ORACLE IN-MEMORY DATABASE CACHE

- In-memory Database Cache Grid
- Preloaded and on-demand SQL read/write caching
- Cache data location transparency
- Transactional consistency across cache grid nodes
- Online addition/removal of cache nodes
- Automatic data synchronization with Oracle Database
- Transactional replication with automated failover

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

In-Memory Database Cache Grid

In-memory Database Cache Grid provides horizontal scalability in performance and capacity. A Cache Grid consists of a collection of **Oracle In-Memory Database Caches** (IMDB Cache) that collectively manage an application's cached data. Cached 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.
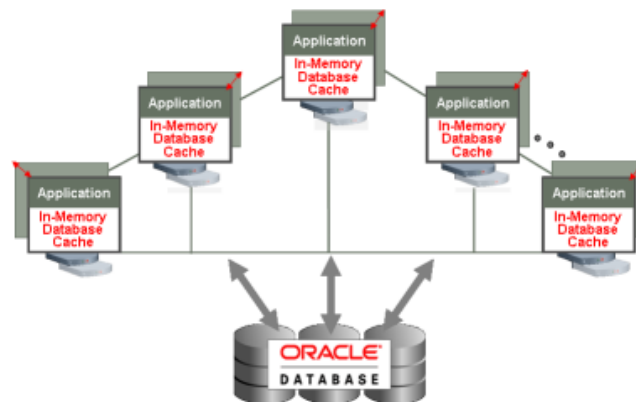

Figure 1. Oracle In-Memory Database Cache Grid

Flexible Caching Options

Applications using IMDB Cache may choose to configure a combination of caching options:

- Read-only caches where updates are performed in the Oracle Database and refreshed to the cache

- Updatable caches where transactions are performed in the 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.

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Data Synchronization with Oracle Database

Data synchronization with the Oracle Database is performed automatically. Updates to the in-memory cache tables are asynchronously or synchronously written through to the Oracle Database, depending upon the desired trade off between performance and consistency. Synchronous write-through will ensure that, if the Oracle Database cannot accept the update(s), the transaction is rolled back from the cache database. Whereas asynchronous write-through leverages the speed of Oracle TimesTen by first committing the transactions locally, and then using asynchronous write-through to send the updates to the Oracle 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 in the application-tier, at user-specified intervals.

Multi-User Concurrency, Persistence and Durability

IMDB Cache is built using Oracle TimesTen In-Memory Database (TimesTen) and is deployed in the application tier for multi-user and multi-threaded applications. Applications access the cache tables using standard SQL via JDBC, ODBC, Oracle Call Interface (OCI), Pro*C/C++, and Oracle PL/SQL programming interfaces. Cache tables are operated 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 IMDB Cache, a transaction that reads a database record can take less than 5 microseconds (a microsecond is one millionth of a second), and transactions that update or insert a record can take less than 15 microseconds (measured with Oracle Enterprise Linux on AMD Opteron 1.8Ghz processor). Consequently, throughput is measured in tens to hundreds of thousands of transactions per second, using commodity hardware.
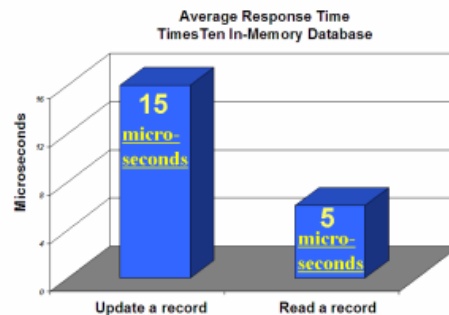

Figure 2. Oracle TimesTen In-Memory Database Average Response Times

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. Oracle In-Memory Database Cache (IMDB Cache) enables such information to be cached for real-time access, resulting in fast and consistent response time with very high transaction throughput.

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High Availability

Availability is an essential requirement for most real-time applications. High availability for in-memory cache tables is provided through real-time transactional replication.

- Asynchronous replication provides maximum performance. The application is completely decoupled from the receipt process of the replicated elements on the subscriber.

- Synchronous replication provides higher level of confidence for 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.

- 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 server to be taken offline for software upgrades, while other servers continue uninterrupted.

- Integration with Oracle Real Application Clusters and Oracle Data Guard provide cross-tier high availability in the application tier and the backend database tier.

Resilience to Failures and Automatic Resynchronization

IMDB 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.

Wide Range of Applications

Because IMDB 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, fraud detection, managing user/subscriber profiles, travels reservations, and other transactional systems.

Contact Us

For more information about Oracle In-Memory Database Cache, please visit http://oracle.com/technology/products/timesten/imdb_cache or call +1.800.ORACLE1 to speak to an Oracle representative.

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