COLLABORATE14
TECHNOLOGY AND APPLICATIONS FORUM FOR THE ORACLE COMMUNITY

#C14LV

Exadata & Exalytics Integration for Fast Analytics and Optimized Data Warehouse

Session ID#: 424

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About the Presenter

- Bharath Terala
  - Senior Principal Consultant DBA at Apps Associates LLC
  - 8 Years of Experience as an Oracle Apps/Business Intelligence/Fusion Middleware DBA
  - Oracle Certified Professional

About Apps Associates LLC

apps associates
extreme expertise

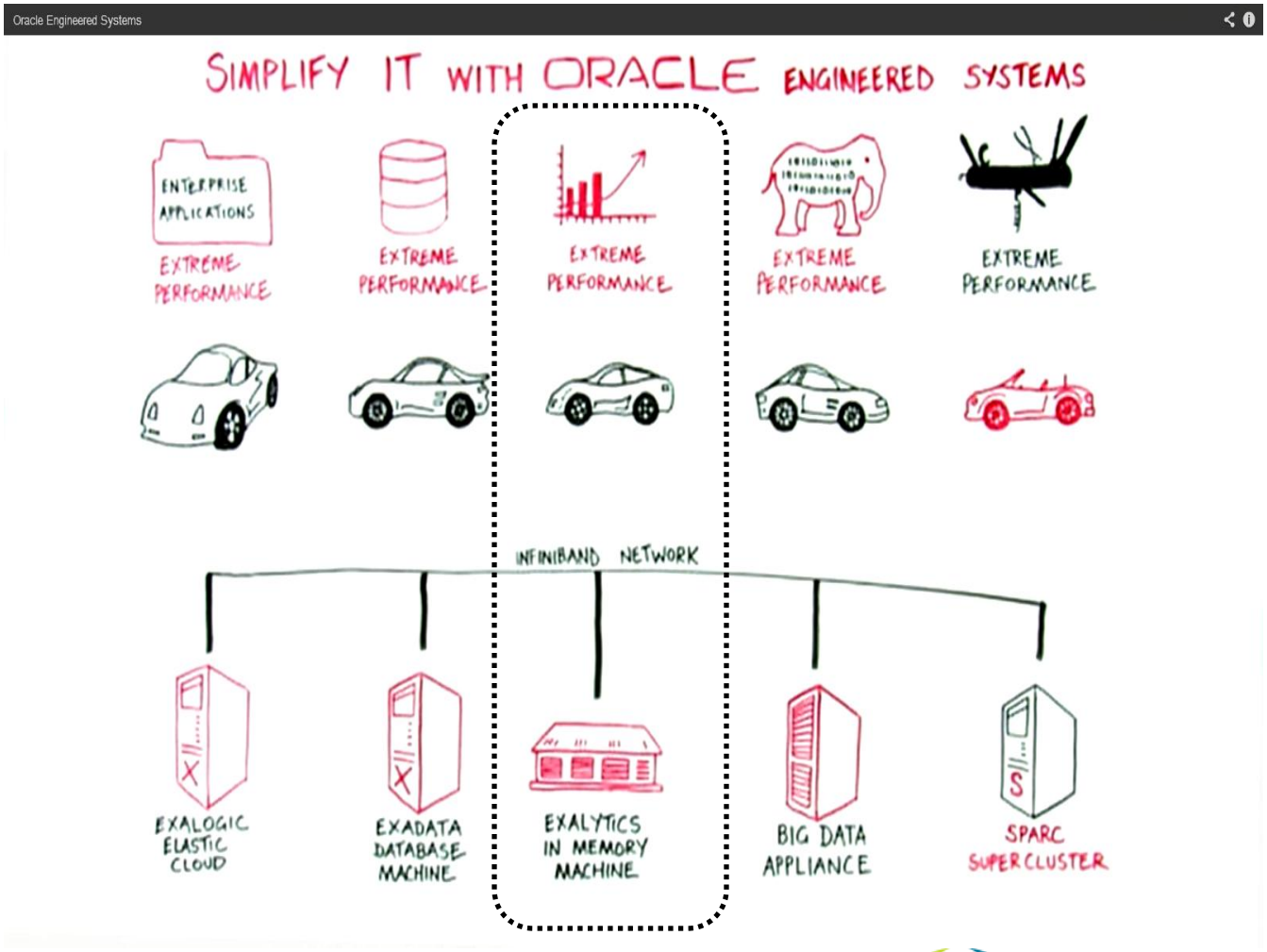
- Strategic Partnerships and Certifications
  - Oracle Platinum Partner
  - Oracle Specializations (EM12c ,EBS, BI, SOA & Database)
  - AWS Advanced Consulting Partner
  - CMMI Level 3 Certification
  - SSAE 16/SAS70 Type II
  - Microsoft Gold Certified
- Recognized as one of the fastest growing private US companies by Inc. 500|5000 for four consecutive years
- Founded in 2002 and achieved consistent growth
  - 600+ employees
  - Boston, New York, Chicago, Atlanta
  - Germany, Netherlands, India, Oman

Session Agenda

- Introduction to Exalytics and Software Features
- In-Memory Analytics
  - Oracle Exalytics for Analyzing vast datasets held in relational and OLAP databases through in-memory aggregates
  - TimesTen In-Memory Columnar Compression
  - Parallel Essbase
- InfiniBand connection to Exadata
- Using DBFS in the Exadata Storage Servers for ETL
- EHCC
- Management and Monitoring
- Workloads

Introduction to Exalytics and Software Features

Exalytics - One of Oracle Engineered Systems



Oracle Exalytics – Hardware Platforms

Exalytics X3-4

- 2 TB DRAM
- 40 Intel Cores
- 2.4 TB Flash Storage
- 5.4 TB Hard Disk Drive

Exalytics T5-8

- 4 TB DRAM
- 128 SPARC T5 Processor Cores
- 3.2 TB Flash Storage
- 7.2 TB Hard Disk Drive

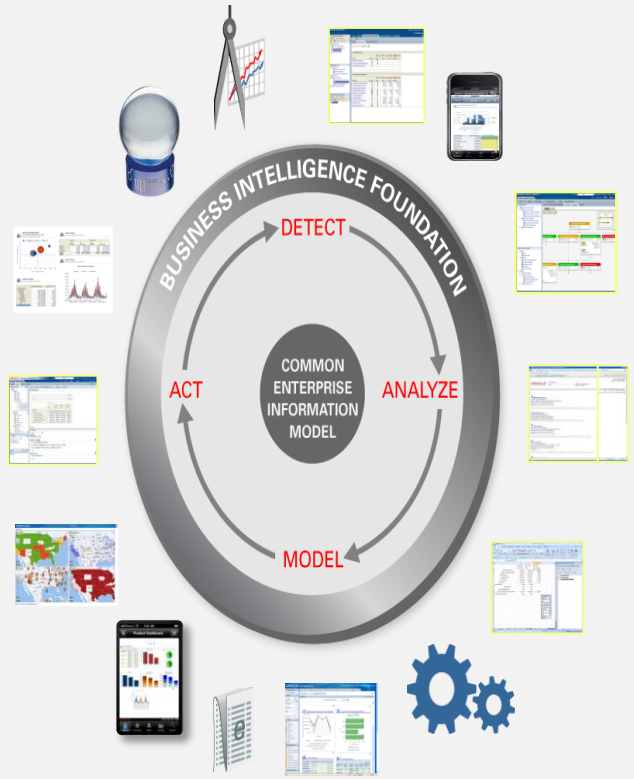
Oracle Exalytics – In Memory Machine

- **Oracle Exalytics** is the industry's first in-memory machine that delivers the fastest performance for business intelligence and planning applications

- Why Exalytics?
  - **New Challenges**
    - Need to analyze/aggregate/display huge volume of data with extreme fast response time
  - **Solutions by Exalytics**
    - High computing capacity: more CPUs/Memory
    - In-Memory Analytics: DW/Aggregates /Tmp in memory for extremely high performance
    - Fast inter-connectivity with InfiniBand
    - Fully Optimized: Analytics software is optimized to fully utilize the highly performing hardware.

Oracle Exalytics – Under the Hood

New **Exalytics T5-8**



Oracle Business Intelligence Foundation Suite

TimesTen for Exalytics

Essbase

Adaptive In-Memory Tools

In-Memory Analytics Software

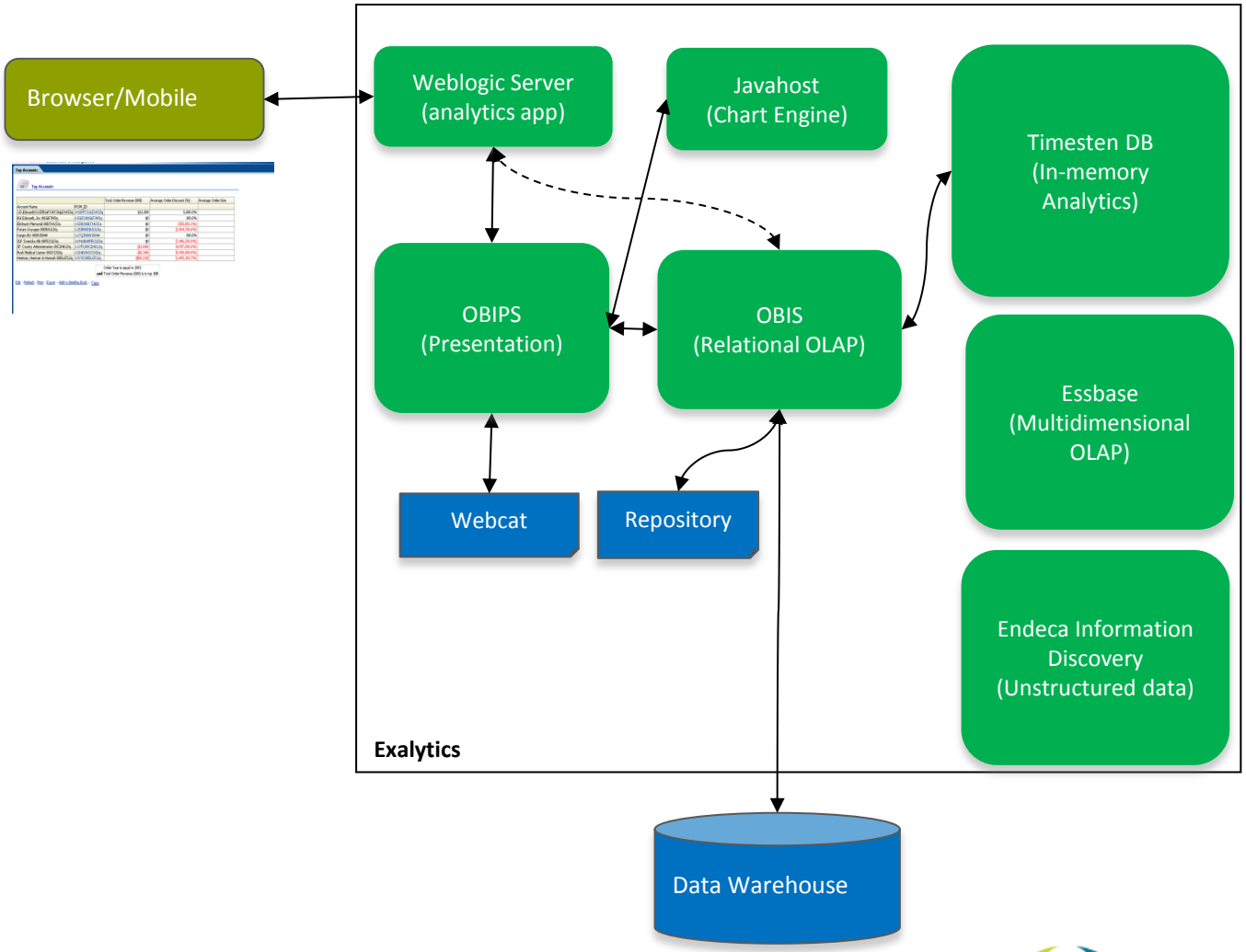
4 TB RAM
128 Processing Cores
3.2 TB Flash Storage

Exalytics X3-4

2 TB RAM
40 Processing Cores
2.4 TB Flash Storage

In-Memory Analytics Hardware

Oracle Exalytics – Software Components



Oracle Exalytics – OBIEE Diagnostic Map

-**WLS console: Monitoring**
-JVM heap usage
- ActiveThreadsCount
- Queue Length
- JDBC connections
- # of analytics sessions
- # of bisecurity sessions
- thread dump

-**Jconsole: Threads**
- Heap Usage & GC usage
- Thread dumps to check number of active threads

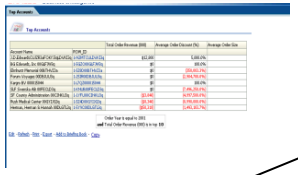
-**ttStatus:** check active connections

WLS (bi_server)
(analytics app)

Javahost
(Chart Engine)

Timesten DB

Browser/Mobile



OBIPS
(sawserver)

OBIS
(nqserver)

Webcat

Repository

Exalytics

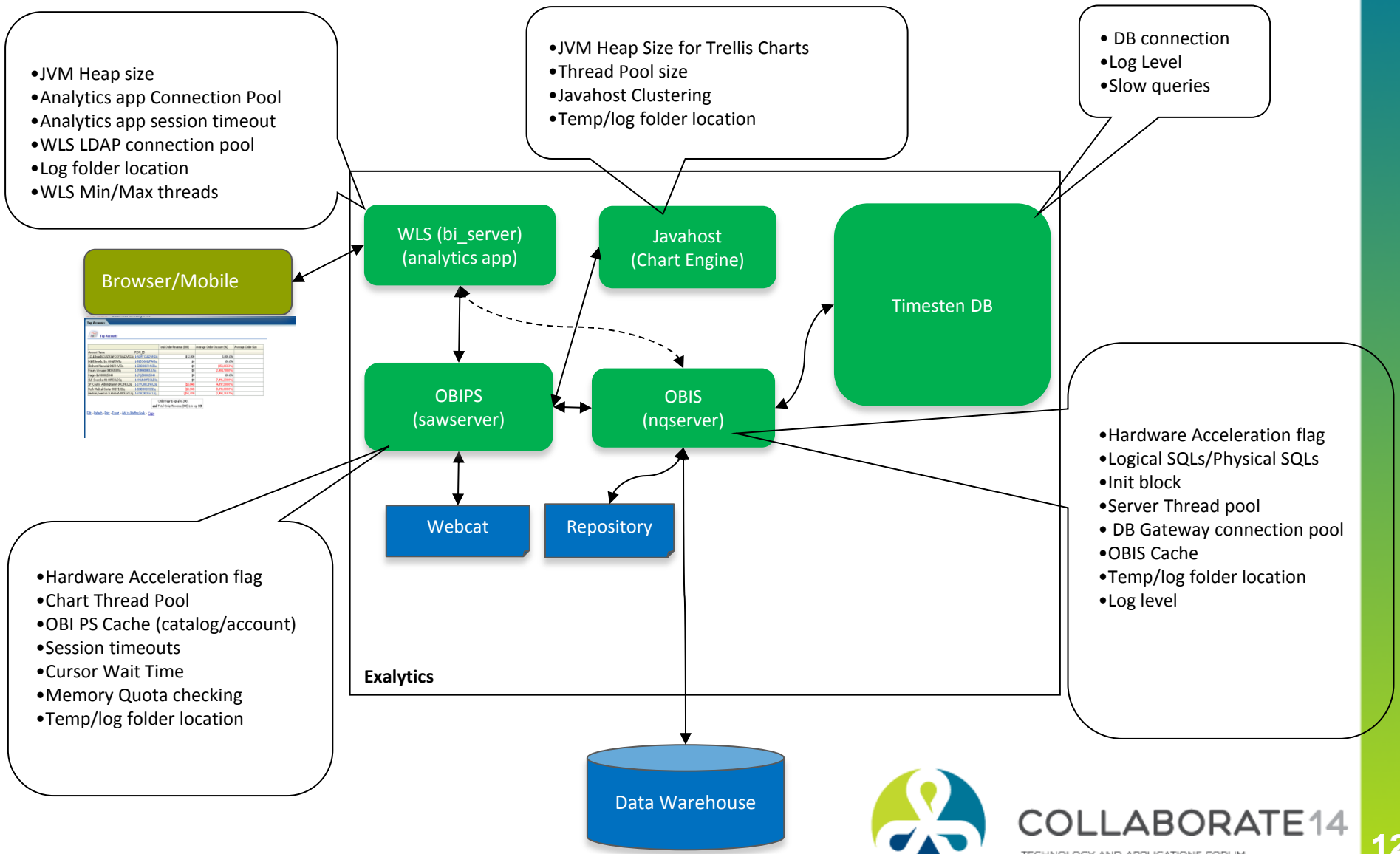
-**OBIS query logging** to check slow queries
-**BI Admintool**: Active Sessions

- OBIPS perfmon: active sessions/thread pool sizes…etc.

-**EM:** to monitor OBIEE domain

Data Warehouse

Oracle Exalytics – Performance Tuning Map



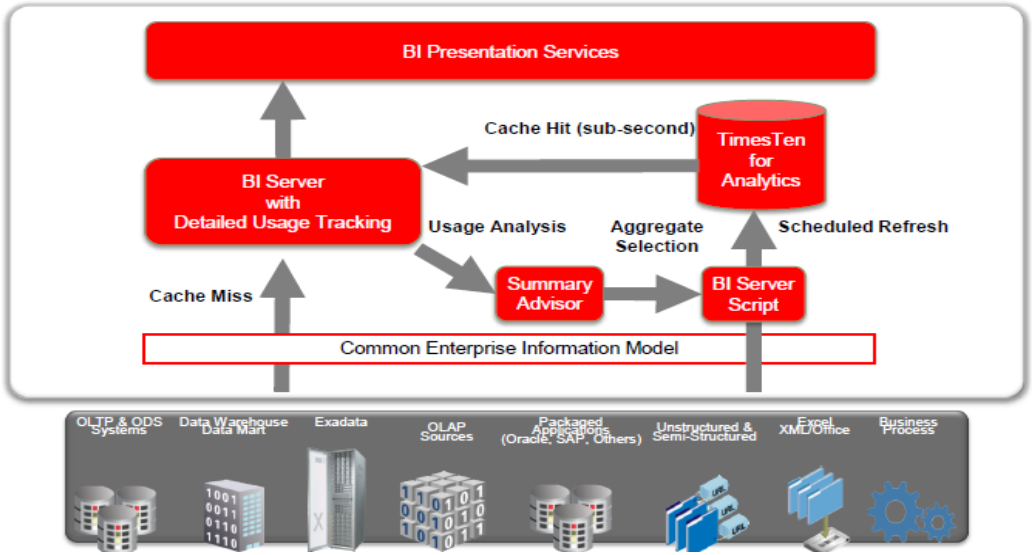
In-Memory Analytics

Summary Advisor, TimesTen, Essbase

Summary Advisor In-Memory Aggregates

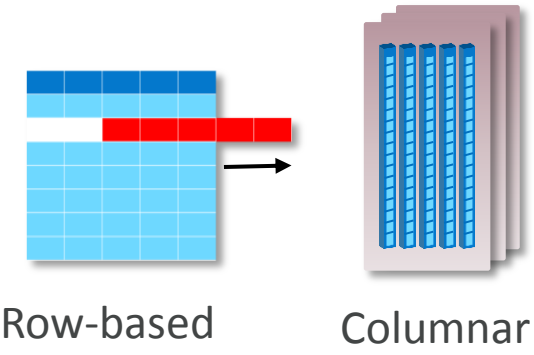
Summary Advisor scripts to populate TimesTen cache

- Intelligently recommends an optimal list of aggregate tables based on query patterns that will achieve maximum query performance.
- Summary Advisor generates an aggregate creation script that can be run to create the recommended aggregate tables.



TimesTen In-Memory Columnar for Exalytics

Adaptive In-Memory ROLAP Data Management



- Out of the box acceleration for analytics
  - Process Billion-rows per second
  - Ideal for Aggregates and Data Marts
- Store more data in Exalytics
  - No Indexes required
  - Lower administration cost
- Offload analytics processing
  - Data and Operational isolations from production data warehouse

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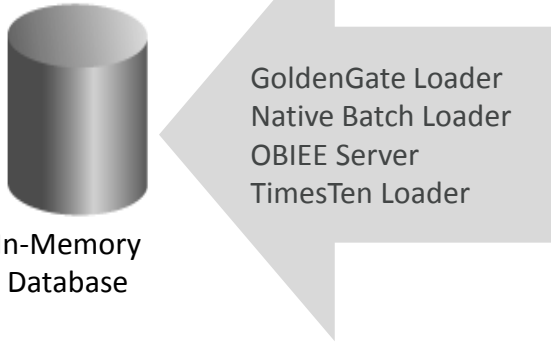
Automated In-Memory Data Load / Refresh

- Easy wizard based interface for Cache definitions
- More options for Data Load
  - Real-time data refresh using native GoldenGate integration
  - Incremental Batch Loading with built-in Batch Loader
- Data Optimizations for efficiency and performance
  - Data type Optimizations
  - Compression heuristics based on data
  - Selective columns
  - Load sequencing, Parallelization
  - TimesTen indexing



Essbase In-Memory Optimizations

In-Memory MOLAP

- Multi Dimensional OLAP Server for Analytic applications
- Essbase on Exalytics has number of optimizations for in-memory operations
  - Improvements to overall storage layer performance
  - Enhancements to parallel operations
  - Enhanced MDX syntax and high performance MDX query engine
- Essbase on Exalytics provides up to 16x faster query execution as well as up to 6x reduction in write back and calculation operations, including batch processes

InfiniBand Connection to Exadata

Exadata, Exalytics, and Big Data Appliance

Exalytics
In-Memory Analytics

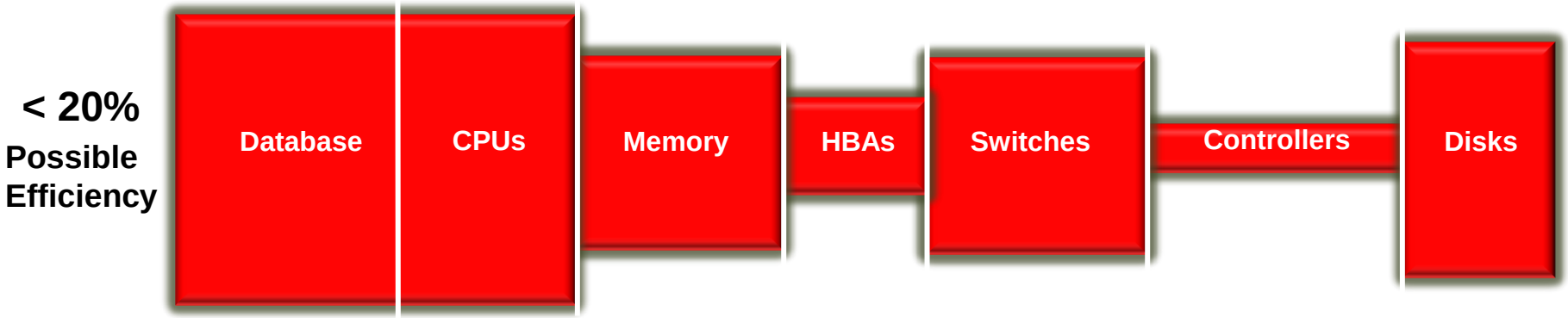
InfiniBand Fabric

Exadata
OLTP
Data Warehousing

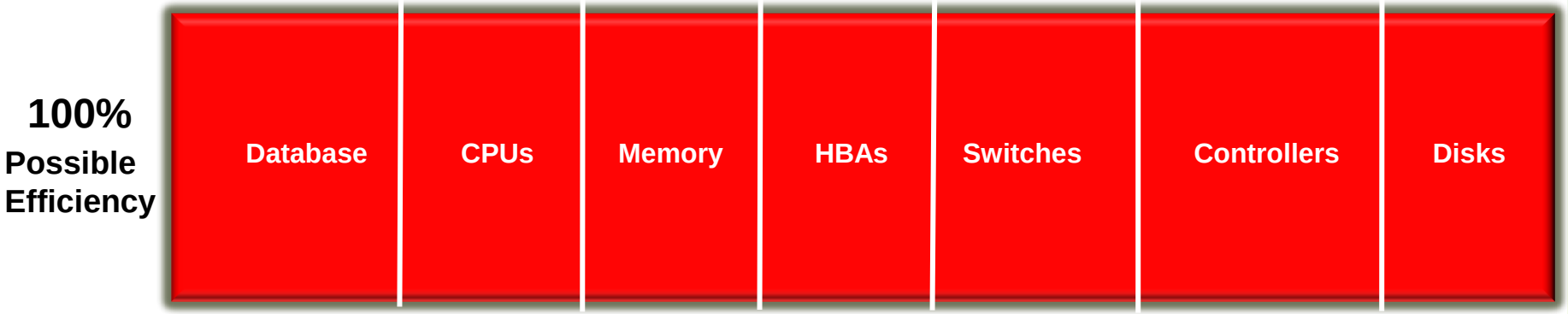
Big Data Appliance
High Performance
Hadoop Engine

Engineered for Database Physical I/O

- An Unbalanced Configuration



- Exadata Configuration



The Highest Performance Cluster Fabric

Highest Bandwidth

- Delivers 40 Gigabit Server Connections Today
- Over 3x the Throughput of 10 Gb Ethernet

Lowest Latency

- Application-to-Application Latency as Low as 1 µS
- Less Than 1/10th the Latency of Ethernet

Unleash Server Resources

- Eliminates O/S Intervention in Network and Storage Communication
- Frees Up CPU & Memory for Application Processing

Unrivaled Scalability

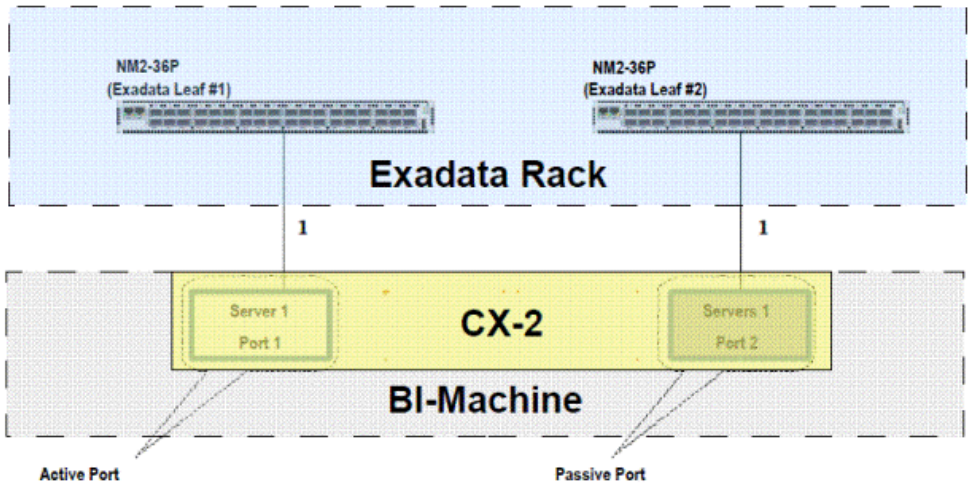
- Scales to Thousands of Physical Systems
- Partitionable Into Isolated Virtual Networks

Sun QDR InfiBand Bandwidth Connectivity for Sun Servers and Storage

- 40 Gb Quad Data Rate InfiniBand connectivity
- Supports Rich Set of Network and Storage Protocols
  - Ideal for Delivering Network Services to High Performance Clusters
- Form Factor: Sun InfiniBand Dual Port 4x QDR PCIe Low Profile Host Channel Adapter M2
  - PCIExpress Low Profile (x8 PCIe Base 2.0)
  - Two QDR InfiniBand QSFP ports

InfiBand Connector for Exalytics with Exadata

- Oracle Exalytics has 2-port QDR InfiniBand Host Channel Adapter (HCA) installed in the PCIe Slot 6.
- Oracle Exadata Database Machine includes two 36-port InfiniBand leaf switches (Sun Datacenter QDR InfiniBand Switch 36).
  - These two switches located in the middle of the rack are referred to as leaf switches



Optimized to work with Exadata

Uniform responsiveness over large federated deployments

Exalytics
In-Memory Analytics

"Speed of Thought" Enterprise Business Intelligence Platform

Optimum SQL Generation for Exadata

InfiniBand

Exadata
OLTP
Data Warehousing

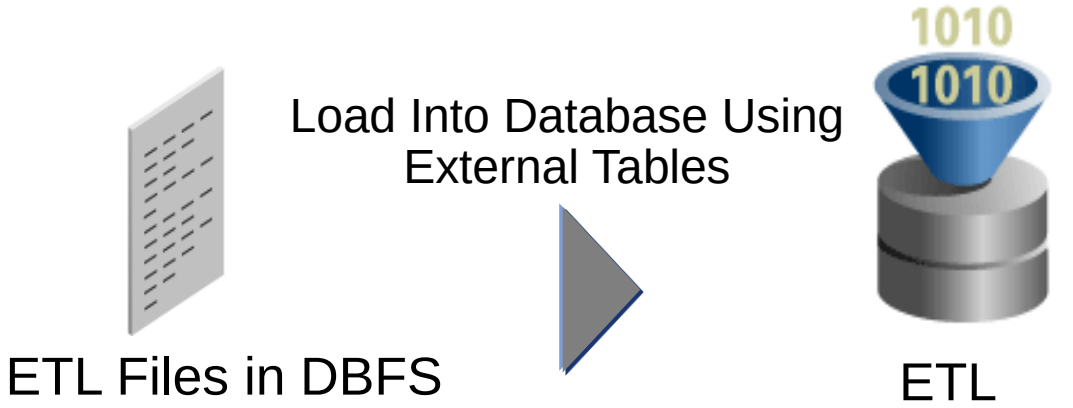
- Parallel Processing
- Extension to In-Memory Cache / Data Mart

Extreme Performance via pre-integrated, optimized Oracle database platform

Using DBFS in the Exadata Storage Servers for ETL

DBFS – Scalable Shared File System

- Database Machine comes with DBFS Shared Linux File System
  - Shared Storage for ETL Staging, Scripts, Reports and Other Application Files
- Files are Stored as SecureFile LOBs in Database Tables Stored in Exadata
  - Protected Like any Database Data – Mirroring, DataGuard, Flashback, etc.
- 5 to 7 GB Per Sec File System I/O Throughput

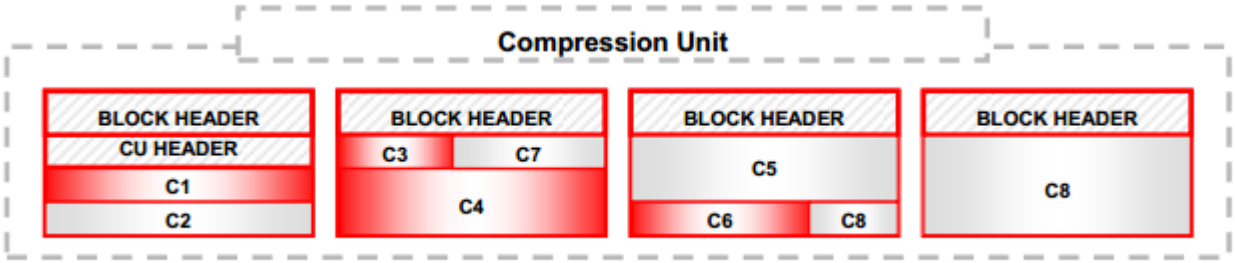


More File Throughput than High-End NAS Filer


EHCC

Exadata Hybrid Columnar Compression

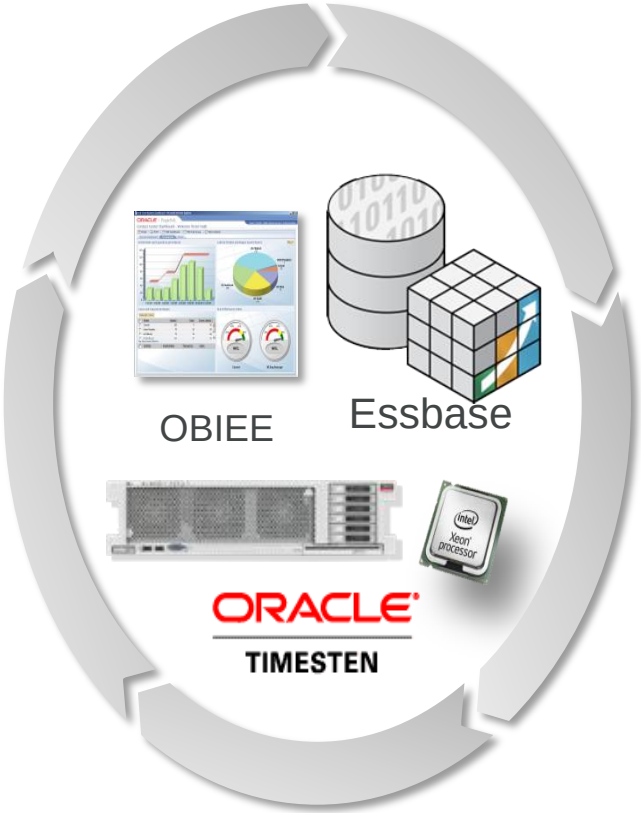
- Oracle's Hybrid Columnar Compression technology is a new method for organizing data within a database block.
  - Utilizes Row and Columnar methods for storing data
  - Compressed data is stored in a compression unit



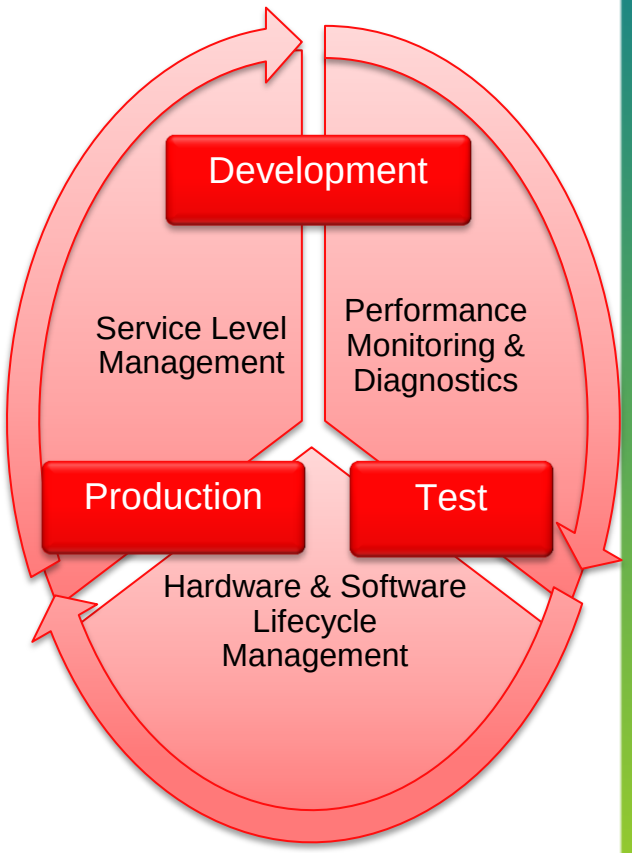
- Data must be loaded using DW bulk loading techniques
- High performance Query Engine with Smart Scans on compressed data

Management and Monitoring

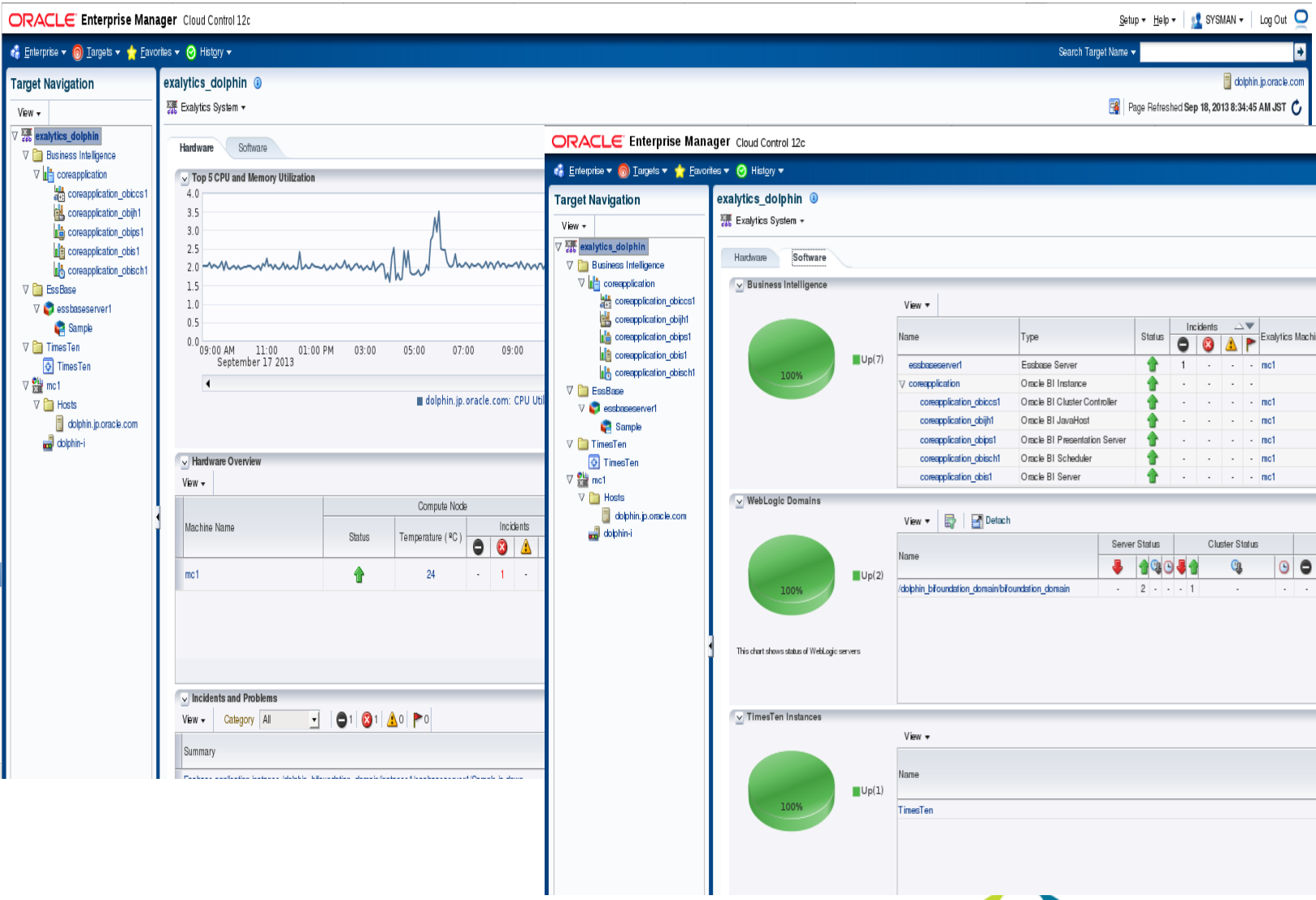
Exalytics Management with Enterprise Manager



ORACLE ENTERPRISE MANAGER 12c



Enterprise Manager Support



Workloads

TimesTen Query Performance

- With real customer FIN DB (500 GB), the queries are 2.5x faster
- With CRM DW (320 GB), the queries are 23% faster
- Optimizations
  - Improved Index Advisor to provide excellent index recommendations
  - Query functions for Analytics replaced with faster implementations
  - Faster Star Join and Merge Join
  - Faster expression evaluator
  - Faster Hash index and Tmp index

FIN DB

Attributes	TT 11.2.2.5	TT 11.2.2.4
No. of SQLs	514	514
Response Time in Sec	12890 (3.5hrs)	32527 (9 hrs)

CRM DW

Attributes	TT 11.2.2.5	TT 11.2.2.4
No. of SQLs	132	132
Response Time in Sec	226	297

Summary Advisor and Aggregate Persistency

- 5.7x faster on recommending aggregates
- Financial Data Warehouse / Exadata (360 GB)
  - Optimized Summary Advisor internal queries
  - Optimized Statistics Logging

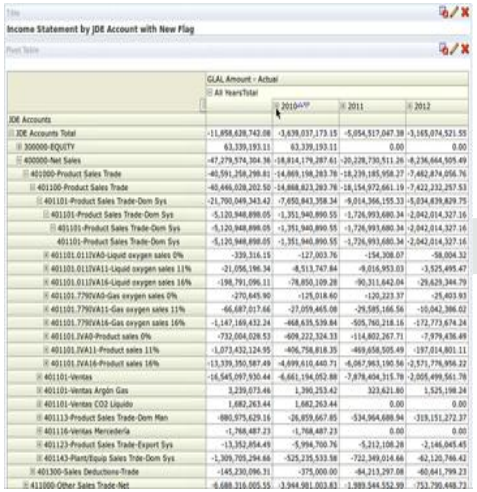
BI Build	Exalytics	11.1.1.6.10
Time Taken to complete summary advisor	44 mins	249 mins
No of Aggregates Suggested	8	10

- Aggregates in TT improved overall query response time by 2.5x

	Exadata DW	TT 11.2.2.5 Aggregates
Total number of Queries	514	514
Total RT in seconds	10817 (3hrs)	4355 (1.2hrs)

Exalytics Used Case

- Recreate Drilldown Usage
  - Measure & Compare



Query	Original Timing	Exalytics Timing
Fiscal Year/Account Level 1	9 sec	< 1 sec
Fiscal Year/Account Level 2	15 sec	< 1 sec
Fiscal Year/Account Level 3	11 sec	< 1 sec
Fiscal Year/Account Level 4	9 sec	< 1 sec
Fiscal Year/Account Level 5	9 sec	< 1 sec
Fiscal Year/Account Level 6	9 sec	< 1 sec
Fiscal Year/Account Level 7	9 sec	< 1 sec
Fiscal Qtr/Account Level 7	39 sec	< 1 sec
Fiscal Month/ Account Level 7	28 sec	< 1 sec
Fiscal Month/Account Level 7/Sub Region Level 2	15 sec	< 1 sec

Q & A

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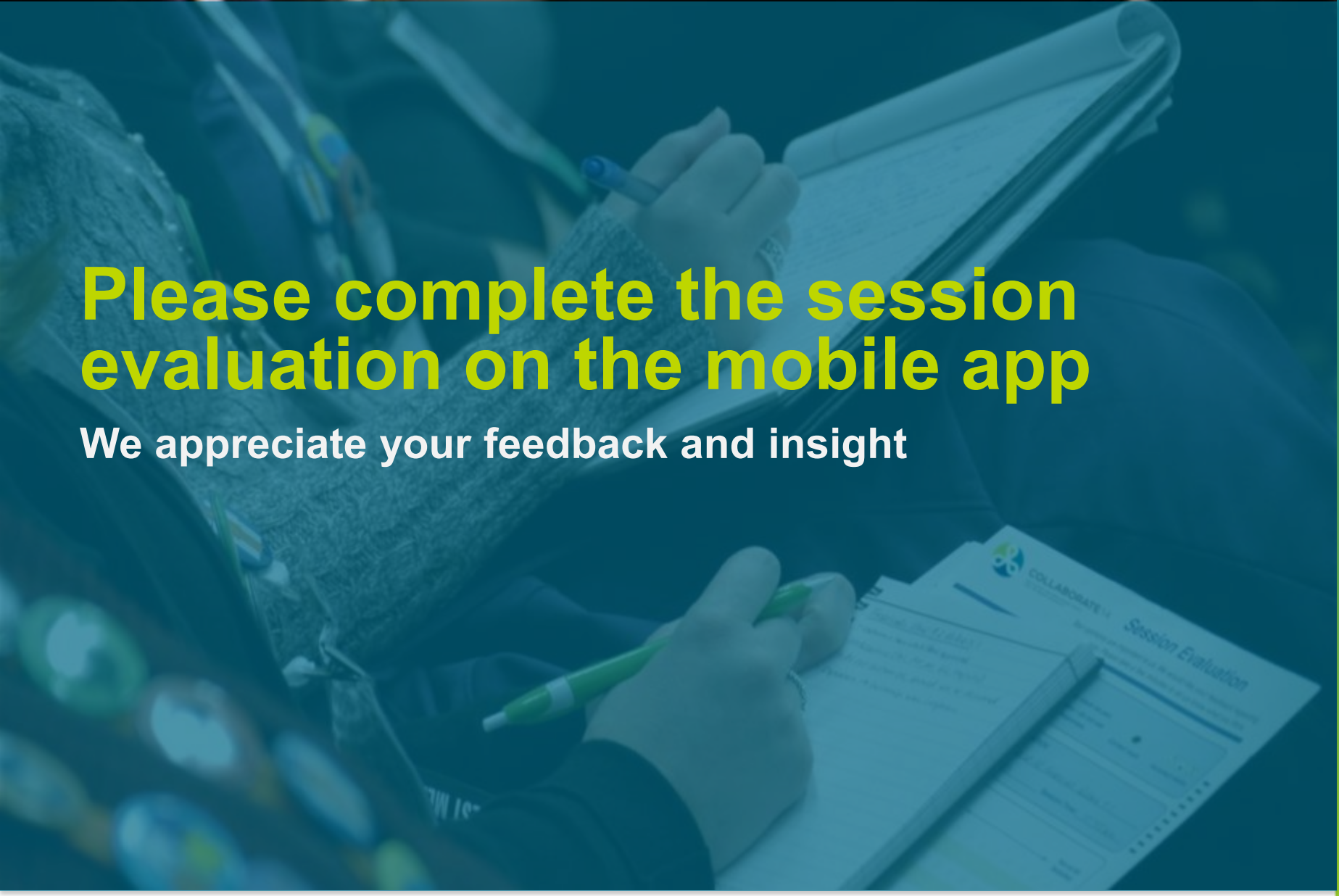
- Questions & Suggestions can be mailed to
  - Email: bharath.terala@appsassociates.com
  - Twitter: @bharathterala
  - Web URL: www.appsassociates.com

Thank you



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