



# The Journey to World-Class

## HUGmn – Hyperion Users Group (Minnesota)

Design, tune and optimize Oracle EPM 11.1.2.x architectures

Presented by; Mark T Wirth & John LoPresti

# A little about your Presenters;

## Mark T Wirth

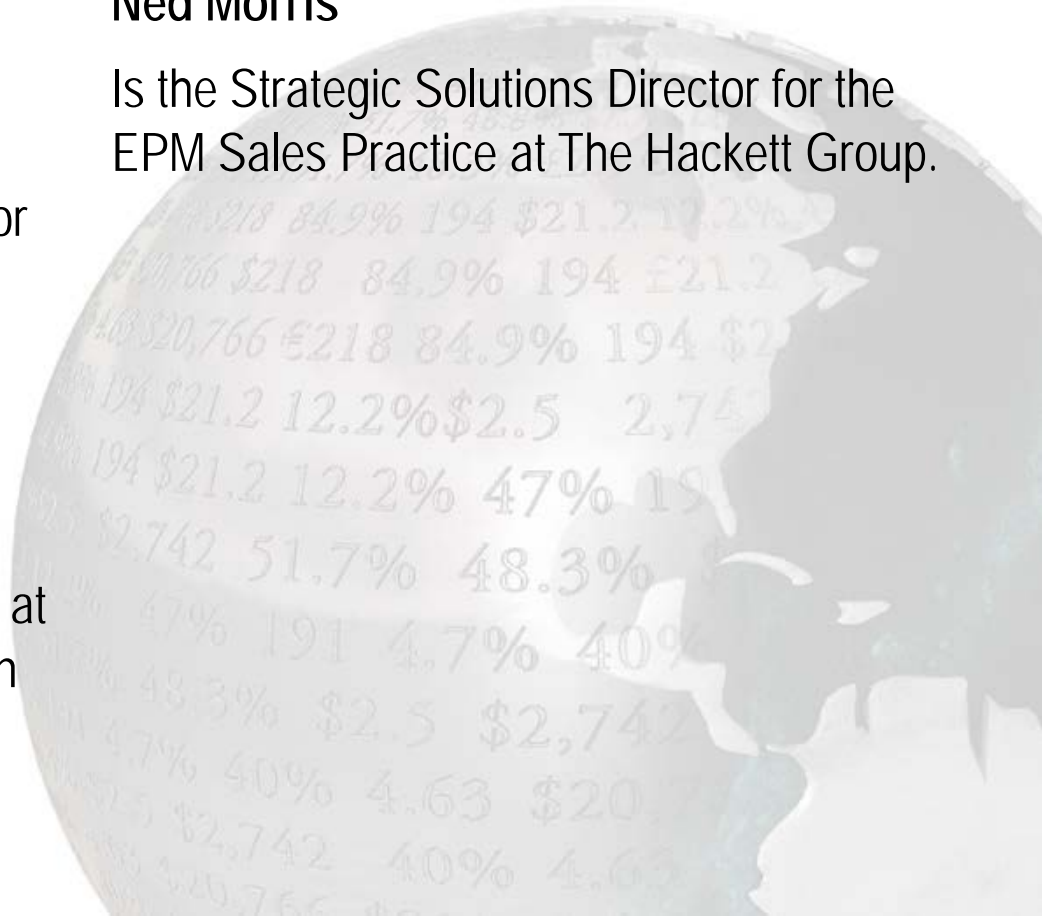
Is the National Practice Lead for the EPM Infrastructure Practices at The Hackett Group. Discussing the Tuning exercises for the EPM 11.1.2.x Architectures.

## John LoPresti

Is the Director for the EPM Infrastructure Performance Management Practice (IPM) at The Hackett Group. Discussing the Design approach for the EPM 11.1.2.x tuning.

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# Agenda

## Design Approach

- What is tuning & optimization?
- Design and the evolution
- 'Best Practices' tuning approach
- POA – Performance Testing
- Performance Test Criteria – Organizational Approach
- Influential factors for Performance Testing
- Common Design Doubts
- Performance Testing Benefits
- ROI: Case Examples
- Outcome of Performance Tuning/Optimization
- Tuning Examples

# Design Approach



# What is Performance Tuning & Optimization? (IT Definition)

## Performance Tuning

- Defined as the improvement to an architecture design using various systematic methods/approaches from the result of analysis.
- Tuning Examples; Hyperion Oracle Database or a SQL Server, eCommerce Landing page, HTTP server, Browsers – IE, Firefox, Safari.

## Performance Optimization

- Defined as the act, process or methodology of making a system component as fully functional or effective as possible.
- Optimization Examples; SQL statements, modifying application code or hardware definitions.
- **Note:** Hyperion Performance Tuning is a complex & iterative process

# Design and the Evolution

What impact has the evolution of technology had on design? (some points)

- Design teams got larger
- New roles emerge into the field
- Solutions became more complex
- Longer design sessions
- 'Best Practices' evolved with change



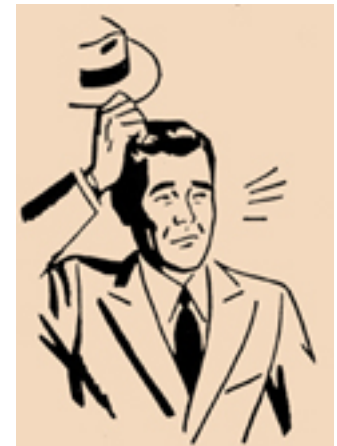
- Interesting Fact – The Commodore PET (Personal Electronic Transactor), Apple II, Tandy Radio Shack computers came out in '1977'. During that year Atari launches their video game system console.

Quote: *"For Tomorrow belongs to the people who prepare for it today."*

# 'Best Practices' tuning approach

## So how do we plan for tomorrow?

- Understand the scope of the project (start planning early)
- Align IT with objectives & define your team
- Come up with a fail-safe/backup plan (build buffer avoid scope creep)
- Provide multiple solutions
- Define your 'Best Practice' approach (POA Solution)
  - Performance Testing (Proof of Architecture)
- Why Performance Testing for proofing an architecture?



# POA – Performance Testing

## What is Performance Testing?

- Defined as an approach in measuring an architecture for responsiveness and stability based on a prescribed workload.

## Performance Terms that come to mind;

- Scalability – systems ability to perform while under load
- Latency – delayed response back measured in time from a submitted request
- Think-Time – the actual user responses from pauses between actions
- Resource Utilization – usage metrics defined by CPU, Memory, Disk Space, etc....
- Throughput – measuring requests made by users, i.e. – requests per second or bits per second
- Response Time – metric to measure a round-trip event or transaction



# Performance Test Criteria – Organizational Approach

## Performance Testing Focus

- It measures three key areas of an organization (designed);
  - Business – target time, SLAs
  - Application – code, database
  - Infrastructure – hardware, integrations

## Performance Testing Approach (type of test)

- Load Testing – simulate number of users to validate the behavior of the system.
- Stress Testing – large number of users to validate capacity of system
- Endurance Testing (or Soak) – number of users against a prescribed window of time
- Spike Testing – number of users all running simultaneously
- Component Testing – running a series of tests against a specific architecture component
- DITL Testing (Day-in-the-Life) – simulating an actual business event

# Influential factors for Performance Testing

## Business Influences

- User Activity
  - Defining the user and business transactions conducted in a day; data entry, reporting, analysis
  - Business Rules
  - BPMs – Business Process Models
- Rate of User Activity
  - Consist of the number of user transactions conducted per day or by hour (specific to a single user)
- Concurrency of Users
  - Based on the number of users working simultaneously for each activity defined

# Influential factors for Performance Testing cont'd

## Application Influences

- Number of applications
  - Custom versus out-of-the-box
  - Type; Web, Application Components, Databases
- Database
  - Connectivity between the application
  - Connectivity within the infrastructure
- Tech-Stack
  - Associated drivers & compatibility, versions, patches, etc....
- Instance Environments
  - DEV, SIT, UAT, PRF PROD

# Influential factors for Performance Testing cont'd

## Infrastructure Influences

- Number of servers
  - Server SPECS – CPU, Memory, HD, etc...
- Types of servers
  - Web, Application, Database, etc....
- Integrated server farms (Web, CITRIX, Other)
  - Web, External (CITRIX, VPN), Security, etc....
- Networking
- Storage Frames
- Instance Environments
  - DEV, SIT, UAT, PRF PROD

# Influential factors for Performance Testing cont'd

## Other Technical Influences

- Tune/Optimize Browsers
  - IE, Firefox, Safari
- Tune/Optimize Web Servers
- Tune/Optimize Operating System (Client)
  - Windows, LINUX or otherwise
- Tune/Optimize Operation System (Server)
  - Windows, LINUX or otherwise
- Tune/Optimize JAVA Application Servers (JVMs)
- Tune/Optimize Relational Databases

# Associated Design Costs – Performance Instance

Model 1 - Permanent License In-house solution (\$180 per user)

ITEM	Total
Performance Testing Tool	\$32,000.00
Performance Testing Protocol - Web eCommerce Solution	\$22,500.00
Performance Testing Protocol - Networking Solution	\$22,500.00
Performance Testing Protocol - ICA Solution	\$22,500.00
<b>Total Cost -</b>	<b>\$99,500.00</b>

## Associated Cost for full-blown solution;

- Specifically to software & licensing (Model 1)
- Not taking in account infrastructure which varies based on solution as well as maintenance
- Note:** Resource Planning has to be taken into account in addition as well as infrastructure

Model 2 - 1-month term license solution (\$31 per user)

ITEM	Total
Performance Testing Tool	\$5,509.00
Performance Testing Protocol - Web eCommerce Solution	\$3,875.00
Performance Testing Protocol - Networking Solution	\$3,875.00
Performance Testing Protocol - ICA Solution	\$3,875.00
<b>Total Cost -</b>	<b>\$17,134.00</b>

Model 3 - 3-month term license solution (\$52 per user)

ITEM	Total
Performance Testing Tool	\$9,182.00
Performance Testing Protocol - Web eCommerce Solution	\$6,500.00
Performance Testing Protocol - Networking Solution	\$6,500.00
Performance Testing Protocol - ICA Solution	\$6,500.00
<b>Total Cost -</b>	<b>\$28,682.00</b>

## Associated Cost for term solutions;

- Specifically to software & licensing for 1-month & 3-months (Model 2 & 3)
- Not taking in account infrastructure which varies based on solution as well as maintenance

# Common Design Doubts

## Old School Thinking

- Fix-it later mentality
  - Defer after SIT is complete (Functional Testing Cycle)
  - Resolve in production
- Myth Mentality (most common)
  - *Performance Problems are rare*
  - *Hardware is fast and inexpensive*
  - *Responsive software costs too much to build*
  - *You can always tune it later*

# Performance Testing Benefits

Benefits are anything that generates revenue and avoids costs;

- More problem discovery by management systems versus user complaints
- Better mean time to repair/recovery (MTTR) problems
- Trend analysis for future expansion=>Improved capacity planning
- Improved user productivity and business process
- Improved IT staff productivity
- Resource shifting to more strategic IT initiatives (helpful to fueling business innovation and growth)
- Lower overall investment in tools (resources per project)
- Discover network and security issues
- Reduce wasted costs



# Outcome of Performance Tuning/Optimization

## Overall objectives: (some examples)

- Improving system load for scalability
  - Removing bottlenecks in the architecture
  - Reducing response times within defined SLAs
  - Proofing the overall architecture (validation)
  - Building effective Monitoring Strategy
  - Creating awareness around the architecture
    - Align the Business, Applications & Infrastructure
- 
- **Note:** *“Using Performance Testing will help you understand the performance of applications at key stages of their lifecycle.”*

# EPM 11.1.2.1 Infrastructure Tuning

# Oracle EPM 11.1.2.1 Tuning Changes

- Oracle HTTP Server (OHS)
- IIS HTTP Server 7.x
- Windows 2008 R2
- WebLogic 10.3.4
- Oracle JRockit R28+
- Oracle Database
- Reporting and Analysis Framework
- HFM
- Planning
- Essbase

# Oracle HTTP Server (OHS)

- New features:
  - Compression library is included by default in OHS shipped with Fusion Middleware 11g / OHS 11g PS2. (Oracle Web Cache)
- Implement following tuning settings for OHS:
  - Compression filters.
  - Caching rules.
- Issues Without:
  - Significant increase in remote (with high latency) users response time.
  - Network team reports high bandwidth usage for EPM traffic.
  - Web server unable to handle peak users load.

# Microsoft Internet Information Server 7.x (IIS)

- IIS 7.x involves a new configuration system this means IIS 6.0 “metabase.xml” is no longer used.
  - IIS 7.x settings are configurable from IIS Manager or via “appcmd.exe” or using the Configuration Editor.
  - In IIS 7.0 to use configuration editor, download / install Administration Pack 1.0. Note in IIS 7.5, configuration editor is installed by default.
- Implement following tuning settings in IIS 7.x:
  - Compression filters.
  - Caching rules.
  - Increase Timeouts and Maximum Content Length (HFM data load).
- Issues Without:
  - Significant increase in remote (with high latency) users response time.
  - Network team reports high bandwidth usage for EPM traffic.
  - Web server unable to handle peak users load.
  - Unable to upload large multiple data files in HFM.

# Tune HTTP Server Compression / Caching

- Bandwidth Savings.
- Improves request/response latency
- Firefox 3.5 web form processing much faster than Internet Explorer 7.0 and 8.0

# Performance Gain Test (OHS)

- Below table summarizes the performance improvement for Workspace / Planning transactions over a 1 Mbps bandwidth link for one remote user (ran with multiple iterations for 30 minutes).

Transaction Name	Average Time Non-Compression (seconds)	Average Time Compression (seconds)	% Improvement
Workspace Login	56	25	55%
Workspace Home Page	49	32	35%
Open Planning Application	18	10	44%
Open Planning Web Form (50,000 cells)	590	200	66%
Workspace Logoff	7	5	29%
Total Throughput (bytes)	21,587,996	2,272,578	89%

# Performance Gain Test (IIS)

- Below table summarizes the performance improvement for Workspace / HFM transactions over a 1 Mbps bandwidth link for one remote user (ran with multiple iterations for 30 minutes).

Transaction Name	Average Time Non-Compression (seconds)	Average Time Compression (seconds)	% Improvement
Workspace Login	58	26	55%
Workspace Home Page	51	30	41%
Open HFM Application	20	13	35%
Open HFM WDEF (large)	42	22	48%
Change POV	20	11	42%
Open HFM Grid	26	12	54%
Workspace Logoff	8	6	25%
Total Throughput (bytes)	5,523,842	1,191,405	78%



# Tune HTTP Servers Parameters (OHS)

Parameters	Default Value	Suggested Value
MaxKeepAliveRequests	100	0
KeepAliveTimeout	5	15
KeepAlive	On	On

# Tune HTTP Servers Parameters (IIS)

Parameters	Default Value	Suggested Value
<p>Disable "Idle Time-out (minutes)" setting for all the EPM Application Pools.                      Tip: In IIS manager, on Application Pool page, selection an application pool and then click on "Advanced Settings ..." to set this configuration.</p>	20	0
<p>Disable "Regular Time Interval (minutes)" setting for all the EPM Application Pools.                      Tip: On the Application Pools page, select an application pool, and then click Recycling in the Actions pane and deselect this option.</p>	1740	0
<p>minBytesPerSecond property                      Tip: If "Timer_MinBytesPerSecond" error message noted in httperr1.log file on the IIS server. It is recommended to reduce or disable the minBytesPerSecond property in IIS 7.0+ to prevent a slow client connection from being closed prematurely.</p>	240	50 How-To: Navigate to Path: C:\Windows\System32\Inetsrv\ , Run the Command: appcmd.exe set config - section:system.applicationHost/webLimits /minBytesPerSecond:"50" /commit:apphost
<p>Connection Timeout                      Tip: In order to avoid random disconnections for remote users, it is recommended to increase this value.</p>	120	7200 How-To: Navigate to Path: C:\Windows\System32\Inetsrv\, Run the Command: appcmd.exe set config - section:system.applicationHost/sites "[name='Default Web Site'].limits.connectionTimeout:02:00:00" /commit:apphost

# Tune HTTP Servers Parameters (IIS)

Parameters	Default Value	Suggested Value
<p>Tune the following memory limits for all the EPM (64bit) Application Pools:            Private Memory Limit (KB)            Virtual Memory Limit (KB)</p> <p>Tune the following memory limits for all the EPM (32bit) Application Pools:            Private Memory Limit (KB)            Virtual Memory Limit (KB)</p> <p>Important Note: It is recommended to set no memory limits (0) only for 64bit IIS. Only force memory limits for 32bit IIS.</p> <p>Tip: On the Application Pools page, select an application pool, and then click Recycling in the Actions pane and deselect all the options.</p>	<p>= Default            = Default            = Default            = Default</p>	<p>= 0            = 0            = 1048576            = 1572864</p>
ASP Session Timeout (HFM) - Tip: Set to longer than the longest consol.	20	360
ASP Response Buffering Limit (HFM) To allow Downloads e.g. Data Extracts and avoid truncated files.	4194304	1073741824 - which equates to 1GB
maxAllowedContentLength (HFM) In HFM, during loading of the files if you see error "HTTP Error 404.13 - Not Found" then increase this value.	30 MB	1073741824 - which equates to 1GB How-To: Navigate to Path: C:\Windows\System32\Inetsrv\, Run the Command: appcmd set config "Default Web Site/hfm" /section:requestfiltering /requestlimits.maxallowedcontentlength:1073741824 Note: You may need to further increase this value depending on the total size of all the HFM files.

# Windows 2008 R2

- New features:
  - No need to adjust the TCP parameters such as wait\_time value etc. Windows 2008 has a auto TCP window scaling feature to maximize the network performance.
  - Core-parking, when cores are not in use, Windows 2008 R2, transition to a state that consumes less power.
- Implement following tuning settings for Windows 2008:
  - Increase MaxUserPort.
  - Set Power Saving option to High Performance.
  - Apply /3GB to Windows 2008 32-bit
- Issues Without:
  - Smart View users unable to refresh large worksheets.
  - Planning users unable to open / connect to applications.
  - HFM consolidations taking more time to complete.
  - HFM / Essbase 32bit process hang / crashed (due to process memory limit reached 2048MB)

# Tune Operating Systems Parameters - Windows 2008

Parameters	Default Value	Suggested Value
<p>MaxUserPort</p> <p>Under heavy loads it may be necessary to adjust the MaxUserPort. This parameter determines the availability of user ports requested by an EPM application e.g. Smart View, Planning etc.</p> <p>Tip: By default, the start port is 49152, and the default end port is 65535, this means there are 16383 usable dynamic ports. *Use the following "netsh" command to configure start port and the range: netsh int ipv4 set dynamicport tcp start=1025 num=64508</p> <p>Important Note: If you are using firewalls to restrict traffic on your internal network you will need to update the configuration of those firewalls to compensate for the new port range. You can view the current dynamic port range on the server by using the following "netsh" command: netsh int ipv4 show dynamicport tcp</p>	16383	65532
<p>Set the power option setting to "High performance"</p> <p>With High Performance power scheme, processors are always locked at the highest performance state. Refer to below section 2.1.2.1 for performance benchmark on two power plans. Important Note: For more details, read MS KB article: <a href="http://support.microsoft.com/kb/2207548">http://support.microsoft.com/kb/2207548</a></p> <p>Tip: How-to change a power plan:</p> <ol style="list-style-type: none"> <li>1. Under Control Panel click on Power Options.</li> <li>2. Choose the "High Performance" option</li> <li>3. Close the Power Option window.</li> </ol> <p>Note: With High Performance power plans "Turbo Boost" is enabled on all Intel processors and it also turns off core parking feature (in Windows 2008 R2).</p>	Balanced	High Performance

# Oracle WebLogic Server 10.3.4

- New change in EPM 11.1.2: EPM components uses JDBC data sources. So now you need to fine tune the JDBC connections and caches.
- Implement following tuning settings in WebLogic 10.3.4:
  - Increase Stuck Threads – Time before running thread is deemed stuck
  - Increase Accept Backlog – TCP Connections Queue
  - Increase Connection Pool
- Issues Without:
  - During normal operations, EPM managed server shuts down.
  - WebLogic Server hangs during long running operations (FR, WA).

# Tune WebLogic Server Parameters - Tuning JDBC Data Sources

EPM Data Source Name	Default Value	Suggested Value
EPMSystemRegistry	Initial Capacity: 1 Maximum Capacity: 150	Initial Capacity: 10* Maximum Capacity: 150 *Note: Each managed server target to EPMSystemRegistry data source creates 1 pool on start-up. Ensure you have enough Oracle DB processes; refer to Oracle Database Tuning slide.
raframework_datasource	Initial Capacity: 1 Maximum Capacity: 15	Initial Capacity: 1 Maximum Capacity: 150
planning_datasource	Initial Capacity: 1 Maximum Capacity: 15	Initial Capacity: 1 Maximum Capacity: 150
financialclose_datasource (FCM)	Initial Capacity: 1 Maximum Capacity: 30	Initial Capacity: 1 Maximum Capacity: 150
eas_datasource (Essbase Admin Services)	Initial Capacity: 1 Maximum Capacity: 15	Initial Capacity: 1 Maximum Capacity: 30
calc_datasource (CalcMgr)	Initial Capacity: 1 Maximum Capacity: 15	Initial Capacity: 1 Maximum Capacity: 30
profitability_datasource (Profitability)	Initial Capacity: 1 Maximum Capacity: 15	Initial Capacity: 1 Maximum Capacity: 30
hps_datasource (HpsAlerter, HpsWebReports)	Initial Capacity: 1 Maximum Capacity: 15	Initial Capacity: 1 Maximum Capacity: 30
discman_datasource (DisclosureManagement)	Initial Capacity: 1 Maximum Capacity: 15	Initial Capacity: 1 Maximum Capacity: 30
aif_datasource (ErpIntegrator)	Initial Capacity: 1 Maximum Capacity: 120	Initial Capacity: 1 Maximum Capacity: 200

# Tune Java Virtual Machines

- Newly created application server instances use default memory settings, which are often too small to accommodate EPM System requirements. Optimal settings can be determined only by close monitoring of application server performance under peak realistic load.
  - Tuning JRockit JVM
  - Tuning Sun Hotspot JVM



# Oracle JRockit R28+

- New features:
  - Improved Garbage Collection.
  - CommandLine Options Changed to the HotSpot Format i.e. XX:+|option.
- Implement following tuning settings from previous JRockit (32 bit) version to JRockit (64bit) R28:
  - Set maximum (Xmx) heap size to larger value.
- Issues Without:
  - Startup Times Take Longer When Using JRockit JVM Versus Sun JVM.
  - *Note: On Solaris box, apply JRockit R28.0.2 as this issue has been fixed in release. For more information, read below: [3.4.1 Oracle JRockit Starts Slowly on Some Solaris Machines] [http://download.oracle.com/docs/cd/E15289\\_01/doc.40/e15066/issuesresolved.htm#BEIFIBEA](http://download.oracle.com/docs/cd/E15289_01/doc.40/e15066/issuesresolved.htm#BEIFIBEA)*
  - *Native OutOfMemory errors occurs despite memory being available (this issue only occurs in R27 version NOT in R28 version.*

# Tuning Oracle JRockit 64-bit JVM

- This table lists the memory setting, the suggested value (depending on available physical memory on each server), and the Oracle JRockit 64bit Java argument:

Setting	Suggested Value	Java Argument
Minimum heap	1024 MB	-Xms1024m
Maximum heap	2048 MB	-Xmx2048m
For SOA, increase the size of Compressed References to resolve native OutOfMemory (OOM) error. Tip: This can be done for other EPM web components besides the SOA, only if you encounter a native OutOfMemory error despite memory being available.	32 GB (4/32/64)	-XXcompressedRefs:size=32GB

# Tuning Sun Hotspot JVM

- This table lists the memory setting, the suggested value (depending on available physical memory on each server), and the Oracle JRockit 64bit Java argument:

Setting	Suggested Value	Java Argument
Minimum heap	1536 MB	-Xms1536m
Maximum heap	1536 MB	-Xms1536m
Minimum permanent generation heap	256 MB	-XX:PermSize=256m
Maximum permanent generation heap	256 MB	-XX:MaxPermSize=256m
Minimum young generation size	512 MB	-XX:NewSize=512m
Maximum young generation size	512 MB	-XX:MaxNewSize=512m

# Tune Oracle Database Parameters

- The following table describes several performance-related database initialization parameters for Oracle 10g / 11g Database:

Products (in an Oracle Instance)	Java Argument
Shared Services, Reporting and Analysis, Financial Management (HFM), EAS, HPCM, Performance Scorecard, Planning.	<p>PROCESSES=1200</p> <ul style="list-style-type: none"> <li>- whatever is needed to support the expected number of applications and application servers. Important Note: Further increase this value to 2500, if you have large deployment with many managed servers running i.e. 22 or 27.</li> </ul> <p>Set OPEN_CURSORS=7000</p> <ul style="list-style-type: none"> <li>- the default value for this parameter is too small for systems such as WebLogic Server / HFM.</li> <li>- It is important to set the value of OPEN_CURSORS high enough to prevent system from running out of open cursors.</li> <li>- Note: assuming that a session does not open the number of cursors specified by OPEN_CURSORS, there is no added overhead to setting this value higher than actually needed.</li> </ul> <p>Set CURSOR_SHARING=FORCE.</p> <ul style="list-style-type: none"> <li>- changing this parameter to the suggested value will increase the performance, and will not impact any data results. Important Note: Using the default setting (i.e. EXACT) under high HFM users load can lead to high levels of unnecessary parsing of SQL statements on the database side, which in turn causes a substantial degradation in performance for HFM.</li> </ul> <p>Set SESSION_CACHED_CURSORS parameter.</p> <ul style="list-style-type: none"> <li>- the default value is 50. To evaluate the accuracy of the value, set to 50 and then evaluate if this is enough. If it's not enough then increase to 100.</li> </ul> <p>Set OPTIMIZER_INDEX_COST_ADJ to 50</p> <ul style="list-style-type: none"> <li>- setting of 50 makes the index access path look half as expensive as normal.</li> </ul>
Financial Data Quality Management (FDM)	<p>DBA must read and follow the tuning instructions included in the FDM DBA Guide. Failure to tune the database per the FDM DBA Guide will result in poor performance.</p>

# Reporting And Analysis Framework (RAF)

- Implement following tuning settings from RAF 11.1.2.1:
  - Increase DB connection pool for repository metadata connections.
  - Increase the maximum heap size (Xmx).
- Issues Without:
  - Under peak period load, some users when click on “Explore” gets intermittent error “...Service cannot be acquired”.
  - RAF agent stop responding under peak load (i.e. when FR batch tries to generate 10K-15K PDF outputs).
  - Out of memory error occurs.

# HFM (Hyperion Financial Management)

- New feature:
  - HFM subcube memory settings in the registry that previously were only environment level settings have been expanded to an application level.
- Implement following tuning settings for HFM 11.1.2.1:
  - FreeLRU memory settings and maximum data cache size.
  - No. of maximum database connections.
- Issues Without:
  - HFM consolidations / data copy taking long time to complete.
  - Reports (via FR, Smart View) are slower.
  - Web Grid / WDEF takes longer time to load.

# Planning

- New feature:
  - By default “SMARTVIEW\_COMPRESSION\_THRESHOLD” system property is enabled in order to optimize large queries performance for Smart View.
- Implement following tuning settings from Planning 11.1.1.3 / 9.3.3 / 9.2.1 to Planning 11.1.2.1:
  - Planning compression filters.
  - Planning Smart View compression value (if any).
- Issues
  - Significant increase in remote (with high latency) users response time when accessing Planning web forms.
  - Network team reports high bandwidth usage for Planning traffic.

# Essbase

- Implement following tuning settings from Essbase 11.1.2.1:
  - ESS CSS Java heap - opmn.xml
  - Set NO\_HOSTNAME\_LISTCONNECT to True - essbase.cfg
- Issues
  - Essbase agent run out of memory / terminate abnormally.
  - EAS hang / stop responding when admin user tries to view active login sessions multiple times.