

REPLICATION – TIMESTEN TO TIMESTEN

OVERVIEW



- High availability
- Load sharing
- Flexible architecture
- Performance and consistency
- Replicating cached data

Replication – TimesTen to TimesTen is an option to the Oracle TimesTen In-Memory Database that enables real-time data replication between servers for high availability and load sharing. Data replication configurations can be active-standby or active-active, using asynchronous or synchronous transmission, with conflict detection and resolution and automatic resynchronization after a failed server is restored. Data replication is fully compatible with the Cache Connect to Oracle product option.

High Availability

Availability is an essential requirement for most real-time applications. Industries that operate 24x7, such as telecommunications, and global systems that are Web-accessible, such as travel and reservations sites, cannot tolerate service downtime. Securities trading systems must remain continuously available while financial markets are open. The more real-time the system, the more likely it needs to be highly available.

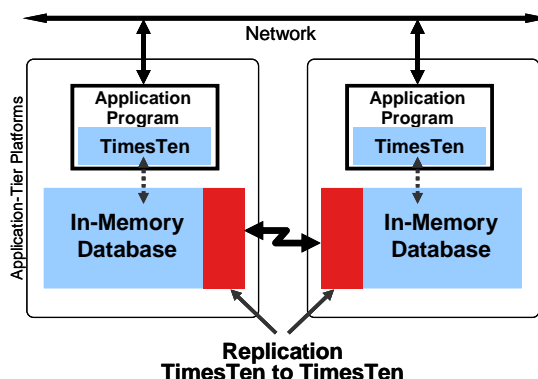


Figure 1. Replication added to the TimesTen In-Memory Database

Data replication is the foundation technology for high-availability with Oracle TimesTen In-Memory Databases. Replication maintains copies of the same data on two or more servers on a network. In the event of a server failure, additional copies of the data are available on other servers to continue processing. Data replication also allows an individual server to be taken offline for administration, schema changes and software upgrades, while other servers continue uninterrupted. When the offline server rejoins the configuration, replication automatically applies the changes needed to bring the server current, and then resumes the normal replication process.

Load Sharing

In addition to enabling high availability, replication enables workloads to be distributed across multiple servers for more effective utilization of hardware resources. As workloads grow, additional servers can be added to extend the configuration.

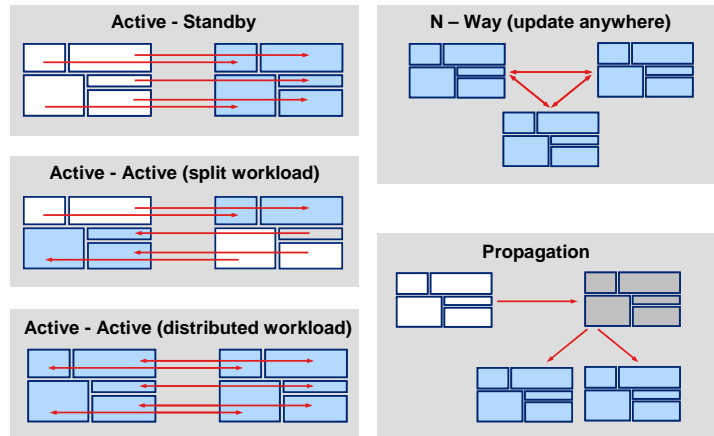


Figure 2. Configuration flexibility

Flexible Architecture

Data replication has a variety of configuration options to fit a range of scenarios, including active-standby and active-active configurations.

Data replication follows a “master-subscriber” model, whereby committed changes to designated tables or entire database are copied from their source to one or more subscriber databases. By designating a database as both a master and a subscriber, bi-directional replication may be configured, including multi-node “N-way” replication. In the event that bi-directional replication conflicts occur, a time-stamp-based collision detection and resolution mechanism prevents inconsistent replicas.

A subscriber can serve as a propagator that receives replicated updates from a master and passes them on to subscribers of its own. Propagators are useful for optimizing replication performance over lower bandwidth network connections, whereby the master replicates to a single propagator over the slower network connection and the propagator in turn forwards the updates to each subscriber on its local area network. Propagators are also useful for distributing (or fanning out) replication loads from a master database to a large number of subscribers.

Performance and Consistency

A transaction-log based replication scheme enables high efficiency and low overhead. Data replication at each master and subscriber database is controlled by replication agents that communicate through TCP/IP stream sockets. The agent on the master database reads the records from its transaction log and forwards any relevant changes to the agent on the subscriber database, which then applies the updates to the its local database. If the subscriber agent is not running, the master retains updates in its log files until they can be applied at the subscriber.

REPLICATION – TIMESTEN TO TIMESTEN

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:

- Oracle TimesTen In-Memory Database
- Cache Connect to Oracle

Asynchronous and synchronous data replications are both supported. When using asynchronous replication, an application updates a master database and continues working without waiting for the updates to be received by subscribers. The master and subscriber databases have internal mechanisms to confirm that the updates have been successfully received and committed by the subscriber. These mechanisms ensure that updates are applied at a subscriber only once.

Asynchronous replication provides maximum performance, but the application is completely decoupled from the receipt process of the replicated elements on the subscriber. For “pessimistic” applications that need higher levels of confidence that the replicated data is consistent between the master and subscriber databases, the optional *return receipt* or *return twosafe* services are available.

The return receipt service loosely couples or “synchronizes” the application with the replication mechanism by blocking the application until replication confirms that the update has been received by the subscriber. The return twosafe service provides a fully synchronous option by blocking the application until replication confirms that the update has been both received and committed on the subscriber.

Replicating Cached Data

The Replication – TimesTen to TimesTen product option is fully compatible with the Cache Connect to Oracle product option. To achieve high availability for cached tables from Oracle Database, configure the cache groups to be replicated between Oracle TimesTen databases. Data replication works in this configuration by replicating changes between cache groups, similar to replicating changes between Oracle TimesTen In-Memory Database tables. Both read-only cache groups and write-through cache groups are supported.

In the event of a system failover, data synchronization between the cached tables in Oracle TimesTen and the tables in Oracle Database is automatically resumed from the last propagated transaction prior to the system failure.

For more information about Replication - TimesTen to TimesTen, visit

<http://www.oracle.com/technology/products/timesten>

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