

Oracle TimesTen In-Memory Database

Oracle TimesTen In-Memory Database (TimesTen) is a memory-optimized relational database that provides applications with extremely fast response time and very high throughput, which as many applications in a wide range of industries require. Deployed in the application tier, TimesTen databases reside entirely in physical memory with persistence to disk storage for recoverability. Applications access the in-memory databases using standard SQL interfaces. TimesTen is highly available through real-time transactional replication.

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 run with maximum efficiency, achieving dramatic gains in responsiveness and throughput, even compared to a fully cached disk-based RDBMS. In addition to using the conventional client/server connections to the database, applications can improve on transaction response time by embedding the TimesTen database within the application, thus eliminating inter-process communication and network overhead.



Key Features

- Low latency
- Microsecond response time
- Multi-user concurrency
- Durability and persistence
- Transactional parallel replication
- Supports SQL and PL/SQL via ODBC, JDBC, ODP.NET, OCI and Pro*C/C++
- Easy deployment to containerized environment

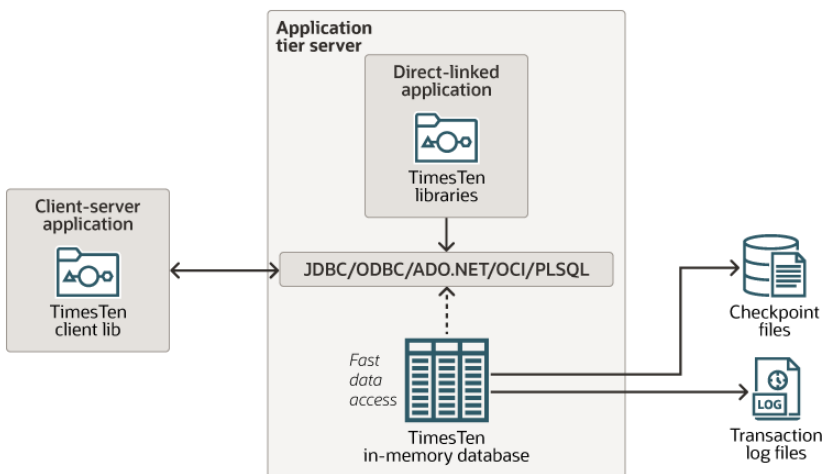


Figure 1. TimesTen Database Configuration

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 2 microseconds, and transactions that update a record can take less than 5 microseconds (measured on Oracle Linux running AMD EPYC 7J13 2.55Ghz processors). Consequently, throughput is measured in tens to hundreds of thousands of transactions per second, using commodity hardware.

Average Response Time

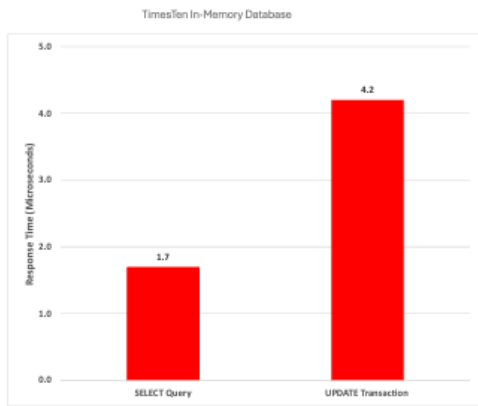


Figure 2. TimesTen Database Performance

Multi-User Concurrency, Persistence and Durability

TimesTen uses memory-optimized data layout and access methods for highly concurrent workloads. Applications access TimesTen databases using standard SQL and PL/SQL via JDBC, ODBC, ODP.NET, Oracle Call Interface (OCI), and Pro*C/C++ programming interfaces. While you can achieve the best response time with TimesTen running co-locate with the application, you can use client/server access when a database is shared by applications running on several servers. Oracle TimesTen databases are fully persistent and recoverable. TimesTen achieves durability through a combination of transaction logging and database checkpointing to disk.

Workloads

TimesTen is ideal for performance critical OLTP (online transaction processing) applications. Examples of OLTP applications include latency sensitive applications in telecommunications (such as call processing, session management, online-charging, billing and rating management), trading platforms in financial services, high volume Web applications, travel and airline reservation systems, smart metering, gaming and many others.

Key Benefits

- Real time performance
- Consistent response time
- Automated database failover
- Zero data loss
- Supports OLTP

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

High Availability

Availability is an essential requirement for most real-time applications. Industries that operate 24x7, such as telecommunications, and web-accessible global systems such as travel and reservations sites, cannot tolerate service downtime. Securities trading systems must remain continuously available when financial markets are open. The more real-time the system, the more likely it needs to be highly available. TimesTen Replication 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 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.
- Seamless integration with Oracle Clusterware automates failure detection and failover to the standby database.
- Online upgrade enables software upgrades without application down time.
- Flexible configuration supports a range of topologies over LAN and WAN.

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

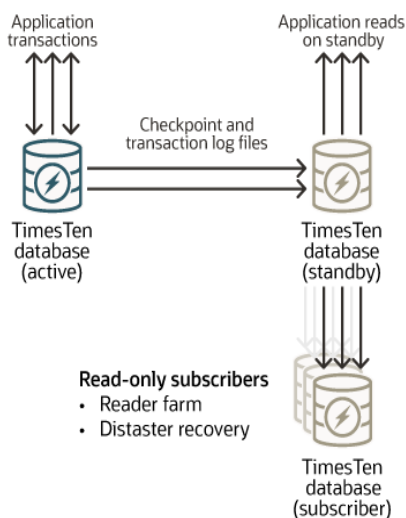


Figure 3. TimesTen Replication

Container Support

Running applications in containerized environment can simplify installation and deployment processes. TimesTen Kubernetes feature provides flexible options, Helm charts or YAML manifest files, for users to configure, customize, and create TimesTen databases in your Kubernetes cluster. In addition, the TimesTen Kubernetes Operator functions much like a human operator. It automatically manages the lifecycle of your TimesTen databases, enabling your production systems to run effectively and efficiently. You can access TimesTen container images on the cloud and on-premises. In Oracle Cloud infrastructure, (OCI), you can directly export the TimesTen container image from Oracle Cloud Marketplace to further streamline your installation and deployment processes.

Simplify Administration

- Flexible options with either Helm charts or YAML manifest files
- Automatic detection of TimesTen databases
- Automatic corrective action

Platform Availability

TimesTen is available on wide range of operating systems including Linux for Arm processor.

Server Platforms

Operating System	OS Version
Linux x86 64-bit	<ul style="list-style-type: none"> • Oracle Linux 7.4+, 8.2+, 9.2 + • Redhat Enterprise Linux 7.4+, 8.2+, 9.2+ • SUSE Enterprise Server 12 , 15 • Ubuntu 22.04
Linux aarch 64-bit	Oracle Linux 8.4+
Solaris SPARC & Intel 64-bit	11.3, 11.4
IBM AIX PC 64-bit	7.1, 7.2, 7.3

Related Products

- Oracle In-Memory Database Cache
- Oracle SQL Developer
- Oracle Enterprise Manager
- Oracle Clusterware
- Oracle Golden Gate

Client Only Platforms

Operating System	OS Version
Microsoft Windows 64-bit	10, 11, Server 2012 R2, 2016, 2019, 2022
Apple macOS Intel 64-bit	12.6 Monterey

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