Cache

Oracle TimesTen Application-Tier Database Cache (TimesTen Cache) enables database applications to selectively cache performance-critical subsets of the Oracle Database tables into the TimesTen In-Memory Database to improve application response time. TimesTen Cache is built using Oracle TimesTen In-Memory Database (TimesTen). Applications perform read/write operations on the cache tables using SQL and PL/SQL with automatic persistence, transactional consistency, and data synchronization with the Oracle Database.

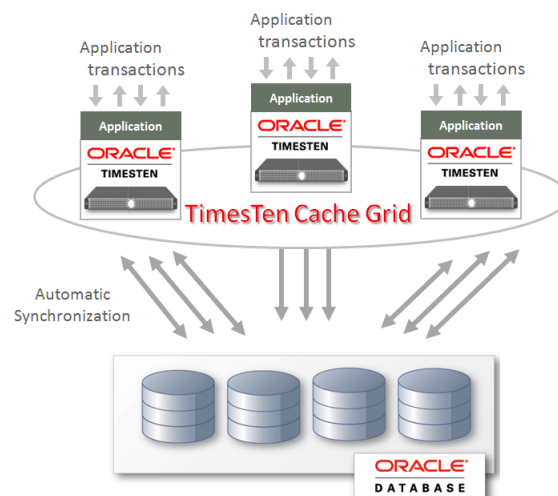


Figure 1. TimesTen Cache Grid

TimesTen Cache Grid provides horizontal scalability in performance and capacity. A Cache Grid consists of a collection of TimesTen Cache databases that collectively

manage an application's cached data. The cache data is distributed between the grid members and is available to the application with location transparency and transactional consistency across all grid members. Online addition and removal of cache grid members are performed without service interruption to the application.

RELATED PRODUCTS

- Oracle TimesTen In-Memory Database
- Oracle Exalytics
- Oracle SQL Developer
- Oracle Enterprise Manager
- Oracle Clusterware
- Oracle Database

Flexible Caching Options

Applications using TimesTen Cache may choose from a combination of caching options:

- Read-only caches where updates are performed in the Oracle Database and refreshed to the cache
- Read-write caches where transactions are performed in the TimesTen Cache and then propagated to the Oracle Database
- Cache data may be loaded on-demand or preloaded, and may be shared across the cache grid members or reside in specific cache node

Depending upon data access patterns and performance requirements, an application may choose to allocate specific data partitions to some grid members for locality optimizations, or it may choose to make all data available to all grid members for location transparency. The cache grid software manages cache coherency and transactional consistency across the grid members

Data Synchronization with Oracle Database

TimesTen Cache provides automatic data synchronization with the Oracle Database. Read-write cache tables can be written through to the Oracle Database either synchronously or asynchronously, depending upon the desired tradeoff between performance and consistency.

- Asynchronous write-through cache groups leverage the speed of Oracle TimesTen by first committing the transactions in the TimesTen cache database, and then asynchronously sending the updates to the Oracle Database. Applications with high volume transactions may choose the parallel write-through option to boost the overall transaction throughput to the Oracle Database. Parallel write-through provides scalability and throughput while maintaining the order of the related transactions.
- For Synchronous write-through cache groups, the transaction is first committed in the Oracle Database, followed by committing the transaction in the TimesTen cache database. The application must wait for the commit to complete in the Oracle Database and the TimesTen cache database.

Asynchronous write-through cache groups provide better application response time and transaction throughput.

For read-only cached groups, incremental updates in the Oracle Database are asynchronously refreshed to the in-memory cache tables, at user-specified intervals.

Multi-User Concurrency, Persistence and Durability

Applications deploy TimesTen Cache for multi-user and multi-threaded environment in the application tier. Applications access the cache tables using standard SQL and PL/SQL via JDBC, ODBC, ODP.NET, Oracle Call Interface (OCI) and Pro*C/C++ programming interfaces. Cache tables operate like regular relational tables inside the TimesTen database and are persistent and recoverable. Durability is achieved through a combination of transaction logging and database checkpointing to disk by TimesTen.

High Performance

By managing data in memory, and optimizing data structures and access algorithms accordingly, database operations execute with maximum efficiency, achieving dramatic gains in application performance. With TimesTen Cache, a transaction that reads a database record can take less than 3 microseconds (a microsecond is one millionth of a second), and transactions that update or insert a record can take about 7 microseconds (measured with Oracle Linux running on Intel Xeon E5-2680 2.7GHz processors). Consequently, throughput is measured in tens to hundreds of thousands of transactions per second, using commodity hardware.

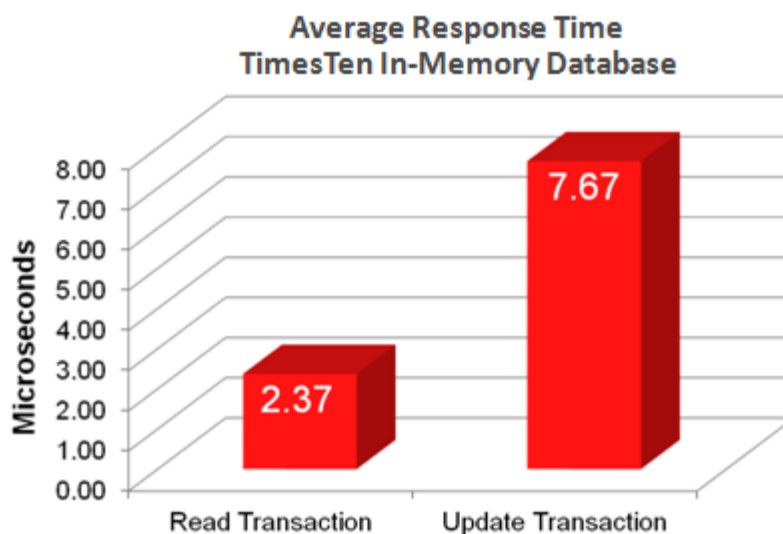


Figure 2. TimesTen In-Memory Database Average Response Times

The majority of data in corporate databases is historical and infrequently accessed. However, there are pockets of information that should be instantly accessible when requested. Your best customers, open orders, account balance, recent transactions and product catalog are examples. TimesTen Cache enables such information to be cached for real-time access, resulting in fast and consistent response time with very high transaction throughput.

FLEXIBLE REPLICATION

- Active Standby
- Active Standby with Read-only Subscribers
- Asynchronous and synchronous replication
- Parallel replication for high throughput
- Streaming TCP/IP for optimized LAN and WAN support

High Availability

Availability is an essential requirement for most real-time applications. High availability is provided through TimesTen Replication, which uses memory-optimized, transactional replication technology over a high-throughput low-latency network protocol for performance, reliability, and robustness. Key functionalities include:

- Asynchronous replication provides maximum performance, and decouples the application from the subscriber receipt process of replicated elements.
- Synchronous replication provides maximum availability and data consistency between the active and standby databases; the application is blocked until the transaction has been both received and committed on the standby database.
- Hot read availability of the standby database; additional read capacity can be provided by configuring additional read-only subscribers.

- Parallel replication provides replication throughput scaling while maintaining transaction execution order.
- Automated failure detection and failover to the standby database, achieved by seamless integration with Oracle Clusterware.
- Online upgrade enables software upgrades without application down time.
- Flexible configuration supports a range of topologies over LAN and WAN.

Resilience to Failures and Automatic Resynchronization

TimesTen Cache is designed to continue running even after the Oracle Database server or network connection has been lost. Committed transactions to the in-memory cache tables are tracked and, once the connection is restored, propagated to the Oracle Database. Similarly, committed transactions to the cached tables in the Oracle Database are tracked and refreshed to the in-memory cache tables, once the connection to the Oracle Database is restored.

REAL-TIME DATA MANAGEMENT FOR PERFORMANCE-CRITICAL APPLICATIONS:

- Telecom and networking
- Capital markets
- Defense and intelligence
- Travel and reservations
- Call Center applications
- Self-service portals
- Smart Metering
- Gaming
- Real Time Business Intelligence
- Fraud detection

Wide Range of Applications




Because TimesTen Cache supports read/write SQL transactions for the cache tables, it can be used for a wide range of applications where response time and throughput requirements are business critical. For example, capturing and processing data at network speeds, online commerce, securities trading systems, real-time billing and data analysis, , managing user/subscriber profiles, travels reservations, analytic applications, fraud detection, and other transactional systems.



CONTACT US

For more information about Oracle TimesTen Application-Tier Database Cache, visit oracle.com or call +1.800.ORACLE1 to speak to an Oracle representative.

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