Oracle In-Memory Data Processing

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Doug Hood @ScalableDBDoug Consulting Member of Technical Staff Product Manager for Oracle TimesTen, Oracle InMemory and Oracle NoSQL Dec 12, 2018

Oracle Database In-Memory Enabling Real-Time Analytics

Andy Rivenes
Database In-Memory Product Management
Oracle Corporation

Email: <u>andy.rivenes@oracle.com</u> Twitter: @TheInMemoryGuy Blog: blogs.oracle.com/in-memory





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What are Oracle's In-Memory Databases





In-Memory Database Technology Across Tiers

In-Memory Row Store



TimesTen In-Memory Database

- Embeddable In-Memory Database for Application Tier
- Primary Use case: Latency-critical custom OLTP
 Microsecond Response Time
- Standalone Database or as Application-Tier Cache for Oracle Database

Oracle Database In-Memory

- Dual-Format In-Memory Database
- Primary Use case: Real Time Analytics on any source
 Billions of Rows/Sec analytic data access
- Faster mixed-workload enterprise OLTP
- Storage-Tiering: Combines best of memory, flash, disk
- Transparent: packaged apps run with no changes

What is Database In-Memory





Row Format Databases vs. Column Format Databases



- Transactions run faster on row format
 Example: Query or Insert a sales order
 - Fast processing few rows, many columns



- Analytics run faster on column format
 - Example : Report on sales totals by region
 - Fast accessing few columns, many rows

Until Now Must Choose One Format and Suffer Tradeoffs



Breakthrough: Dual Format Database



- **BOTH** row and column formats for same table
- Simultaneously active and transactionally consistent
- Analytics & reporting use new in-memory Column format
- OLTP uses proven row format

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How easy is it to get started





Database In-Memory: Trivial to Implement

Easy to Deploy

100% Compatible

Full Functionality

Simple to Configure



E-BUSINESS SUITE

UITE FUSION APPLICATIONS

ORACLE'

PEOPLESOFT





No data migration

No application changes

No SQL restrictions

No complex setup Set column store size Declare In-Memory tables



Oracle In-Memory: Simple to Setup

- 1. Configure Memory Capacity
 - inmemory_size = XXX GB

2. Configure tables or partitions to be in memory alter table | partition ... inmemory;

3. Later drop analytic indexes to speed up OLTP





Why Are Analytic Queries Faster In The In-Memory Column Store?



Database In-Memory Technology

Scanning and filtering data more efficiently



columns you need

compressed format

data from the column

values in a single CPU instruction

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Optimizer Enhancements Improves all aspects of analytic queries



- Speed of memory
- Scan and Filter only the needed Columns
- Vector Instructions



- Convert Star Joins into 10X Faster Column Scans
- Search large table for values that match small table

In-Memory Aggregation



 Create In-Memory Report Outline that is Populated during Fast Scan
 Runs Reports Instantly

Database In-Memory and other Oracle Database features





Database In-Memory: Scale Out

Scale-Out



Scale-Up



- Scale-Out Across Servers to Grow Memory and CPUs
- In-Memory Queries
 Parallelized Across Servers

• Scale-Up on large SMPs • NUMA Optimized

Combine with Flash and Disk



- Easily place data on most cost effective tier
- Simultaneously Achieve:
 - Speed of DRAM
 - I/Os of Flash
 - Cost of Disk

Database In-Memory: Industrial Strength Availability

Data Guard & GoldenGate



- Pure In-Memory format does not change Oracle's storage format, logging, backup, recovery, etc.
- All Oracle's proven availability technologies work transparently
- Protection from all failures
 - Node, site, corruption, human error, etc.

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Extend In-Memory Analytics into Storage

- Exadata automatically transforms table data into In-Memory DB columnar formats in Exadata Flash Cache
 - Enables fast vector processing for storage server queries
- Additional compression for OLTP compressed or uncompressed tables in flash – new in 18.1
- Enables dictionary lookup and avoids processing unnecessary rows
- Smart Scan results sent back to database in In-Memory Columnar format
 - Reduces Database node CPU utilization
- Uniquely optimizes next generation Flash as memory



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How are customers using Database In-Memory





Database In-Memory References

AT&T WiFi – Data Warehouse 🛛 😂 at&t Wi-Fi	Villeroy & Boch – SAP BW
 Business Objects reports 100X faster 	 SAP BW COPA queries 30 – 33X faster
 ETL processes improved by 50% faster 	 SAP Transaction list queries 4 – 4,800X faster
 No changes to SAP Business Objects reports 	 Avoided expensive & risky upgrade to S4/Hana
BOSCH – SAP CRM 🕞 BOSCH	Die Mobiliar – Mixed Workload <i>Die</i> Mobiliar
BOSCH – SAP CRM BOSCH • Dropped all custom indexes	 Die Mobiliar – Mixed Workload <i>Die</i> Mobiliar Analytic queries 50-200X faster
 BOSCH – SAP CRM BOSCH Dropped all custom indexes Analytic queries 2-20X faster, DML 2-3X faster 	 Die Mobiliar – Mixed Workload <i>Die</i> Mobiliar Analytic queries 50-200X faster Database size reduced considerably
 BOSCH – SAP CRM BOSCH Dropped all custom indexes Analytic queries 2-20X faster, DML 2-3X faster No changes to application required 	 Die Mobiliar – Mixed Workload <i>Die</i> Mobiliar Analytic queries 50-200X faster Database size reduced considerably Phase out of Netezza and mainframe systems

Database In-Memory Customers

Mankind Pharma – Mixed Workload	Shanghai Customs – Mixed Workload
Analytical reports 11x faster	 Processes Clearance 43x Faster
 Dropping indexes improved OLTP 	 Improves Declaration-Services Efficiency
 90% reduction in database size 	Reduced Costs
・ LION – SAP ERP	Lufthansa – Reporting Application Solutions
 LION – SAP ERP Analytic queries 4X faster 	 Lufthansa – Reporting Application ^C Lufthansa Industry Solutions Analytic queries up to 100x faster
 LION – SAP ERP Analytic queries 4X faster Transactions 2X faster 	 Lufthansa – Reporting Application ^C Lufthansa – Reporting Application Analytic queries up to 100x faster Improved data ingest performance

Can we see an example







Temperature Trends Demo



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Where can I get more information





Additional Resources



Join the Conversation

- https://twitter.com/db_inmemory
- https://twitter.com/TheInMemoryGuy
- https://blogs.oracle.com/In-Memory/
- https://www.facebook.com/OracleDatabase
- http://www.oracle.com/goto/dbim.html

White Papers (otn.com)

- Oracle Database In-Memory White Paper
- Oracle Database Implementation and Usage White
 Paper
- Oracle Database In-Memory Aggregation Paper
- When to use Oracle Database In-Memory
- Oracle Database In-Memory Advisor

Videos

- Oracle Database In-Memory YouTube Channel
- oracle.com
 - Powering the Real-Time Enterprise oracle.com/us/corporate/events/dbim/index.html
 - Real-Time Analytics Demo
- •Ask TOM DBIM Office Hours Sessions

Additional Questions

- In-Memory blog: blog: blogs.oracle.com/In-Memory
- My email: andy.rivenes@oracle.com

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