

Oracle Times Ten In-Memory Database

Everything you wanted to know about In-Memory Databases!



SOARING EAGLE
CONSULTING

Because Performance Matters



Presented by:
Jeff Garbus

About Soaring Eagle

Shameless Marketing Plug!



Since 1997, Soaring Eagle Consulting has been helping enterprise clients improve their overall system performance at the database tier, arguably the most volatile and critical component of distributed application architecture. Our clients range in size from fledgling startups through Fortune 100 companies and leading financial institutions.

Soaring Eagle has been a leader in software development, architecture, performance and tuning databases, while promoting mentoring and training all over the world for over a decade. Many of our employees, and partners have written books, speak at seminars about leading edge technologies. We have expertise in all business tiers, financial; health, manufacturing, government agencies and many ecommerce businesses.

Consulting

- Performance & Tuning
- Data Performance Management
- Emergency Triage
- Performance & Security Audits
- Staff Augmentation
- Project management
- Database architecture
- Scalability assessment and planning

Training

- Onsite/Web based
 - Microsoft
 - Sybase
 - Oracle
 - APM
 - Six Sigma

Managed Services

- Remote Database Management
- Performance management
- Emergency db Service
- Proactive mitigation
- Problem notification
- Problem resolution

Software

- Application Performance Management
- Database performance accelerator
- Database performance management
- Database Security



OverSight^{db}



CONFIO^{SOFTWARE}



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EXPERT Assist

rpmTM | remote
performance
monitoring

Why In-Memory Database

- Predictable microsecond response times
- Some customers must have very fast response times
- High availability – 99.999% up time
- Transactional Replication
- Automated database failover
- Durability and persistence
- Ease of implementation

Market Dynamics

SAP / Sybase: “The future of I.T. is putting data in memory.” – Bill McDermott, SAP CEO, 2010

IBM: Acquired Solid Technologies’ in-memory database, positioning it with DB2

“We have the leading in-memory database in TimesTen.” – Larry Ellison. January 2010



The Real-Time Shift in Communications Business Challenges and Requirements

Longer response time for growing number of concurrent users

- Inability to capture and store growing number of events
- Exponential data volume growth
 - Exceeds available batch processing time
- Expand real-time services while
 - Retaining existing middleware infrastructure
 - Leveraging existing skills to save cost

Why an IMDB is faster than a Conventional DB?

In a conventional RDBMS, client applications communicate with a database server process over some type of IPC connection, which adds substantial performance overhead to all SQL operations.

An application can link an IMDB directly into its address space to eliminate the IPC overhead and streamline query processing. This is accomplished through a *direct connection* to the IMDB.

Client/server connections are also available to applications. From an application's perspective, an IMDB API is identical whether it is a direct connection or a client/server connection.



Oracle Times Ten Overview

Healthcare Equipment
Industrial Systems
Manufacturing Systems
Semiconductor Equipment
Communications Systems

Telecom Billing
IP Multimedia Systems
Core Networking Systems
Telco Softswitches
Call Centers / CRM

Gateways / Routers
Storage & Systems Mgmt
Security / Authentication
Mobile Services Software
Appliances

Mobile Devices
Telematics
Field Force Automation
Point-of-Sale Devices
Distrib Asset Mgmt

ORACLE
DATABASE



ORACLE
TIMESTEN



ORACLE
TIMESTEN

ORACLE
BERKELEY DB



ORACLE
BERKELEY DB



Mobile Applications

Oracle's Embedded Portfolio

FinServ

Defense

Manufacturing

Healthcare

Automotive

Telco/NEMS

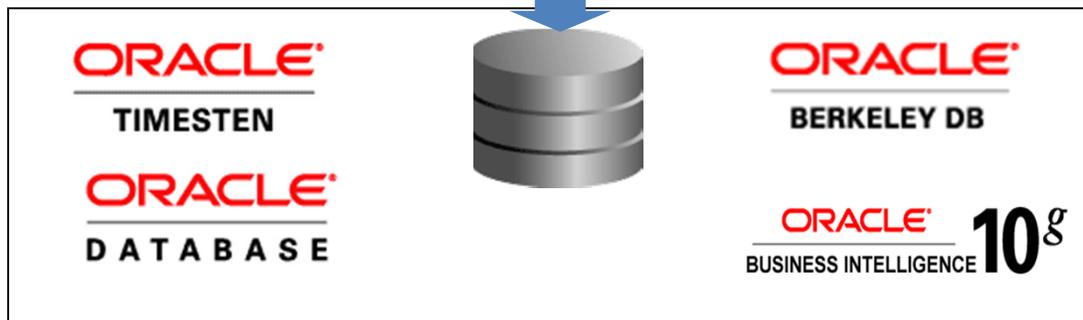
Pervasive

Security

Real-Time Data Mgmt

Telematics

CGF



Integrated



Embeddable



Standards Based



Complete

Which Embeddable Database?

ORACLE
DATABASE

Choose Oracle Database when:

- Advanced features (spatial, triggers, stored procedures) are required
- Clustering via RAC or integration with Fusion Middleware is required
- Footprint is not a constraint

ORACLE
TIMESTEN

Choose Oracle TimesTen In-Memory Database when:

- Low latency and fast response required
- Oracle caching is needed
- SQL is required
- Database fits into memory

ORACLE
BERKELEY DB

Choose Oracle Berkeley DB when:

- Low latency and high throughput required
- Data access is predictable
- XML/XQuery is required
- SQL is required (Now with SQL Lite)

Times Ten Evolution

1998

High Availability
Online Upgrades
Mid-tier Cache for Oracle DB
1st Commercial In-Memory RDBMS

2000

Integration with Oracle RAC

2005

Oracle Database Data Types

2007

OEM & SQLDeveloper

2009

Oracle Call Interface

PL/SQL Support

Oracle Clusterware Integration

2010

Cache Grid for Scale Out

Parallel Grid Search

Parallel Replication

ODP.NET



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In-Memory Database Appliances

In-memory Analytic Server

In-Memory Analytics – Ultra high performance analytic solutions performing calculations and query results much faster than disk-based approaches. Real-time, ad-hoc query capabilities can be extended to high volume transaction industries.

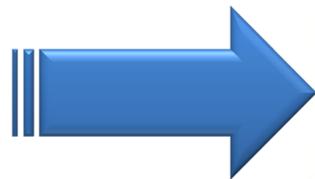
- **Analytics Accelerator** – Add as an extra node to your existing Enterprise Data Warehouse for data mining, advanced analytics or high performance ad-hoc queries
- **Turn-key Analytics** – Direct connect to your OLTP Systems for high performance analytics, ad-hoc queries and drill down dashboards
- **Departmental Data Mart or Enterprise Data Warehouse** – High performance enterprise class platform that allows you to build your own data mart or data warehouse from multiple data sources
- **Information Life Cycle Management** – Archiving and cross analytics for unstructured and multimedia data



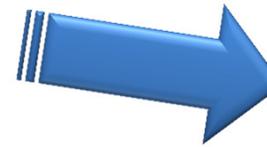
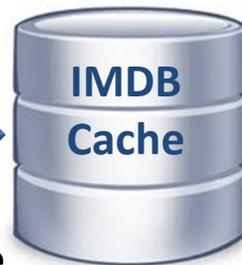
IMDB!



OLTP or OLAP Reports



Near Real Time Replication



Mobilize

Any Device



IMDB!

In-memory Analytic Server

Predictive Models - Predictive analytics can help you optimize existing processes, better understand customer behavior, identify unexpected opportunities, and anticipate problems before they happen. Some examples include:

- Equity Analysis - Correlation analysis of equity returns in an index or portfolio
- construction of portfolio with higher Sharpe ratio
- Fixed Income Analysis - Calculation of implied default probability – identify opportunistic trading of credit risk premium based on historical trends
- Risk Management - Mark-to-future and sensitivity analysis around time, asset prices, risk free rates
- Consumer Banking - What-if Analysis of new strategies for active portfolio management



IMDB!

In-memory Analytic Server

Web Data Analytics -

To be competitive and informed, you need to know what's happening now, live from millions of websites. Extract key data from thousands of websites using our precision ETL technology.



Competitive Intelligence



News and Content Integration



Human Capital Intelligence



Financial Intelligence



Compliance



Risk Management

Advanced, Scalable, Precise Data Extraction



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Data Consolidation Server

Standardize to Reduce Costs – Data Consolidation Server leverages our Oracle, SQL Server, Sybase, and DB2 expertise with standard toolsets, custom scripts, and programs to address your modernization and migration needs.

Our Modernization Services use migration best practices, methodologies, tools, knowledge repository, and infrastructure. Our modernization team will work with you to determine your short and long term modernization strategies and know how to look for the right business and technology drivers in your organization.

Our expert consultants assess the legacy database environment, determine the level of effort required, and provide an optimized migration approach and timeline.

Understand the future of legacy modernization based upon industry trends such as Extreme Transaction Processing (XTP), Grid computing, Cloud computing, etc.



Data Consolidation Server

OLTP Applications

- Triggers
- Alerts
- Stored Procedures
- Customized Libraries



Legacy
RDBMS

In-memory Database & DW Specialized Data Store

- Triggers
- Alerts
- Stored Procedures
- Customized Libraries



Data
Consolidation
Server

Reports/OLAP Applications

- Triggers
- Alerts
- Stored Procedures
- Customized Libraries



Legacy Data
Warehouse



Server Migrations

- Management Console
- Monitoring & Alerting
- 7*24 Database and Systems Production Support
- HA (Replication)
- Mobile Device Deployment

Performance Manager

The Performance Manager has a single monitoring system for **Oracle, SQL Server, DB2 and Sybase**. Performance Manager has demonstrated ROI in excess of 800% or more. When compared with alternatives for solving application performance problems, Performance Manager **proves to be the lowest cost solution**.

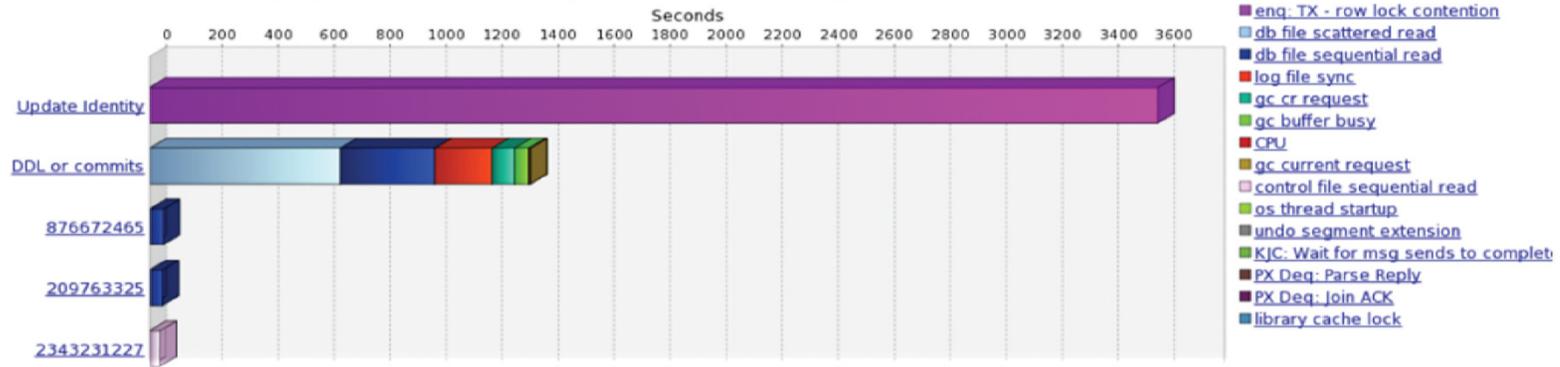
- **Performance Intelligence** – Applies Business Intelligence analysis techniques to IT performance management
- **Wait-Time Analysis** – Identifies most important bottlenecks based on their service level impact
- **Agentless Operation** – Less than 1% load on production databases
- **30 Minutes to Results** – Fast to install, easy to use, & fast to find problems



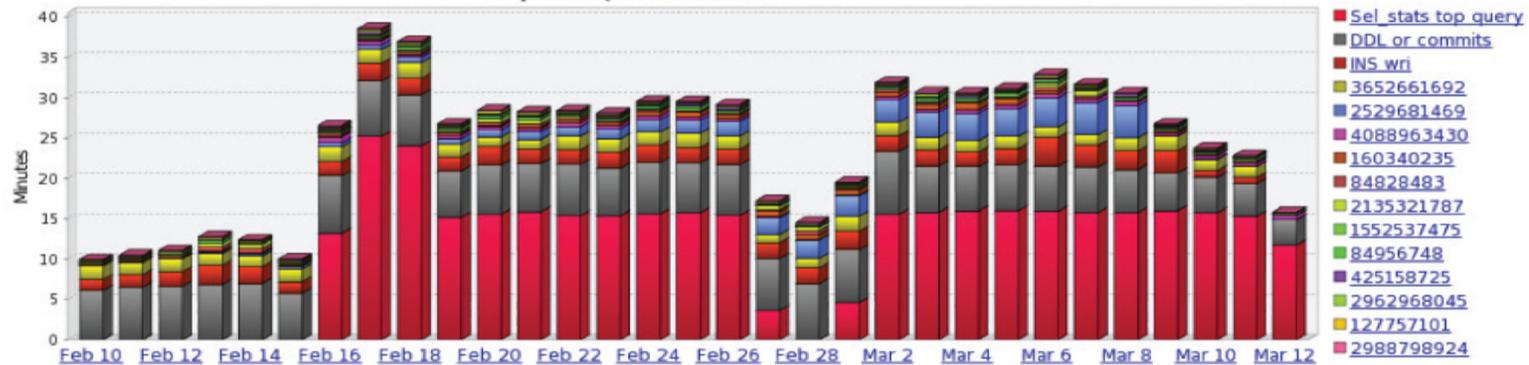
Performance Manager

Top SQL Statements | RAC1_LINUX

November 22, 2009 - 10:00AM to 11:00AM



Top 15 SQL Statements



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General Usage for TimesTen

- The **Primary Database** for real-time applications. In this case all data needed by the application(s) resides in TimesTen.
- A **Real-time Data Manager** for specific tasks in an overall workflow in collaboration with disk-based RDBMSs. For example, a phone billing application may capture and store recent call records in TimesTen while storing information about customers, their billing addresses, credit information, and so on in a disk-based RDBMS. It may also age and keep archives of all call records in the disk-based database. Thus, the information that requires real-time access is stored in TimesTen while the information needed for longer-term analysis, auditing, and archival is stored in the disk based RDBMS.

General Usage for TimesTen

- A **Data Utility** for accelerating performance-critical points in an architecture. For example, providing persistence and transactional capabilities to a message queuing system might be achieved by using TimesTen as the repository for the messages.
- A **Data Integration Point** for multiple data sources on top of which new applications can be built. For example, an organization may have large amounts of information stored in several data sources, but only subsets of this information may be relevant to running its daily business. A suitable architecture would be to pull the relevant information from the different data sources into one TimesTen operational data store to provide a central repository for the data of immediate interest to the applications.

General Usage for TimesTen

Industry Segments

- Communications
- Financial Services
- Retail websites
- “High Technology”
- Media and entertainment
- Transportation
- Public Sector

Application Types

- Real-time billing
- Algorithmic trading
- Personalization
- Fraud detection
- Order matching
- Provisioning
- Authentication
- Authorization
- CRM

General Usage for TimesTen

Fast, Predictable Response Time for Real-Time OLTP

- Predictable response time, even with heavy trading volume
- Must complete many SQL transactions per trade to ensure compliance
- Faster response time than even a fully cached Oracle Database

Capacity, Throughput, and fast Data Warehousing

- Massive data capacity
- Massive transaction throughput
- Fast historical queries on very large data sets
- Flexible scaling – add nodes and/or machines as future needs grow



IMDB Architectural Overview

TimesTen In-Memory Database Enabling the Real-Time World

Authorization,
Online Charging,
Location-Based
Services



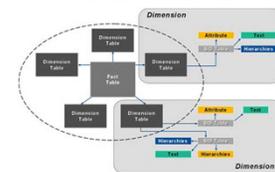
eCommerce,
Personalization,
Real-Time Ad
Serving



Market Data,
Market Events,
Order Matching,
Trading



Real-Time
Data Mart



Real-Time Applications
Instantly Responsive / Highly Scalable / Always-On

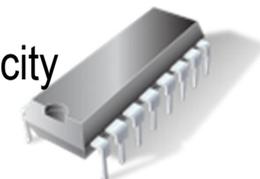
Mainstream 64-bit
Processors



Fast
Networks



Large Capacity
RAM



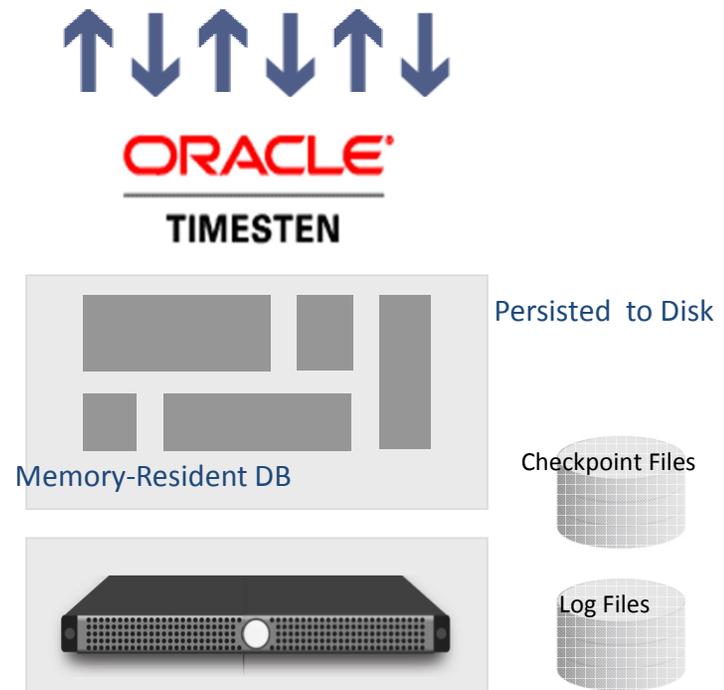
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Key Enabling Technology

Oracle TimesTen In-Memory Database

Memory-Optimized Relational Database

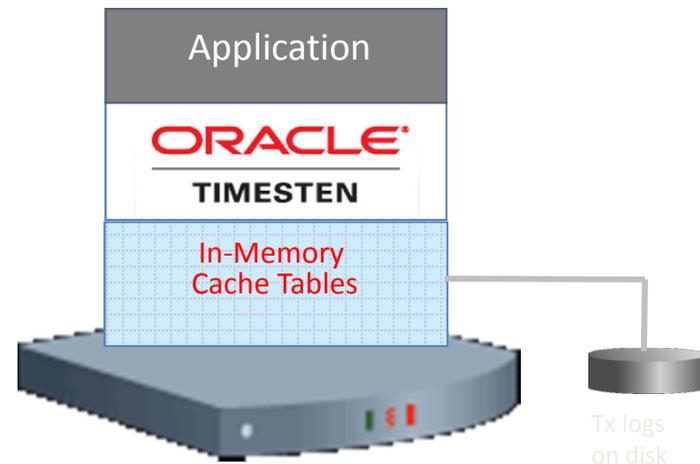
- In-memory RDBMS
 - Fully Relational data model
 - Entire database in memory
 - Optimized memory layout and algorithms
- Exceptional performance
 - Instantaneous response time
 - High throughput
- Persistent and durable
 - Transactions persisted to disk
 - Synchronous and Asynchronous
- Standard SQL and PL/SQL with
 - JDBC, ODBC, OCI, Pro*C
 - Data types compatible with Oracle Database
- Designed for Embedded Applications



Achieving Microsecond Response Times

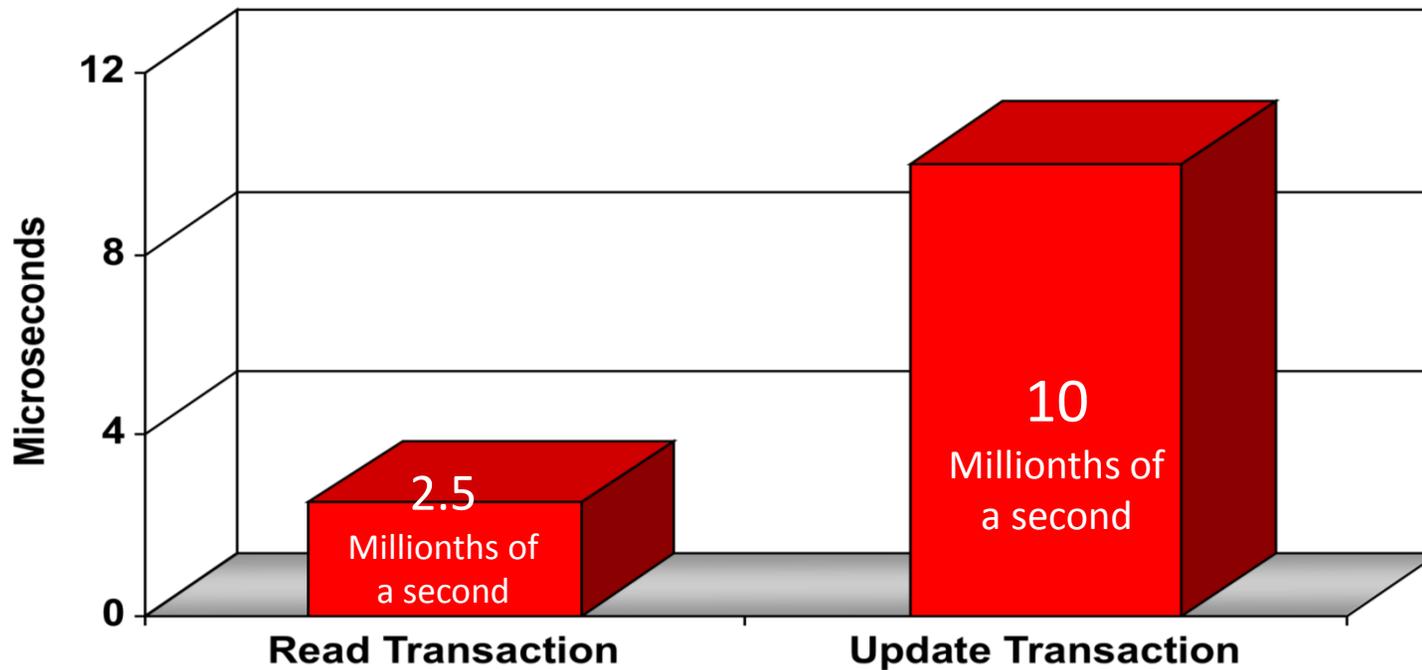
Database Engine Resides on Middle-Tier, Linked into Application

- Eliminates Network latency
- Eliminates inter-process latency
- Optimized for RAM
- Much shorter code path to data



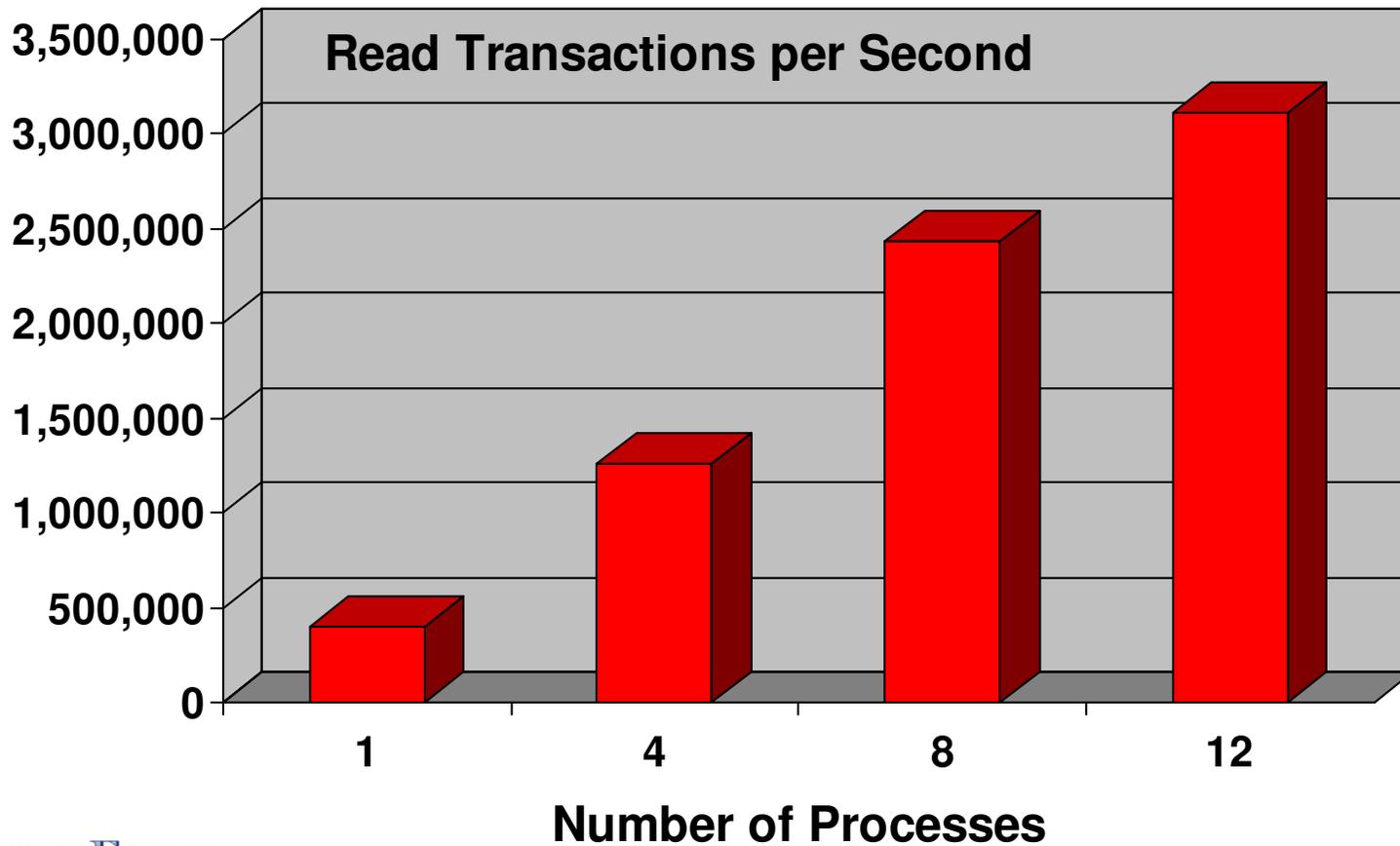
Lightning Fast Response Times

**Average Response Time
TimesTen In-Memory Database**



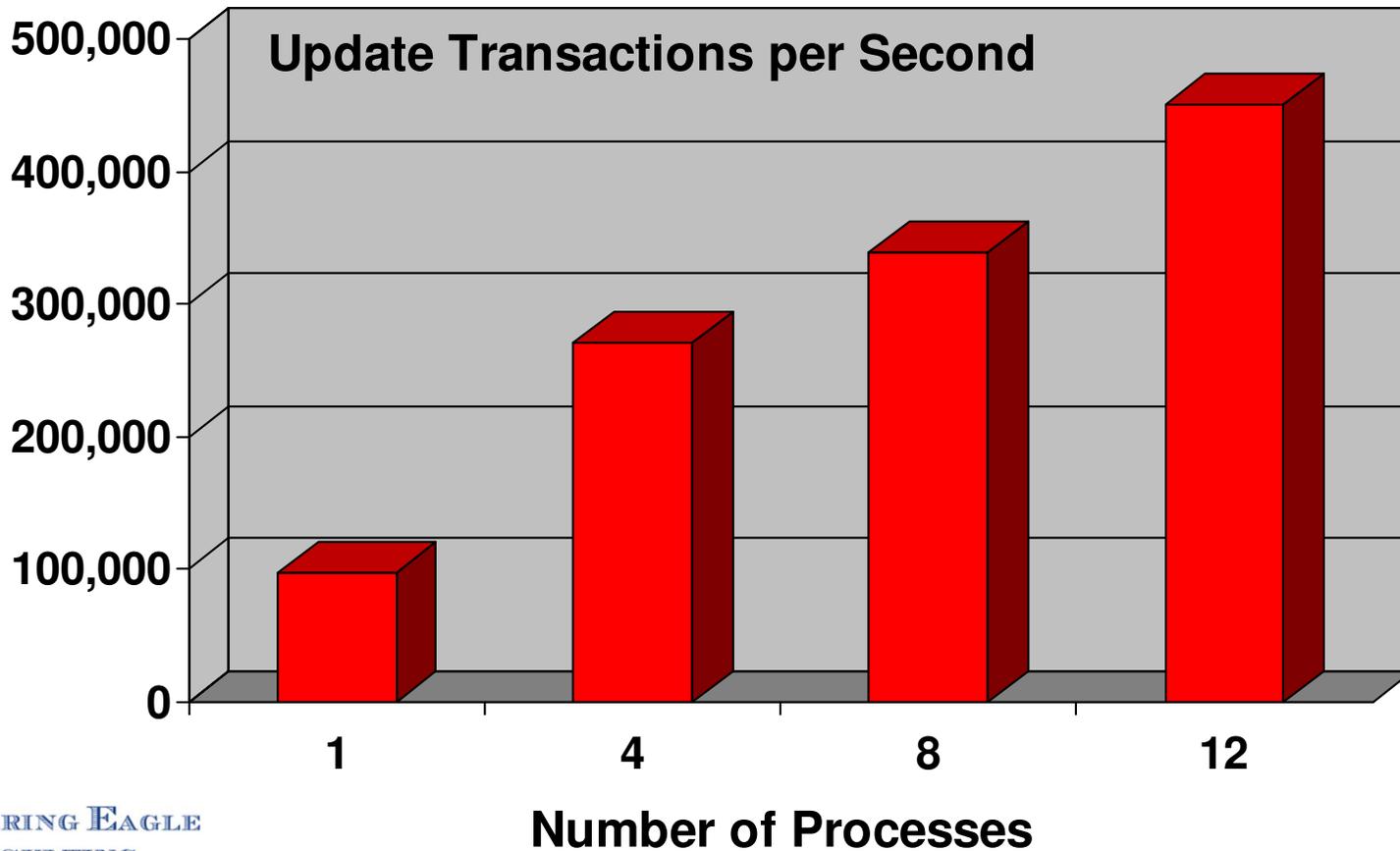
TimesTen 11g – Read Throughput Scaling

Scale Up on Multi-Processor/Multi Core Hardware



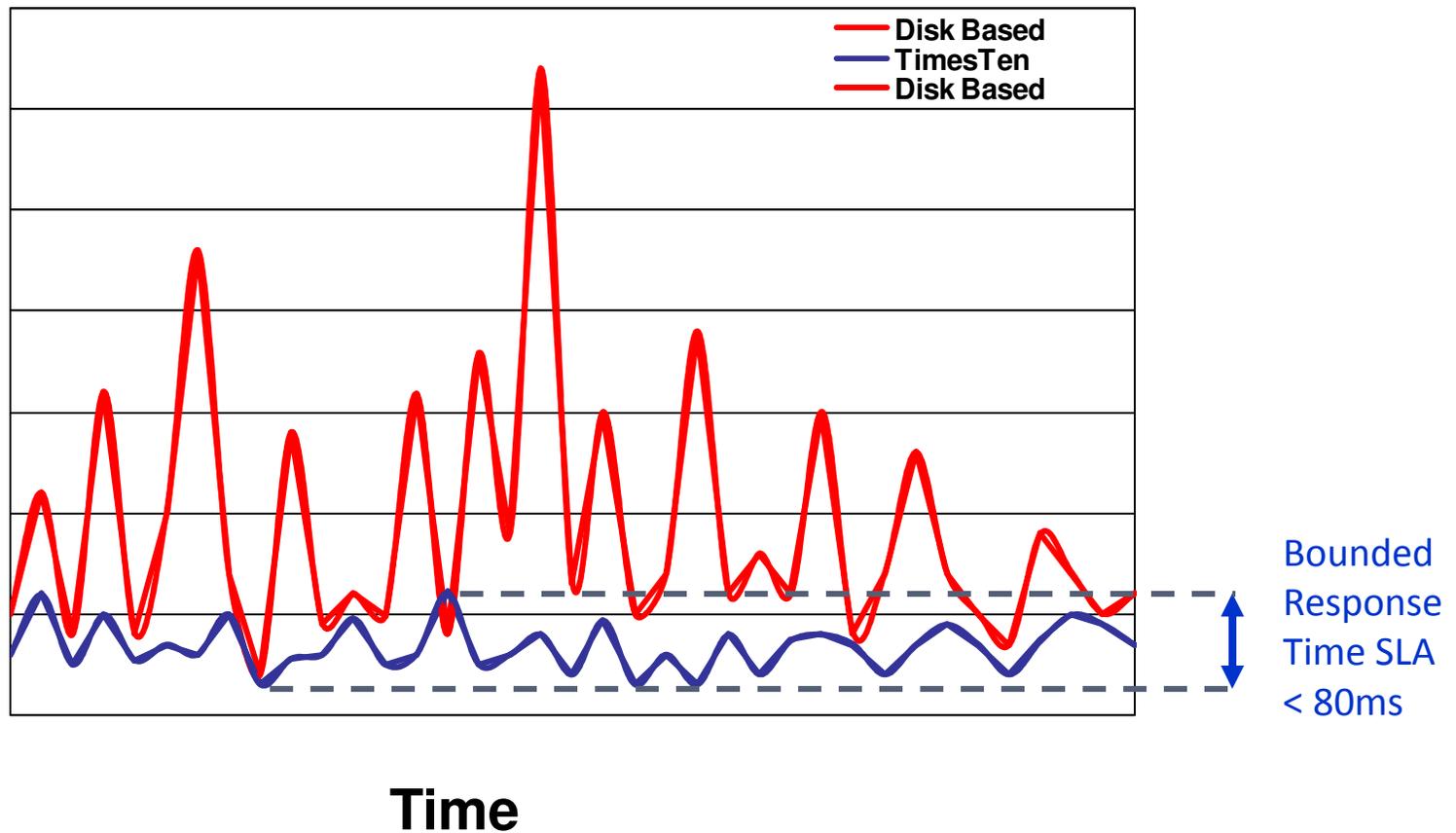
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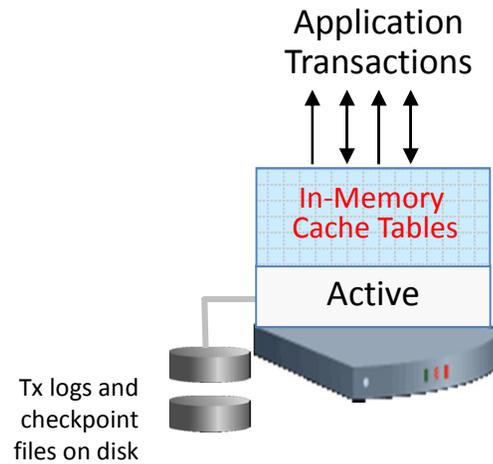
Deutsche Börse – Xentric Order Application

Achieves Predictable Response Time for SLA



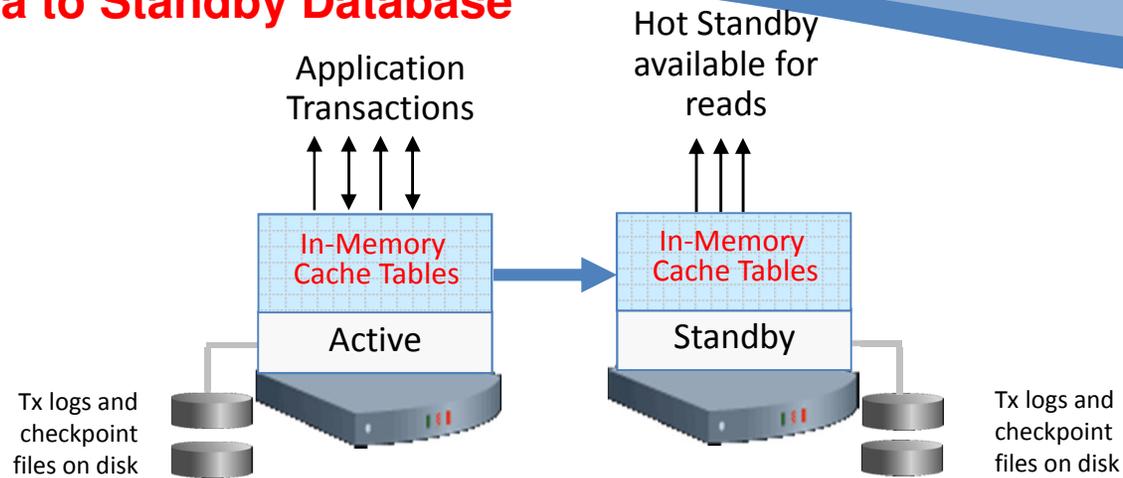
High Availability

Persist Data to Disk



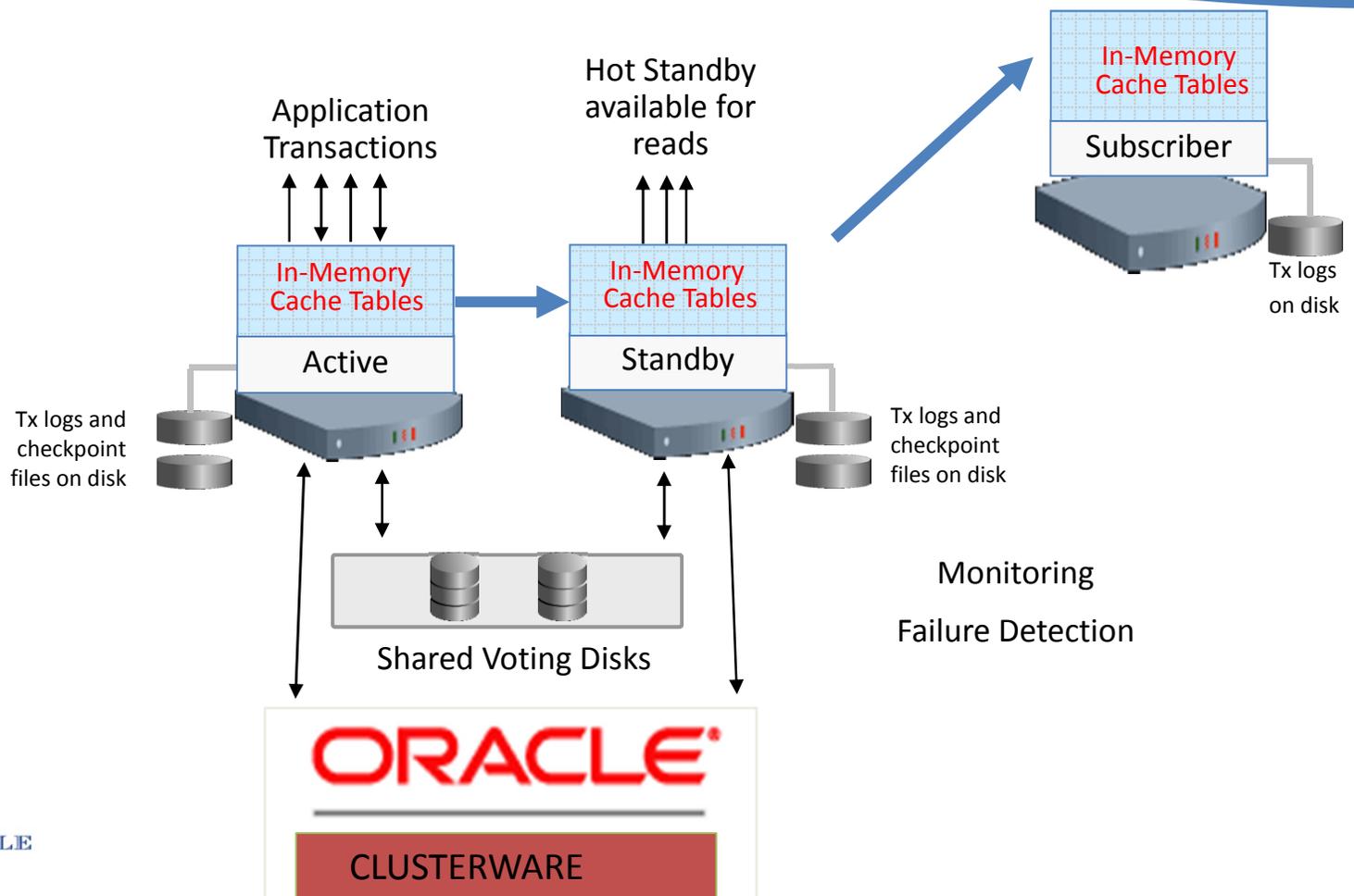
High Availability

Replicate data to Standby Database

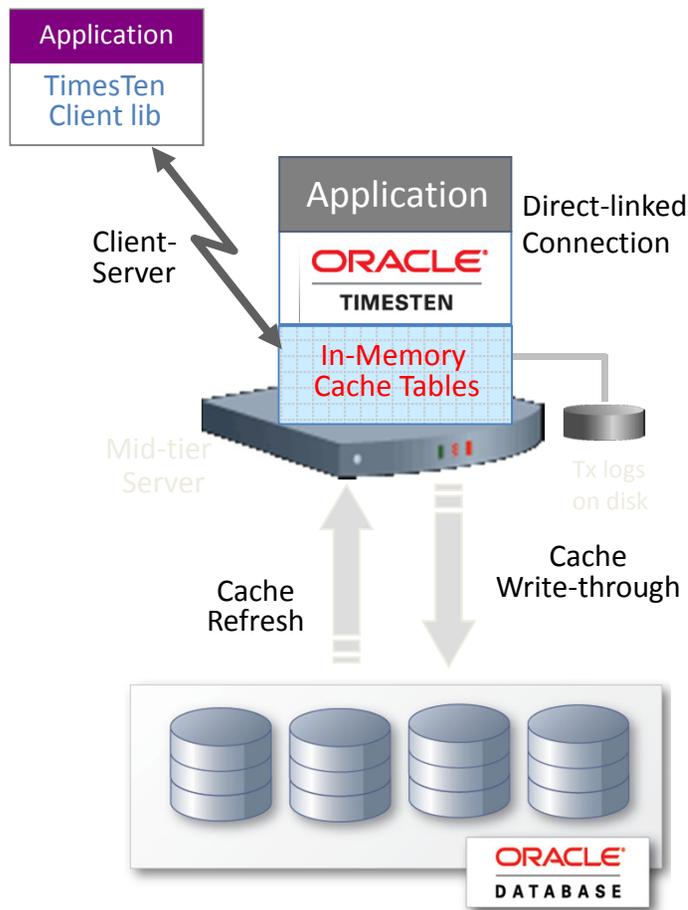


High Availability

Automatic Failover



IMDB Cache

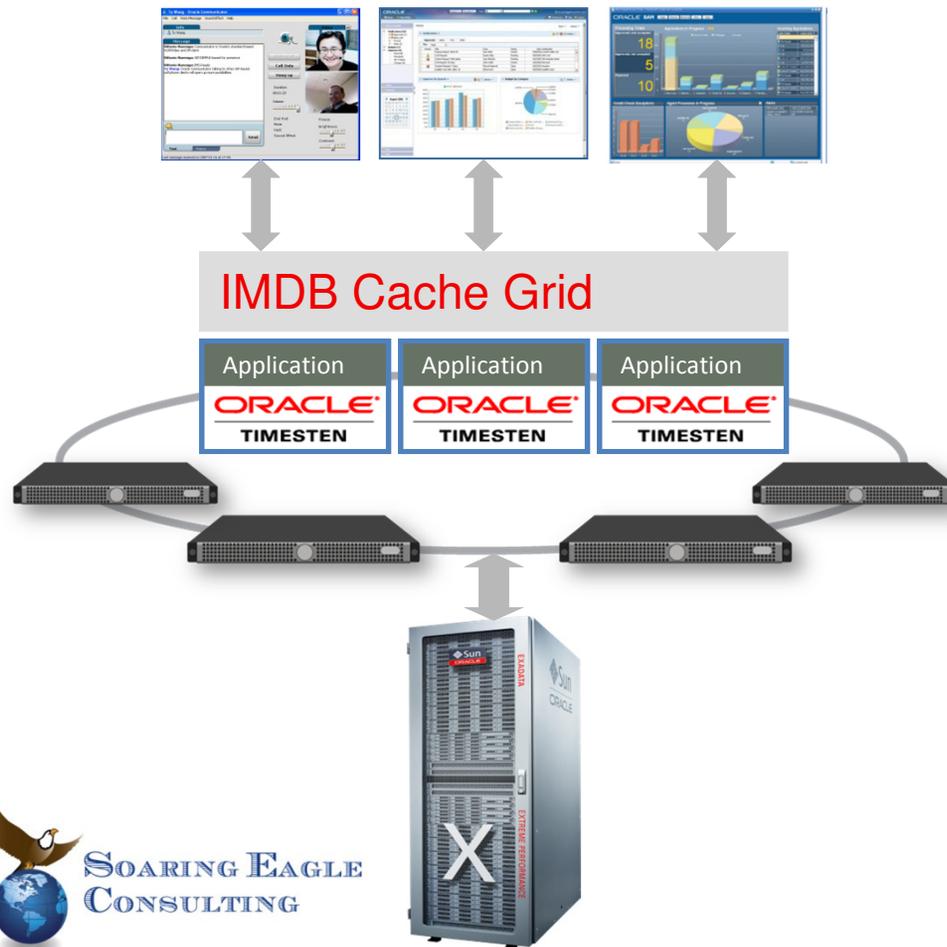


- Flexible Caching
- Automatic Synchronization
- Update and Read-only
- Grid Scaleout Feature

IMDB Cache

Accelerates Oracle Database Applications

Financial / Telco Services, Web Portal, CRM

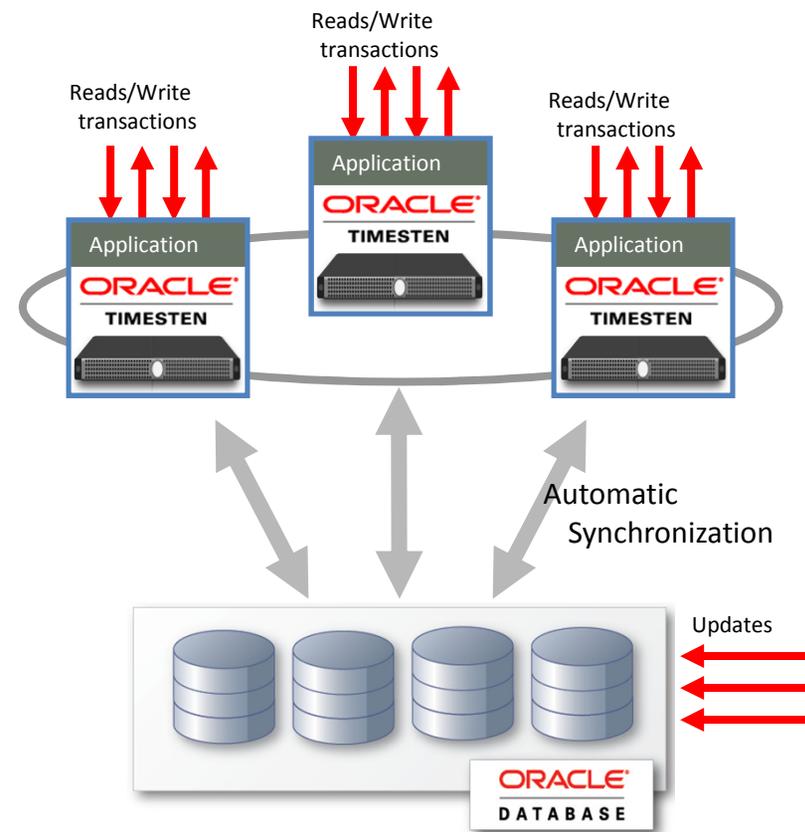


- Runs in the middle-tier
- Caches subset of Oracle DB
- Full featured in-memory RDBMS with standard SQL and PL/SQL
- Accelerates applications with micro-second response time
- Scale up on SMP
- Scale out on commodity hardware
- Read/write caching
- Cached data pre-loaded or loaded on demand
- Automatic synchronization with Oracle DB
- Built-in high availability

Globally Shared Caches

Horizontal Scaling on Commodity Hardware

- Location transparency
 - Content of *all* cache nodes available at *each* node
- On-demand loading of cached data
- Usage-driven, adaptive redistribution of cached data for optimal performance
- Distributed parallel searches
- Transactional consistency
- Peer-to-peer communication
- Automatic data synchronization with Oracle Database

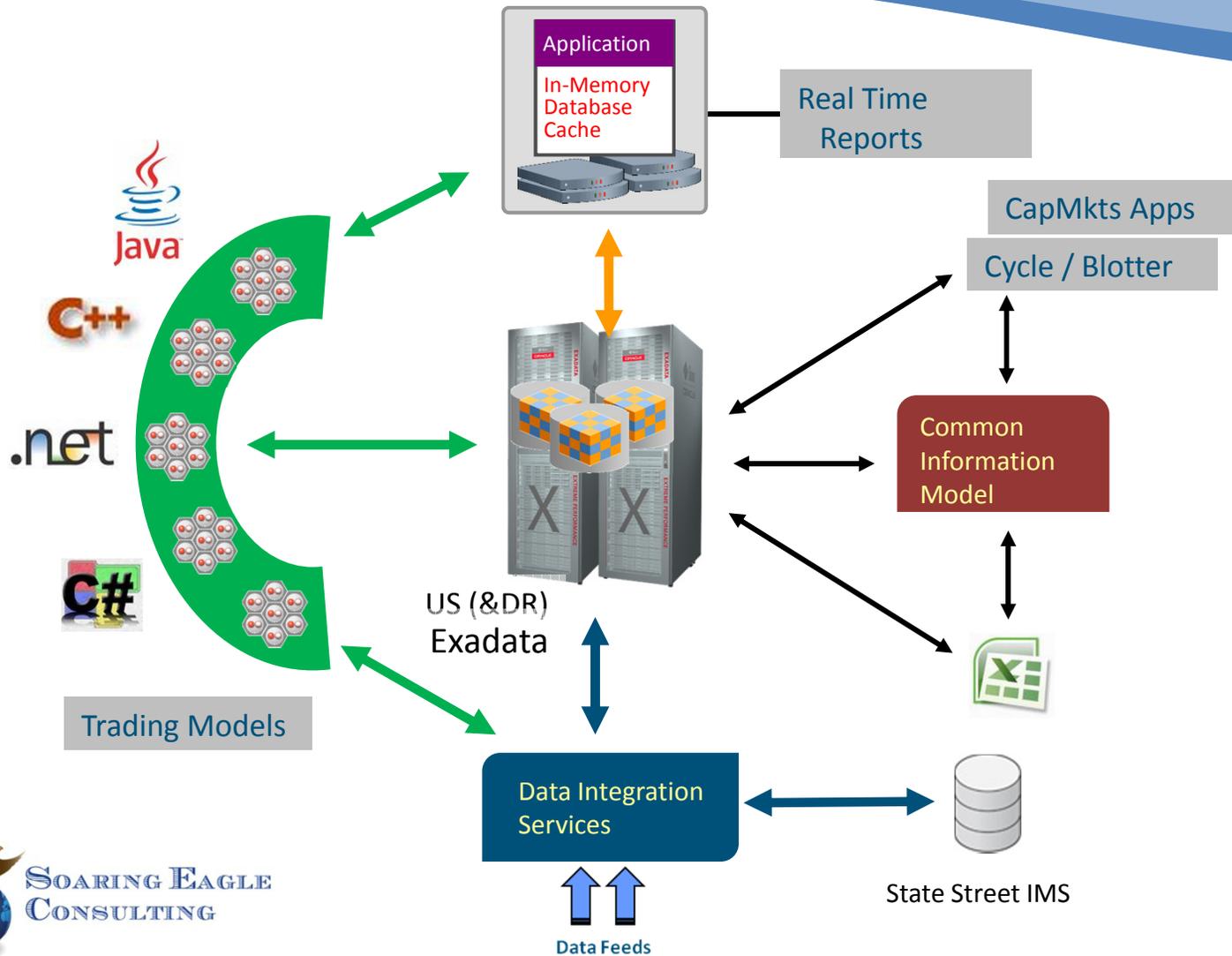


Proven Deployments

上海市电信有限公司
Shanghai Telecom Co.,ltd



Large Financial Services Firm: Global Information Platform



NYFIX: Real-Time Trading Application

Capable of

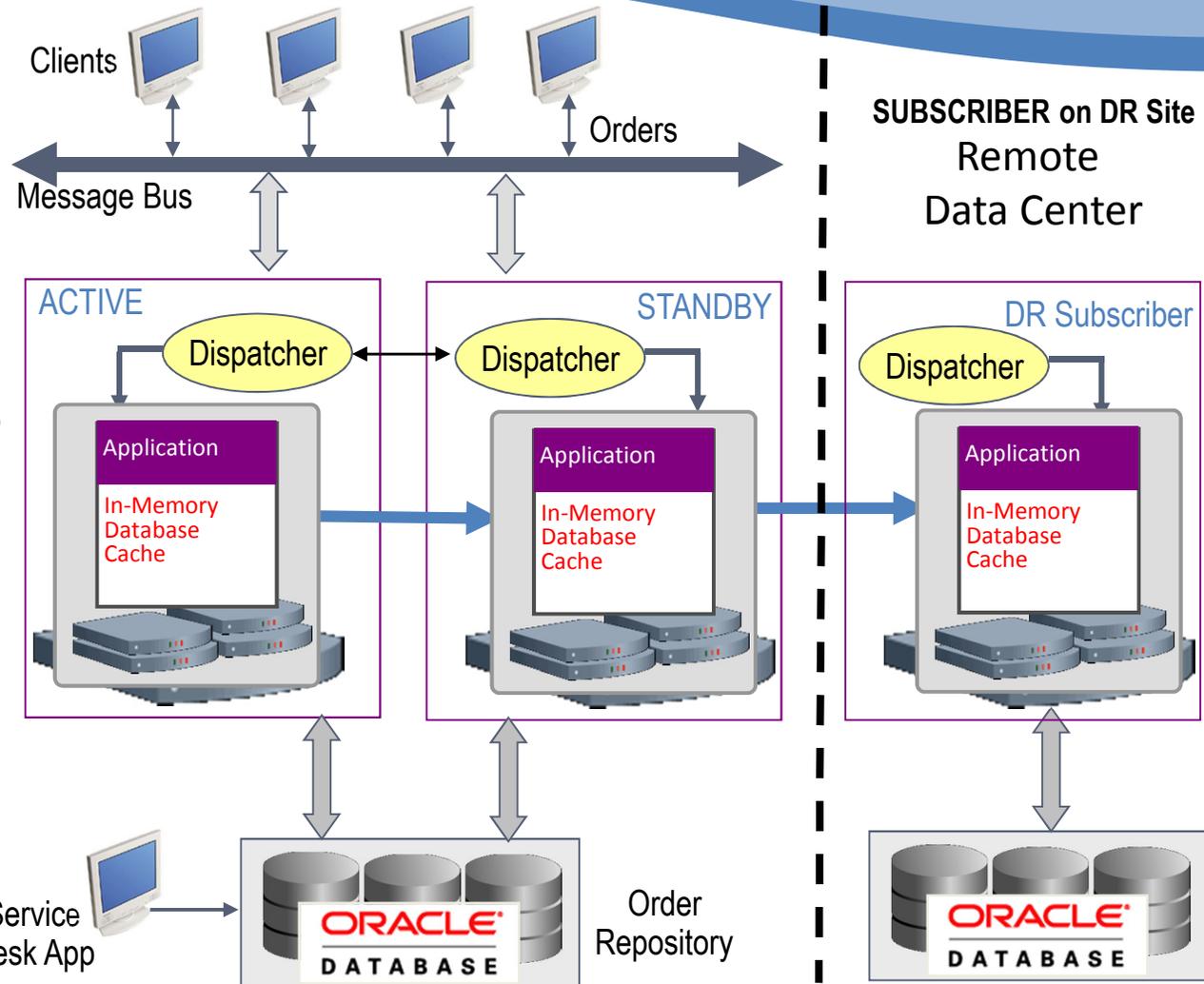
3000 TPS

No transaction loss

Guaranteed

Commodity

Hardware



Summary

Top Reasons Customers Select TimesTen

- Predictable Microsecond Response Times**
- High Availability Features**
- Caching Capabilities**

Thank You!

Let's take a few questions

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Contact Ray Rannala to register for your Free *Express Tune-up!*
ray@soaringeagle.biz – 941-981-3913

