ORACLE®

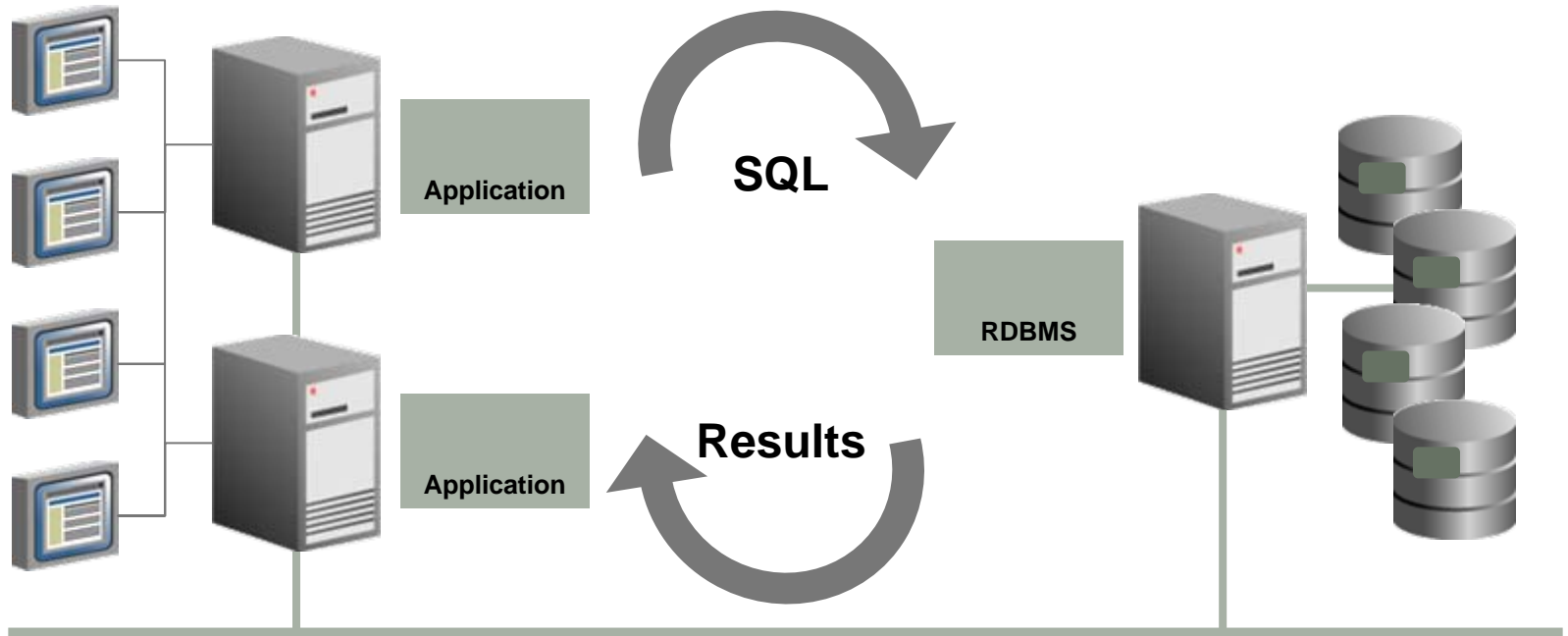# Value of TimesTen
Oracle TimesTen Product Overview

Shig Hiura
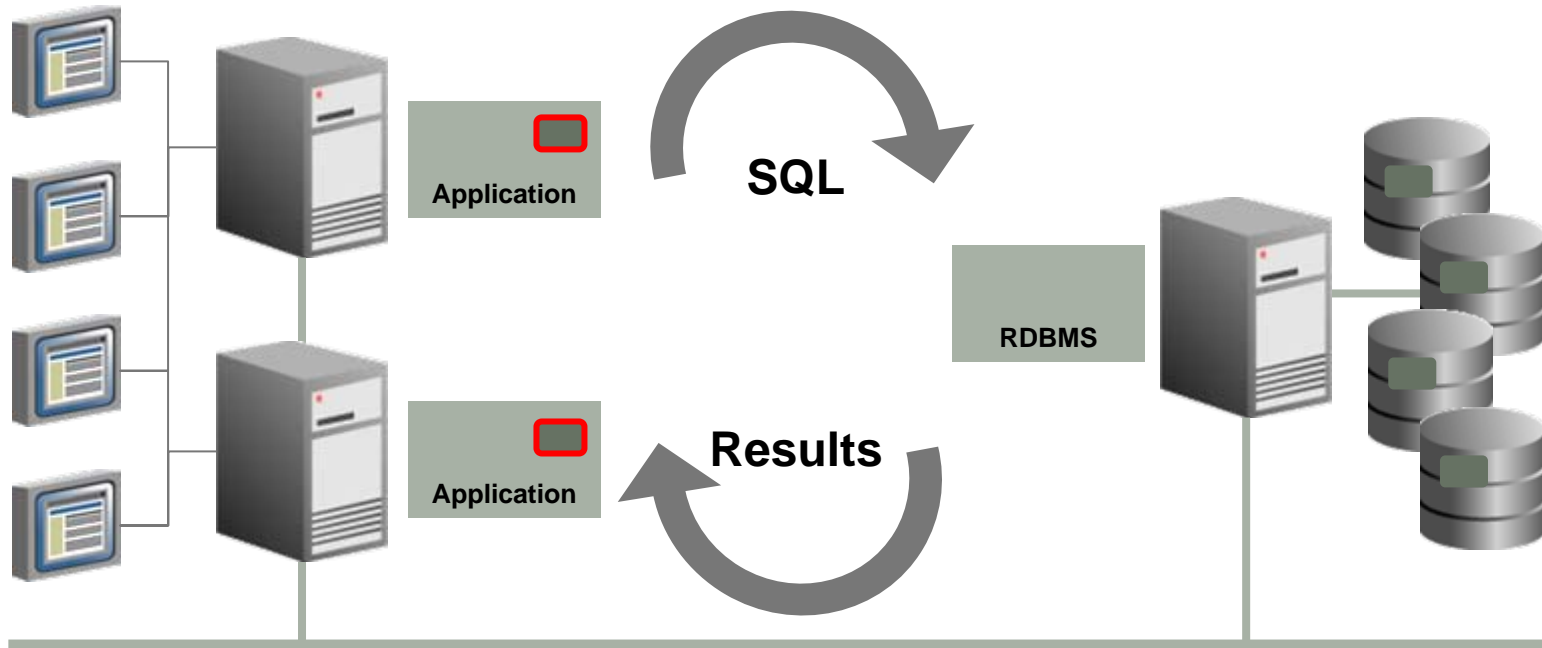Sales Consultant, Oracle Embedded Global Business Unit

When You Think "Database…"

RDBMS + client/server connectivity

- Data accessed by client application via the network
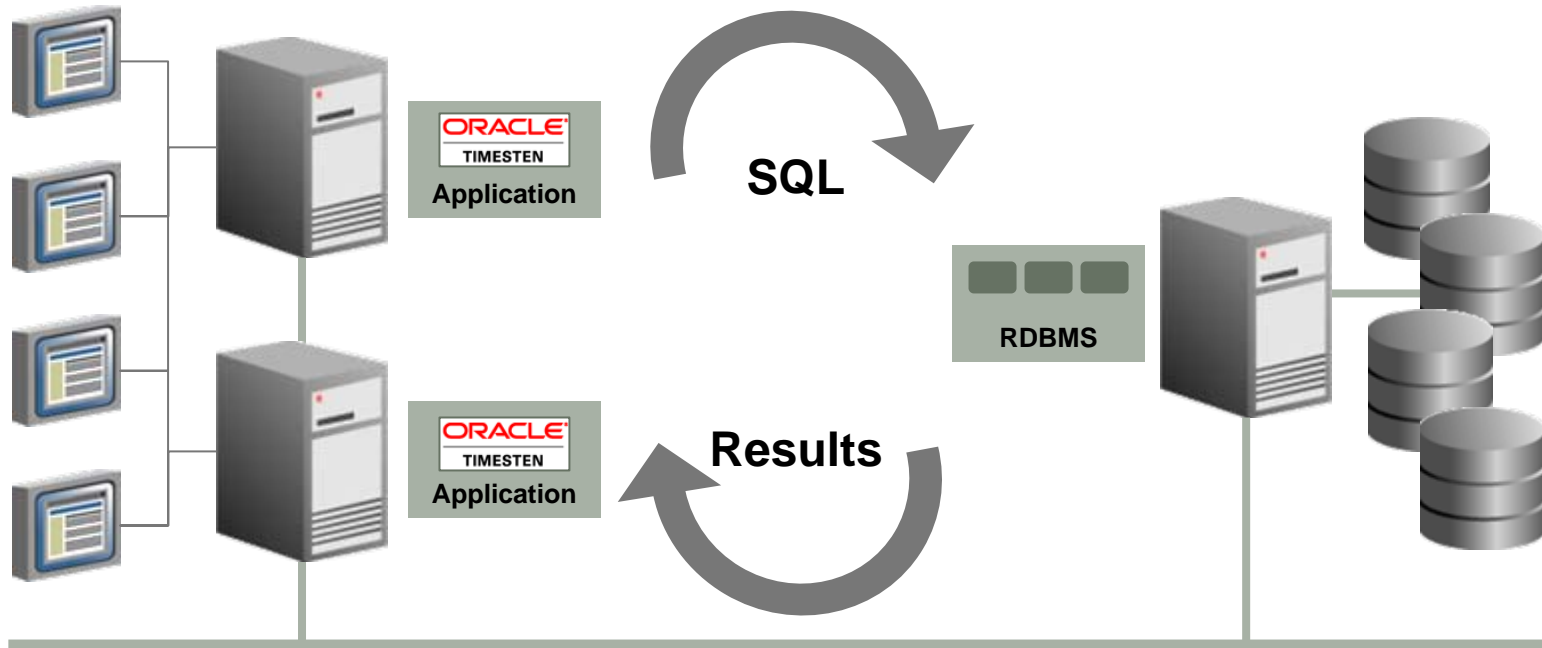- Not fast enough for some applications

RDBMS with Home-Grown Cache

SQL

Application

RDBMS

Results

Application

For very demanding applications:

- Build a home grown, application-specific, in-memory "cache"

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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

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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"
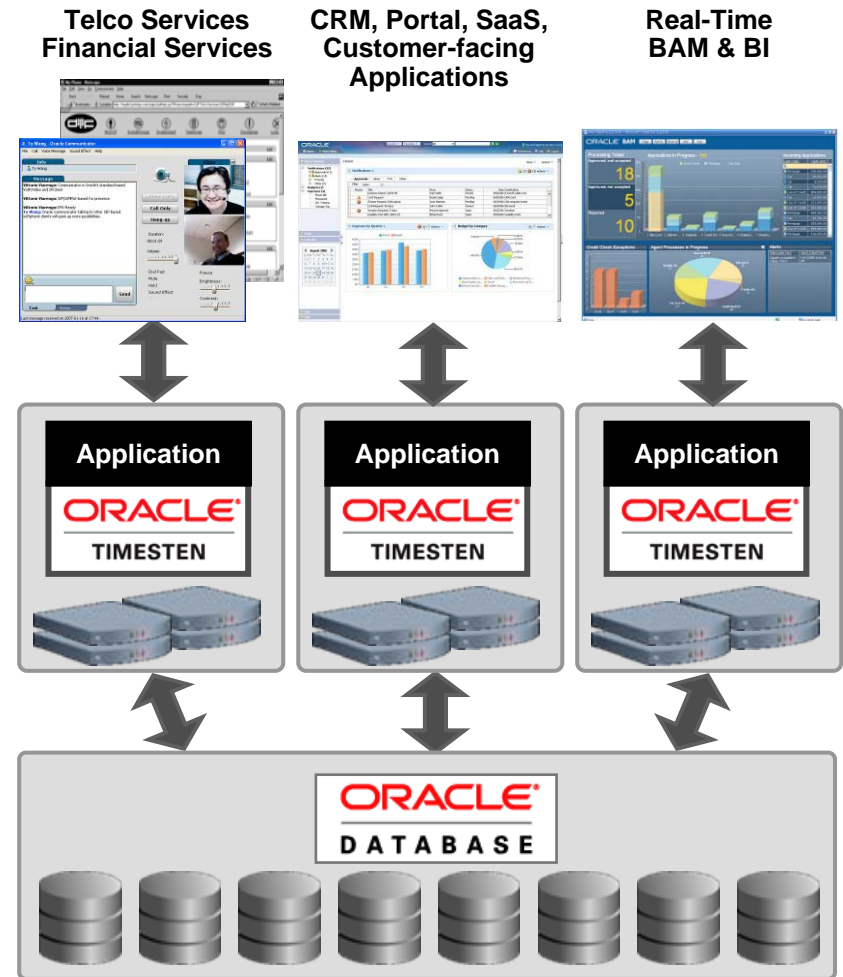
Driving Trends

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

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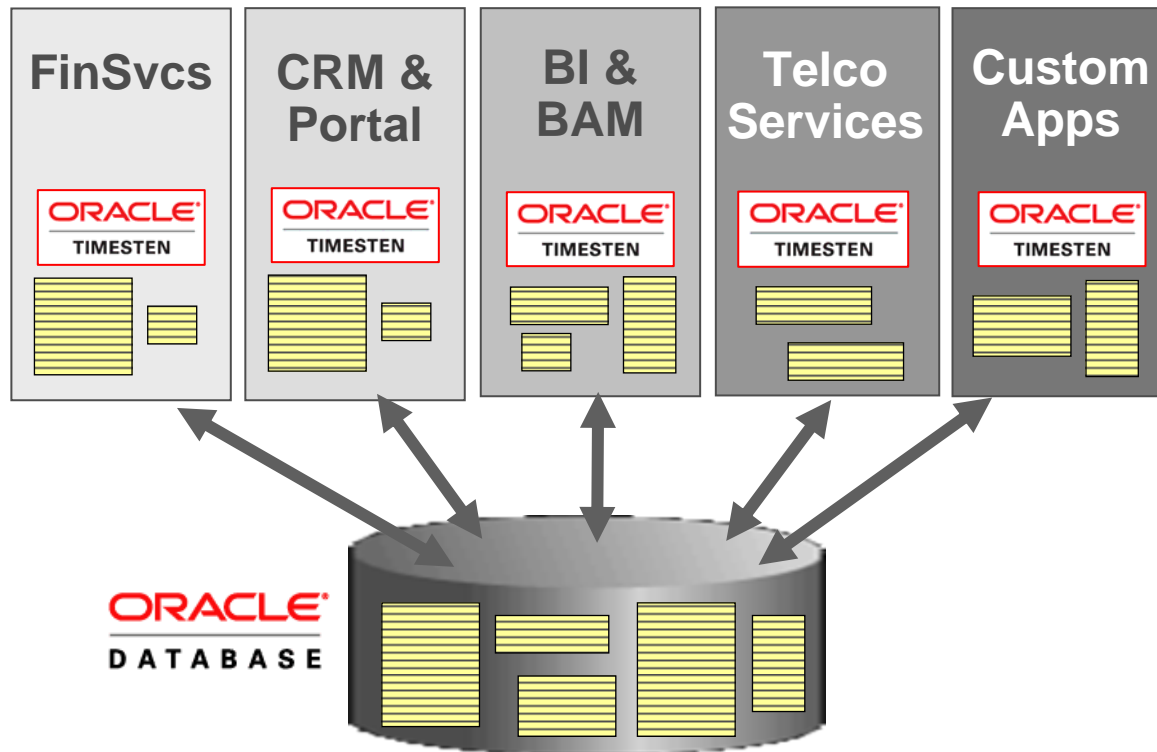
Proven in Real-Time Deployments
Thousands of companies use Oracle TimesTen

Networks	Telecom	Wall Street	Customer-Facing Applications
• *Real-time billing* • *Voice over IP* • *Mobile Networks*	• *Value-added Services* • *Revenue Assurance* • *Network and QOS Management* • *Authentication*	• *Order Matching* • *Risk Management* • *Real-time Analytics*	• *Call Centers* • *Hosted CRM* • *Dynamic personalization*

ERICSSON

CISCO SYSTEMS

NOKIA

Lucent Technologies
Bell Labs Innovations

T··Mobile

Sprint.

amdocs

TIM

BEAR STEARNS

PHLX

JPMorgan

Bombay Stock Exchange Limited
BSE

AVAYA

ASPECT

salesforce.com
ucces.

factiva
Dow Jones & Reuters

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Oracle TimesTen Products

Product	▶	**Oracle TimesTen In-Memory Database**
Option	▶	**Replication: TimesTen to TimesTen**
Option	▶	**Cache Connect to Oracle**

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Oracle TimesTen In-Memory Database
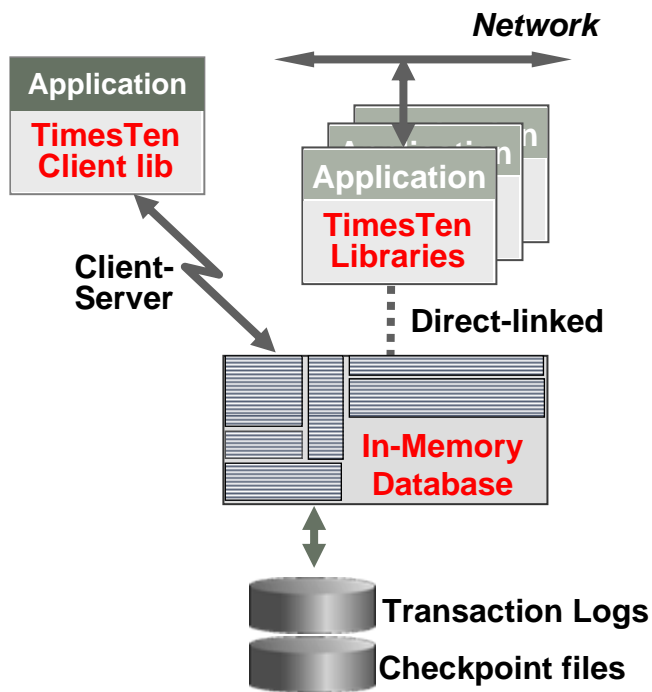
- **In-memory RDBMS**
  - Entire database in memory
 - Standard access ODBC/JDBC, SQL 92
  - Compatible with Oracle Database
- **Exceptional performance**
  - Instantaneous response time
  - High throughput
  - Embeddable
- **Persistence and durability**
  - Database persists to disk
  - Transactions with ACID properties
- **Real-time services**
  - On-line, non-blocking operations
  - Real-time database change notification
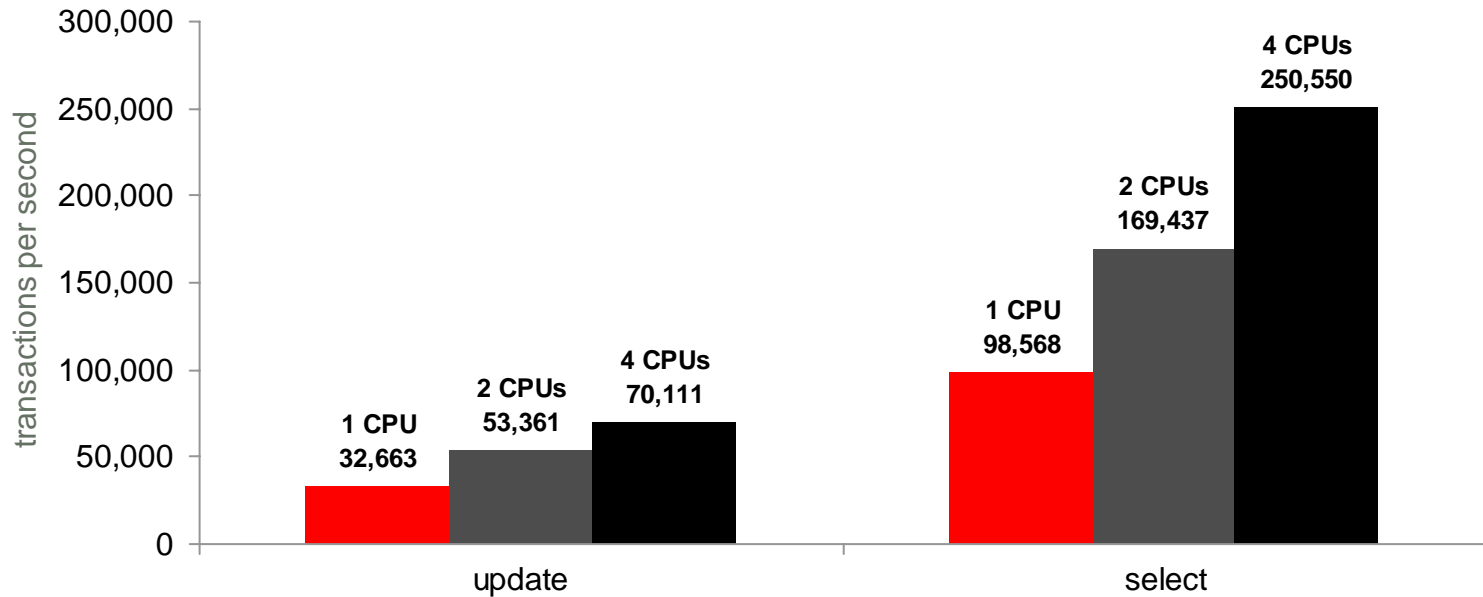- **Near-zero administration**

Lightning Fast Response

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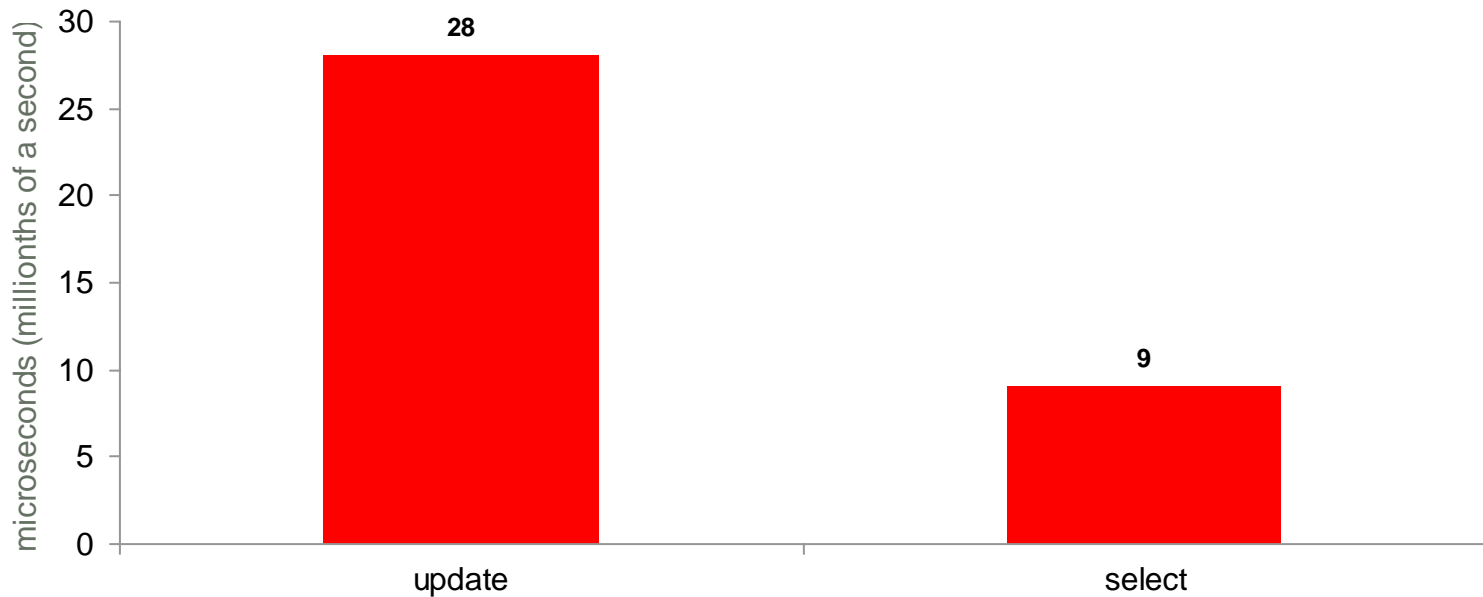
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Outstanding Platform Efficiency

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

Finding a Row of Data in a Traditional Disk-Optimized RDBMS

Application

Determine disk address of desired page

SQL

IPC

Query Processor

Table# Page#

Send buffer to application (via IPC)

Buffer pool

Hash function

Copy row to private buffer

Linked lists into buffers

Data page

Assuming the page is already in memory

Locate page pointer via hashing and linear search

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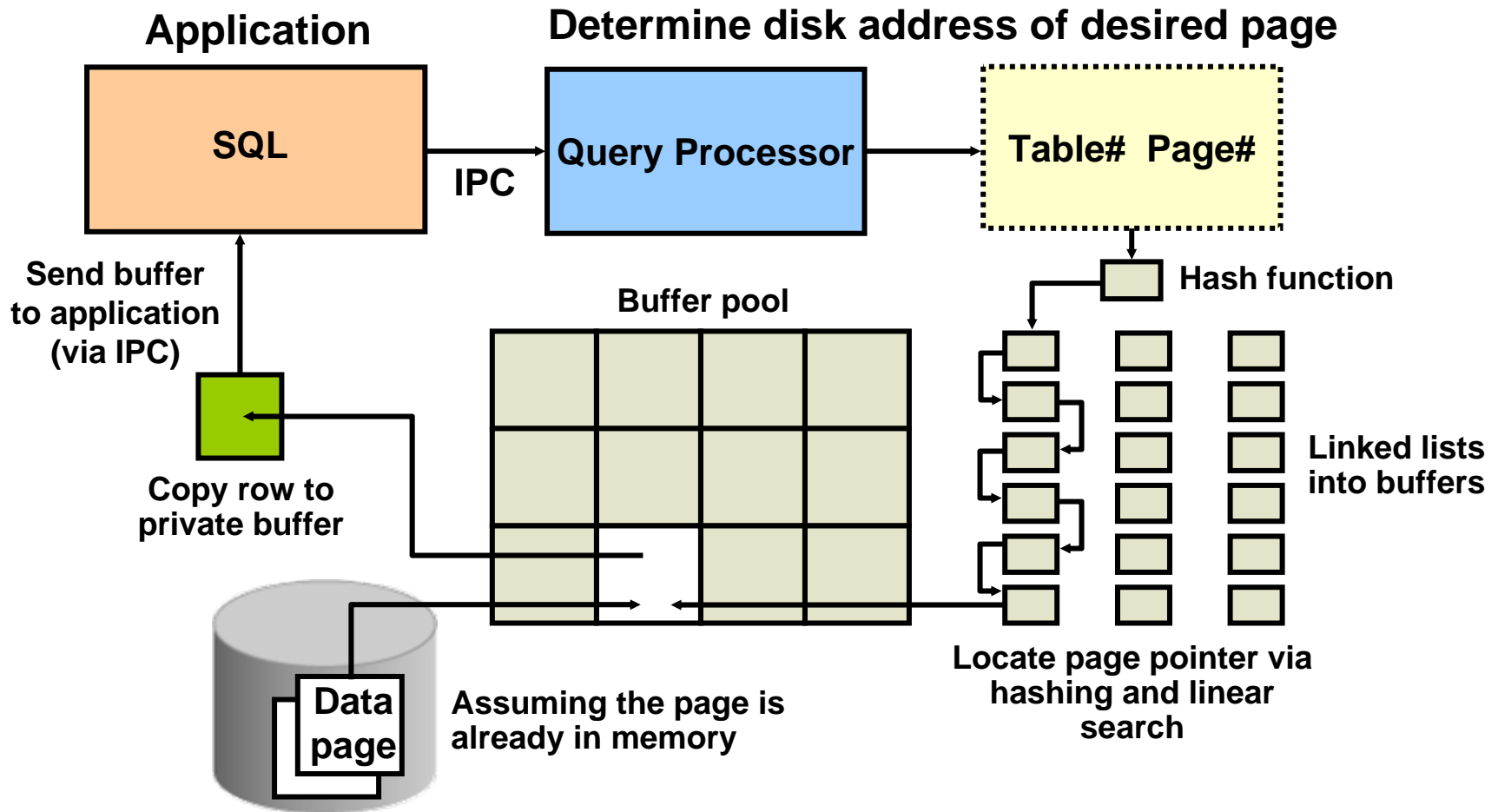
Finding a Row of Data in the TimesTen IMDB

Application

Determine memory address of desired record

SQL → Query Processor → Memory address

Copies data to application buffers

Memory-resident database

Data store

The full database is preloaded from disk to memory

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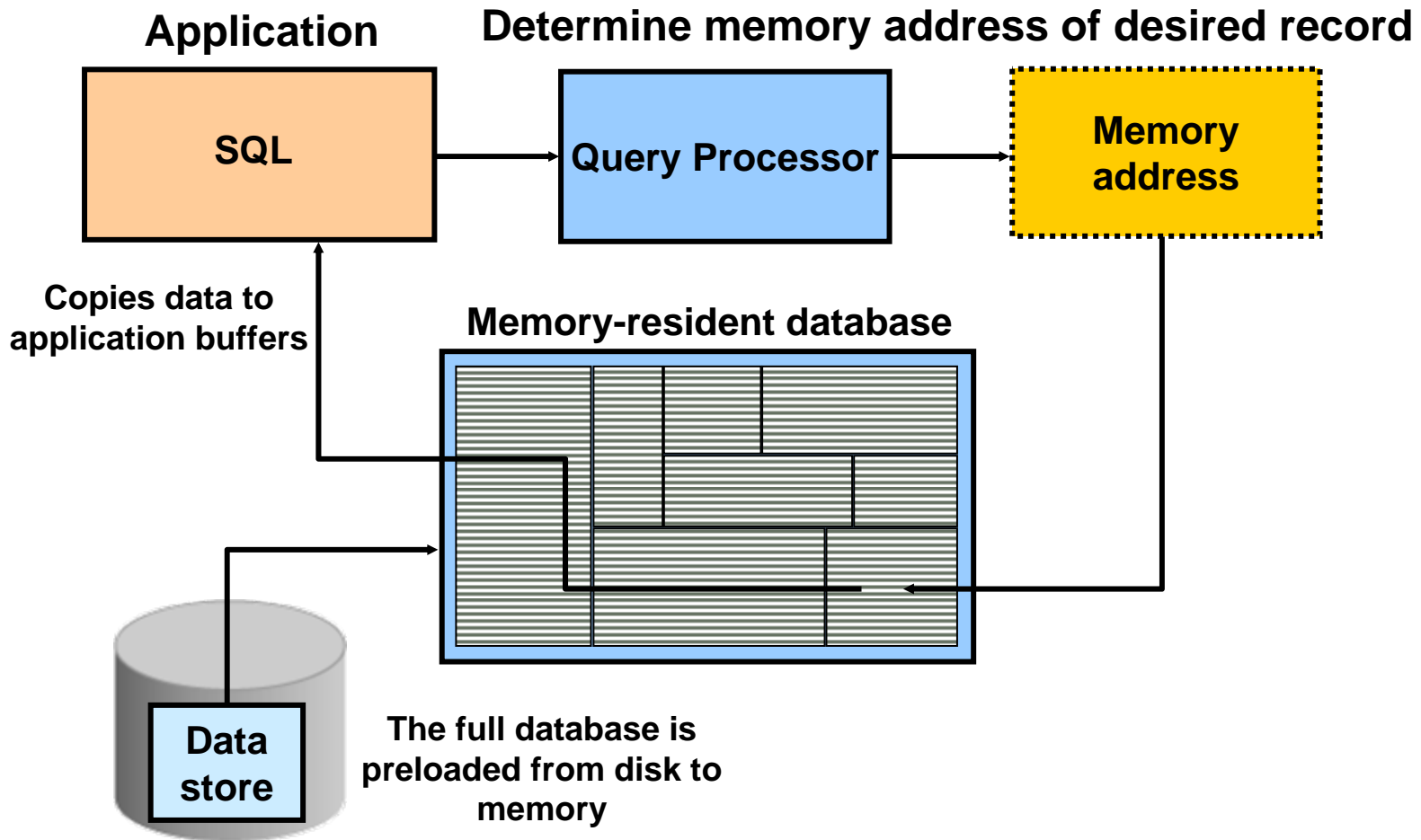
Data Publishing
Transaction Log API (XLA)

Real-time Apps

XLA Apps

XLA interface

Updates

In-Memory Database

Log Memory Buffer

TX Log files
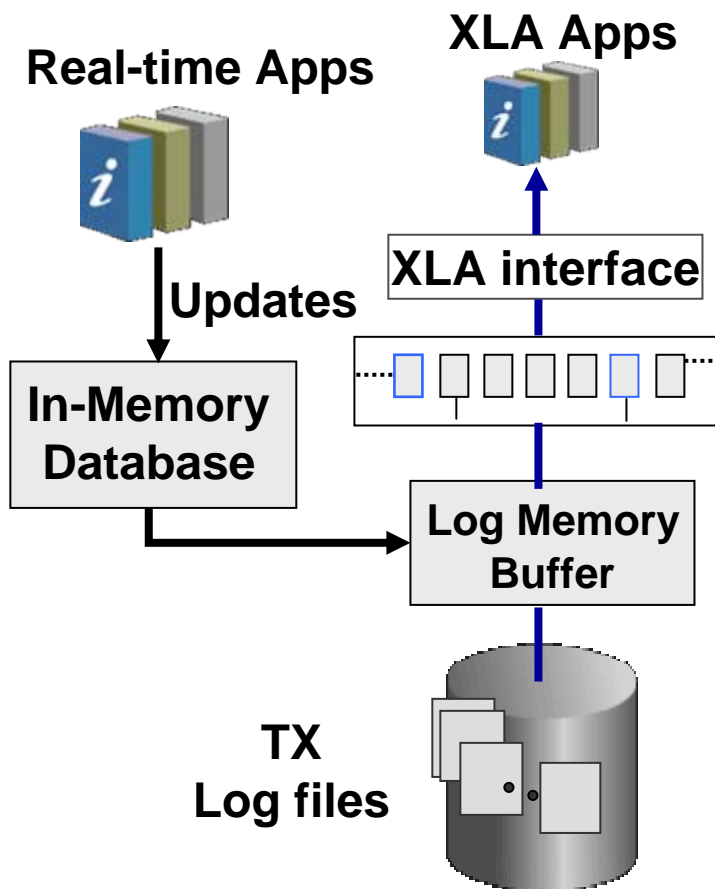
- Transaction Log API (XLA)
  - Track real-time data changes
  - Monitor transaction updates
  - Propagate changes to external applications
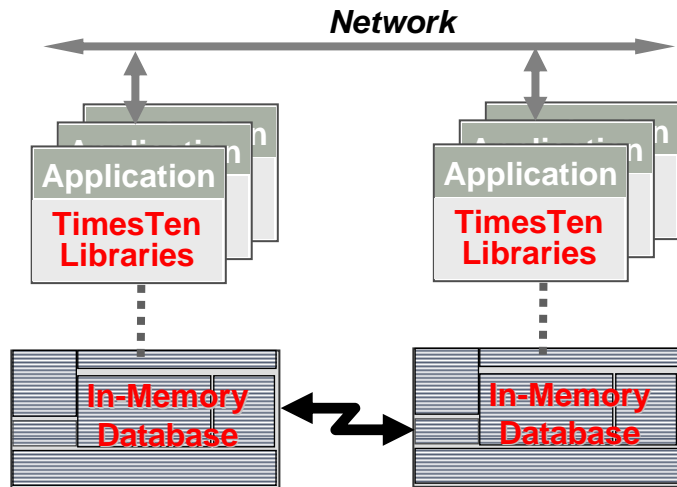 - Implement real-time event notification and processing
- Track changes in Tables and Materialized Views
  - Return only committed records from transaction log
- Maintain log positions via *Bookmarks*

Replication – TimesTen to TimesTen

Network

Application
TimesTen Libraries

Application
TimesTen Libraries

In-Memory Database

In-Memory Database

**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

Active - Standby

Active - Active
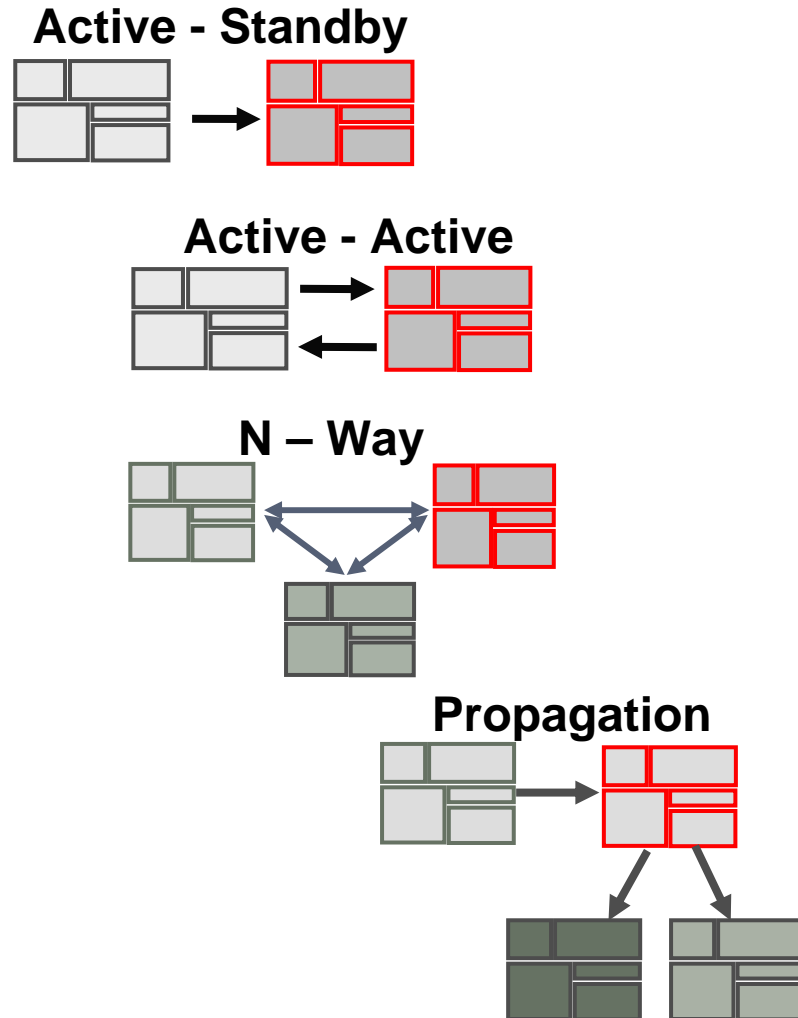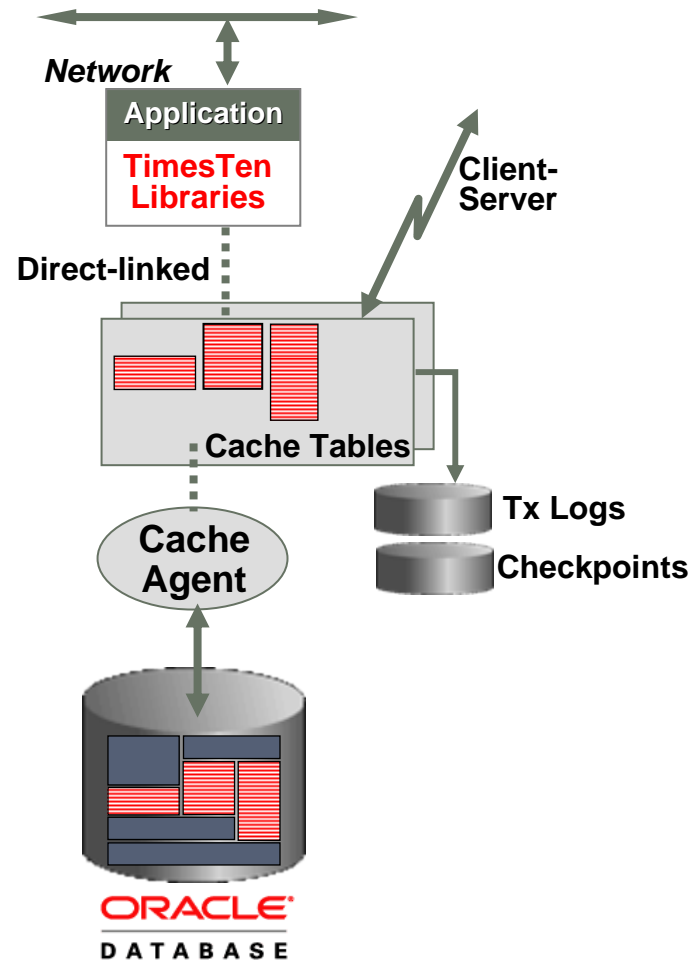
N – Way

Propagation

- 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

Network

Application

TimesTen Libraries

Client-Server

Direct-linked

Cache Tables

Tx Logs

Checkpoints

Cache Agent

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DATABASE

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Cache Connect to Oracle

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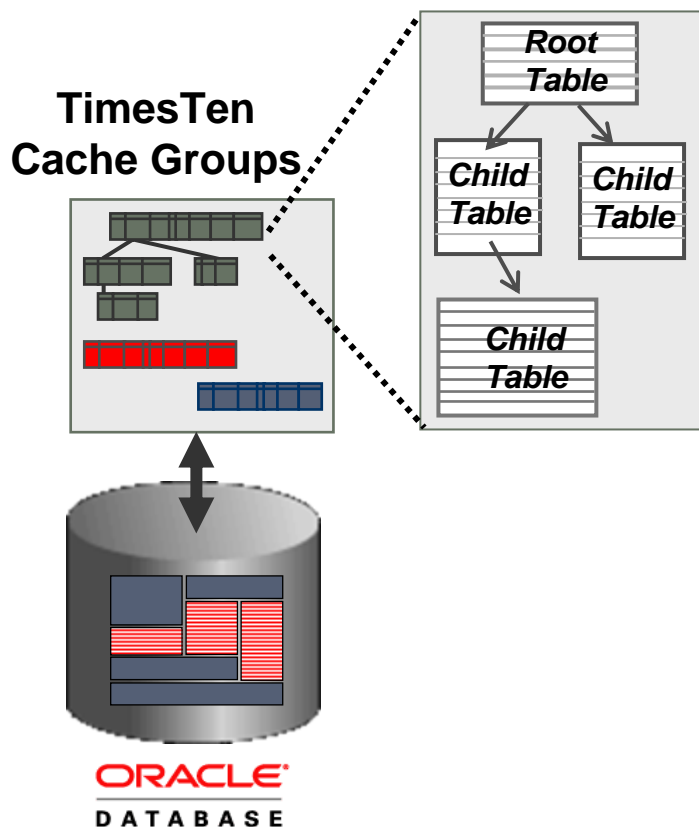
- Synchronous or Asynchronous
- User configured cache groups
  - Individual and related tables
  - All or subset of rows and columns
- Automatic Synchronization
- Automatic Data Aging
  - Time or LRU based
  - Time window-based caching
- Transparent SQL pass-through for non-cached data requests

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

ORACLE APPLICATION SERVER

ORACLE BPEL PROCESS MANAGER

ORACLE TOPLINK

ORACLE JDEVELOPER

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TimesTen 7.0 Supported Platforms

Platform	Processor
HP-UX 11i and 11i v2	PA-RISC (32-bit and 64-bit)
HP-UX 11i v2	IA64 (32-bit and 64-bit)
HP Tru64	64-bit
IBM AIX 5L 5.2 and 5.3	POWER (32-bit and 64-bit)
Microsoft Windows 2000, Windows XP, Windows 2003 Server	X86 (32-bit and 64-bit)
MontaVista Linux CGE 4.0	X86 (32-bit and 64-bit)
Red Hat Enterprise Linux 3 and 4	X86 (32-bit and 64-bit) Itanium2 (64-bit)
Sun Solaris 8, 9, 10	Sparc (32-bit and 64-bit)
Sun Solaris 10	x86 on AMD Opteron (32-bit*/64-bit)
SUSE Linux Enterprise Server 9, 10	X86 (32-bit and 64-bit) Itanium2 (64-bit)

Oracle Database 10*g* and TimesTen
Complementary Database Strengths

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

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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!

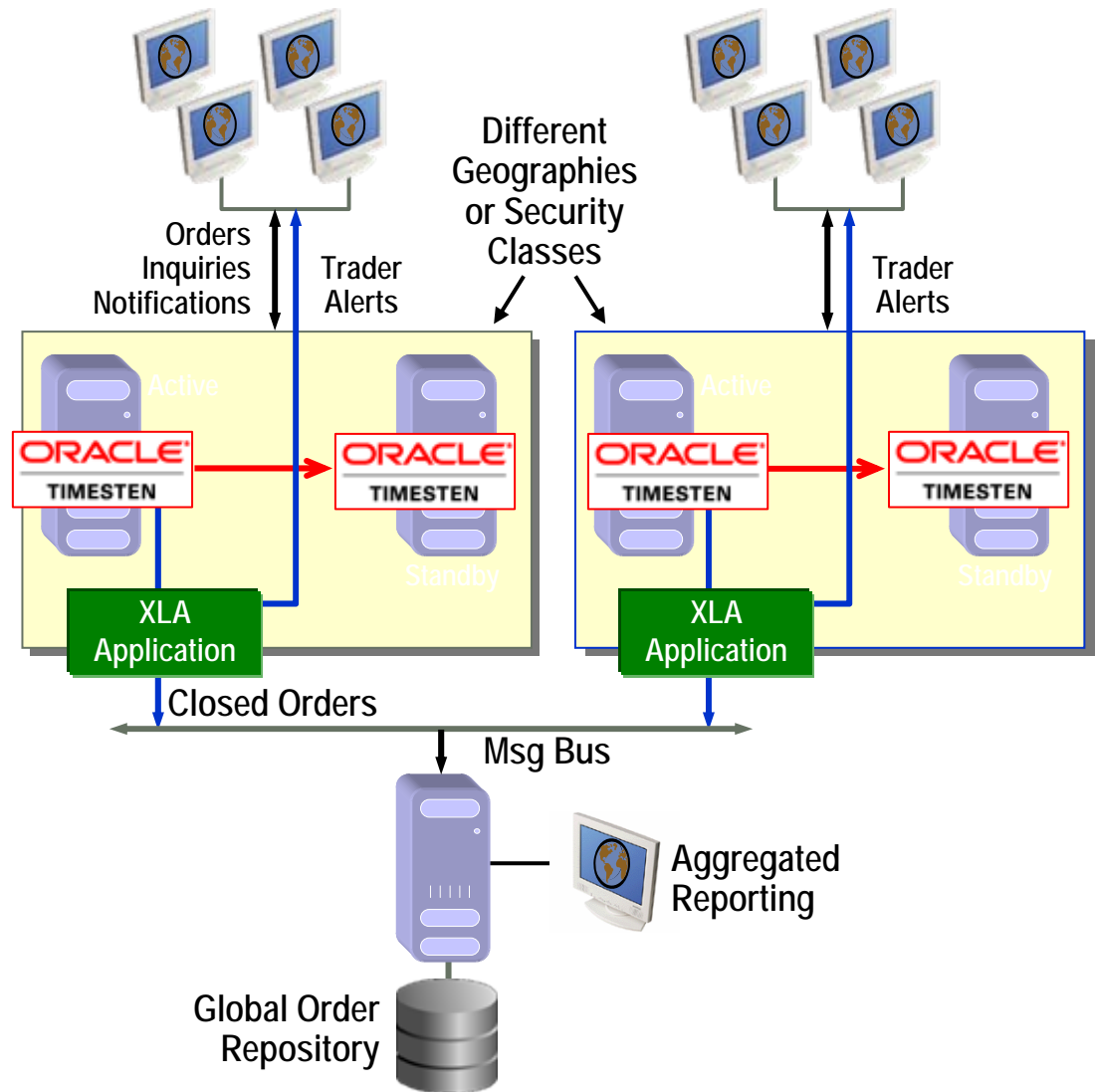**ORACLE**

Oracle TimesTen

Customer Use Cases

Fixed Income Trading System

TimesTen Usage

- Order processing
- Event publishing

TimesTen Values

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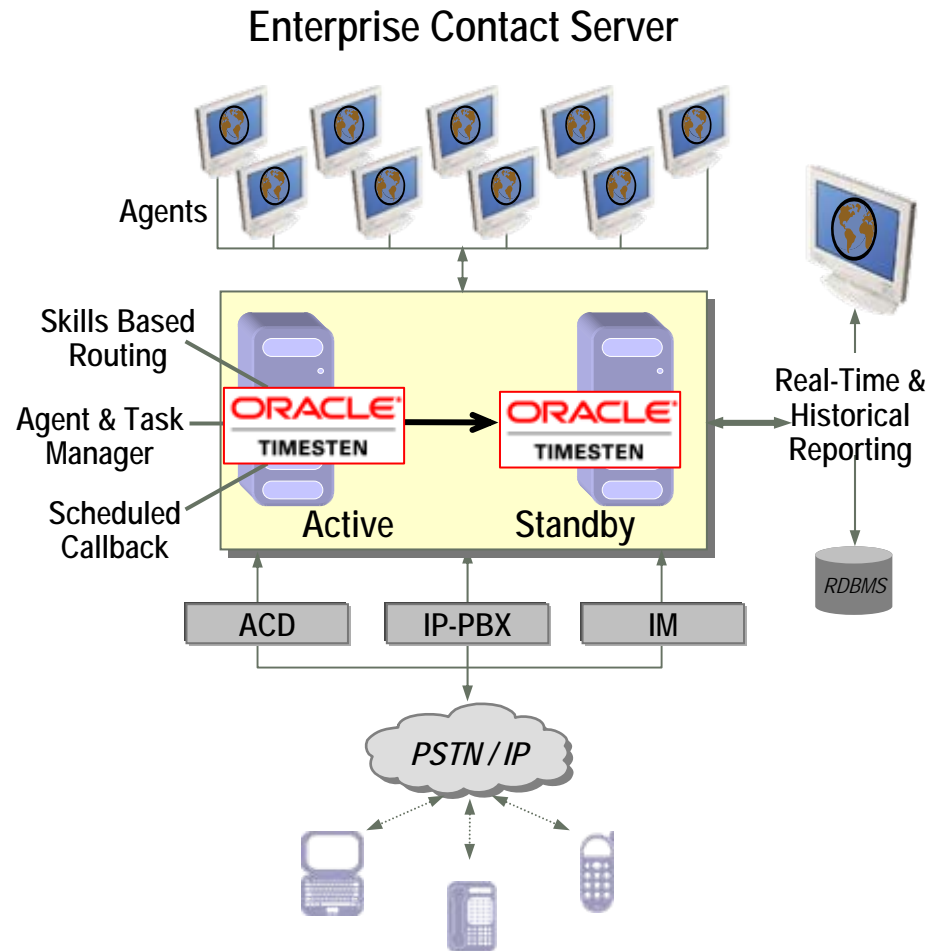
Fast, On-Target Customer Service
Leading Call Center Solution Vendor

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

Enterprise Contact Server

Agents

Skills Based Routing

Agent & Task Manager

Scheduled Callback

ORACLE TIMESTEN → ORACLE TIMESTEN

Active   Standby

Real-Time & Historical Reporting

RDBMS

ACD   IP-PBX   IM

PSTN / IP

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