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How to Achieve High Performance using OBIEE

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About Me

- Overall 12 Years with 9 years in Business Intelligence
- Director BI with FCS-Inc
- Oracle ACE (Business Intelligence)
- Extensively worked with fortune 500 leaders.
- Held positions of Head Of Product Development, Architect, etc.
-  <http://sranka.wordpress.com>,  sunil_ranka
- Speaking engagements at following conferences :
 - OAUG COLLABORATE 09,
 - NorCal OAUG-2010 at Santa Clara Convention Center, CA
 - OAUG's COLLABORATE 10 at Las Vegas, Nevada.
 - Northern IOUG – 11, San Francisco
 - OAUG COLLABORATE 11, Florida
 - BIWA – Tech Casts



About Me

My Tag Line :: “Superior BI is the antidote to Business Failure”



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What is SurfBI®?

- SurfBI Mobile Framework
 - Intelligence and Integration
- Mobility Framework on iPad/ iPhone/ Android
 - Delivered as Cloud or On-Premise
 - Out-of-the Box integration to Oracle, SFDC, POS
- SurfBI Enterprise Apps
 - Pre-Packaged Enterprise Apps
 - Pre-Packaged Industry Vertical Apps
 - Applications **“Powered by SurfBI”**



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Dilbert On Performance





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Dilbert On Performance



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Reason for BI Projects Nonperformance

- **Poor Report Performance**
- **Using Analytical tool as reporting tool.**
- **No Data Quality Processes**
- **Has no reliable source of historical data**
- **Manual, Error-Prone Processes**
- **No Single Source Of Truth for Data**
- **No Clear Road Map for BI Implementation**
- **Ignoring the True end users**
- **Lack of User Adoption due to poor user interface**



Some of the easiest ones to avoid are related to the Performance



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Stage to decide on Performance

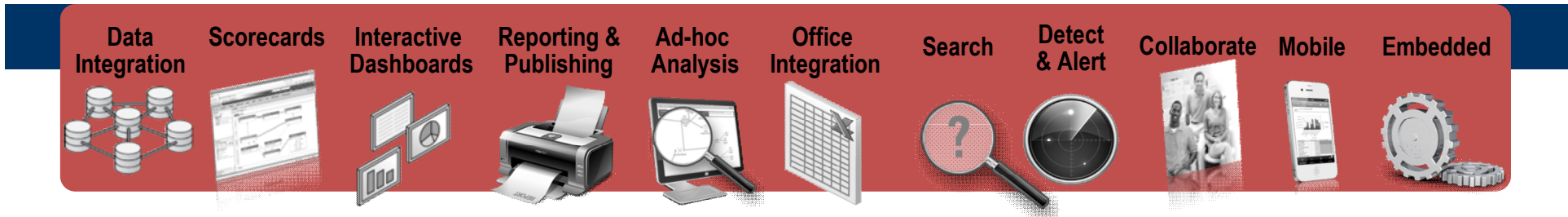
- Based on business Requirement and Need
- Not every thing can run in matter of Seconds
- Performance should always be before presentation in term of priority.
- Sacrifices on presentation during the design of the project.
- Its always difficult to explain to users to give up the presentation because of performance.





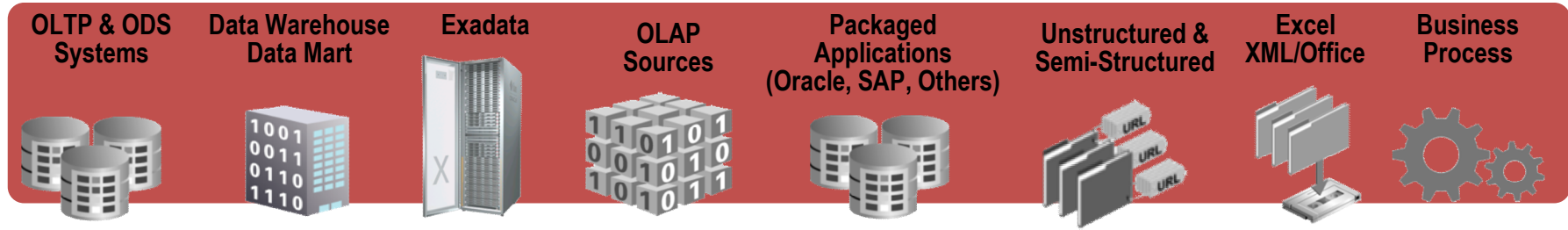
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Oracle Business Intelligence 11g Landscape



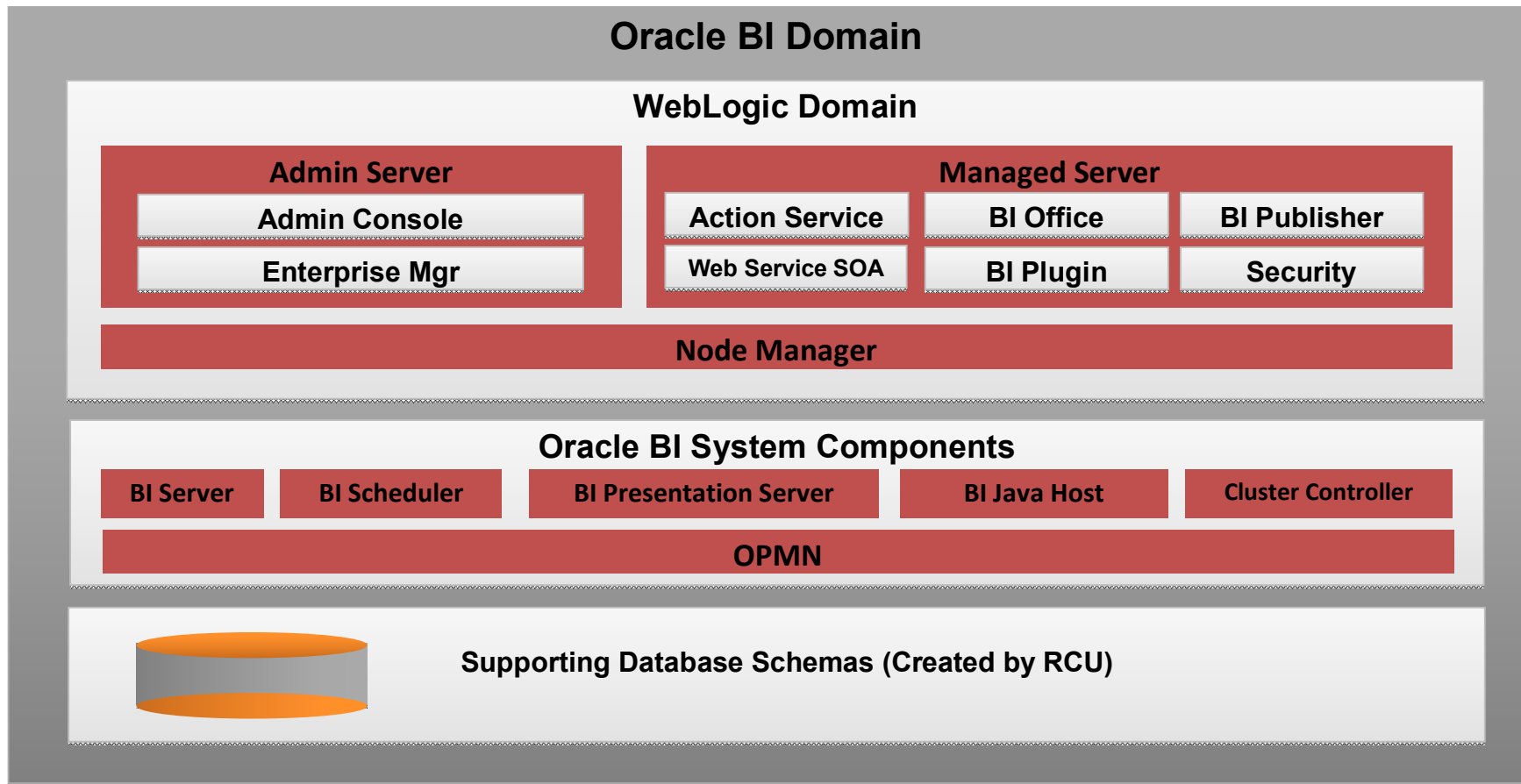
Common Enterprise Information Model

- Common Metadata Foundation across all Data Sources
- Common Security, Access Control, Authorization, Auditing
- Common Request Generation and Optimized Data Access Services
- Common Clustering, Workload Management, & Deployment
- Common Systems & Operational Lifecycle Management





OBIEE 11g High Level Architecture



Classic Cry's For OBIEE Users

- **Slow login page to OBIEE**
- **Even though report is showing few Rows, its taking for ever**
- **Even if there are no users, System response is slower.**
- **As concurrent users increases, system stops responding**
- **How to trouble shoot OBIEEE performance problem.**
- **Any OBIEE Performance Checklist ?**
- **Does caching works?**
- **In spite of cluster env, server response is sporadic ?**





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Implementation Sizing

	Total User	Concurrent User	Cores
Small Size Oracle BI EE implementation	< 3000	~ 300	2 - 4
Medium Size Oracle BI EE implementation	< 5000	~ 500	4 - 16
Large Size Oracle BI EE implementation	50,000	5000+	16+

Total User	Concurrent User	Estimate CPU
10	1	2
50	5	2
100	10	2
500	50	2
1000	100	4
1200	120	4
1600	160	6
1800	180	6
2200	220	8
2800	280	10
3400	340	12
3600	360	12
4600	460	16
7200	720	24
9600	960	32





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Things That Can help OBIEE Performance

- Connection Pools
- Setting the NQSConfig.ini parameters
- Use of “filter By” Option compared to “Case When”
- Always specify the number of elements per level. BI Server will use it to identify aggregate tables and mini dimensions. It does not need to be accurate, a rough estimate is fine.
- Exposing materialized views in Physical layer
- Deploying SSL will have a level of overhead on the overall performance
- Formatting of reports has overhead on the system verse executing HTML based reports only (i.e. Dashboards)
- Turning off logging
- Setting query limits
- Pushing calculations to the database



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Things That Can help OBIEE Performance

- **Using database hints**
- **Infrastructure sizing**
- **Using aggregates**
- **Constraining results using a WHERE clause**
- **Limiting the number of initialization blocks**
- **Caching (Last Resort)**
- **Depending on your configuration, enable some parameters in database feature:**
- **Always specify the content level in all logical table**
- **Delete Unused Views from Presentation Layer**
- **Do not overuse dashboard conditions, it has a cost on performance.**
- **Dashboard should be as interactive as possible:**
 - column selectors,
 - Contextual drill-down,
 - guided navigation



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How to troubleshoot performance issues

- NqQuery.log – At loglevel 5 this file can give a lot of information.
- Usage Tracking - When you enable usage tracking, statistics for every query are inserted into a database table or are written to a usage tracking log file.
- If the performance problem is with a single report then NqQuery.log is more useful than Usage tracking data.
- NqQuery.log file shows Physical SQL Query, logical execution plan.
- Usage tracking does not have this information.
- Usage Tracking can be enabled all the time and can be stored in a table for analysis.
- Good way to confirm an issue with Presentation Services is to check if the the query is fast in OBI ODBC client
- <http://<host url>:<port number>/analytics/saw.dll?perfmon>



Connection Pool and Database

- What is Maximum Connections
 - When the limit is reached, then the system waits for a connection to become available.
- How to decide on Connection Pool Number
 - **Maximum number of connections in a connection pool : 20% of * number of reports per dashboard.**
- How Connection Pool can improve Performance
 - Create dedicated connection pools for your Session Variables.
 - Create dedicated connection pools for your report queries.
- Always use OCI Call Interface in the rpd if your backend db is Oracle
 - Using ODBC for the Oracle RDBMS Connection can degrade performance
 - DB tracing
 - ODBC tracing is enabled to troubleshoot ODBC issues. This can cause huge performance problems. This is not indicated in any OBI logs.





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OBIEE Performance Checklist

- Using aggregates
 - Enabling OBI to generate queries against smaller, summarized tables
- Constraining results using a WHERE clause
 - Limiting the rows returned from a data source
- Caching
 - Fulfilling a query from a local cache as opposed to processing the query through a data source
- Limiting the number of initialization blocks
 - Initialization block queries are executed when OBI is started and when users log in
- Turning off logging in production
 - No overhead for OBI to generate log files
 - NqQuery.log – At loglevel 5 this file can give a lot of information





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OBIEE Performance Checklist

- Setting query limits
 - Enabling OBI to track and cancel runaway queries
- Pushing calculations to the database
 - Automatically pushing certain operations to the database based on database feature entries
- Exposing materialized views in Physical layer
 - Guarantees to choose the most economical table source to satisfy a query
- Using database hints
 - Forcing the database query optimizer to execute the statement in a more efficient way
- Network Issues
 - Any network issues. It may be necessary to enable network tracing tools, if you suspect problems with slow network.



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OBIEE Performance Checklist Continue

- Other Factors
 - Sizing of the OBI servers is an important part in implementations when the number of users and the complexity of the dashboards/reports is significant. It may be necessary to involve infrastructure Admin to get a sizing review for large implementations.
 - The size of the RPD and webcatalog may affect start up times of the services. It is recommended to clean up the RPD and webcatalog to remove redundant objects.
 - Sometimes ODBC tracing is enabled to troubleshoot ODBC issues. This can cause huge performance problems. This is not indicated in any OBI logs.
 - When analyzing the NqQuery.log, if the Physical SQL is taken a lot of time, performance tuning needs to be done on the database.
 - Oracle Database features like **proper indexing , partitioning and Star Transformations** can help performance to a great extent.





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Repository Consideration

- RPD considerations
 - The RPD should be designed according to best practices.
 - De-normalize dimensional objects, combine several dimensional attributes into one flat table. This will help reduce joins.
 - Model your physical tables in a way that should help in creating simpler Business Models.
 - Use Aggregate Tables when necessary to help better performance.
 - Aggregate tables will need additional ETL, storage and complex mapping efforts.
 - The size of the RPD may affect start up times of the services
- Complex Calculations
 - It may be better to move complex calculations to ETL for performance reasons.
 - If customers have complex logic that involves complex SQL, it is a good idea to consider pushing this logic to ETL rather than handling it in the RPD at the run time



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Repository Consideration Continue

- Avoid Cross-database joins
 - Cross-database joins or “federated queries” can be expensive in terms of performance when compared to joins within the same database. For cross-database joins, tables are normally loaded into memory, and then joined.
- Caching (***THE LAST RESORT***)
 - Caching can be very helpful in alleviating performance issues for complex queries that are reused many times.
 - iBots can be used to seed queries during off peak hours to achieve performance.
 - DBFeatures
 - If one of the dbfeatures is turned off, improper SQL may be generated by OBI.
 - Improper SQL may cause performance degradation
- Control long running queries
 - Set certain timeout parameters in the RPD



Webcat/Report Consideration

- Use a default value for the prompts in dashboards.
 - This will make sure that the reports will return a smaller result set
 - If this is not possible to do due to the business requirements
 - Consider adding some links on the dashboard page for reports.
- If the query ran quickly in the NqQuery.log, then Presentation services may be taking more time to display the results.
 - If you have a significant number of Charts or Pivot table views for the reports.
 - Changing the existing reports to Table view could help performance
- Too many pivot tables and charts on a dashboard page can make the UI very slow
- Check for hidden sections and guided navigations that will run always.
- Make sure the logconfig.xml file is not modified to get enhanced logging. This is not recommended in production systems.





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Some of the Reasons Caching doesn't work

- SQL request contains Non-cacheable element Current_Timestamp, Current_Time, Rand, Populate, or a parameter marker then it is not added to the cache
- Result set is too big. MAX_ROWS_PER_CACHE_ENTRY and MAX_CACHE_ENTRY_SIZE parameters in nqconfig.ini limit the max rows and max size for cache
- Oracle BI Server is clustered.
- Caching cannot be used for constrained Prompts.
- If session variables are used, caching will not work since this results in the cache being specific to a user.
- ORDER BY clause made up of columns in the select list. Queries that order by columns not contained in the select list result in cache misses.
- Cache entries become specific to users depending on the way data-level security is setup in the RPD.
- The logical query has an additional column as compared to the seeded query.



Setting the NQSConfig.ini parameters

- Setting following NQSConfig.ini parameters that can affect OBI performance
 - SORT_MEMORY_SIZE: specifies the maximum amount of memory to be used for each sort operation
 - SORT_BUFFER_INCREMENT_SIZE: specifies the increment by which the sort memory is increased as more memory is needed
 - VIRTUAL_TABLE_PAGE_SIZE: specifies the size of a memory page for OBI internal processing
- There are some more parameters which can help/effect the performance
 - SERVER_THREAD_RANGE
 - SERVER_THREAD_STACK_SIZE
 - DB_GATEWAY_THREAD_STACK_SIZE
 - MAX_SESSION_LIMIT
 - MAX_REQUEST_PER_SESSION_LIMIT
 - BUFFER_POOL_SIZE
 - MAX_CACHE_ENTRY_SIZE
 - DATA_STORAGE_PATHS
 - INIT_BLOCK_CACHE_ENTRIES



Recommended Parameters in NQSConfig.ini

- INIT_BLOCK_CACHE_ENTRIES = 5000
- MAX_SESSION_LIMIT=5000
- SERVER_THREAD_RANGE = 40-260;
- DB_GATEWAY_THREAD_RANGE = 50-520;
- MAX_QUERY_PLAN_CACHE_ENTRIES = 1024; // default is 1024
- ENABLE = YES;
- MAX_ROWS_PER_CACHE_ENTRY = 100000; # 0 is unlimited size
- MAX_CACHE_ENTRY_SIZE = 20 MB;
- MAX_CACHE_ENTRIES = 10000;
- WORK_DIRECTORY_PATHS = "C:\Temp"; /* /dev/shm on Linux */
- SORT_MEMORY_SIZE = 4 MB ;
- SORT_BUFFER_INCREMENT_SIZE = 256 KB ;
- GLOBAL_CACHE_STORAGE_PATH = "<shared directory name>" SIZE;
- MAX_GLOBAL_CACHE_ENTRIES = 1000;
- CACHE_POLL_SECONDS = 300;





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Oracle Recommendations Presentation Server

Charting thread related tunable parameters

Number of charting threads and maximum number of jobs allowed in the queue can be tuned for performance when the dashboards have several charts:

```
<ServerInstance>
  <ThreadPoolDefaults>
    <ChartThreadPool>
      <MaxQueue>2048</MaxQueue>
      <MaxThreads>32</MaxThreads>
    </ChartThreadPool>
  </ThreadPoolDefaults>
</ServerInstance>
```



MaxQueue: Specifies the maximum number of jobs allowed in the queue. On 64bit OS, the default value is low so you may need to set it to 2048.

MaxThreads: Specifies the maximum number of threads. **Tip:** [default is 8 i.e. numProcessors() * 8]



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Oracle Recommendations Presentation Server

Catalog related tunable parameters

There are several OBIPS web catalog related parameters available like Soft limit on when a lock is warned of being stale, Hard limit on when a lock is removed as stale, How many characters to use to hash usernames into sub directories etc

```
<ServerInstance>
  <Catalog>
    <LockStaleSecsSoft>14400</LockStaleSecsSoft>
    <LockStaleSecsHard>14400</LockStaleSecsHard>
    <HashUserHomeDirectories>3</HashUserHomeDirectories>
  </Catalog>
  <BIEEHomeLists>
    <Enabled>>false</Enabled>
    <CatalogSynhronizationFrequencyMinutes>30</CatalogSynhronizationFrequencyMinutes>
  </BIEEHomeLists>
</ServerInstance>
```





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Oracle Recommendations Presentation Server



Waiting time for results

Controls how long the server waits for results after the initial request before returning the Searching page to the browser. It may be useful to set this value higher (such as 10 seconds) to avoid page refreshes if the majority of queries are not returning in 1 second. If running performance tests some test implementations behave properly only if this setting is set very high (such as 1000 seconds).

```
<ServerInstance>  
  <Cursors>  
    <NewCursorWaitSeconds>10</NewCursorWaitSeconds>  
  </Cursors>  
</ServerInstance>
```



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BW-SAP Tuning

- Use of BAPI connectivity instead of XMLA
- Using navigational Attributes instead cubes
- Setting up “Is Greater Than” feature on db-feature
- Using variable feature on cubes
- Put agg rules on the columns in Physical Layer
- Try to consolidate BEXes





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Oracle BP2 Patch Set

Oracle has release Patch 13611078 for performance improvement.

12821662	SEVERE PERFORMANCE DEGRADATION WITH PIVOT TABLE PROMPT OVER OLAP SOURCE
12800814	PSR:PERF:BI THERE ARE SOME MEMORY LEAKS IN SAS(OBIS)
12739309	PSR:PERF:BI OBIS RESPONSE TIME GOES UP TO 500SECONDS+ WHEN RUNNING SCOTIA RPD
12717149	PERFORMANCE ISSUE IN VALUE HIERARCHY DRILL ISSUE - WITH ESSBASE ALIAS COLUMNS
12701483	BAD PERFORMANCE IN A PIVOT TABLE WITH ESSBASE AND UNCHECKUSE UNQUALIFIED MEMBER
12399899	PERFORMANCE IMPROVEMENT - REMOVE CENTER QUERIES FOR PAGE SLICES NOT DISPLAYED
11924932	PERFORMANCE ISSUES IN 11G
11823765	SIGNIFICANT PERFORMANCE DIFFERENCE BETWEEN PIVOT AND TABULAR VIEWS



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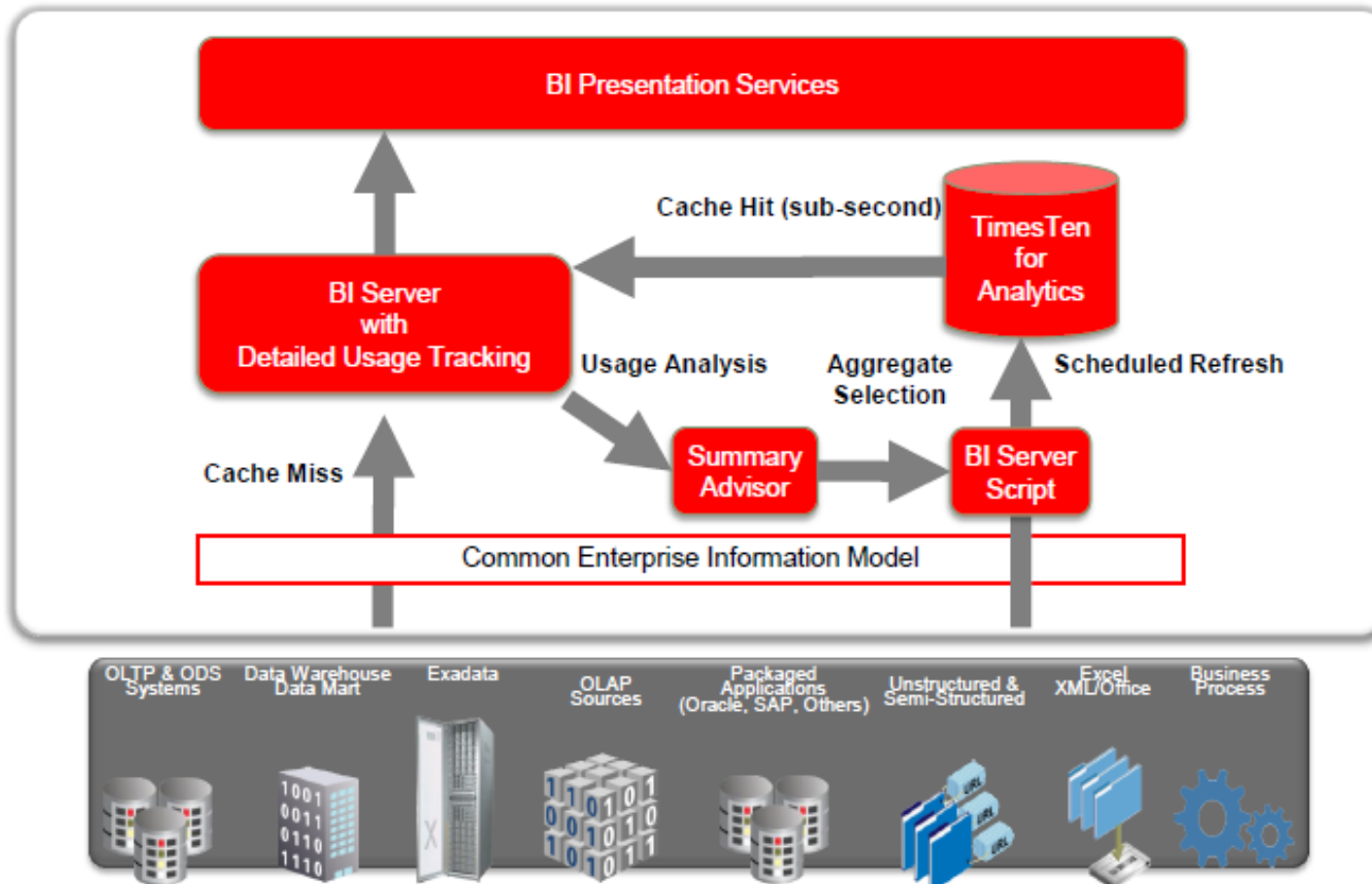
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About Exalytics BI Machine

- Super-fast ROLAP and MOLAP
- Speed-of-thought analysis
- **Optimized Hardware**
 - Memory : 1TB DRAM
 - Processors : 40 Intel Xeon® E7-4800 Core:
 - Software Engineering
- Adaptive In-Memory Caching
- In-Memory Columnar Compression
- Optimized Storage Block Access
- Free-form Data Exploration
- High-Density Visualizations
- Optimized for Exadata(out of the box Infiniband Connection)
- Oracle BI and EPM applications right out of the box
- Seamless migration of existing Oracle BI applications built on EssBase and OBIEE



Adaptive In-Memory Cache





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Oracle's Performance Claims for Exalytics

- **BI Query reporting: Exalytics on Oracle DB**
 - Lock elimination, in-memory aggregates lead to 18X response time improvements.
 - Scales better with significantly larger user populations.
- **BI Query reporting: Exalytics on Exadata DB**
 - Lock elimination, in-memory aggregates, fast inter-connect to Exadata, SQL optimizations for Exadata lead to 23X response time improvements
- **OLAP Planning: Exalytics on Essbase running EPM Application**
 - Minimizing contention in block access and pagination, in-memory computations, deferred computations, lead to over 16X improvements in Essbase response times and throughput levels.
 - End-to-end Planning: 6X improvements in throughput, and 5X improvements in response times.



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