Value of TimesTen
Oracle TimesTen Product Overview

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When You Think “Database…”

RDBMS + client/server connectivity

- Data accessed by client application via the network
- Not fast enough for some applications
RDBMS with Home-Grown Cache

For very demanding applications:
- Build a home grown, application-specific, in-memory “cache”
One Product: Database + Cache

- Full capabilities of relational database
- Standalone or with Oracle
- Memory-optimized speed & latency

- Optimized for embedded architecture
- Persistent, recoverable, highly available
Oracle TimesTen In-Memory Database

Memory-optimized RDBMS for real-time applications

- Application-tier relational database
- Delivers instant responsiveness and very high throughput
- Operates as database of record or as a read/write cache for Oracle Database
- Provides replication for high availability and scalability

“When milliseconds matter”
Driving Trends
Enabling the Real-Time Enterprise

• Real-time transactional operations
  • Financial services and trading applications (front-office)
  • Telecom subscriber management and billing applications
  • Defense and intelligence systems – data capture and analysis

• Real-time BAM and BI
  • Data analysis and intelligence “in the transaction path”
  • Position & risk management in financial services

• Real-time CRM and customer care
  • Call center applications
  • Personalization and user profiles

• Real-time SOA
  • Massive increase in data & metadata access

• Real-time sensor-based computing
Oracle TimesTen for Real-Time Business

*Extends* Oracle Database with *real-time data management*, to support *performance-critical applications*
Proven in Real-Time Deployments
Thousands of companies use Oracle TimesTen

<table>
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<tr>
<th>Networks</th>
<th>Telecom</th>
<th>Wall Street</th>
<th>Customer-Facing Applications</th>
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<tr>
<td>• Real-time billing</td>
<td>• Value-added Services</td>
<td>• Order Matching</td>
<td>• Call Centers</td>
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<td>• Voice over IP</td>
<td>• Revenue Assurance</td>
<td>• Risk Management</td>
<td>• Hosted CRM</td>
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<td>• Mobile Networks</td>
<td>• Network and QOS Management</td>
<td>• Real-time Analytics</td>
<td>• Dynamic personalization</td>
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<td></td>
<td>• Authentication</td>
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- ERICSSON
- Cisco Systems
- NOKIA
- Lucent Technologies
- T-Mobile
- Sprint
- amdocs
- TIM
- Bear Stearns
- PHLX
- JPMorgan
- Avaya
- ASPECT
- salesforce.com
- Factiva
- Dow Jones & Reuters

ORACLE
Oracle TimesTen Products

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<th>Product</th>
<th>Option</th>
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<td>Oracle TimesTen In-Memory Database</td>
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Oracle TimesTen In-Memory Database

- In-memory RDBMS
  - Entire database in memory
  - Standard access ODBC/JDBC, SQL 92
  - Compatible with Oracle Database

- Exceptional performance
  - Instantaneous response time
  - High throughput
  - Embeddable

- Persistence and durability
  - Database persists to disk
  - Transactions with ACID properties

- Real-time services
  - On-line, non-blocking operations
  - Real-time database change notification

- Near-zero administration
Lightning Fast Response

Oracle TimesTen 6.0
4-CPU, 3 GHz x86 Xeon, 32-bit RHLinux

- Update: 28 microseconds (millions of a second)
- Select: 9 microseconds (millions of a second)
Outstanding Platform Efficiency

Oracle TimesTen 6.0
4-CPU, 3 GHz x86 Xeon, 32-bit RHLinux

transactions per second

1 CPU 32,663
2 CPUs 53,361
4 CPUs 70,111
1 CPU 98,568
2 CPUs 169,437
4 CPUs 250,550
Finding a Row of Data in a Traditional Disk-Optimized RDBMS

Application

SQL

Send buffer to application (via IPC)

Copy row to private buffer

Query Processor

Determine disk address of desired page

Table# Page#

Hash function

Linked lists into buffers

Data page

Assuming the page is already in memory

Locate page pointer via hashing and linear search
Finding a Row of Data in the TimesTen IMDB

Application

- SQL

Determine memory address of desired record

Query Processor

Memory address

Memory-resident database

Data store

Copies data to application buffers

The full database is preloaded from disk to memory
Data Publishing

Transaction Log API (XLA)

- Transaction Log API (XLA)
  - Track real-time data changes
  - Monitor transaction updates
  - Propagate changes to external applications
  - Implement real-time event notification and processing

- Track changes in Tables and Materialized Views
  - Return only committed records from transaction log

- Maintain log positions via Bookmarks
Replication – TimesTen to TimesTen

- Real-time transactional data replication between TimesTen databases
  - Database or tables
  - Configure using SQL
- High performance
  - Asynchronous or Synchronous
- Transparent to the application
  - No application code changes
- Works with Oracle Cache
  Connect option
Replication – TimesTen to TimesTen

- Flexible configurations
  - Active-standby – most often used
  - Active-active
  - N-way
  - Propagation
- Robust
  - Auto recovery, master catch-up
- Conflict detection & resolution
- Online upgrade – no downtime
Cache Connect to Oracle
Using Oracle TimesTen to Cache Oracle Data

• Read-only and updatable caches
• Pre-load or load-on-demand the most active data from Oracle
• Bi-directional synchronization
• Works with replication to protect application-tier data
• Keeps working even if the connection to Oracle is down
Cache Connect to Oracle

- Synchronous or Asynchronous
- User configured cache groups
  - Individual and related tables
  - All or subset of rows and columns
- Automatic Synchronization
- Automatic Data Aging
  - Time or LRU based
  - Time window-based caching
- Transparent SQL pass-through for non-cached data requests
Java Middleware Tested with TimesTen

- Oracle Application Server 10.1.2 & 10.1.3
- Oracle BPEL Process Manager 10.1.3
- Oracle TopLink 9.0.4 & 10.1.3
- Oracle JDeveloper 10.1.3
- JBoss Application Server 4
- Hibernate 3
- WebSphere Application Server 6
- Weblogic Application Server 8
- Sun Java System Application Server 8
## TimesTen 7.0 Supported Platforms

<table>
<thead>
<tr>
<th>Platform</th>
<th>Processor</th>
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</thead>
<tbody>
<tr>
<td>HP-UX 11i and 11i v2</td>
<td>PA-RISC (32-bit and 64-bit)</td>
</tr>
<tr>
<td>HP-UX 11i v2</td>
<td>IA64 (32-bit and 64-bit)</td>
</tr>
<tr>
<td>HP Tru64</td>
<td>64-bit</td>
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<tr>
<td>IBM AIX 5L 5.2 and 5.3</td>
<td>POWER (32-bit and 64-bit)</td>
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<tr>
<td>MontaVista Linux CGE 4.0</td>
<td>X86 (32-bit and 64-bit)</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux 3 and 4</td>
<td>X86 (32-bit and 64-bit)</td>
</tr>
<tr>
<td>Sun Solaris 8, 9, 10</td>
<td>Sparc (32-bit and 64-bit)</td>
</tr>
<tr>
<td>Sun Solaris 10</td>
<td>x86 on AMD Opteron (32-bit*/64-bit)</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server 9, 10</td>
<td>X86 (32-bit and 64-bit)</td>
</tr>
<tr>
<td></td>
<td>Itanium2 (64-bit)</td>
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## Oracle Database 10g and TimesTen

Complementary Database Strengths

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<tr>
<th>Database Characteristic</th>
<th>Oracle Database 10g</th>
<th>Oracle TimesTen In-Memory Database</th>
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<tr>
<td>Data Model</td>
<td>Relational – SQL</td>
<td>Relational – SQL</td>
</tr>
<tr>
<td>Target Applications</td>
<td>All</td>
<td>OLTP, some DSS</td>
</tr>
<tr>
<td>Optimization</td>
<td>Disk-centric</td>
<td>Memory-centric</td>
</tr>
<tr>
<td>Typical Deployment</td>
<td>Database Tier</td>
<td>Application Tier</td>
</tr>
<tr>
<td>Architecture</td>
<td>Client / Server</td>
<td>Direct Data Access</td>
</tr>
<tr>
<td>Response Time</td>
<td>Milliseconds</td>
<td>Microseconds</td>
</tr>
<tr>
<td>Data Capacity</td>
<td>Tens of Terabytes</td>
<td>Tens of Gigabytes</td>
</tr>
<tr>
<td>Scalability</td>
<td>Unlimited SMP/Cluster</td>
<td>Good SMP</td>
</tr>
</tbody>
</table>
Oracle TimesTen + Oracle Database
End-to-End Data Management

1. Instantly Responsive
2. Tightly Integrated
3. Highly Scalable
Summary

• Oracle offers industry-unique in-memory technology to enable Real-time business
• Proven technology with thousands of deployed customers
• Oracle TimesTen
  • Offers real-time performance for enterprise and embedded applications
  • Provides high availability in the application tier
  • Can run stand-alone as the database of record
  • Extends Oracle Database to improve application performance
  • Provides strong compatibility and interoperability with Oracle Database
  • Offers predictable response-time where microseconds matter!
Oracle TimesTen

Customer Use Cases
Fixed Income Trading System

TimesTen Usage
- Order processing
- Event publishing

TimesTen Values
- Fast order execution
- Trader alerting
Fast, On-Target Customer Service
Leading Call Center Solution Vendor

TimesTen Usage

- Reference data lookups
- Routing calls to agents
- State management (case & agent status)
- Real-time reporting (call center monitoring)

TimesTen Values

- Instant, accurate matches
- High throughput per server
- High availability