Best Practices Guide for Infrastructure Tuning Oracle® Business Intelligence Enterprise Edition
11g Release 1 (11.1.1.6, 11.1.1.7)

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Disclaimer:

- All tuning information stated in this guide is for orientation only. Tuning is an iterative process, every modification has to be tested and its impact should be monitored and analyzed.

- Before implementing any of the tuning settings, it is recommended to carry out end to end performance testing that will also include to obtain baseline performance data for the default configurations, make incremental changes to the tuning settings and then collect performance data. Otherwise it may worsen the system performance.

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INTRODUCTION

This document is written for people who monitor performance and tune the components in a BI environment. It is assumed that readers know server administration, Oracle® Fusion Middleware (FMW), hardware performance tuning fundamentals, web servers, java application servers and database.

1.0 PERFORMANCE OVERVIEW

This chapter discusses performance and tuning concepts for Oracle® Business Intelligence Enterprise Edition. This chapter contains the following sections:

1.1 Introduction to Oracle® Business Intelligence EE System Performance
1.2 Performance Terminology
1.3 Understanding Key Performance Drivers

1.1 Introduction to Oracle® Business Intelligence EE Performance

To maximize Oracle® Business Intelligence Enterprise Edition performance, you need to monitor, analyze, and tune all the Fusion Middleware / BI components. This guide describes the tools that you can use to monitor performance and the techniques for optimizing the performance of Oracle® Business Intelligence Enterprise Edition components.

1.2 Performance Terminology

This guide uses the following performance terminologies:

- **Scalability**
  - System's ability to perform within specification under increasing user load, data load and hardware expansion.
- **Latency**
  - Time between the issuing of a request and the time when the work actually begins on the request.
- **Think time**
  - The time a real user pauses to think between actions.
- **Resource utilization**
  - A consumption metric, for example, the percent of CPU usage.
- **Response time**
  - A time metric, for example round-trip time it takes the server to deliver a Web page.

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- **Throughput**
  - A rate metric (requests per unit of time), for example, requests per second, bits per second. For example, if an application can handle 20 customer requests simultaneously and each request takes one second to process, this site has a potential throughput of 20 requests per second.

1.3 Understanding Key Performance Drivers

To optimize your deployment, you must understand the elements that influence performance and scalability. A factor that dictates performance is called a key performance driver. Knowing how the drivers behave in combination further enhances your ability to deploy Oracle® Business Intelligence Enterprise Edition optimally, based on the unique requirements of each deployment.

- **Hardware Capacity** - Factors such as number of servers, quantity and speed of processors, available RAM, network speed etc.

- **Technical Platforms Tuning** – Fine tuning other third party software required for installing and running Oracle® Business Intelligence Enterprise Edition product; for example: relational databases, Java application servers, Web servers, Server / Client Operating System and browsers.

- **Business Application Design** - Application design is an important factor in OBIEE system performance i.e. structure, size, and use of product / custom features in designing reports and dashboards etc.

- **Business process usage** - Activities carried out by users in the normal flow of your business cycle.
  - Business process usage has three components:
    - User activity—Activities available to users for reporting and analysis.

    - Rate of user activity – A number of transactions executed by one user per one hour.

    - User concurrency—Number of users for each activity being carried out simultaneously.

2.0 TOP TUNING RECOMMENDATIONS FOR OBIEE

Performance tuning Oracle® Business Intelligence Enterprise Edition is a complex iterative process, care needs to be taken to have appropriate backups, proceed incrementally and thoroughly test with each incremental change.

To get you started, we have created a list of recommendations to help you optimize your Oracle® Business Intelligence Enterprise Edition performance.

This chapter includes the following sections that provide a quick start for performance tuning Oracle® Business Intelligence Enterprise Edition infrastructure.

2.1   Tune Operating Systems parameters.

2.2   Tune Oracle® WebLogic Server (WLS) parameters.

2.3   Tune 64bit Java Virtual Machines (JVM).

2.4   Tune 32bit Java Virtual Machines (JVM).

2.5   Tune HTTP Server parameters.

2.6   Tune HTTP Server Compression / Caching.

2.7   Tune Web Browser Settings.

2.8   Tune Database Parameters.

2.9   Tune IBM WebSphere Server (IBM WAS) Parameters.

Note: While the list in each of the above stated section is a useful tool in starting your performance tuning, it is not meant to be comprehensive list of areas to tune. You must monitor and track specific performance issues within your Business Intelligence Enterprise Edition dashboards / reports design to understand where tuning can improve performance.

2.1 Tune Operating Systems parameters

Proper OS tuning might improves system performance by preventing the occurrence of error conditions. Operating system error conditions always degrade performance. The following sections describe issues related to operating system performance:

2.1.1 Linux Tuning Parameters

This topic describes how to tune the Linux operating system to optimize the performance of your Oracle® Business Intelligence Enterprise Edition.

Linux Parameter	Default Value	Suggested Value
tcp_fin_timeout By reducing the value of this entry, TCP/IP can release closed connections faster, providing more resources for new connections. Consult your Linux (OEL / RHEL / SLES) documentation for more information on how to permanently change the value for this parameter.	60	**30**
Backlog connections queue (tcp_max_syn_backlog) When the server is heavily loaded or has many clients with bad connections with high latency, it can result in an increase in half-open connections. Consult your Linux (OL / RHEL / SLES) documentation for more information on how to permanently change the value for this parameter.	1024	**4096**
/etc/security/limits.conf Make the following changes to the */etc/security/limits.conf* file: 　　* *soft nofile 131072* 　　* *hard nofile 131072* 　　* *soft nproc 131072* 　　* *hard nproc 131072* It is recommended to implement above ulimits settings to avoid following potential BIEE system issues: 　-　If file descriptors (open files - nofile) is set to low value, the OBIEE processes *(sawserver, nqsserver)* will stop responding and throw Too Many Open Files error message in BI logs. You can check current open files value using the "ulimit -n" command 　-　If a max user processes *(nproc)* value is low (default is 1024) the exception *java.lang.OutOfMemoryError: unable to create new native thread* will occur for bi_serverN/OPMN/JavaHost processes. Linux has a maximum allowed process per user limit, that you can check this value using the "ulimit -u" command.		

For more information about Linux tuning, you should consult your Linux documentation. Note the above TCP/kernel tunable parameters and their corresponding values are provided as examples and rough guidelines only. You can re-adjust these and other parameters based on actual system load, usage patterns such as the number of concurrent users and sessions and so on.

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2.1.2   Windows Server 2012 Tuning Parameters

This topic describes how to tune the Windows Server 2012 operating system to optimize the performance of your Oracle® Business Intelligence Enterprise Edition.

Windows Server 2012 Server Parameter	Default Value	Suggested Value*
MaxUserPort Under heavy loads it may be necessary to adjust the MaxUserPort. This parameter determines the availability of user ports requested by Oracle® Business Intelligence Enterprise Edition. **Tip:** By default, the start port is 49152, and the default end port is 65536, this means there are 16384 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* **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*	16384	**64508**
Set the power option setting to "High performance" With High Performance power scheme, processors are always locked at the highest performance state. Turbo is enabled for High Performance power plans on all Intel and AMD processors and it is disabled for Power Saver power plans. **Important Note:** Set the operating system power management profile to **High Performance** System. Note that this will not work properly if the system BIOS has been set to disable operating system control of power management. **Tip:** How-to change a power plan: 1. Navigate to **Control Panel > System and Security** 2. Click on **Power Options**. 2. Choose the *"High Performance"* option 3. Close the Power Option window.	Balanced	**High Performance** *(Set the server BIOS to **High Performance**, with C-states disabled).*

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2.1.3 Windows 2008 Tuning Parameters

This topic describes how to tune the Windows 2008 operating system to optimize the performance of your Oracle® Business Intelligence Enterprise Edition.

Windows 2008 Server Parameter	Default Value	Suggested Value*
MaxUserPort Under heavy loads it may be necessary to adjust the MaxUserPort. This parameter determines the availability of user ports requested by Oracle® Business Intelligence Enterprise Edition. **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* **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*	16383	**65532**
Set the power option setting to "High performance" With High Performance power scheme, processors are always locked at the highest performance state. **Important Note:** For more details, read MS KB article: http://support.microsoft.com/kb/2207548 Tip: How-to change a power plan: 1. Under Control Panel click on Power Options. 2. Choose the *"High Performance"* option 3. Close the Power Option window.	Balanced	**High Performance**
Tune Windows 2008 *(32bit)* **/3GB switch. Important Note:** It is only recommended to enable /3GB, if BI Presentation Services *(32bit)* crashes due to 2 GB process virtual memory limit.		

Tip: The utility to manage the BCD Store, BCDEDIT.EXE.
/3GB switch applies to BI Presentation *(sawserver.exe)* process i.e. compiled with the /LARGEADDRESSAWARE switch:
 	
`C:\Oracle\BIEE11g\Oracle_BI1\bifoundation\web\bin>imagecfg sawserver`
`sawserver contains the following configuration information:`
`    Subsystem Version of 4.0`
`    Image can handle large (>2GB) addresses`
`    Stack Reserve Size: 0x100000`
`    Stack Commit Size: 0x1000`
	Default process user limit (userVa) is 2048 MB.	To set /3GB /USERVA=2900, you would need to type in *BCDEDIT.EXE /Set IncreaseUserVa 2900* in command prompt (cmd).

2.1.4 Windows 2003 Tuning Parameters

This topic describes how to tune the Windows 2003 operating system to optimize the performance of your Oracle® Business Intelligence Enterprise Edition.

Parameter	Default Value	Suggested Value
TcpTimedWaitDelay This parameter controls the amount of time the OS waits to reclaim a port after an application closes a TCP connection, has a default value of 4 minutes. During a heavy users load, these limits may be exceeded resulting in an address in use: connect exception. Tip: In registry set this parameter using following: *HKLM\System\CurrentControlSet\Services\Tcpip\Parameters* *Value: TcpTimedWaitDelay* *Value Type: dword* *Data: 30 (decimal)*	240	**30**
MaxUserPort The number of user-accessible ephemeral ports that can be used to source outbound connections is configurable using this parameter. Tip: In registry set this parameter using following: *HKLM\System\CurrentControlSet\Services\Tcpip\Parameters* *Value: MaxUserPort* *Value Type: dword* *Data: 65534 (decimal)*	5000	**65534**
Tune Windows 2003 *(32 bit)* **/3GB switch**		
Important Note: It is only recommended to enable /3GB, if BI Presentation Services (32bit) crashes due to 2 GB process virtual memory limit. Using the /3GB switch allocates 1 GB to the kernel and 3 GB to the User-mode space. Therefore it is strongly recommended to implement following settings when /3GB switch is applied, in order to make sure OBIEE and Windows stability: **1. Using a range of memory for the /userva=xxxx switch that is within the range of 2900 to 3030**. The following sample *boot.ini* file demonstrates how to use the new switch to tune a server to allocate 2,900 MB of User-mode virtual memory and 1,196 MB of Kernel-mode virtual memory. This increases the available kernel space by 172 MB: *[boot loader]* *timeout=30* *default=multi(0)disk(0)rdisk(0)partition(1)\WINDOWS* *[operating systems]* *multi(0)disk(0)rdisk(0)partition(1)\WINDOWS="Windows Server 2003, Enterprise" /fastdetect* */NoExecute=OptOut* **/3GB /***Userva=2900* **2. Increase the SystemPages in registry:** The setting being updated controls the allocable memory for the operational system caches, file caches among others, and the value being set will tell Windows to calculate the value itself on the side of the maximum allocable resources. *HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management* *Open the Data: SystemPages* *Enter its new value (hex): FFFFFFFF* **3. After applying above settings, reboot the server.**		

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2.1.5   AIX Tuning Parameters

This topic describes how to tune the AIX (6.1 / 7.1) operating system to optimize the performance of your Oracle® Business Intelligence Enterprise Edition.

AIX Parameter	Default Value	Suggested Value
tcp_timewait By reducing the value of this entry, TCP/IP can release closed connections faster, providing more resources for new connections. Tip: Set using command no -r -o tcp_timewait=1	1	**1**
tcp_keepidle KeepAlive packet ensures that a connection stays in an active/ESTABLISHED state. Tip: Set using command no -r -o tcp_keepidle=600	14400 (2 hours)	**600** **(5 minutes)**
tcp_keepintvl Specifies the interval between packets that are sent to validate the connection. Tip: Set using command no -r -o tcp_keepintvl=10	150	**10**
tcp_keepinit Specifies the initial timeout value for TCP connection. Tip: Set using command no -r -o tcp_keepinit=40	150	**40**
Listen Backlog Increase this to handle peak incoming connection rates under heavy load. Tip: Set using command no -r -o somaxconn=8192	1024	**8192**
Socket send buffer size Tip: Set using command no -r -o tcp_sendspace=16384	16384	**For optimal value for your Ethernet adapter, consult IBM support.**
Socket receive buffer size Tip: Set using command no -r -o tcp_recvspace=16384	16384	**For optimal value for your Ethernet adapter, consult IBM support.**
User Limit Parameter: Tip: ulimit -a command displays all the ulimit limits.		
time (seconds)	Default	**unlimited**
file (blocks)	Default	**unlimited**
data (kbytes)	Default	**unlimited**
stack (kbytes)	Default	**4194304**
memory (kbytes)	Default	**unlimited**
coredump (blocks)	Default	**unlimited**
nofiles (descriptors)	Default	**10240**
threads (per process)	Default	**unlimited**
processes (per user)	Default	**unlimited**
AIX Libraries: It is recommended that the version of xlC runtime library is at least version 11.1.0.4 or later. To find the current version type: *lslpp –l xlC.aix61.rte*		

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Set the following environmental variables in *opmn.xml* **file in each BI Component environment section** *(<environment><variable id=".."/></environment>)* **i.e.** *OracleBIPresentationServicesComponent, OracleBIServerComponent and Essbase***:**
AIXTHREAD_SCOPE=S Tip: For OBIEE, you should set this value to S, which signifies system-wide contention scope (1:1).
AIXTHREAD_MNRATIO=1:1
AIXTHREAD_MUTEX_DEBUG=OFF Tip: Maintains a list of active mutexes for use by the debugger.
AIXTHREAD_RWLOCK_DEBUG=OFF Tip: For optimal performance, you should set the value of this thread-debug option to OFF.
AIXTHREAD_COND_DEBUG=OFF Tip: Maintains a list of condition variables for use by the debugger
SPINLOOPTIME=1000 Tip: SPINLOOPTIME controls the number of times the system will retry a busy lock before yielding to another process. The default value is 40. This should be increased to 1000 or higher because a busy lock retry is inexpensive compared to the alternative. Use the tprof command to determine if the check_lock routine has high CPU usage. If it does, you can increase the value even more.
YIELDLOOPTIME=<<CORES>> Where <<CORES>> is set to the number of physical cores (not logical). Tip: This variable has been shown to be effective in OBIEE, where multiple locks are in use. The number of times to yield the processor before blocking on a busy lock is n. The default is 0.
MALLOCMULTIHEAP=considersize,heaps:4 Multiple heaps are required so that a threaded application can have more than one thread issuing malloc(), free(), and realloc() subroutine calls. With a single heap, all threads trying to do a malloc(), free(), or realloc() call would be serialized (that is, only one call at a time). The result is a serious impact on multi-processor machines.
MALLOCTYPE=buckets
LDR_CNTRL=LOADPUBLIC@IGNOREUNLOAD Ensure AIX shared libraries have "read-other" permissions so that AIX will load them in global memory. Otherwise concurrent use by multiple processes will require their own CPU cache blocks. Substantial performance gains are possible when libraries are shared globally. The environment variable, LDR_CNTRL, provides a means of modifying memory and libraries behavior for OBIEE components. It is recommended that LOADPUBLIC and IGNOREUNLOAD be set. This will improve the performance and use of memory.
Tip: How to verify all above environment settings for a running process under AIX: Under AIX you can use the ps command to verify the environment settings for a running process with the following command: *ps eww <processid>	tr ' ' '\n'	grep =	sort*

For more information about AIX tuning, you should consult your AIX vendor's documentation. Note the above TCP/kernel tunable parameters and their corresponding values are provided as examples and rough guidelines only. You can adjust these and other parameters based on actual system load, usage patterns such as the number of concurrent users and sessions and so on.

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2.1.6 Oracle® Sun Solaris Tuning Parameters

This topic describes how to tune the Solaris operating system to optimize the performance of your Oracle® Business Intelligence Enterprise Edition. Note: Solaris default network tuning parameters should be sufficient in most cases. For heavy, network centric workloads, it's always best practice to increase the size of key TCP-related parameters to improve system performance and reduce dropped connections.

Sun Solaris Parameter	Default Value	Suggested Value
File descriptors (nofiles) **Important Note:** On any box that hosts an Oracle® HTTP Server / WebLogic Server / OBIEE (Presentation/BI) server / Essbase server it is recommended to increase nofiles (descriptors) to optimal value. On Solaris this means setting the "rlim_fd_cur" in the /etc/system file and rebooting the box. Please make sure to check your operating system documentation and release notes; there are some negative performance implications on some older versions of Solaris if you set these numbers too high. Tip: The syntax for adjusting this parameter in the /etc/system file is shown below: set rlim_fd_cur=65535	256	**65535**
tcp_time_wait_interval It is recommended to reduce this setting to 60,000 milliseconds, or 1 minute; *this is the default value starting in Solaris 10.* By reducing the value of this entry, TCP/IP can release closed connections faster, providing more resources for new connections. Tip: The command "`netstat -a | grep TIME_WAIT | wc -l`" will count all of the TCP connections that are in the TIME_WAIT state. As this number approaches the maximum number of file descriptors per process, your application's throughput will suffer dramatic degradations because new connection requests may have to wait for a free space in the application's file descriptor table. Tip: Set using command: ndd -set /dev/tcp tcp_time_wait_interval 30000	60000	**30000**
tcp_xmit_hiwat The tcp_xmit_hiwat and tcp_recv_hiwat parameters control the default size of the send window and receive window for each TCP connection. On very fast	49152	**This parameter is calculated based on the network bandwidth and latency. You could follow this rule to calculate:**

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networks, you should make sure that the values are set to at least 32K.		<numbers of bits per second> * <roundtrip latency> * 8 [bits/byte]
tcp_recv_hiwat The tcp_xmit_hiwat and tcp_recv_hiwat parameters control the default size of the send window and receive window for each TCP connection, respectively. On very fast networks, you should make sure that the values are set to at least 32K.	49152	**This parameter is calculated based on the network bandwidth and latency. You could follow this rule to calculate:** **<numbers of bits per second> * <roundtrip latency> * 8 [bits/byte]**
ipcl_conn_hash_size This parameter controls the size of a hash table that helps quickly locate the TCP socket's data structure in the kernel. If the size is too small, it will result in long hash chains in each bucket that force the operating system into a linear search for the socket entry of interest, and performance will suffer accordingly.	0 (in Solaris 10)	**In Solaris 10, the default value of 0 means that the system automatically sizes an appropriate value for this parameter at boot time, depending on the available memory.**
Connection backlog This parameter controls the maximum allowable number of completed connections waiting to return from an accept call (that have completed the three-way TCP connection handshake). You should increase this parameter only if you notice that your system is dropping connections. Increase these values if you do see non-zero values for tcpListenDrop in the output for the following command: `netstat –s	fgrep –i listendrop` Increase the values in steps of 256 starting from the default value **Tip:** Set using commands: ndd -set /dev/tcp tcp_conn_req_max_q 1024 ndd -set /dev/tcp tcp_conn_req_max_q0 4096	128 (max_q) 1024 (max_q0)	**1024 (max_q)** **4096 (max_q0)**

Important Note: It is important to keep systems up to date with Solaris patches because the patches provide fixes for security vulnerabilities, performance, and other improvements of the OS. *Certain patches specifically target the Java platform, which benefits WebLogic Server in regards to performance and functionalities.*

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2.2 Tune Oracle® WebLogic Server (WLS) parameters

This topic describes how to tune the WebLogic Server to optimize the performance of your Oracle® Business Intelligence Enterprise Edition.

2.2.1 Tuning JDBC Data Sources

You can improve Oracle Business Intelligence Enterprise Edition performance and stability by properly configuring the attributes in JDBC data sources in your *bifoundation_domain* domain.

2.2.1.1 Increase the Number of Connection Pool

If JDBC (BI) data sources are running out of connections to the relational database then you need to set the maximum number of connections to high value for the following Business Intelligence Enterprise Edition data sources:

Important Note: Reason why the default value maximum capacity size is set to lower value is because it is important to protect database resources. *So make sure you have enough resources on the database server (available memory is a constraint). If you increase initial / maximum capacity to very high value, you may exceed the limit of PROCESSES / OPEN_CURSORS on Oracle® database server.*

Data Source Name	Default Value	Suggested Value
bip_datasource	Initial Capacity: 0 Maximum Capacity: 50	*Initial Capacity: 0* *Maximum Capacity: 150*
mds-owsm	Initial Capacity: 0 Maximum Capacity: 50	*Initial Capacity: 0* *Maximum Capacity: 150*
EPMSystemRegistry	Initial Capacity: 0 Maximum Capacity: 50	*Initial Capacity: 0* *Maximum Capacity: 150*
aps_datasource	Initial Capacity: 0 Maximum Capacity: 50	*Initial Capacity: 0* *Maximum Capacity: 150*
calc_datasource	Initial Capacity: 0 Maximum Capacity: 50	*Initial Capacity: 0* *Maximum Capacity: 50*
raframework_datasource	Initial Capacity: 0 Maximum Capacity: 50	*Initial Capacity: 0* *Maximum Capacity: 150*

Important Note: *You need to determine the optimal value for the Maximum Capacity as part of your pre-production performance testing.* Once optimal values are determined then set the value of Initial Capacity equal to the value for Maximum Capacity in order to boost performance of JDBC in WebLogic Server web applications.

Tip: Here is the example on how to size open cursors value on Oracle® database, if you have a data source with 150 connections deployed on 1 server and if you use default Statement Cache Size 10, you may open 1500 (150 x 1 x 10) cursors on your database server for the cached statements.

Tip: To increase this value:

1. Log in to the WebLogic Server administration console.

2. Select your data source (for example *"mds-owsm"*), and then click on Connection Pool tab, and then Maximum Capacity.
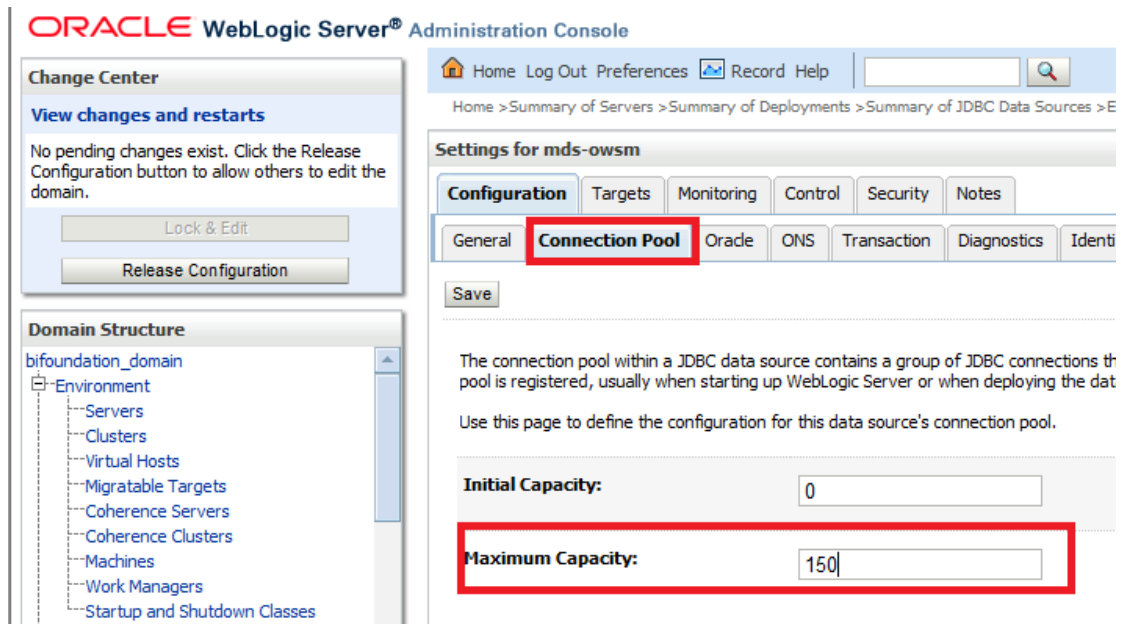
2.2.2 Tune Connection Backlog Buffering

Tune the number of connection requests that a WebLogic Server instance will accept before refusing additional requests. The *Accept Backlog* parameter specifies how many Transmission Control Protocol (TCP) connections can be buffered in a wait queue.

Important Note: In WebLogic Server 10.3.x, it is not required to increase *Accept Backlog* as default listen thread *Accept Backlog* value is increased to *300* which is a better default value.

2.2.3 Stuck thread detection behavior Tuning

WebLogic Server automatically detects when a thread in an execute queue becomes "stuck." Because a stuck thread cannot complete its current work or accept new work, the server logs a message each time it diagnoses a stuck thread.

A thread might get stuck due to various reasons. For example: When large BI report is running and the time it takes to complete is say 800 seconds, then, as the default stuck thread timing is 600 seconds in WebLogic Server, the thread allocated for that query waits for 600 seconds and goes to stuck state.

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Note: the stuck state does not mean that it is stuck forever and it might get unstuck at a later point of time which can be checked in the BI managed server logs. But if there is no reference like that then it might infer that the thread got stuck forever

Use the below Stuck Threads suggested settings as a starting point to improve stuck thread detection, and then, after careful testing of your long running BI transactions, adjust as needed.

Managed Servers	Default Value	Suggested Value
bi_server1	Stuck Thread Max Time=600 Stuck Thread Timer Interval=60 Max Stuck Thread Time=600	*Stuck Thread Max Time=2400* *Stuck Thread Timer Interval=2400* *Max Stuck Thread Time=2400*
AdminServer	Stuck Thread Max Time=600 Stuck Thread Timer Interval=60 Max Stuck Thread Time=600	*Stuck Thread Max Time=2400* *Stuck Thread Timer Interval=2400* *Max Stuck Thread Time=2400*

Tip: To configure above stuck thread detection behavior settings, you need to:
- Access the Administration Console for the BI domain.
- Expand the Servers node in the left pane to display the servers configured in your BI domain.
- Click on BI Managed Server *(bi_serverN)* instance and then select the Configuration -> Tuning tab in the right pane. Modify the attributes i.e. Stuck Thread Max Time and Stuck Thread Timer Interval
- Then click on Overload tab for each BI Managed Server *(bi_serverN)* and modify the attribute Max Stuck Thread Time.

2.2.5   Tune Analytics (WebLogic Server app) (plug-in) Connection pool

There is a connection pool between WebLogic Server analytics app and OBIPS, and the default value is *128* inadequate for a large number of concurrent users which is typically expected in a BIEE system with high users concurrency.

When the number of connections reaches the maximum limit, any new requests are kept waiting. Hence, it is recommended to increase this pool to *512* for your BIEE system to support more concurrent users.
Tip: Where it is configured:
- Go to directory:
  ../user_projects/domains/bifoundation_domain/config/fmwconfig/biinstances/coreapplication/
  and take a copy the file: **bridgeconfig.properties**

- Open and edit the *bridgeconfig.properties* file and add the following line at the end of the file:
  oracle.bi.presentation.sawconnect.ConnectionPool.MaxConnections=512

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2.2.6 To improve the performance of WebLogic and LDAP Authentication providers: To optimize the group membership caches for WebLogic and LDAP Authentication providers, set the following attributes (found in the Administration Console on the *LDAP Authentication provider's Configuration → Provider Specific and Performance pages*):

- **Group Membership Searching**—Controls whether group searches are limited or unlimited in depth. This option controls how deeply to search into nested groups. For configurations that use only the first level of nested group hierarchy, this option allows improved performance during user searches by limiting the search to the first level of the group.

    o If a limited search is defined, Max Group Membership Search Level must be defined.

    o If an unlimited search is defined, Max Group Membership Search Level is ignored.

- *Max Group Membership Search Level*—Controls the depth of a group membership search if Group Membership Searching is defined. Possible values are:

    o 0—Indicates only direct groups will be found. That is, when searching for membership in Group A, only direct members of Group A will be found. If Group B is a member of Group A, the members will not be found by this search.

    o Any positive number—indicates the number of levels to search. For example, if this option is set to 1, a search for membership in Group A will return direct members of Group A. If Group B is a member of Group A, the members of Group B will also be found by this search. However, if Group C is a member of Group B, the members of Group C will not be found by this search.

Tip: *If you see BI Managed Server JVM seg faults and then it restarts / hangs when a user logs in, check the user group memberships in Active Directory. If the user belongs to groups in a circular reference (group A belongs to group B that belongs to group A), without additional configuration parameters, the JVM may segfaults.* **To workaround that** *set in WebLogic Server administration console the "Max Group Membership Search Level" for the AD provider. For more information, refer to "Improving the Performance of WebLogic and LDAP Authentication Providers" section at* http://download.oracle.com/docs/cd/E12840_01/wls/docs103/secmanage/atn.html .

2.2.7 Tune LibOVD searches

LibOVD is a java library providing virtualization capabilities over LDAP authentication providers in Oracle Fusion Middleware. LibOVD is activated when you set the property *virtualize=true* for the identity store provider in *jps-config.xml*.

By setting the libOVD property attribute parameter **OPTIMIZE_SEARCH=*true*** will improve the performance of searches as it forces libOVD to search only within the users and groups search bases defined in the authenticator providers. No searches are performed elsewhere.

Tip: Add libOVD property *OPTIMIZE_SEARCH=true* via Enterprise Manager:
a. Navigate to the WebLogic Domain > Security > Security Provider Configuration screen and click the Configure button, as shown:
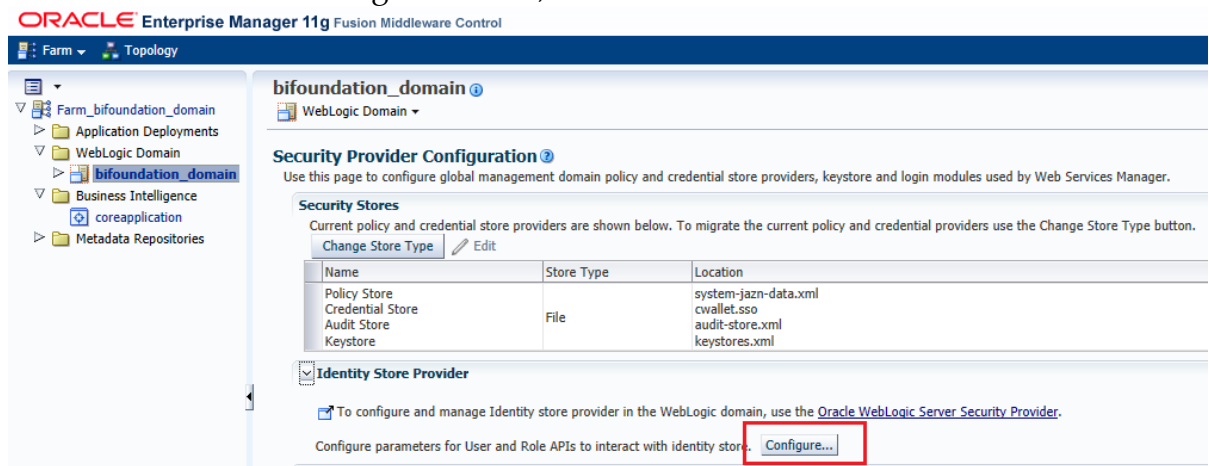
Then use the Add button to add the **OPTIMIZE_SEARCH=*true*** to the identity store *(jps-config.xml)* -- the same place where you have set *"virtualize=true"*.
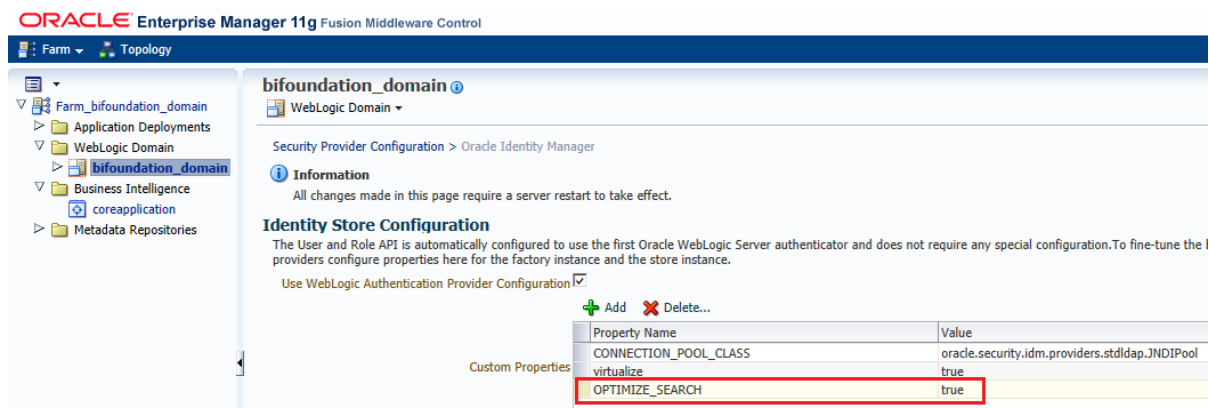
Important Note: In order to take advantage of *OPTIMIZE_SEARCH* property, you do not need FMW patch for BI release 11.1.1.7.x. but for previous BI releases make sure to get the appropriate patch for the corresponding release of FMW.

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2.2.8 Disable Wrap Data Types

By default, JDBC data type's objects are wrapped with a WebLogic wrapper. This allows for features like debugging output and track connection usage to be done by the server.

The wrapping can be turned off by setting this value to false. This improves performance, in some cases significantly, and allows for the application to use the native driver objects directly.

Tip: How to Disable Wrapping in WLS Administration Console

You can use the Administration Console to disable data type wrapping for following JDBC data sources in *bifoundation_domain* domain:

Data Source Name
bip_datasource
mds-owsm
EPMSystemRegistry
aps_datasource
calc_datasource
raframework_datasource

Tip: To disable wrapping for each JDBC data source (as stated in above table):

1. If you have not already done so, in the Change Center of the Administration Console, click **Lock & Edit**.

2. In the **Domain Structure** tree, expand **Services**, then select **Data Sources**.

3. On the Summary of Data Sources page, click the data source name for example *"mds-owsm"*.

4. Select the **Configuration: Connection Pool** tab.

5. Scroll down and click **Advanced** to show the advanced connection pool options.

6. In **Wrap Data Types**, deselect the checkbox to disable wrapping.

7. Click Save.

8. To activate these changes, in the Change Center of the Administration Console, click **Activate Changes**.

   Important Note: This change does not take effect immediately—it requires the server be restarted.

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2.3   Tune 64bit Java Virtual Machines (JVM)

Newly deployed web application server instances use default memory heap settings, which are often too small to accommodate Oracle Business Intelligence Enterprise Edition 64 bit requirements. Optimal JVM settings can be determined only by close monitoring of application server performance under peak realistic load.

2.3.1   Tuning 64bit Oracle® JRockit JVM

In JRockit JVM *(R28.x)*, the heap grows faster than before. The JVM also ensures that the heap size grows up to the maximum Java heap size *(-Xmx)* before an *OutOfMemory* error is thrown.

Below table lists the memory settings that applies to BI managed servers in BI domain i.e. *bi_serverN*.

Important Note: Below the suggested value, make minimum and maximum to the same value *(4096m in this example – depending on available physical memory on each server, you need to put in the right value for your system)*. Making them the same size means the JVM will not spend time trying to work out if it needs to increase the size of the heap:

Setting	Suggested Value	Java Argument*
Minimum heap	*4096 MB*	*-Xms4096m*
Maximum heap	*4096 MB*	*-Xmx4096m*
Increase the size of Compressed References only to resolve native OutOfMemory (OOM) error despite physical memory being available.	*32 GB*	*-XXcompressedRefs:size=32GB*
Thread-local areas (TLA) is used for object allocation. This option (-XXtlaSize) can be used to tune the size of the thread-local areas. *Important Note: Only apply this setting if you see "java.lang.OutOfMemoryError: getNewTla" error in bi_serverN web app logs. You may also need to consider increasing the physical memory on server to permanently resolve the "getNewTla" error occurrences.*	*min=128k preferred=512k wasteLimit=128k*	*- XXtlaSize:min=128k,preferred=512k ,wasteLimit=128k*

Note: It is recommended to use the default garbage collection mode i.e. -Xgc:throughput. Also large heap reduces the garbage collection frequency and fragmentation, improving the throughput of the application; however, a large heap increases the memory footprint of the Java process.

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Warning: Make sure you have enough physical memory allocated / available on 64bit servers and then use the above settings as a starting point, and after load testing, adjust as needed. For a stable / an even performance over time, you should set the initial heap size (-Xms) to the same value as the maximum heap size (-Xmx).

Tip: How to increase the Oracle (JRockit) JVM heap memory value for BI managed server (bi_serverN):

1. Edit the *…/user_projects/domains/<DOMAIN-NAME>/bin/setOBIDomainEnv.sh file* (.cmd on Windows).

2. There, you will find *–Xmx2048m* in two places, one for the Sun JVM (64BIT) and the other for the Oracle JVM (JRockit – 64BIT). Please make JVM heap size changes in *"Oracle"* (as shown in bold text below). The snippet of script where you need to make changes looks like below:

```
echo "SVR_GRP = ${SVR_GRP}"
if [ "${SVR_GRP}" = "obi" ] ; then
  if [ "${JAVA_VENDOR}" = "Sun" ] ; then
    if [ "${JAVA_USE_64BIT}" = "true" ] ; then
        SERVER_MEM_ARGS="-Xms256m -Xmx2048m -XX:MaxPermSize=512m"
        export SERVER_MEM_ARGS

  fi
        if [ "${JAVA_VENDOR}" = "Oracle" ] ; then
            if [ "${JAVA_USE_64BIT}" = "true" ] ; then
 SERVER_MEM_ARGS="-Xms4096m -Xmx4096m -XXcompressedRefs:size=32GB
-XXtlaSize:min=128k,preferred=512k,wasteLimit=128k"
                      export SERVER_MEM_ARGS
                else ...
```

2.3.2   Tuning 64bit Oracle® Sun JVM

Below table lists the memory settings that applies to BI managed servers in BI domain i.e. *bi_serverN*.

Important Note: Below the suggested value, make minimum and maximum to the same value *(4096m in this example – depending on available physical memory on each server, you need to put in the right value for your system)*. Making them the same size means the JVM will not spend time trying to work out if it needs to increase the size of the heap:

Setting	Suggested Value	Java Argument*
Minimum heap	*4096 MB*	*-Xms4096m*
Maximum heap	*4096 MB*	*-Xmx4096m*
Maximum permanent generation heap	*512 MB*	*-XX:MaxPermSize=512m*

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*Warning: Make sure you have enough physical memory allocated / available on servers and then use the above settings as a starting point, and after load testing, adjust as needed. For a stable / an even performance over time, you should set the initial heap size *(-Xms)* to the same value as the maximum heap size (-Xmx).

Tip: How to increase the Oracle Sun JVM heap memory value for BI managed server (bi_serverN):

1. Edit the *…/user_projects/domains/<DOMAIN-NAME>/bin/setOBIDomainEnv.sh file* (.cmd on Windows).

2. There, you will find *–Xmx2048m* in two places, one for the Sun JVM (64BIT) and the other for the Oracle JVM (JRockit – 64BIT). Please make JVM heap size changes in *"Sun"* (as shown in bold text below). The snippet of script where you need to make changes looks like below:

```
echo "SVR_GRP = ${SVR_GRP}"
if [ "${SVR_GRP}" = "obi" ] ; then
  if [ "${JAVA_VENDOR}" = "Sun" ] ; then
     if [ "${JAVA_USE_64BIT}" = "true" ] ; then
       SERVER_MEM_ARGS="-Xms4096m -Xmx4096m -XX:MaxPermSize=512m"
        export SERVER_MEM_ARGS

  fi
       if [ "${JAVA_VENDOR}" = "Oracle" ] ; then
          if [ "${JAVA_USE_64BIT}" = "true" ] ; then
             SERVER_MEM_ARGS="-Xms256m -Xmx2048m"
                    export SERVER_MEM_ARGS
                else ...
```

2.3.3   Tuning 64bit IBM JVM

Below table lists the memory settings that applies to BI managed servers in BI domain i.e. *bi_serverN*.

Important Note: Below the suggested value, make minimum and maximum to the same value *(4096m in this example – depending on available physical memory on each server, you need to put in the right value for your system)*. Making them the same size means the JVM will not spend time trying to work out if it needs to increase the size of the heap:

Setting	Suggested Value	Java Argument*
Minimum heap	*4096 MB*	*-Xms4096m*
Maximum heap	*4096 MB*	*-Xmx4096m*
Java thread stack size (-Xss)	*8m*	*-Xss8m*

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The maximum size of the new (nursery) heap to the specified value when using -Xgcpolicy:gencon	*2048m*	*-Xmn2048m*	
Maximum permanent generation heap	*512 MB*	*-XX:MaxPermSize=512m*	

-Xgcpolicy:gencon is a generational garbage collector for the IBM JVM. The generational scheme attempts to achieve high throughput along with reduced garbage collection pause times.

*Warning: Make sure you have enough physical memory allocated / available on servers and then use the above settings as a starting point, and after load testing, adjust as needed. For a stable / an even performance over time, you should set the initial heap size *(-Xms)* to the same value as the maximum heap size *(-Xmx).*

Tip: How to increase the IBM JVM heap memory value for BI managed server (bi_serverN) deployed on IBM WebSphere:

1. Log in to the administration console of the WebSphere Application Server.
2. Navigate to the Java virtual machine settings.
    o   WebSphere Application Server: Click *Servers > Server Types > WebSphere application servers >* bi_server1 *> Java and Process Management > Process definition > Java Virtual Machine.*

3. Specify *4096* for the following two settings.
    o   Initial Heap Size (MB)
    o   Maximum Heap Size (MB)

4. Specify following in Generic JVM arguments:
    -Xss8m -Xmn2048m -XX:MaxPermSize=512m -Xgcpolicy:gencon

5. Click OK. Click Save.

Tip: *See screenshot below*:

2.4 Tune 32bit Java Virtual Machines (JVM)

Newly created application server instances use default memory settings, which are often too small to accommodate Oracle Business Intelligence Enterprise Edition requirements. For 32bit JVM in order to allocate a heap of more than 1024 MB, you need to use a 64bit JVM in order to allocate more than 1024 MB of maximum heap. *See section "Tune 64bit Java Virtual Machines (JVM)" in this guide.*

2.4.1 Tuning 32bit JRockit JVM

This table lists the memory settings, the suggested value, and the Oracle® JRockit Java argument:

Setting	Suggested Value	Java Argument
Minimum heap	1024 MB	*-Xms1024m*
Maximum heap	1024 MB	*-Xmx1024m*

Important Note: By setting minimum heap size = maximum heap size gives you a controlled environment where you get a good heap size right from the start and also to minimize minor/major garbage collections.

Important Note: By default, JRockit JVM uses the dynamic garbage collection strategy to optimize for throughput. For OBIEE JVM component, it is not recommended to change to other available dynamic strategies.

2.4.2 Tuning 32bit Sun JVM

This table lists the memory settings, the suggested value, and the Sun's Java argument:

Setting	Suggested Value	Java Argument
Minimum heap	1024 MB	*-Xms1024m*
Maximum heap	1024 MB	*-Xmx1024m*
Minimum permanent generation heap	128 MB	*-XX:PermSize=128m*
Maximum permanent generation heap	256 MB	*-XX:MaxPermSize=256m*

Important Note: By setting minimum heap size = maximum heap size gives you a controlled environment where you get a good heap size right from the start and also to minimize minor/major garbage collections.

Important Note: Also for application servers that use Sun's Java Virtual Machine (JVM), make sure that the size of the permanent generation heap must be increased (as stated in above table). When the permanent area of the heap is too small, the JVM will do a full garbage collection of the entire heap before resizing the permanent area.

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2.5   Tune HTTP Server parameters

This topic describes how to tune the HTTP server to optimize the performance of your Oracle® Business Intelligence Enterprise Edition.

2.5.1   IIS 7.0+ HTTP Server Tuning

Parameters	Default Value	Suggested Value
Disable *"Idle Time-out (minutes)"* **setting BI Application Pool.** **Tip:** In IIS manager, on Application Pool page, selection an application pool and then click on "Advanced Settings ..." to set this configuration.	20	**0**
Disable *"Regular Time Interval (minutes)"* **setting for BI Application Pool.** **Tip:** On the Application Pools page, select an application pool, and then click Recycling in the Actions pane and deselect this option.	1740	**0**
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.	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*

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Connection Timeout Tip: In order to avoid random disconnections for remote users, it is recommended to increase this value.	120	**7,200** 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 the following memory limits for all the BI *(64bit)* **Application Pool:** **Private Memory Limit (KB)** **Virtual Memory Limit (KB)** **Tune the following memory limits for all the BI** *(32bit)* **Application Pool:** **Private Memory Limit (KB)** **Virtual Memory Limit (KB)** **Important Note:** It is recommended to set no memory limits (0) only for 64bit IIS. *Only force memory limits for 32bit IIS.* **Tip:** On the Application Pools page, select an application pool, and then click Recycling in the Actions pane and deselect all the options.	= Default = Default = Default = Default	**= 0** **= 0** **= 1048576** **= 1572864**

Important Note: Use the above suggested settings as a starting point, and then, after careful testing, adjust as needed. To avoid potential performance issues, values for IIS 7.0+ parameters should be set only after considering the nature of the workload and the system capacity (i.e. CPU and memory).

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2.5.2 Oracle® HTTP Server (OHS) Tuning

Oracle® HTTP Server uses directives in *httpd.conf* file. The directives for each Multi-Processing Module (MPM) type are defined in the *httpd.conf* file. The default MPM type is Worker MPM.

Parameters	Default Value	Suggested Value
MaxKeepAliveRequests	100	*0*
KeepAliveTimeout	5	*61*
KeepAlive	On	*On*
Timeout	300	*6000*

# WinNT MPM (this MPM is for Windows Only 	
 <IfModule mpm_winnt_module>
     ThreadsPerChild
     ListenBackLog
     MaxRequestsPerChild
 </IfModule>
	
	 = 150
	 = Default
	 = 0
		
		 = 1048
		 = 1000
		 = 0

#worker MPM (by default OHS use multithreaded mode in UNIX) <IfModule mpm_worker_module> StartServers MaxClients ListenBackLog MinSpareThreads MaxSpareThreads ThreadsPerChild MaxRequestsPerChild AcceptMutex fcntl LockFile "${ORACLE®_INSTANCE}/diagnostics/logs/${COMPONENT_TYPE}/${COMPONENT_NAME}/http_lock" </IfModule>	 = 2 = 150 = Default = 25 = 75 = 25 = 0	 *= 2* *= 1024* *= 1000* *= 25* *= 75* *= 64* *= 0*
SendBufferSize ReceiveBufferSize **Important Note:** Only add this settings if your customer have large volume of data to display e.g. 2000 to 10000 rows of data.	= OS dependent = OS dependent	*= 8123292* *= 8123292*

If there are many users over WAN using Internet Explorer, the default settings in OHS may result in sub-optimal performance due to re-establishment of *HTTPS* connections. To avoid this problem, edit */u01/app/oracle/fmw/Oracle_WT1/instances/instance1/config/OHS/<ohs_name>/ssl.conf* **and remove:**
   *BrowserMatch ".*MSIE.*" *
   *nokeepalive ssl-unclean-shutdown *
   downgrade-1.0 force-response-1.0		

Increase Oracle HTTP Server **WLIOTimeoutSecs** in Oracle HTTP Server (OHS) plug-in (*mod_wl_ohs.conf*), see the CEAL blog post at *https://blogs.oracle.com/pa/entry/obiee_11_1_1_increase1*		

Important Note: Use the above suggested settings as a starting point, and then, after careful testing, adjust as needed. To avoid potential performance issues, values for OHS parameters should be set only after considering the nature of the workload and the system capacity (i.e. CPU and memory).

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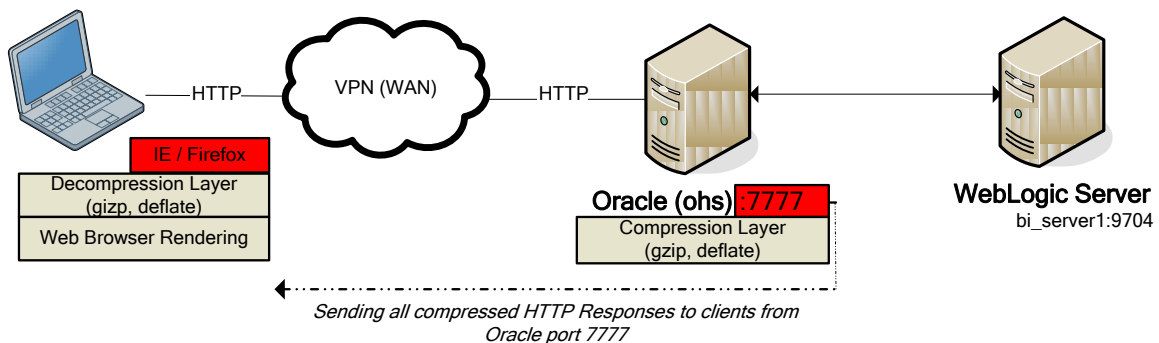## 2.6 Tune HTTP Server Compression / Caching

Why use Web Server Compression / Caching for Oracle® Business Intelligence?

1. Bandwidth Savings: Enabling HTTP compression can have a dramatic improvement on the latency of responses. By compressing static files and dynamic application responses, it will significantly reduce the remote (high latency) user response time.

2. Improves request/response latency: Caching makes it possible to suppress the payload of the HTTP reply using the 304 status code. *Minimizing round trips over the Web to revalidate cached items can make a huge difference in browser page load times.*

2.6.0.1 Web Server Compression Flow

To better understand compression flow, below screen shot depicts the flow and where the compression and decompression occurs on Oracle® HTTP Server (OHS).

Compression enabled on Oracle® HTTP server (OHS) level:

Sending all compressed HTTP Responses to clients from Oracle port 7777

2.6.1 Oracle® HTTP Server (OHS)

This topic describes how to enable caching / compression in Oracle® HTTP Server of your Oracle® Business Intelligence Enterprise Edition. **Important Note:** High load of HTTP replies with 304 status code causes the OBIEE 11g UI to work slow in IE browser 8 / 9. To resolve this issue, it is highly recommended to implement HTTP caching and compression that will help to minimize the round trips over the Web to revalidate cached items, can make a huge difference in browser page load times.

a. How to Enable Compression and Caching:

1. To implement HTTP compression / caching, install and configure Oracle HTTP Server (OHS) 11.1.1.x for the *bi_serverN* Managed Servers *(refer to "OBIEE Enterprise Deployment Guide for Oracle Business Intelligence" document for details).*

2. On the OHS machine, open the file HTTP Server configuration file (*httpd.conf*) for editing. This file is located in the OHS installation directory. For example: *ORACLE_HOME/Oracle_WT1/instances/instance1/config/OHS/ohs1*

3. In *httpd.conf* file, verify that the following directives are included and not commented out:

```
LoadModule expires_module "${ORACLE_HOME}/ohs/modules/mod_expires.so
LoadModule deflate_module "${ORACLE_HOME}/ohs/modules/mod_deflate.so
```

4. Add the following lines in *httpd.conf* file below the directive *LoadModule* section to compression / caching and restart the OHS:

```
#HTTP Compression
<IfModule mod_deflate.c>
  SetOutputFilter DEFLATE
  SetEnvIfNoCase Request_URI \.(?:gif|jpe?g|png)$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.(?:exe|t?gz|zip|bz2|sit|rar)$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.(?:pdf|doc?x|ppt?x|xls?x)$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.avi$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.mov$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.mp3$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.mp4$ no-gzip dont-vary
</IfModule>

#Caching of static files
ExpiresActive On
<IfModule mod_expires.c>
      ExpiresByType image/gif "access plus 3 months"
      ExpiresByType image/jpeg "access plus 3 months"
      ExpiresByType application/x-javascript "access plus 3 months"
      ExpiresByType text/css "access plus 3 months"
      ExpiresByType text/javascript "access plus 3 months"
      ExpiresByType image/png "access plus 3 months"
      ExpiresByType application/x-shockwave-flash "access plus 3 months"
</IfModule>

#This stops the HTTP 304 replies in IE 7/8 browser
<IfModule mod_headers.c>
  <FilesMatch "\.(gif|jpeg|png|x-javascript|javascript|css|swf)$">
      Header set Cache-Control "max-age=7889231"
  </FilesMatch>
</IfModule>
```

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b. Performance Gain Test (Oracle® HTTP Server)

The test with/without HTTP compression enabled was conducted in internal lab to measure the transactions response time / throughput for Oracle® Business Intelligence Enterprise Edition.

Below table summarizes the performance improvement for OBIEE transactions over a 1 Mbps bandwidth link for one remote user.

Transaction Name	Average time (in sec)	Average time (in sec)	% Improvement
	Before (Non-Compressed)	After (Compressed)	
Total transactions response time: *OBIEE Main page > Display report (with 1000 rows) > Click & Navigate to next 1000 rows page up to 5 times.*	300 seconds	20 seconds	93%
Total Throughput (bytes) *(Total generated network traffic for one user)*	18,534,557	1,123,646	94%
Average Network Delay (ms)	350	355	-
Packet Loss %	0	0	-
HTTP Response Codes Count	HTTP/200: 483	HTTP/200: 483	-

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2.6.2 IIS 7.0+ HTTP Server

This topic describes how to enable compression and caching of your Oracle® Business Intelligence Enterprise Edition.

Important Note: High load of HTTP replies with 304 status code causes the OBIEE 11g UI to work slow in IE browser 8 / 9. To resolve this issue, it is highly recommended to implement HTTP caching and compression that will help to minimize the round trips over the Web to revalidate cached items, can make a huge difference in browser page load times.

Tip: Refer to WebLogic Server documentation on how to install and configure the Microsoft Internet Information Server Plug-In for IIS 7.0.

a. How to Enable Compression IIS 7.0+:

1. HTTP Compression should be enabled on the OBIEE site level a*s performance may hindered if enabled globally*.

    Tip: Run the following command line option to apply Dynamic Compression on OBIEE web site level, note in below command replace the *"obiee"* website placeholder with your web site name:

    Navigate to Path: C:\Windows\System32\Inetsrv
    Run the command: Appcmd.exe set config **"obiee"** *-section:system.webServer/urlCompression* */doDynamicCompression:"True"*

2. Only static compression is installed by default. Ensure dynamic compression feature is installed via *Web Server (IIS) > Add Role Services Wizard; for step by step details refer to IIS 7.x documentation*. Increase the compression level of static and dynamic files. Note: dynamic compression level default value is 0 and for static compression level default value is 7. As stated below change the level of compression *(in gzip)* for dynamic files to 7 and for static files to 9.

    Tip: Run the following command line option to increase GZip Compression Level:

    Navigate to Path: C:\Windows\System32\Inetsrv
    *Run the command: Appcmd.exe set config -section:httpCompression -[name='gzip'].*__staticCompressionLevel:9__ *-[name='gzip'].*__dynamicCompressionLevel:7__

    Important Note: Raise the dynamic compression level above seven only if you need more network bandwidth and have sufficient CPU capacity to handle the extra load.
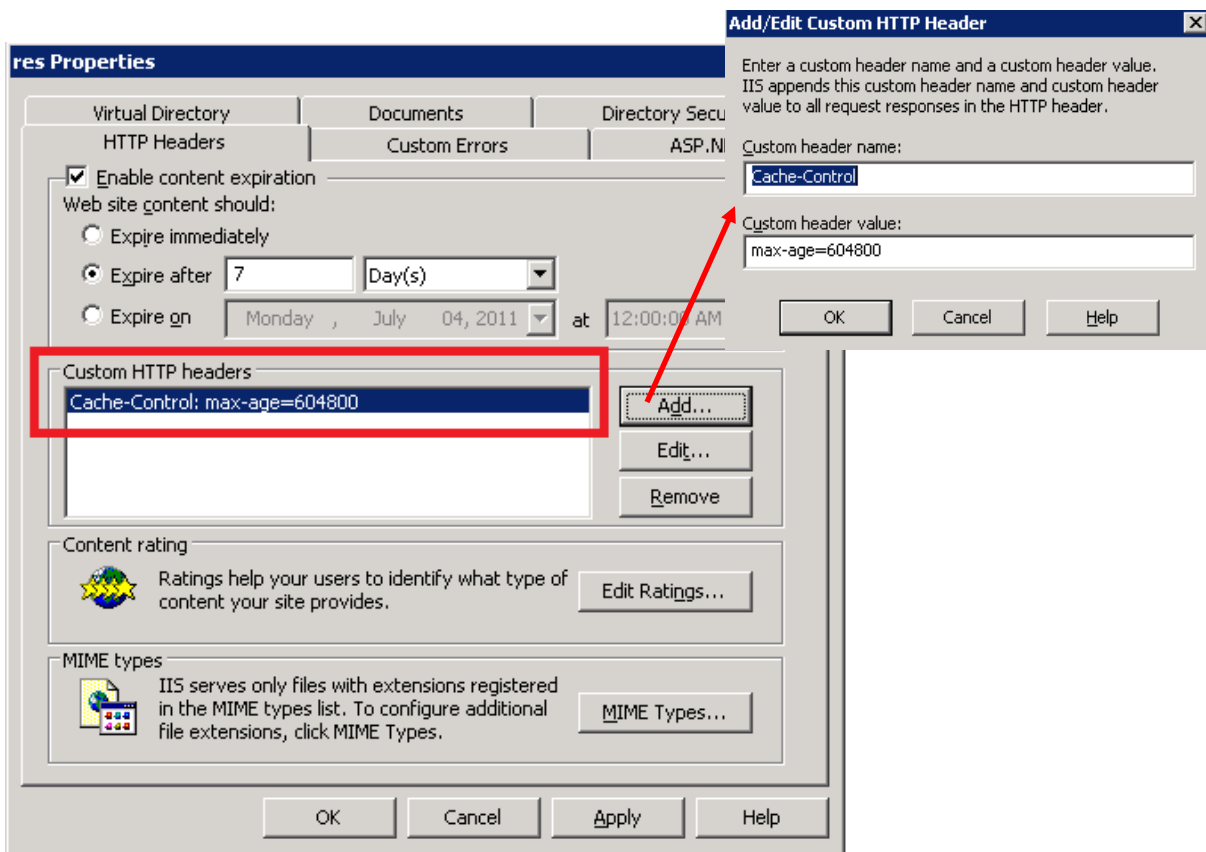
3. Restart the IIS HTTP Server.

b. How to Enable Caching in IIS 7.0+:

Follow these steps to configure static file caching and content expiration if you are using Microsoft IIS 7.0 Web Server with Oracle Business Intelligence.

Tip: It is important to install an IIS *URL Rewrite Module* that enables Web administrators to create powerful outbound rules as stated below.

Following are the steps to set up static file caching for Microsoft IIS 7.0+ Web Server:

1. In *"web.config"* file for OBIEE **static files virtual directory** (`ORACLE_HOME/bifoundation/web/app`) add the following highlight in bold the outbound rule for caching:

```
<?xml version="1.0" encoding="UTF-8"?>
<configuration>
   <system.webServer>
      <urlCompression doDynamicCompression="true" />
      <rewrite>
        <outboundRules>
          <rule name="header1" preCondition="FilesMatch" patternSyntax="Wildcard">
            <match serverVariable="RESPONSE_CACHE_CONTROL" pattern="*" />
            <action type="Rewrite" value="max-age=604800" />
          </rule>
          <preConditions>
            <preCondition name="FilesMatch">
              <add input="{RESPONSE_CONTENT_TYPE}" pattern="^text/css|^text/x-
javascript|^text/javascript|^image/gif|^image/jpeg|^image/png" />
            </preCondition>
          </preConditions>
        </outboundRules>
      </rewrite>
   </system.webServer>
</configuration>
```

2. Restart IIS web server.

Important Note: Following steps can be taken if the *web.config file* is missing in your environment:

a) Manually create the *"web.config"* file for OBIEE static files in the virtual directory (*ORACLE_HOME/bifoundation/web/app*) and place the *"web.config"* file in the custom skin/style application folder as well.
b) Paste in the entire above XML outbound rule content and save the file.
c) Restart the IIS 7.x server.
d) Restart the WebLogic Server managed server (*bi_serverN*).
e) Restart all of the BIEE services using Enterprise Manager.

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2.6.3   IIS 6.0 HTTP Server

This topic describes how to enable compression and caching of your Oracle® Business Intelligence Enterprise Edition.

a. How to Enable Compression IIS 6.0:

1. Specify following additional file types to compress. Edit the *HcFileExtensions* metabase property (for static files) and the *HcScriptFileExtensions* metabase property (for dynamic files) to apply compression to file types for both deflate and gzip compressions:

- *HcScriptFileExtensions* set to **asp**,dll,exe
- *HcFileExtensions* set to htm,html,txt,**js**,**css**

Tip: Run the following command line option to extend file extensions for compression:

Navigate to Path: C:\Inetpub\AdminScripts
Run the commands for gzip and deflate:
*cscript adsutil.vbs set /w3svc/filters/compression/**gzip**/HcFileExtensions "css" "xml" "htm" "txt" "js" "html" "png"*
*cscript adsutil.vbs set /w3svc/filters/compression/**deflate**/HcFileExtensions "css" "xml" "htm" "txt" "js" "html" "png"*

2. As stated below change the level of compression (in gzip, deflate) for dynamic files to 7. **Important Note:** raise the dynamic compression level above seven only if you need more network bandwidth and have sufficient CPU capacity to handle the extra load.

Navigate to Path: C:\Inetpub\AdminScripts
Run the commands for gzip and deflate:
*cscript adsutil.vbs set w3svc/filters/compression/**gzip/HcDynamicCompressionLevel 7***
*cscript adsutil.vbs set w3svc/filters/compression/**deflate/HcDynamicCompressionLevel 7***

3. HTTP Compression should be enabled on the site level a*s performance may hindered if enabled globally*. Use two new metabase properties that are *DoStaticCompression* and *DoDynamicCompression*, to enable compression at the individual *OBIEE* site.

Tip: Run the following command line options to enable compression on the OBIEE site level, note in below commands to replace *obiee* site level with your web site name:

Navigate to Path: C:\Inetpub\AdminScripts
Run the commands: *"cscript adsutil.vbs set w3svc/1/root/**obiee/DoStaticCompression true**"*

Navigate to Path: C:\Inetpub\AdminScripts
Run the commands: *"cscript adsutil.vbs set w3svc/1/root/**obiee/DoDynamicCompression true**"*

4.   Restart the IIS HTTP Server.

Important Note: IIS compression directory should be excluded from the antivirus software's scan list. If not excluded, antivirus scanning of IIS compression directory may result in 0-Byte file. *Read MS KB article at http://support.microsoft.com/kb/817442*

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b. How to Enable Caching in IIS 6.0:

Follow these steps to configure static file caching and content expiration if you are using Microsoft IIS 6.0 Web Server with Oracle Business Intelligence.

Important Note: Only apply following caching to OBIEE static files found inside the */analytics* directory *(/web/app).*

Following are the steps to set up static files caching for Microsoft IIS 6.0 Web Server:

1. Run Internet Service Manager.

2. In Internet Service Manager, right-click the OBIEE **static files** *(/web/app)* subdirectory properties, click on HTTP Headers tab:

      i. Specify the content expiration to 7 days.

      ii. Add Custom HTTP headers *"Cache-Control: max-age=604800".*

3. Restart the IIS HTTP Server.

2.6.4 Apache 2.2.x HTTP Server

This topic describes how to enable caching and compression in Apache HTTP Server of your Oracle® Business Intelligence Enterprise Edition.

Important Note: High load of HTTP replies with 304 status code causes the OBIEE 11g UI to work slow in IE browser 8 / 9. To resolve this issue, it is highly recommended to implement HTTP caching and compression that will help to minimize the round trips over the Web to revalidate cached items, can make a huge difference in browser page load times.

a. How to Enable Compression and Caching:

1. On the Apache machine, open the file HTTP Server configuration file (*httpd.conf*) for editing.

2. In *httpd.conf* file, verify that the following directives are included and not commented out:

```
LoadModule deflate_module modules/mod_deflate.so
LoadModule expires_module modules/mod_expires.so
LoadModule headers_module modules/mod_headers.so
```

3. Add the following lines in *httpd.conf* file below the directive *LoadModule* section to compression / caching and restart the Apache HTTP Server:

```
#HTTP Compression
<IfModule mod_deflate.c>
  SetOutputFilter DEFLATE
  SetEnvIfNoCase Request_URI \.(?:gif|jpe?g|png)$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.(?:exe|t?gz|zip|bz2|sit|rar)$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.(?:pdf|doc?x|ppt?x|xls?x)$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.avi$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.mov$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.mp3$ no-gzip dont-vary
  SetEnvIfNoCase Request_URI \.mp4$ no-gzip dont-vary
</IfModule>

#Caching of static files
ExpiresActive On
<IfModule mod_expires.c>
    ExpiresByType image/gif "access plus 3 months"
    ExpiresByType image/jpeg "access plus 3 months"
    ExpiresByType application/x-javascript "access plus 3 months"
    ExpiresByType text/css "access plus 3 months"
    ExpiresByType text/javascript "access plus 3 months"
    ExpiresByType image/png "access plus 3 months"
    ExpiresByType application/x-shockwave-flash "access plus 3 months"
</IfModule>

#This stops the HTTP 304 replies in IE 7/8 browser
<IfModule mod_headers.c>
  <FilesMatch "\.(gif|jpeg|png|x-javascript|javascript|css|swf)$">
    Header set Cache-Control "max-age=7889231"
  </FilesMatch>
</IfModule>
```

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2.6.5 Oracle® iPlanet HTTP Server

This topic describes how to enable caching and compression in Oracle® iPlanet HTTP Server of your Oracle® Business Intelligence Enterprise Edition.

Important Note: High load of HTTP replies with 304 status code causes the OBIEE 11g UI to work slow in IE browser 8 / 9. To resolve this issue, it is highly recommended to implement HTTP caching and compression that will help to minimize the round trips over the Web to revalidate cached items, can make a huge difference in browser page load times.

a. How to Enable Compression and Caching:

1. To implement HTTP compression / caching, install and configure Oracle® iPlanet HTTP Server 7.0.x for the *bi_serverN* Managed Servers (refer to document http://docs.oracle.com/cd/E23943_01/web.1111/e16435/iplanet.htm)

2. On the Oracle® iPlanet HTTP Server machine, open the file Administrator's Configuration (*obj.conf*) for editing. (Guidelines for modifying the *obj.conf file* is available at http://download.oracle.com/docs/cd/E19146-01/821-1827/821-1827.pdf)

3. Add the following lines in *obj.conf* file inside *<Object name="default"> ... </Object>* and restart the Oracle® iPlanet HTTP Server machine:

```
#HTTP Caching
<If $path =~ '^(.*)\.(jpg|jpeg|gif|png|css|js|swf)$'>
ObjectType fn="set-variable" insert-srvhdrs="Expires:$(httpdate($time + 7889231))"
</If>

<If $path =~ '^(.*)\.(jpg|jpeg|gif|png|css|js|swf)$'>
PathCheck fn="set-cache-control" control="public,max-age=7889231"
</If>


#HTTP Compression
Output fn="insert-filter" filter="http-compression" vary="false" compression-level="9" fragment_size="8096"
```

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2.7 Tune Web Browser Settings

This topic describes how to tune Internet web browser to optimize the performance of your Oracle® Business Intelligence Enterprise Edition.

- Do not clear the cache when exiting the browser

    o **Firefox:** Uncheck *"Clear history when Firefox closes"* when using custom settings for history.

    o **IE**: Uncheck "*Delete browsing history on exit*"

- Increase the cache size to 1024 MB

    o **Firefox**: Enter *"about:config"* as the url and change:
        - *browser.cache.disk.capacity to 1024000*
        - *browser.cache.disk.max_entry_size to -1*

    o **IE**: Set *"Disk space to use"* to 1024 under Internet Options -> Browsing history -> Settings

2.8 Tune Database Parameters

Tuning and indexing underlying databases: For Oracle BI Server database queries to return quickly, the underlying databases must be configured, tuned, and indexed correctly. Note that different database products have different tuning considerations.

Tip: If there are queries that return slowly from the underlying databases, then you can capture the SQL statements for the queries in the query log and provide them to the database administrator (DBA) for analysis. See *"Managing the Query Log"* in *Oracle* Fusion Middleware System Administrator's Guide for Oracle Business Intelligence Enterprise Edition for more information about configuring query logging on the system.

2.9 Tune IBM WebSphere Server (IBM WAS) Parameters

This topic describes how to tune the IBM WebSphere Server to optimize the performance of your Oracle® Business Intelligence Enterprise Edition.

2.9.1 Tuning JDBC Data Sources

You can improve OBIEE system performance and stability by properly configuring the attributes in JDBC data sources in your *bifoundation_domain* domain.

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2.9.1.1 Increase the Number of Connection Pool

If BI data sources are running out of connections to the relational database then you need to set the maximum number of connections to high value for the following BI data sources:

Note the following IBM WAS behavior:

- Each time an application attempts to access a back-end store (such as a database), it requires resources to create, maintain, and release a connection to that data store.

- To mitigate the strain that this process can place on overall application resources, the application server enables you to establish a pool of back-end connections that applications can share on an application server.

- Connection pooling spreads the connection overhead across several user requests, thereby conserving application resources for future requests.

Important Note: Reason why the default value initial and maximum capacity size are set to lower value because it is important to protect database resources. *So make sure you have enough resources on the database server (available memory is a constraint). If you increase initial / maximum capacity to very high value, you may exceed the limit of PROCESSES / OPEN_CURSORS on Oracle database server.*

BI Data Source Name	Default Value	Suggested Value
bip_datasource	Minimum connections: 0 Maximum connections: 20	*Minimum connections: 0* *Maximum connections: 150*
mds-owsm	Minimum connections: 0 Maximum connections: 20	*Minimum connections: 0* *Maximum connections: 150*
EPMSystemRegistry	Minimum connections: 0 Maximum connections: 20	*Minimum connections: 0* *Maximum connections: 150*
aps_datasource	Minimum connections: 0 Maximum connections: 20	*Minimum connections: 0* *Maximum connections: 150*
calc_datasource	Minimum connections: 0 Maximum connections: 20	*Minimum connections: 0* *Maximum connections: 50*
raframework_datasource	Minimum connections: 0 Maximum connections: 20	*Minimum connections: 0* *Maximum connections: 150*
rtd_datasource	Minimum connections: 0 Maximum connections: 20	*Minimum connections: 0* *Maximum connections: 50*

Important Note: *You need to determine the optimal value for the Minimum and Maximum connection as part of your pre-production performance testing.* Once optimal values are determined then set the value of Minimum connection equal to the value for Maximum connection in order to boost performance of JDBC in IBM Websphere Application Server web applications.

Tip: To increase this value:

1. Log in to the IBM Websphere Application Server administration console.

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2. Select *Resources => JDBC => Data Sources => data_source* (for example "*mds-owsm*") *=> Connection pool properties* and then input some values in Minimum and Maximum connection boxes.
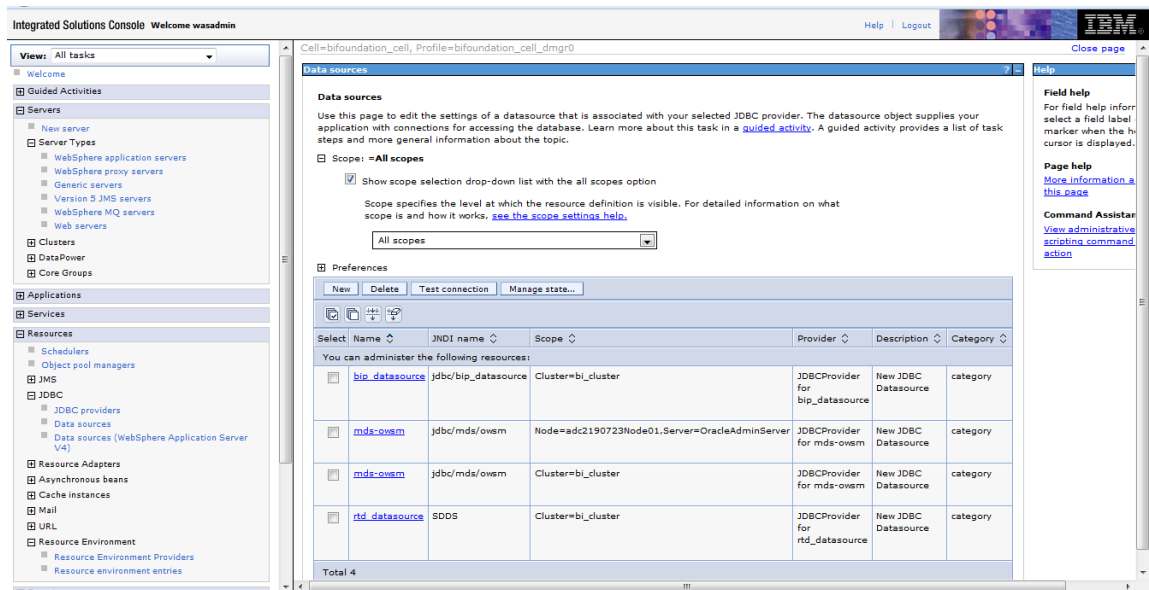
Tip: Monitor the BI data source connections from IBM WAS Console (Tivoli Performance Viewer) i.e. *"Free Pool Size"* and if *"Wait Time"* has a greater than 0 value then increase the pool size.
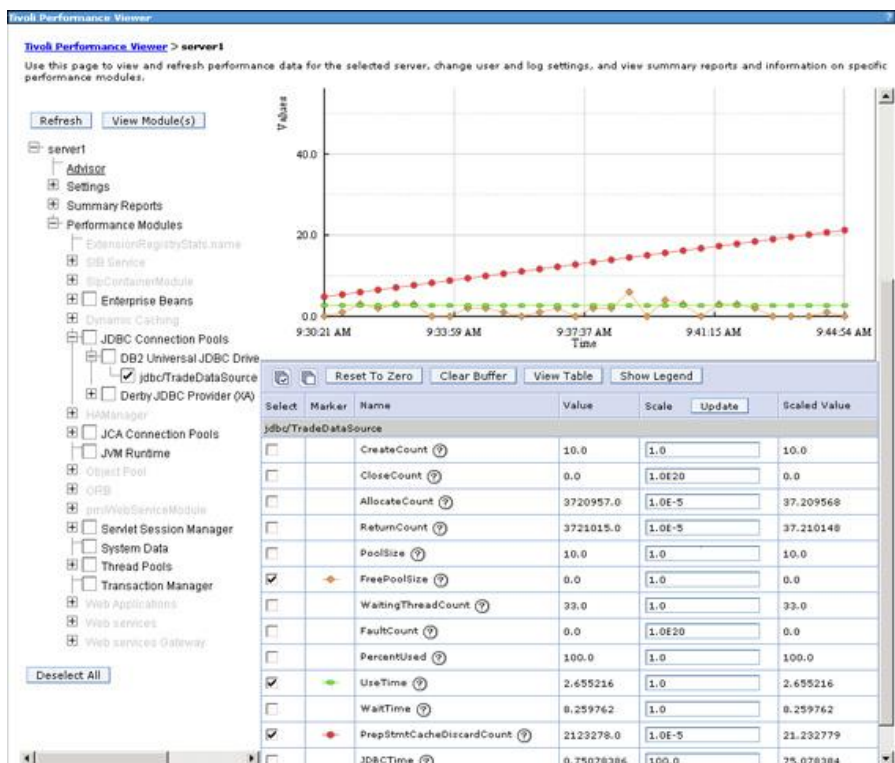
2.9.2 Tune Thread Pool

Each task performed by the server runs on a thread obtained from one of WebSphere Application Server's many thread pools. A thread pool enables components of the server to reuse threads, eliminating the need to create new threads at run time to service each new request. Three of the most commonly used (and tuned) thread pools within the application server are:

- **Web container**: Used when requests come in over HTTP.
- **Default**: Used when requests come in for a message driven bean or if a particular transport chain has not been defined to a specific thread pool.
- **ORB**: Used when remote requests come in over RMI/IIOP for an enterprise bean from an EJB application client, remote EJB interface, or another application server.

Use the below Thread Pool suggested settings as a starting point, and then, after careful testing of your long running transactions, adjust as needed.

BI Managed Servers	WebContainer	Default	ORB.thread.pool
OracleAdminServer	*Minimum Size =50* *Maximum Size = 300*	*Minimum Size =20* *Maximum Size = 100*	*Minimum Size =10* *Maximum Size = 50*
bi_serverN	*Minimum Size =50* *Maximum Size = 300*	*Minimum Size =20* *Maximum Size = 100*	*Minimum Size =10* *Maximum Size = 50*

Tip: Thread pool settings can be changed in the administrative console by navigating to *Servers => Application Servers => server_name (e.g. bi_server1) => Thread Pool*

Tip: Monitoring Thread Pool Size using IBM WAS Console
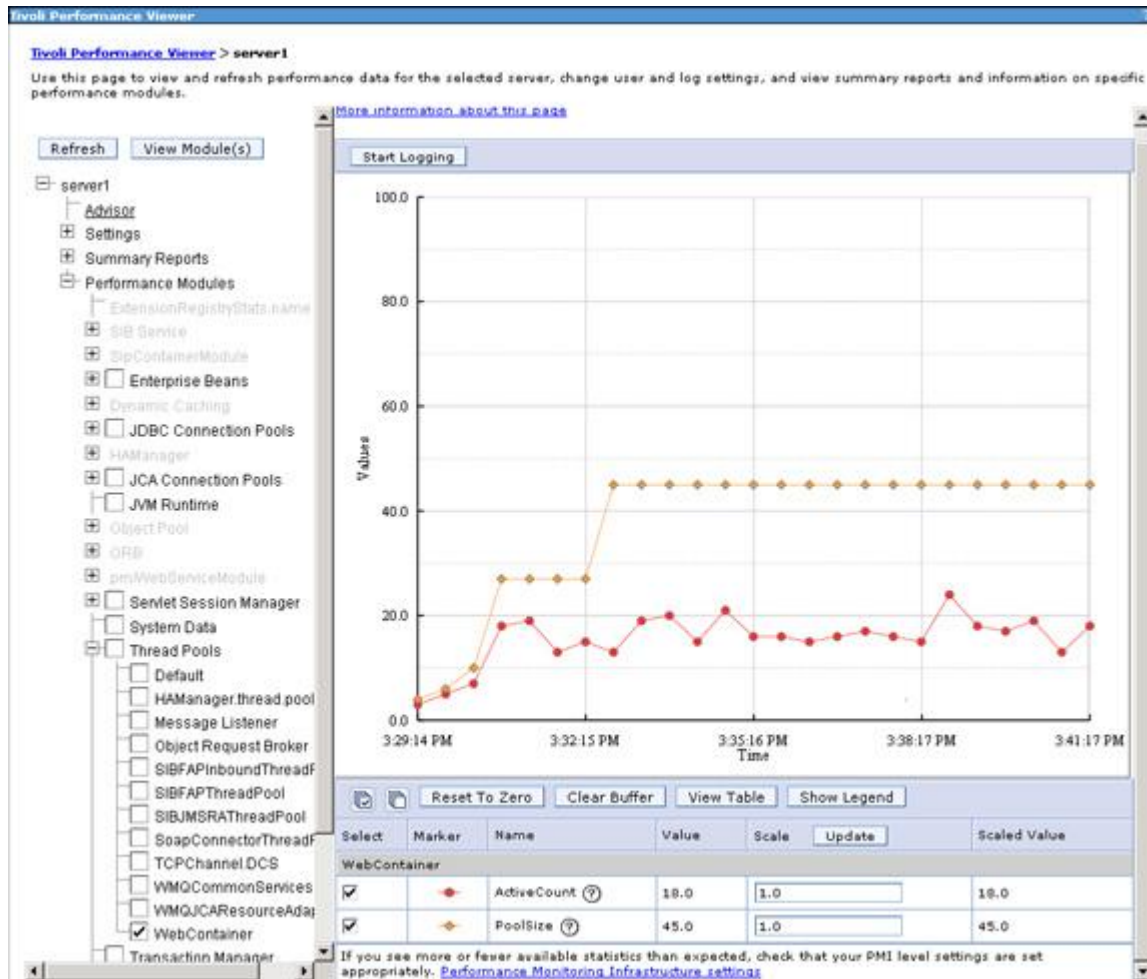
2.9.3   Tuning Servlet Caching

WebSphere Application Server's DynaCache provides a general in-memory caching service for objects and page fragments generated by the server. The DistributedMap and DistributedObjectCache interfaces can be used within an application to cache and share Java objects by storing references to these objects in the cache for later use. Servlet caching, on the other hand, enables servlet and JSP response fragments to be stored and managed by a customizable set of caching rules.

Servlet caching can be enabled in the administrative console by navigating to Servers => Application servers => server_name => Web container settings => Web container. The URI path to the servlet or JSP to be cached must be defined in a cachespec.xml file, which is placed inside the Web module's WEB-INF directory.

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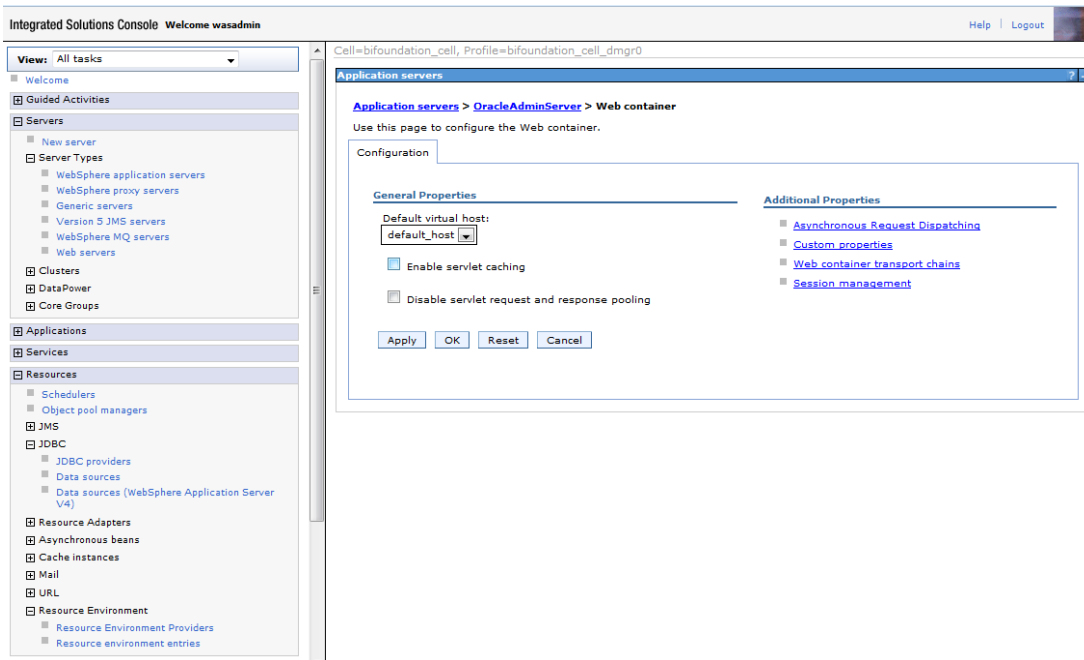
```xml
<?xml version="1.0"?>
<!DOCTYPE cache SYSTEM "cachespec.dtd">
<cache>
    <cache-entry>
    <class>servlet</class>
    <name>/marketSummary.jsp</name>
    <property name="consume-subfragments">true</property>
    <property name="EdgeCacheable">true</property>
    <cache-id>
      <priority>3</priority>
      <timeout>60</timeout>
    </cache-id>
    <dependency-id>MarketSummary
    </dependency-id>
  </cache-entry>
</cache>
```

2.9.4   Tuning HTTP Transport persistent connections

Persistent connections specify that an outgoing HTTP response should use a persistent (keep-alive) connection instead of a connection that closes after one request or response exchange occurs. In many cases, a performance boost can be achieved by increasing the maximum number of persistent requests that are permitted on a single HTTP connection.

SSL connections can see a significant performance gain by enabling unlimited persistent requests per connection because SSL connections incur the costly overhead of exchanging keys and negotiating protocols to complete the SSL

handshake process. Maximizing the number of requests that can be handled per connection minimizes the impact of this overhead.

Also, high throughput applications with fast response times can realize a performance gain by keeping the connections open, rather than building up and closing the connection on each request. When this property is set to 0 (zero), the connection stays open as long as the application server is running.

However, if security is a concern, then careful consideration should be placed on this setting, as this parameter can help prevent denial of service attacks when a client tries to hold on to a keep-alive connection.

HTTP transport persistent connections settings can be set in the administrative console by navigating to *Servers => Application servers => server_name =>* Ports. Once there, click on View associated transports for the port associated with the HTTP transport channel settings you want to change:

3.0 PERFORMANCE MONITORING AND TESTING OBIEE

This topic outlines the processes that have to be monitored for the Oracle® Business Intelligence using built-in BI metrics and default Operating System performance utilities. In addition to the BI performance monitoring, it also outlines on how to create load / performance test scripts against Oracle Business Intelligence Enterprise Edition (OBIEE) using Oracle Load Testing tool.

3.1 Built-in BI Metrics for Performance Monitoring

You can use following built-in BI metrics to monitor System Components (BI processes) and WebLogic Server processes.

Tips:

- Use Oracle Enterprise Manager (EM) URL to monitor end to end OBIEE real time performance: *http://<server>:7001/em* . To proactively monitor your Oracle BI environment from both systems & end-user perspectives, it is recommended to use Oracle Enterprise Manager (OEM) 12c BI Management Pack, for more details refer to *http://www.oracle.com/technetwork/oem/pdf/511863.pdf* .

- In Oracle Business Intelligence 11g, the *perfmon* URL is still valid to use i.e. *http://<server:port>/analytics/saw.dll?Perfmon*

3.1.1 How to Analyze Oracle Business Intelligence Server Metrics

If you encounter a problem, such as Presentation Services and BI Server components are running slowly or are hanging, you can view more detailed performance information, including performance metrics for a particular target, to diagnose further about the problem.

Note that Fusion Middleware Control provides real-time data. If you are interested in viewing historical data, consider using Oracle Enterprise Manager Grid Control.

Tip: To view the performance of an Oracle Presentation Services and BI Server:

1. From the navigation pane, expand the farm, then **Business Intelligence**, and then the **coreapplication**.
   The Business Intelligence instance home page is displayed.

2. From the Business Intelligence instance menu, choose *Monitoring > Performance :*
   The Performance Summary page is displayed. It shows performance metrics, as well as information about Active Sessions, Current Sessions, Total sessions and Queries/sec for OBIPS and Oracle BI Server.

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3. To see additional metrics, click *Show Metric Palette* and expand the metric categories.

The following figure shows the Performance Summary page with the Metric Palette displayed:
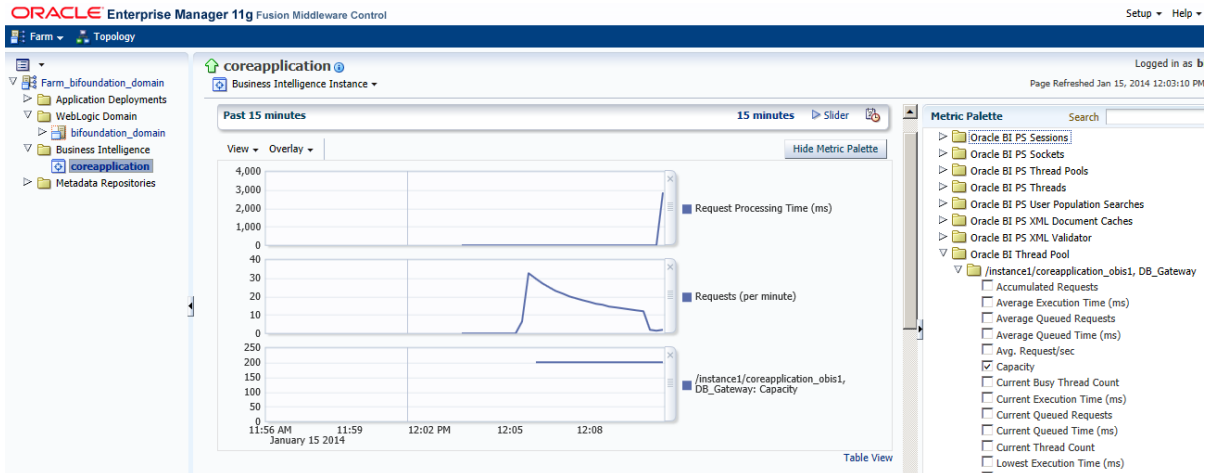
1. Select a metric to add it to the Performance Summary.

2. To overlay another target, click *Overlay > Another BI Instance...*, and select the target. The target is added to the charts, so that you can view the performance of more than one target at a time, comparing their performance.

3. To customize the time frame shown by the charts, you can:

   o Click **Slider** to display a slider tool that lets you specify that more or less time is shown in the charts. For example, to show the past 10 minutes, instead of the past 15 minutes, slide the left slider control to the right until it displays the last 10 minutes.

   o Select the calendar and clock icon. Then, enter the **Start Time** and **End Time.**

Tip: You can also view the performance of components, such as Oracle HTTP Server or Oracle WebLogic Server. Navigate to the component and select **Monitoring,** then **Performance Summary** from the dynamic target menu.

3.1.2 Viewing Oracle Presentation Services perfmon page

In your web browser, type in *http://<server:port>/analytics/saw.dll?Perfmon* .

Note: You need to login with BI Administrator role.

Oracle BI Presentation ServicesPerformance Monitor - Windows Internet Explorer

http://us.oracle.com:9704/analytics/saw.dll?perfmon

File   Edit   View   Favorites   Tools   Help

⭐ Favorites   Oracle BI Presentation ServicesPerformance Moni...

Performance Monitor

This page shows diagnostic performance metric information.

Oracle BI PS File Accesses

This category provides information related to usage of file accesses within Oracle BI Presentation Services.

Counter Name	Instance	Type	Value	Comments
Current Open Files	---	Counter	5	The current number of open files.
Peak Open File	---	Counter	7	The peak number of open files.
Total Files	---	Counter	1755	The total number of files that have been opened.

Oracle BI PS Thread Pools

This category provides information about about threads pools within the Oracle BI Presentation Services. A thread pool is responsible for executing jobs of a specific type.

Counter Name	Instance	Type	Value	Comments
Current Jobs Queued	AsyncLogon	Counter	0	The number of jobs currently waiting in queue for processing by this thread pool.
Peak Jobs Queued	AsyncLogon	Counter	1	The peak number of concurrent jobs waiting in queue for processing by this thread pool.
Current Jobs Running	AsyncLogon	Counter	0	The number of jobs currently being processed by this thread pool.
Peak Jobs Running	AsyncLogon	Counter	1	The peak number of concurrent jobs being processed by this thread pool.
Current Threads	AsyncLogon	Counter	0	The number of threads currently in this thread pool.
Peak Threads	AsyncLogon	Counter	2	The peak number of concurrent threads in this thread pool.
Total Jobs Unfinished	AsyncLogon	Counter	0	The total number of jobs that ended prematurely or unexpectedly during processing.
Total Jobs Completed	AsyncLogon	Counter	2	The total number of jobs that were completed by this thread pool. This metric does not include jobs that ended prematurely or unexpectedly.
Total Jobs Submitted	AsyncLogon	Counter	2	The total number of jobs submitted for processing by this thread pool.
Current Jobs Queued	Cancel	Counter	0	The number of jobs currently waiting in queue for processing by this thread pool.
Peak Jobs Queued	Cancel	Counter	0	The peak number of concurrent jobs waiting in queue for processing by this thread pool.
Current Jobs Running	Cancel	Counter	0	The number of jobs currently being processed by this thread pool.
Peak Jobs Running	Cancel	Counter	0	The peak number of concurrent jobs being processed by this thread pool.
Current Threads	Cancel	Counter	0	The number of threads currently in this thread pool.
Peak Threads	Cancel	Counter	0	The peak number of concurrent threads in this thread pool.
Total Jobs Unfinished	Cancel	Counter	0	The total number of jobs that ended prematurely or unexpectedly during processing.
Total Jobs Completed	Cancel	Counter	0	The total number of jobs that were completed by this thread pool. This metric does not include jobs that ended prematurely or unexpectedly.
Total Jobs Submitted	Cancel	Counter	0	The total number of jobs submitted for processing by this thread pool.
Current Jobs Queued	ChartThreadPool	Counter	0	The number of jobs currently waiting in queue for processing by this thread pool.
Peak Jobs Queued	ChartThreadPool	Counter	1	The peak number of concurrent jobs waiting in queue for processing by this thread pool.
Current Jobs Running	ChartThreadPool	Counter	0	The number of jobs currently being processed by this thread pool.
Peak Jobs Running	ChartThreadPool	Counter	21	The peak number of concurrent jobs being processed by this thread pool.
Current Threads	ChartThreadPool	Counter	32	The number of threads currently in this thread pool.
Peak Threads	ChartThreadPool	Counter	32	The peak number of concurrent threads in this thread pool.
Total Jobs Unfinished	ChartThreadPool	Counter	0	The total number of jobs that ended prematurely or unexpectedly during processing.
Total Jobs Completed	ChartThreadPool	Counter	21	The total number of jobs that were completed by this thread pool. This metric does not include jobs that ended prematurely or unexpectedly.
Total Jobs Submitted	ChartThreadPool	Counter	21	The total number of jobs submitted for processing by this thread pool.

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3.1.3 Viewing Active Sessions via BI Admin Tool

In BI Admin Tool, you can monitor sessions via Manage-Sessions i.e. # of sessions, current request and session variables.

3.1.4 Using Usage Tracking Statistics

The Oracle BI Server supports the accumulation of usage tracking statistics that can be used in a variety of ways such as database optimization, aggregation strategies, or billing users or departments based on the resources that they consume.

The BI Server tracks usage at the detailed query level. It is recommended to use production usage tracking data to design the workload for your performance / load testing. *See "About Usage Tracking" in Oracle Fusion Middleware System Administrator's Guide for Oracle Business Intelligence Enterprise Edition.*

3.2 Diagnosing and Resolving Issues in Oracle Business Intelligence

The usual indication that you should troubleshoot Oracle BI will be sluggish performance of BI component. BI components can be in the form of such things as charts, tables, dashboards, and queries. Many of the configuration / performance issues can be detected from the following logs:

- **Presentation Services Log** *(saw.log)*.
- **BIServer Log** *(nqquery.log, nqserver.log)*.
- **Scheduler Log** *(nqscheduler.log)*.
- **JavaHost Log** *(jh.log)*.
- **Cluster Controller Log** *(nqcluster.log)*.
- **WLS Managed Servers Log** *(AdminServer-diagnostic.log, AdminServer.log, bi_server1.log, bi_server1-diagnostic.log)*.

Important Note: For additional information about Diagnosing and Resolving Issues in Oracle Business Intelligence, see the "Diagnosing and Resolving Issues in Oracle Business Intelligence" in Oracle® Fusion Middleware System Administrator's Guide for Oracle Business Intelligence Enterprise Edition.

3.3 Performance Testing Oracle Business Intelligence Enterprise Edition

Refer to the document published in My Oracle Support (MOS) website (*Doc ID 1611188.1*) at https://support.oracle.com/epmos/faces/DocumentDisplay?id=1611188.1 is intended as a guide for creating load/performance test scripts against Oracle Business Intelligence Enterprise Edition (OBIEE) 11g using Oracle Load Testing 12.x.

This guide will assist during the script creation process and enable the OBIEE tester to create scripts faster and more reliably. It assumes that the person using this document has experience working with Oracle Application Testing Suite.

Note: This support document (*Doc ID 1611188.1*) does not necessarily cover all OBIEE transactions that have to be tested, nor does it guarantee that the parameters mentioned in this document will perfectly match your particular environment.

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3.4 How to Analyze Host Metrics

Administrators will find it useful to study these suggestions on further analysis to undertake when a metric value exceeds threshold. The commands provided are for the Linux and Windows operating system. For Oracle Solaris and AIX, consult the documentation for more information.

When logical free memory/swap activity or paging activity is beyond threshold i.e. the combined value of Pages (Paged-in and Pages Paged-out) should be <=1000:
This usually happens when memory is not sufficient to handle demands from all the running processes.

- Linux: Check *"cat /proc/meminfo"* and confirm total RAM is expected.
  Windows: Open the Task Manager, click the Performance tab and check the Physical Memory section.

- Check if there is unallocated huge pages. If there are and the WebLogic Server / Oracle BI instances (OBIPS, JH, OBIS) are not expected to use them, reduce the huge page pool size.

- Linux: Run top and sort by resident memory (type OQ). Look for processes using the most resident memory and investigate those processes.
  Windows: Open the Task Manager, click the Processes tab and click the Mem Usage column to sort the processes by memory usage

When Network Interface Error Rates Is Beyond Threshold
The normal cause is mis-configuration between the host and the network switch. A bad network card or cabling also can cause this error. You can run */sbin/ifconfig* to identify which interface is having packet errors. Contact network administrator to ensure the host and the switch are using same data rate and duplex mode.

Otherwise, check if cabling or the network card is faulty and replace as appropriate.

When Packet Loss Rate Is Beyond Threshold
The normal cause of this error is network saturation of bad network hardware.
- Run `lsof -Pni | grep ESTAM` to determine which network paths are generating the problem. Then run `mtr <target host>` or `ping <target host>` and look for packet lost on that segment.

  ```
  20 packets transmitted, 20 received, 0% packet loss, time 18997ms
  rtt min/avg/max/mdev = 0.168/0.177/0.200/0.010 ms
  ```

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The packet loss should be 0% and rtt should be less than .5 ms.

- Ask the network monitoring staff to look for saturation or network packet loss from their side.

When Network Utilization Is Beyond Threshold i.e. All Network Interfaces Combined Utilization > 95%

The normal cause is very heavy application load.

- Run top or lsof to determine which processes are moving a lot of data.
- Use tcpdump to sample the network for usage patterns.
- Use atop, iftop, ntop or pkstat to see which processes are moving data.

When CPU Usage or Run Queue Length Is Beyond Threshold i.e. Run Queue (5 min average) > 4 (The run queue is normalized by the number of CPU cores):

The normal cause is runaway demand, a poorly performing application, or poor capacity planning.

- Linux: Run top to identify which application/process is using time.
  Windows: Open the Task Manager, click the Processes tab and click the CPU column to sort the processes based on CPU usage.

- If top processes are WebLogic Server JVM processes, conduct a basic WebLogic Server health check. That is, review logs to see if there are configuration errors causing excessive exceptions, and review metrics to see if the load has increased.

- If top processes are Oracle BI processes, use Oracle Enterprise Manager Control to look for BI components level statistics.

When System CPU Usage Is Beyond Threshold i.e. CPU Utilization > 95%

- High system CPU use could be due to kernel processes looking for pages to swap out during a memory shortage.

- High system CPU use is also frequently related to various device failures. Run `{{dmesg | less}}` and look for repeated messages about errors on some particular device, and also have hardware support personnel check the hardware console to see if there are any errors reported.

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When Filesystem Usage Is Beyond Threshold i.e. Filesystem Space Available <5%

The normal cause is an application that is logging excessively or leaving behind temporary files.

- Run `lsof -d 1-99999 | grep REG | sort -nrk 7 | less` to see currently open files sorted by size from largest to smallest. Investigate the large files.

- Run `du -k /mount_point_running_out_of_space > /tmp/sizes` to get space used for directories under the mount point. This may take a long time. While it is running, run `sort -nr /tmp/sizes` and find the directories using most space and investigate those first.

When Total Processes Is Beyond Threshold > 25000

The normal cause is runaway code or a stuck NFS filesystem.

- Linux: Run `ps aux`. If many processes are in status D, run `df` to check for stuck mounts.
  Windows: Run Task Manager, click the Processes tab, and check the list of running processes. If there are hundreds or thousands of processes of a particular program, determine why.

- Run `ps o pid,nlwp,cmd | sort -nrk 2 | head` to look for processes with many threads.

When Disk Device Busy Is Beyond Threshold > 95%

- Check for disk drive failure.

Linux: As root, check `/var/log/messages*` and `/var/log/mcelog` to see if there are any error messages indicating disk failure. For a RAID array, the disk controller needs to be checked. The commands will be specific to the controller manufacturer.

Windows: Run `perfmon` and look at the Alert logs. Run `chkdsk` to check for disk failure.

- Look for processes that are using the disk. From a shell window, execute `ps aux | grep ' D. '` several consecutive times to look for processes with "stat" D.

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4.0 TUNING OBIEE COMPONENTS

This chapter includes the following sections that provide a quick start for tuning main Oracle® Business Intelligence system components (i.e. BI Presentation Services, JavaHost, BI Server).

4.0.1 OBIEE Performance Tuning Map

Below OBIEE performance tuning map can help you to navigate the main OBIEE performance components that need to be tuned and help you to resolve your BI performance issues.
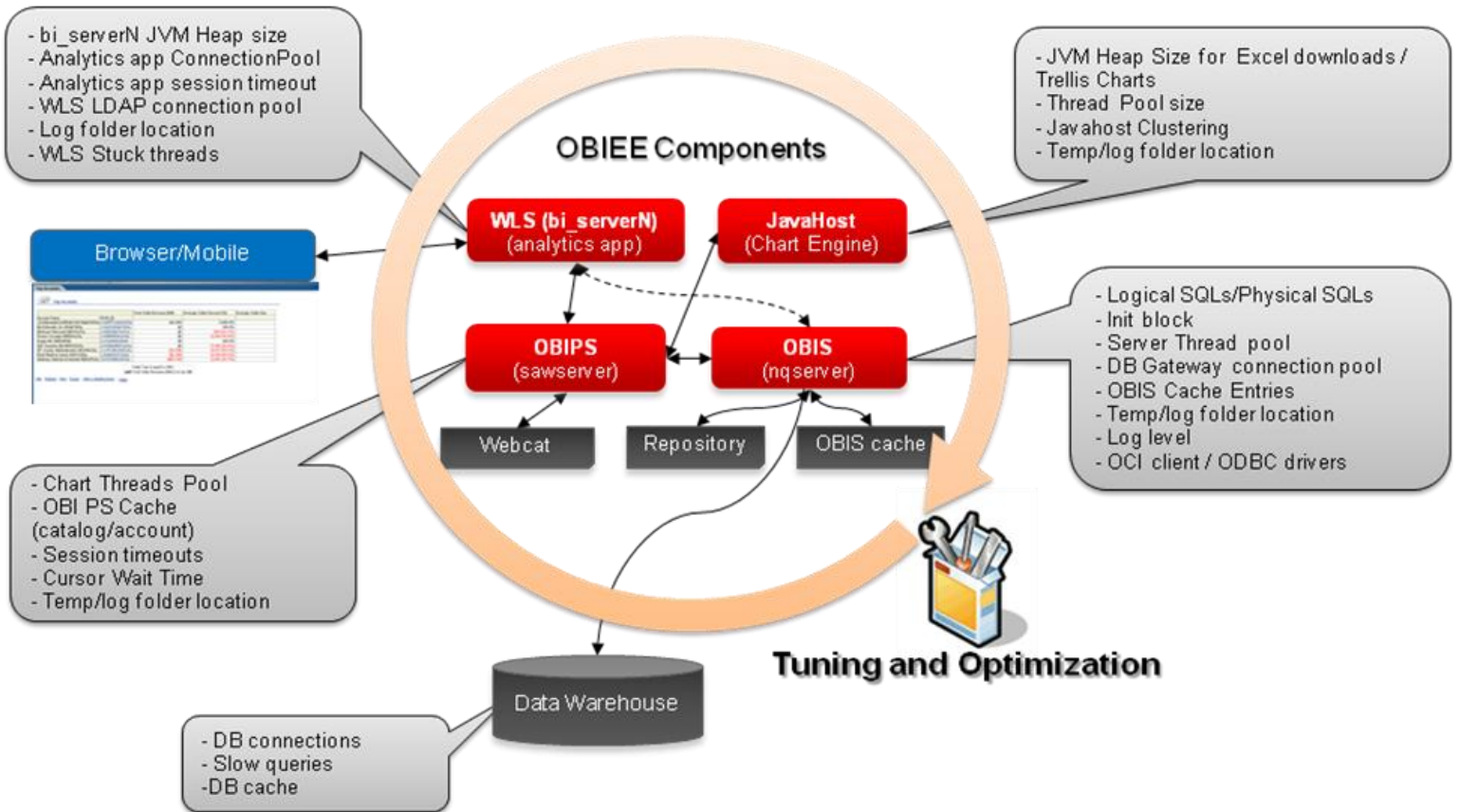
4.1 Oracle® BI Presentation Services Component

To achieve better performance with Presentation Services (*OBIPS*) component, the following parameters can be tuned in *instanceconfig.xml, config.xml and opmn.xml files* for better performance and scalability.

Charting threads / memory 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:

Important Note: OBIPS has a thread pool for Javahosts. Its size needs to be the total number of threads allowed in all Javahosts. For example, if there are two Javahost instances. Each has 200 threads defined in its own (Javahost) configuration file *(config.xml),* and then the *MaxThreads* size for OBIPS chart threadpool size needs to be 400 (200 + 200).

a. In instanceconfig.xml file located at
ORACLE_INSTANCE/config/OracleBIPresentationServicesComponent/coreapplication_obipsn,
add the following inside <ServerInstance>:

```
<ServerInstance>
<ThreadPoolDefaults>
    <ChartThreadPool>
        <MinThreads>100</MinThreads>
        <MaxThreads>400</MaxThreads>
        <MaxQueue>2048</MaxQueue>
    </ChartThreadPool>
  </ThreadPoolDefaults>
</ServerInstance>
```

b. In config.xml file located at
ORACLE_INSTANCE/config/OracleBIJavaHostComponent/coreapplication_obijhn/, add the following
inside <JavaHost>:

```
<JavaHost>
    <JobManager>
        <MinThreads>100</MinThreads>
        <MaxThreads>200</MaxThreads>
        <MaxPendingJobs>200</MaxPendingJobs>
    </JobManager>
</JavaHost>
```

Caching related tunable parameters

There are several OBIPS cache related parameters that can be used to increase OBI PS Caching i.e. number of cache entries, expiry time, and algorithm to clean up the cache etc.

In instanceconfig.xml file, add the following inside <ServerInstance>:

```
<ServerInstance>
 <Cache>
    <CatalogXml>
        <!-- Remove from the cache everything older than N minutes -->
      <MaxAgeMinutes>240</MaxAgeMinutes>
      <MaxLastAccessedSeconds>14400</MaxLastAccessedSeconds>
    </CatalogXml>
```

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```
      <Query>
        <MaxEntries>5000</MaxEntries>
          <!-- AbsoluteMaxEntries is the enforced maximum number of entries. When this maximum is reached -->
          <!-- subsequent queries will fail until the maximum is no longer exceeded. -->
        <AbsoluteMaxEntries>20000</AbsoluteMaxEntries>
          <!-- CruiseEntries is amount of entries the OracleBI Presentation server tries to maintain in its cache. -->
        <CruiseEntries>3000</CruiseEntries>
          <!-- Forces the cache to attempt to remove an old entry when MaxEntries is exceeded. -->
        <ForceLRU>true</ForceLRU>
      </Query>

      <Accounts>
          <!-- Cleanup this cache every N minutes. -->
        <CleanupFrequencyMinutes>14400</CleanupFrequencyMinutes>
      </Accounts>

      <AccountIndex>
          <!-- Cleanup this cache every N minutes. -->
        <CleanupFrequencyMinutes>14400</CleanupFrequencyMinutes>
      </AccountIndex>

      <CatalogAttributes>
          <!-- Cleanup this cache every N minutes. -->
        <CleanupFrequencyMinutes>14400</CleanupFrequencyMinutes>
      </CatalogAttributes>
  </Cache>
</ServerInstance>
```

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).

In instanceconfig.xml file add the following inside *<ServerInstance>*:
```
<ServerInstance>
   <Cursors>
      <NewCursorWaitSeconds>10</NewCursorWaitSeconds>
   </Cursors>
</ServerInstance>
```

OBIPS Session Timeout parameter

In *Fusion Middleware Control* following value (see in screenshot below) can be decreased from 3.5 hours to free up resources: **Important Note:** By default in Analytics plug-in in WLS, the Session timeout (in seconds) is set to 3600 seconds (60 minutes) to control the timeout of the sessions. By setting OBIPS timeout to 60 minutes, it will be in sync with the session timeout in Analytics plug-in in WLS.

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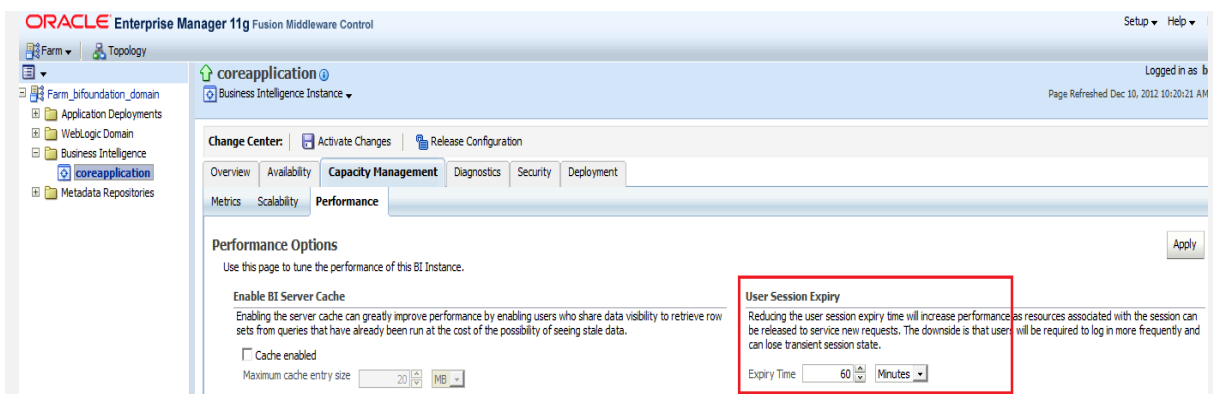
Validating the Catalog

Tip: Web catalog upgrade from *10g to 11.1.1.6 or 11.1.1.7* sometime corrupts some user permissions, this may cause slow user login time and also slowness in accessing the dashboard. Below are the steps to perform web catalog validation:

Resolution:

(a) Cleanup Web catalog via instanceconfig.xml using the steps documented in *"Validating the Catalog"* section in *System Administrator's Guide for Oracle Business Intelligence Enterprise Edition.*

(b) *Runcat* cmd line commands (./runcat.sh –help) to cleanup all permissions that appear to be invalid (for more details on how to use *"runcat"* command, refer to doc link at http://docs.oracle.com/cd/E28280_01/bi.1111/e10541/prescatadmin.htm#BIESG319).

Note: It is recommended to run all above tasks each & every time content is delivered from a development environment into production environment (e.g. weekly), as part of the OBIEE administrator's regular backup & maintenance of the catalog.

Updating Catalog Objects

Scan the catalog and update any objects that were saved with earlier versions of Oracle Business Intelligence. These updates might improve the performance of these objects. In a multiple node cluster, update objects only after all nodes have been upgraded to the appropriate version of Oracle Business Intelligence. For details on how to *Use Scan and Update Web Catalog* feature documented in "Updating Catalog Objects" in *System Administrator's Guide for Oracle Business Intelligence Enterprise Edition.*

Performance / Capacity Considerations for Large BI Web Catalog

- **Specifies the hashing of directories**. If you have more than 4000 catalog users, then you must turn on the hashing of users' home directories to address a file system limitation. **To do so, set the *HashUserHomeDirectories* element to 2 from its default value of 0, see section "Manually Changing Additional Configuration Settings for the Catalog"** in *System Administrator's Guide for Oracle Business Intelligence Enterprise Edition. Important Note: This setting can only be done on new catalog. You may have to remove all of existing users and their home directories in webcat and then apply the hash directive [and create a new ps catalog] and then add the users back.*
- It is recommended to use latest disk File System such as **ZFS** or **EXT4**.
- **Use fast storage system** i.e. Fast NAS filer with high throughput dedicated network link or SAN or Solid State Drive (SSD).

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4.2 Oracle® BI Server Component

Following are the important parameters to tune in *NQSConfig.INI* file and will increase the performance of the BI system under high users load:

Initialization blocks

- Repository init-blocks: Called once during server startup and refreshed after the refresh interval as needed.

- Session init-blocks: called for each new session; slow SQL can slow down login. Use **Allow deferred execution** option**.** If you select this option, execution of the initialization block is deferred until an associated session variable is accessed for the first time during the session. **This option prevents execution of all session variable initialization blocks during the session logon stage, giving a shorter logon time.** Session variables that are not needed during the session do not have their initialization blocks executed. This saves the resources which would have been used to execute these unnecessary initialization blocks.
    - Session init-blocks should be minimized and lazily loaded (deferred). Previously it was not possible to defer row-wise init-blocks; restriction has been lifted in 11.1.1.6 release or later. See when "When Execution of Session Variable Initialization Blocks Cannot Be Deferred" in Oracle® Fusion Middleware Metadata Repository Builder's Guide for Oracle Business Intelligence Enterprise Edition.

Number of Init Blocks

For a given session, Init Block queries are executed serially and represent the per session memory costs. Be judicious in creating Init Blocks. Verify that the same Init Block query is not already being used in some other Init Block. Verify that cache is enabled for the Init Block and is being utilized

Init block connection pool and location of data source

As a practice, allocate a separate DB connection pool for Init Blocks [ensure enough connections are available] in the OBIS repository. Init Block query response time will be high if the connection pool points to a remote database.

Init Blocks Cache

- The number of Init Block result sets that are cached with respect to row-wise initialization, can be tuned.
- NQSConfig.INI parameter:
  [SERVER]
  INIT_BLOCK_CACHE_ENTRIES = 5000

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BI Database Connection Pool Settings - If you anticipate a higher load on a system, you can change the number of Maximum connections for various data sources to make resource use more efficient. The maximum connection size needs to be set in the repository (RPD) for each DB connection pool. The size of the connection pool determines the number of available BI Server connections and the number of available threads for processing physical queries. A logical query may generate multiple physical queries, each of which could go to different connections.

Use OBIS performance counters in EM to determine if more or fewer DB connections are required. *For a simple sizing calculation, let's assume there are peak N users concurrently downloading dashboard pages. On average, each dashboard page executes L logical queries. On average, each logical query executes P physical queries. Then the number of DB connections required for this load would be N * L * P.*

Important Note: *If fewer connections are specified, then physical query response times will increase.*

Data Mart Automation performance tuning in repository
The following parameters in the OBIS repository can be tuned to achieve better aggregate creation time:

   MIN_BULK_FETCH_BUFFER_SIZE (default value 32768) and
   MAX_BULK_FETCH_BUFFER_SIZE (default value 327680) needs to be set to a higher value i.e. 5000000.
   Tip: Based on your data source used, tune these above values in *DBFeatures.INI* file.

Tuning of OBI Server session and threads
- NQSConfig.INI parameters to be tuned:
   [SERVER]
   MAX_SESSION_LIMIT = 2000;
   #Above parameters specifies the number of sessions that can be connected to BI Server
   #even if inactive. The sessions and the corresponding queries are queued to the
   #threads for processing as they become available. Typically, the number of sessions
   #specified by *MAX_SESSION_LIMIT* is higher than the number of available threads
   #specified by *SERVER_THREAD_RANGE*. Set the *MAX_SESSION_LIMIT* to a value
   #that reflects the maximum number of users per node + 10% for sessions yet to be
   #timed-out.
   SERVER_THREAD_RANGE = 50-520;
   #Above parameter specifies the number of threads that process the logical queries—
   #the number of queries that can be active in the BI Server at any time. When the
   #number of required threads goes beyond 50, threads will be created and destroyed
   #as on a demand basis. For a typical OBIEE implementation a setting of *50-520* is
   #sufficient. This value may be increased if load and stress tests prove more threads
   #are beneficial for the throughput and response time of the BI Server.

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DB_GATEWAY_THREAD_RANGE = 50-520;
#The parameter *DB_GATEWAY_THREAD_RANGE* in the Server section of #NQSConfig.INI establishes when Oracle BI Server terminates idle threads. The #lower number in the range is the number of threads that are kept open before Oracle #BI Server takes action. If the number of open threads exceeds the low point in the #range, Oracle BI Server terminates idle threads. For example, if #*DB_GATEWAY_THREAD_RANGE* is set to *50-520* and 75 threads are open, Oracle #BI Server terminates any idle threads back down to the 50 thread limit.

See "*A NQSConfig.INI File Configuration Settings*" in Oracle Fusion Middleware System Administrator's Guide for Oracle Business Intelligence Enterprise Edition.

Aggregate tables: It is extremely important to use aggregate tables to improve query performance. Aggregate tables contain pre-calculated summarizations of data. It is much faster to retrieve an answer from an aggregate table than to re-computed the answer from thousands of rows of detail.

The Oracle BI Server uses aggregate tables automatically, if they have been properly specified in the repository. See *Oracle Fusion Middleware Metadata Repository Builder's Guide for Oracle Business Intelligence Enterprise Edition* for examples of setting up aggregate navigation.

Query Plan Caching - The query plan cache is an internal performance feature that increases the speed of the query compilation process by caching plans for the most recently used queries.
- When the Query Plan cache is hit :
    - It eliminates query parsing time.
    - It increases scalability due to less lock contention.
- Never set the query plan cache size to 0. Doing so may cause Result Cache misses.
- NQSConfig.INI parameters to be tuned:
  [SERVER]
  MAX_QUERY_PLAN_CACHE_ENTRIES = 1024;   # default is 1024
  MAX_QUERY_PLAN_CACHE_ENTRY_SIZE = 0; # 0 for default

Note: Based on testing you need to put in the right value for your system, for more details see "*A NQSConfig.INI File Configuration Settings*" in Oracle Fusion Middleware System Administrator's Guide for Oracle Business Intelligence Enterprise Edition for more information about query caching concepts and setup.

Query Results Caching
- One of the main advantages of query caching is to improve apparent query performance. It might be valuable to seed the cache during off hours by running

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queries and hence causing the server to cache their results.
- The number of cache entries and disk size limit for the cache can be configured.
- These configuration parameters can be set through by Oracle Business Intelligence Enterprise Manager.
- NQSConfig.INI parameters to be tuned :

[CACHE]

ENABLE = YES;

MAX_ROWS_PER_CACHE_ENTRY = 100000; #Too many rows in cache can slow down performance
#This Configuration setting is managed by Oracle Business Intelligence Enterprise Manager
MAX_CACHE_ENTRY_SIZE = 40 MB;
#This Configuration setting is managed by Oracle Business Intelligence Enterprise Manager
MAX_CACHE_ENTRIES = 5000;
POPULATE_AGGREGATE_ROLLUP_HITS = YES;
#Above parameter specifies whether to aggregate data from earlier cached query
#results set and create a new entry in the query cache for rollup cache hits. The
#default value is *NO*. When this parameter is set to YES, then when a query gets an
#aggregate rollup hit, and then the result is put into the cache. Setting this parameter
#to YES might result in better performance, but results in more entries being added
#to the cache.

You can configure the Oracle BI Server to maintain a local, disk-based cache of query result sets (query cache). The query cache allows the Oracle BI Server to satisfy many subsequent query requests without having to access back-end data sources (such as Oracle Database). This reduction in communication costs can dramatically decrease query response time. See "About the Oracle BI Server Query Cache" in Oracle Fusion Middleware System Administrator's Guide for Oracle Business Intelligence Enterprise Edition.

Read-Only Mode - Permits or forbids changing Oracle BI repository files when the Administration Tool is in either online or offline mode. The default is NO, meaning that repositories can be edited.
- Makes the repository read-only so that online updates cannot be made.
- Increased scalability due to less lock contention
- NQSConfig.INI parameters to be tuned:

> **[SERVER]**
> *# This Configuration setting is managed by Oracle Business Intelligence Enterprise Manager*
> **READ_ONLY_MODE** = YES;

See *"A NQSConfig.INI File Configuration Settings"* in Oracle Fusion Middleware System Administrator's Guide for Oracle Business Intelligence Enterprise Edition.

Improve sort efficiency by increasing sort buffer
- It helps to have the sort directory on a fast disk (e.g. a RAMDisk)
- NQSConfig.INI parameters to be tuned:

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[GENERAL]
WORK_DIRECTORY_PATHS = *"C:\Temp"; /* /dev/shm on Linux */*
#If a Memory Resident File System is not available, for optimum performance,
#temporary directories should reside on local high performance storage devices (i.e.
 #SSD, SAN).
SORT_MEMORY_SIZE = 4 MB;
SORT_BUFFER_INCREMENT_SIZE = 256 KB;

Cluster aware Cache seeding (using nqcmd or Agent a.k.a ibot)
- Seeding one node propagates across cluster
- Data from shared location is pulled into local cache location during every poll
- NQSConfig.INI parameters to be tuned:
    [CACHE]
    # This Configuration setting is managed by Oracle Business Intelligence Enterprise Manager
    GLOBAL_CACHE_STORAGE_PATH = "<shared directory name>" SIZE;
    # This Configuration setting is managed by Oracle Business Intelligence Enterprise Manager
    MAX_GLOBAL_CACHE_ENTRIES = 5000;
    CACHE_POLL_SECONDS = 300;

See *"A NQSConfig.INI File Configuration Settings"* in Oracle Fusion Middleware System Administrator's Guide for Oracle Business Intelligence Enterprise Edition.

Increase VIRTUAL_TABLE_PAGE_SIZE
When VIRTUAL_TABLE_PAGE_SIZE is increased, I/O operations are reduced. Complex queries may use 20 to 30 virtual tables, while simple queries may not even require virtual tables. This parameter can be tuned depending on the number of concurrent users and the average query complexity. NQSConfig.INI parameters to be tuned:
    [GENERAL]
    VIRTUAL_TABLE_PAGE_SIZE = 256 KB;

Important Note: *You need to determine the optimal value for the parameter stated in above table as part of your pre-production performance / load testing.*

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4.2.2   Disable Oracle Client Library signal handling

The Oracle DB Client Libraries are distributed with BIEE 11g install. By default, the library enables a signal handler, which will capture a call stack if the application crashes.   The signal handler is not needed, and definitely disruptive to BI Server diagnostics. It is recommended to disable the signal handler.

Tip: *sqlnet.ora* **is located at Oracle BI Home : $ORACLE_HOME/network/admin/sqlnet.ora**

Add below line at the top of the sqlnet.ora file:

   DIAG_SIGHANDLER_ENABLED=FALSE

Important Note: Above setting applies in all UNIX environments.

4.2.3   Avoid Excessive BI Logging
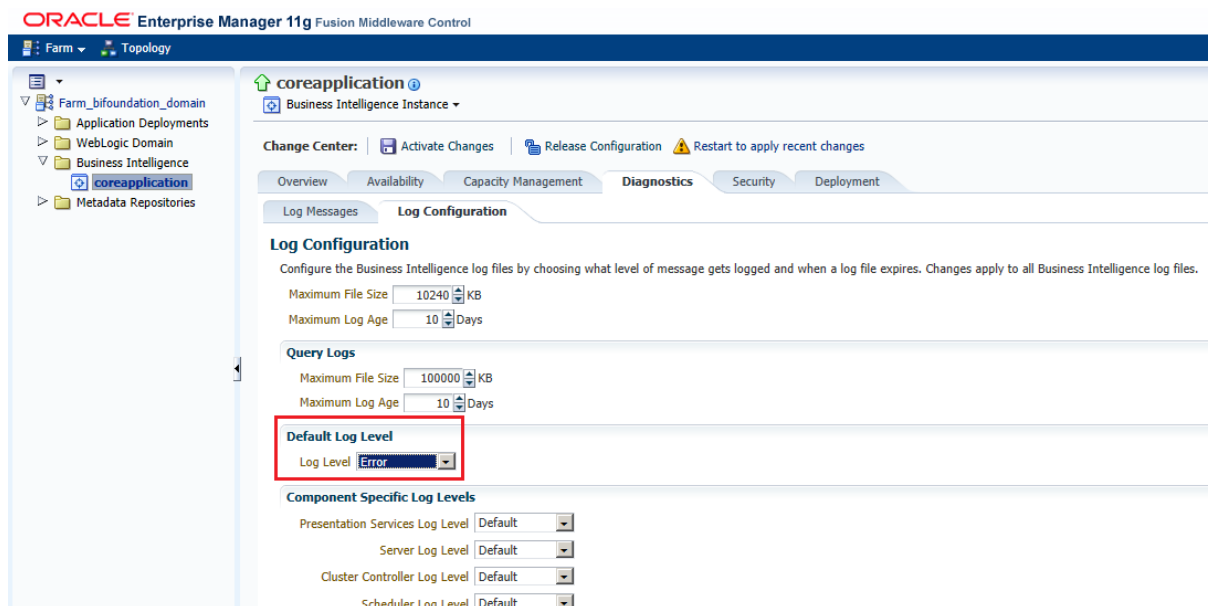
Avoid excessive writing to log files in following BI Server components because this can quickly create a disk bottleneck under high users load test.

a.   OBIS Query Loglevel:

Set *Loglevel 2* this will provide the logical query, physical query and the response times. Note: It has reasonable low overhead in low to moderately busy system and can be kept at level 2 in production.

b.   Set BIEE log level to *'Error'*:

In EM, set default log level for all BI System components to "Error". See below:

4.3 Oracle® JavaHost Component

Following are the important parameters to tune in *JavaHost config.xml and opmn.xml* files and will increase the performance for scenarios with Trellis charts rendering and export to excel downloads.

4.3.1 Tuning Exporting Large Data Sets to Microsoft Excel

OBIEE 11.1.1.7.0 supports native Excel format which reduces the exported file size i.e. the file size of the export *.xlsx* file is approximately 1/10th the size of the previous format in 11.1.1.6 or earlier, but it requires more time to export the content.

In order to improve export to excel download time, it is recommended to perform following fine tuning for the JavaHost process.

Important Note: *To avoid potential system performance issues, below tuning values for JavaHost parameters should be set only after considering the nature of the Excel download workload along with available system memory capacity.*

Java Virtual Machine Settings

In opmn.xml file located at *ORACLE_INSTANCE/config/OPMN/opmn/,* for Javahost (64bit) set heap size to *-server –Xmx8g*. In following section of *opmn.xml* file, increase the heap size to 8GB for 64bit JavaHost process:

```
<process-type id="OracleBIJavaHostComponent" module-id="CUSTOM">
<module-data>
<category id="start-parameters">
 <data id="start-executable" value="$ORACLE_HOME/jdk/bin/java"/>
 <data id="start-args" value="-server -Xms8g -Xmx8g –Xmn4g -
    XX:+UseCompressedOops -XX:+UseParallelOldGC -
    XX:+ExplicitGCInvokesConcurrentAndUnloadsClasses -
    XX:MaxPermSize=512M -XX:PermSize=512M -XX:+DisableExplicitGC -
    Xnoclassgc
....>
```

Set 0 for XMLP tag in JavaHost configuration file to handle large data

Navigate to the */instances/instance1/config/OracleBIJavaHostComponent* folder.
In the config.xml file, configure the XMLP tag for large data as follows:

```
<XMLP>
    <InputStreamLimitInKB>0</InputStreamLimitInKB>
    <ReadRequestBeforeProcessing>false</ReadRequestBeforeProcessing>
</XMLP>
```

Important Note: Setting *InputStreamLimitInKB* parameter value to zero (0), which is unlimited, should only be used for testing. Set the value to something reasonable that works with your large data sets. The default is 8192 (8MB), but you may need to increase it to 16384 (16MB), 32768 (32MB) etc.

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In the xdo.cfg file, change the setting for *xlsx-keep-values-in-same-column* to True.

Note: if the entry does not exist, then you can add it in the following format: *<property name="xlsx-keep-values-in-same-column">true</property>*

Move temporary files locations for JavaHost / OBIPS to fast storage

At least 4.5GB of free temporary space is required for single user export (126821 rows and 90 columns), multiplied by the number of concurrent users who will export such large reports at the same time. Note: the temp file size will be improved in future BI patch sets.

For **JavaHost** the default location for temporary files location is in */tmp* and for **OBIPS** the default location for temporary folder is in *$MW_HOME/instances/instance1/tmp sub-folders.*

Important Note: As temporary files locations are highly used by JavaHost / OBIPS processes, any improvement on IO performance (i.e. use Flash drives, RAMDISK) for these tmp files locations would significantly improve performance of the export to excel.

On Linux you can use RAMDISK to put tmp files for JavaHost and OBIPS processes. *Caution: You need at least 256GB free physical memory in the system in order to implement following RAMDISK tuning settings. Please note below settings will cause severe performance issues if implemented in system that has low memory.*

    a. For JavaHost, you need to add *-Djava.io.tmpdir=/dev/shm* argument in opmn.xml file located at *ORACLE_INSTANCE/config/OPMN/opmn/*, in following section of *opmn.xml* file:

```
<process-type id="OracleBIJavaHostComponent" module-id="CUSTOM">
  <module-data>
    <category id="start-parameters">
      <data id="start-executable" value="$ORACLE_HOME/jdk/bin/java"/>
      <data id="start-args" value="-server -Djava.io.tmpdir=/dev/shm …
        ….>
```

    b. For OBIPS, you need to perform following to move *temp* files location to RAMDISK:

```
mkdir /dev/shm/coreapplication_obips1
cd $BI_HOME/instances/instance1/tmp/OracleBIPresentationServicesComponent
mv coreapplication_obips1 coreapplication_obips1.localDisk
ln -s /dev/shm/coreapplication_obips1
```

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4.4 Oracle® BI Schedulers Component

To achieve better performance with BI Schedulers component, the following parameters can be tuned in instanceconfig.xml.

You may encounter the following behavior with large Agent runs. A description of the issue and a possible tuning solution follows:

- For personalized Agents with large email distributions that include PDF attachments, some concurrency issues between OBIPS and OBISched may be encountered. These will typically manifest as missed email deliveries and corrupt PDF attachments. To alleviate such occurrences, the OBIScheduler parameter '*MaxExecThreads*' should be relatively less than the OBIPS parameter '*MaxConcurrentRequests*'.

Note: The setting in instanceconfig.xml (*MaxConcurrentRequests*) affects only PDFs by throttling their generation.

The setting in scheduler (*MaxExecThreads*) affects all delivers agents by throttling OBISched requests to OBIPS." In the installed default configuration, these values are set as follows:

OBIPS 'MaxConcurrentRequests' = 50
OBISched 'MaxExecThreads' = 100

Important Note: These settings may produce issues for the situation detailed above as OBISched could overwhelm OBIPS with requests. As mentioned above, *'MaxExecThreads'* should be relatively less (25% to 50%) than '*MaxConcurrentRequests*'.

Following settings are recommended as a starting point,

a. In OBIPS *instanceconfig.xml* file located at
ORACLE_INSTANCE/config/OracleBIPresentationServicesComponent/coreapplication_obipsn,
add the following inside <ServerInstance>:

```
<Download>
    <XslFo>
        <MaxConcurrentRequests>50</MaxConcurrentRequests>
    </XslFo>
</Download>
```

b. In OBISched *instanceconfig.xml* located at
ORACLE_INSTANCE/config/OracleBISchedulerComponent/coreapplication_obischn,
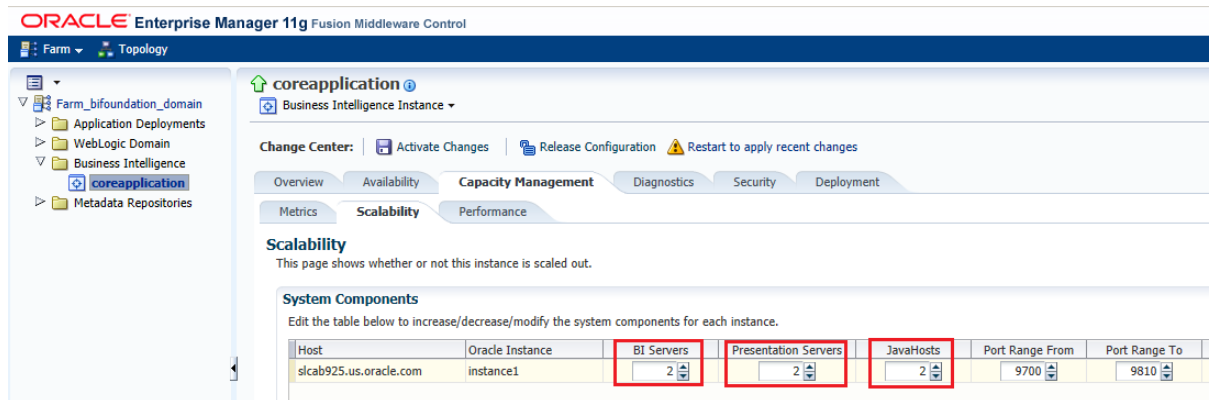update the following parameter value inside <ServerInstance>:

```
<MaxExecThreads>25</MaxExecThreads>
```

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4.5 Vertically Scale Presentation Services / JavaHost / BIServer Components

Before increasing the number of Presentation Services, Javahost and BI Server per server, make sure you have enough system resources available on 32 bit / 64 bit servers and during performance / load testing exercise, adjust as needed. To achieve stable BI system under load, better scalability and an even BI performance over time, you should at least set two Presentation Services per server, two Javahost per server and two BI Server per server.

You can use the below Scalability tab of the Capacity Management page in *Fusion Middleware Control* to scale in the Presentation Services process to two per server, Javahost process to two per server and two BI Server process per server:

Important Note: When you have multiple instances of a given *Oracle Business Intelligence componen*t in the deployment, you should first configure shared files and directories (i.e. Oracle BI Presentation Catalog, Global cache) for the clustered components to use. Then, use *Fusion Middleware Control* to increase the number of Presentation Services, Javahost components and BIServer components that run on the existing Oracle Business Intelligence host (for more information on vertical scaling refers to documentation library link @ http://docs.oracle.com/cd/E28280_01/bi.1111/e10541/cluster.htm#BABCABBC).

Caution: Use the above suggested settings as a starting point, and then, after careful performance testing, adjust as needed.

Important Note: After each post vertical scale for Presentation Services, JavaHost and BIServer, you need to manually examine the component configuration files, make a backup copy, use a "difference" utility and then manually synchronize the parameters and values in the files if necessary. For example, NQSConfig.INI file after vertically scale BI Server and it will create a new obis2, then the NQConfig.INI in obis2 will have new entries and new obis2 NQSConfig.INI file may not have those custom entries that exists in obis1 NQSConfig.INI file. Same applies to instanceconfig.xml, config.xml and opmn.xml files

5.0   TUNING ORACLE® ESSBASE

This chapter includes the following sections that provide a quick start for tuning OBIEE with the Essbase ASO cube as a data source.

5.1   Essbase Aggregate Storage (ASO) Tuning

For full design, tuning and limits details refer to the **Oracle Essbase Documentation Release 11.1.2.3**

 http://docs.oracle.com/cd/E40248_01/nav/portal_3.htm

The key Essbase guides that should be reviewed for all design, tuning and limits considerations are:

- **Oracle Essbase Database Administrator's Guide**
- **Oracle Essbase Technical Reference**
- **Oracle Essbase Administration Services (Online Help)**

The following topics are additional design, tuning and limits considerations to optimize Essbase Aggregate Storage (ASO) performance; however, for full details see the guides referenced above.

5.1.1   Outline

See the **Oracle Essbase Database Administrator's Guide** for complete details regarding Aggregate Storage Outline design and tuning.
http://docs.oracle.com/cd/E40248_01/epm.1112/essbase_db.pdf

The following sections are to help guide with tuning areas. Only methodical performance and load testing can determine the optimal settings for a given application design and process.

5.1.1.1 Compacting the Outline File

It is recommended to include an ASO outline compacting process as part of a normal maintenance process. When you delete members from an aggregate storage outline, the corresponding records of members in the outline file (.otl file) are marked as deleted but remain in the file.

NOTE: Compacting the outline file will not cause Essbase to clear the data.

5.1.1.2 Compression Dimension

The choice of compression dimension can significantly affect performance. A good candidate for a compression dimension is one that optimizes data compression while maintaining retrieval performance.

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Another consideration when choosing a compression dimension is how well it is expected to compress the database. The size of the compressed database changes depending on which dimension is tagged as compression.

Selecting the best compression dimension requires methodical testing to ensure the appropriate setting is selected for a given design, process and data distribution.

NOTE: Changing the compression dimension triggers a full restructure of the database.

5.1.1.3 Dynamic Calculations Log Messages

The Essbase ASO application log has some informative messages related to dynamic calculations that can be helpful with tuning.

The following message indicates that the ASO optimization member needs more memory to process the MDX member formulas. In this case, consider adding MAXFORMULACACHESIZE configuration setting to the Essbase.cfg file.

- *Not enough memory for formula execution. Set MAXFORMULACACHESIZE configuration parameter to [xxxx] KB and try again.*

For additional information on ASO dynamic calculation log messages, see the CEAL blog post https://blogs.oracle.com/pa/entry/epm_11_1_2_understanding

5.1.1.4 MDX Outline Formulas

See the **Oracle Essbase Technical Reference** for complete details regarding Aggregate Storage MDX Outline Formulas.
http://docs.oracle.com/cd/E40248_01/epm.1112/essbase_tech_ref.pdf

The *NONEMPTYMEMBER* and *NONEMPTYTUPLE* properties enable MDX in Essbase to query on large sets of members or tuples while skipping formula execution on non-contributing values that contain only #MISSING data. Because large sets tend to be very sparse, only a few members contribute to the input member (have non #MISSING values) and are returned. As a result, the use of NONEMPTYMEMBER and NONEMPTYTUPLE in calculated members and formulas conserves memory resources, allowing for better scalability, especially in concurrent user environments.

Example: Tuning MDX formula using a NON EMPTY directive:
1. The measure member [Units] is a loaded value
2. The measure member [Avg. Units/Transaction] is calculated using formula
   [Avg. Units/Transaction] = [Units]/[Transactions]

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3. The value of [Avg. Units/Transaction] is empty if value of [Units] is empty
4. The calculation of [Avg. Units/Transaction] can be skipped if value of [Units] is empty
5. We can add the NON EMPTY directive for [Avg. Units/Transaction] by rewriting the formula as

[Avg. Units/Transaction] = NONEMPTYMEMBER [Units] [Units]/[Transactions]

The application log will contain hints on which MDX formulas could benefit with using the NON EMPTY directives. The query performance improvements obtained from defining NON EMPTY directives properly in each MDX outline member formulas can be very significant. The performance improvements increase with the complexity of the formula and sparseness of the data.

5.1.2 Database Level Settings

See the **Oracle Essbase Database Administrator's Guide** for complete details regarding Aggregate Storage Database Settings tuning.
http://docs.oracle.com/cd/E40248_01/epm.1112/essbase_db.pdf

The following sections are to help guide with tuning areas. Only methodical performance and load testing can determine the optimal settings for a given application design and process.

5.1.2.1   Pending Cache Size Limit (MB)

Aggregate storage Pending Cache Size Limit (MB) memory is utilized during data loads, aggregations, and retrievals. Pending Cache Size Limit (MB) is not used during dimension building or outline restructuring. Aggregate storage Pending Cache Size Limit (MB) is allocated on demand.

Typically, ASO databases with > 20 million input level cells, default of 32 MB cache is sufficient. ASO databases with < 20 million input level cells, 64 to 128 MB cache may be more appropriate. ASO databases with 1 billion cells or more, the Pending Cache Size Limit may be set as high as 512 MB or 1 GB if the available memory permits it. However, it is not recommended to set Pending Cache Size Limit (MB) to more than half of the machine's total physical memory. The reason is that it is beneficial to leave space for the operating system's file cache. Also, there is a diminishing benefit to making the Pending Cache Size Limit (MB) larger and larger. For example, there is a huge benefit to increasing the Pending Cache Size Limit (MB) from the default 32 MB to 64 or 128 MB; however, beyond about 1GB, the effect of increasing the cache will probably not be noticeable unless running parallel data loads.

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Tuning Pending Cache Size Limit (MB) requires methodical testing to ensure the appropriate setting is selected for a given design, process and data distribution.

5.1.2.2 Retrieval Buffer Size

The retrieval buffers are a server buffer per database that holds extracted row data cells per user query. When the retrieval buffer is full, the rows are processed and the buffer is reused. If these buffers are too small, frequent reuse of the area can increase retrieval times. If these buffers are too large, too much memory may be used when concurrent users perform queries while also increasing retrieval times.

Important Note: It is recommended to start with default values and incrementally increase during load testing using the largest user reports. Since this setting is per user report request, it may lead to wasted memory so only set to what is needed. Also note the retrieval buffers are allocated per thread. Oracle recommends that you do not exceed 100 KB, although the size limit is set at 100,000 KB.

5.1.3   Data Load

See the **Oracle Essbase Database Administrator's Guide** for complete details regarding Aggregate Storage Data Load tuning.
http://docs.oracle.com/cd/E40248_01/epm.1112/essbase_db.pdf

The following sections are to help guide with tuning areas. Only methodical performance and load testing can determine the optimal settings for a given application design and process.

5.1.3.1 Incremental Data Updates

When performing incremental updates to an Essbase Aggregate Storage (ASO) outline, depending on the nature of the incremental updates, could trigger either a full or light outline restructure.

For additional information on ASO incremental data updates, see the CEAL blog post https://blogs.oracle.com/pa/entry/essbase_aggregate_storage_aso_incremental

5.1.3.2 Merge Data Slices

When performing an Aggregate Storage (ASO) application copy, it is necessary to merge all data slices first so that all data in the ASO application will be copied properly. For additional information on ASO merging data slices before copying an ASO application, see the CEAL blog post
https://blogs.oracle.com/pa/entry/merge_data_slices_before_copying

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5.1.3.3 Table Space

The ASO kernel stores data in two different table spaces, "default" and "temp." The "default" table space is used to store cube cells, both level zero input cells and aggregated cells. The "temp" table space is used for intermediate storage of cells during data load, aggregation, and large queries. There could be data load improvement by separating the two table spaces into two difference physical drives.

5.1.4   Aggregation

See the **Oracle Essbase Database Administrator's Guide** for complete details regarding Aggregate Storage Aggregate Views tuning.
http://docs.oracle.com/cd/E40248_01/epm.1112/essbase_db.pdf

The following sections are to help guide with tuning areas. Only methodical performance and load testing can determine the optimal settings for a given application design and process.

5.1.4.1 Aggregation Methods

The default selection of aggregate views proposed by Essbase provides excellent performance for most ASO applications. To optimize aggregations for different database retrieval situations, such as for generating reports or user queries, you may need to repeat the tuning process, creating an aggregation script for each situation.

There are several aggregate view options in EAS Console and MaxL that should be methodically tested to ensure the appropriate aggregation view option is selected for a given design, process and data distribution.

Refer to the **Oracle Essbase Database Administrator's Guide** and **Oracle Essbase Technical Reference** to review these areas:
- Default Aggregation Option
- Stopping When Total_Size Exceeds a Certain Size Option
- Enable Alternate_Rollups Option
- Query Tracker Enabled Option
- ASOSAMPLESIZEPERCENT Essbase.cfg setting to control the views generated more efficiently

5.1.5 Essbase.cfg Settings

See the **Oracle Essbase Technical Reference** for a complete list of configuration settings that apply to Aggregate Storage applications.
http://docs.oracle.com/cd/E40248_01/epm.1112/essbase_tech_ref.pdf

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The following sections are to help guide with tuning areas. Only methodical performance and load testing can determine the optimal settings for a given application design and process.

5.1.5.1 Suggested ASO CFG Settings to Review:

CFG Setting	
SERVERTHREADS **100** AGENTTHREADS **30** **Important Note:** It is not recommended to set above parameters too high unless necessary. Should increase above parameters values for BI SmartView to support high users load. For additional information on these settings, see the blog post *https://blogs.oracle.com/pa/entry/essbase_11_1_2_agtsvrconnections*	
;NETDELAY **;It is recommended to use default value (200)*** ;NETRETRYCOUNT **;It is recommended to use default value (600)*** For additional information on these settings, see the blog post *https://blogs.oracle.com/pa/entry/epm_11_1_2_in2*	
NO_HOSTNAME_LISTCONNECT **TRUE** For additional information on this setting, see the blog post *https://blogs.oracle.com/pa/entry/epm_11_1_2_add*	
ASOSAMPLESIZEPERCENT	For additional information on this settings, see the blog post *https://blogs.oracle.com/pa/entry/epm_11_1_2_aasosamplesizepercent*
MAXFORMULACACHESIZE	*http://docs.oracle.com/cd/E40248_01/epm.1112/essbase_tech_ref/maxformulacachesize.html*

It is recommended that the default value be used than incrementally increase the value during methodical performance and load testing to find the best setting. It is strongly recommended to not randomly set Essbase configuration setting values high without understanding what the setting does and how it works. Also, methodical testing will uncover issues with higher then needed settings. For instances, it is recommended to set the *NETDELAY / NETRETRYCOUNT* timeout settings to default values, which is 2 minutes. If need be, the max amount of timeout that is recommended should not be above 5 minutes. The reason is because there have been customers reporting Essbase "hangs"; However, technically there is no "hang" until this "hang" exceeds the *NETDELAY / NETRETRYCOUNT* settings. Meaning, if timeout is set to 17 minutes and the "hang" resolved in 10 minutes, this would not be considered a "hang" until the hang was longer than 17 minutes. At this point, an investigation into what processes are taking that long should be done.

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