Maximizing E-Business Suite Performance

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Agenda

- Desktop Tier

- Application Tier
  - Forms
  - Apache / JVM
  - Concurrent Manager

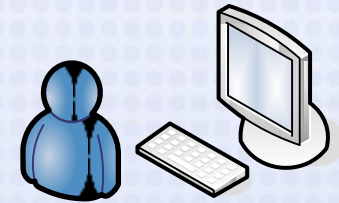- Tuning Workflow

- Network Performance

- Database Tier

- Q & A

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Desktop Tier

Desktop Tier

- Tune the Desktop
  - Check for Memory and CPU intensive programs – Use Task Manager

Desktop Tier

- Jinitiator/JRE runs as a browser Plugin
  - ➤ Java runs in the same process as the browser (iexplore.exe)
  - ➤ Minimize Plug-ins
  - ➤ Disable Phishing Filter
  - ➤ Disable non-essential BHOs

Desktop Tier

- Tune Jinitiator/Java Plug-in options

  ➢ Ensure minimum and maximum heap sizes are specified.

  ➢ If using clients of the Forms Java bean such as Dispatch Center, UWQ, etc.., heap sizes may need to be increased:
    - -mx512m
    - -ms256m

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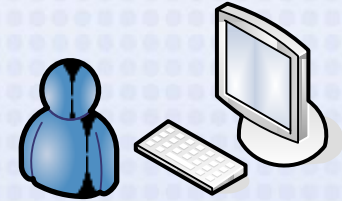
Desktop Tier

- Tune JAR Cache
  - Set the JAR Cache size to 200 MB
    - Accounts for users accessing multiple environments such as test, QA, and production.
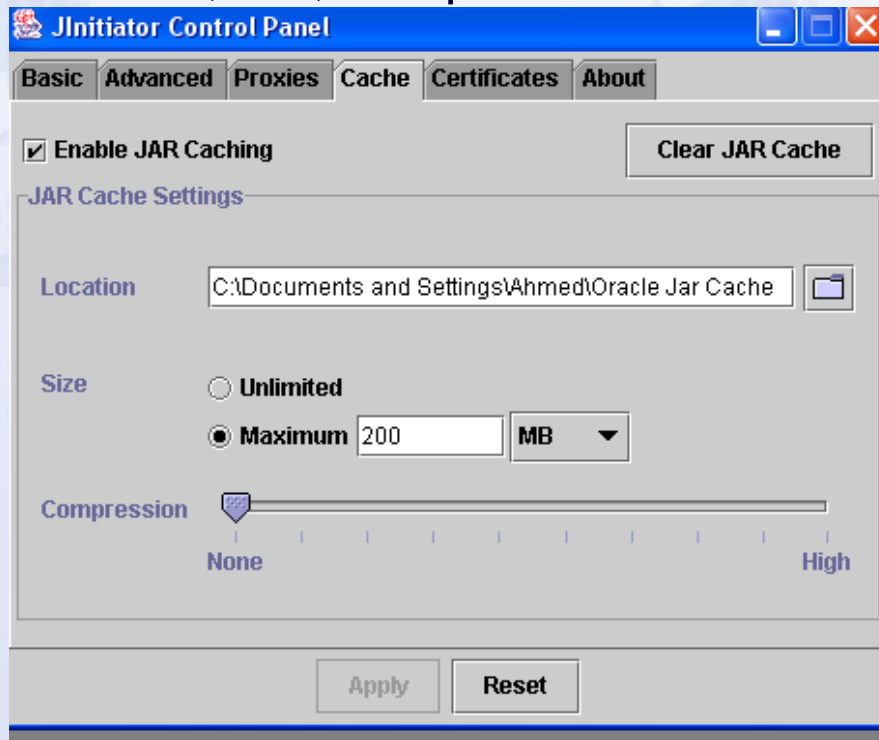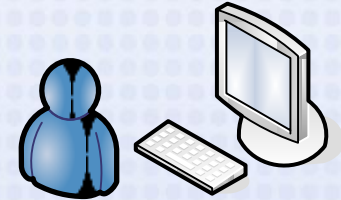
Desktop Tier

• Enable Jinit/Java Console.
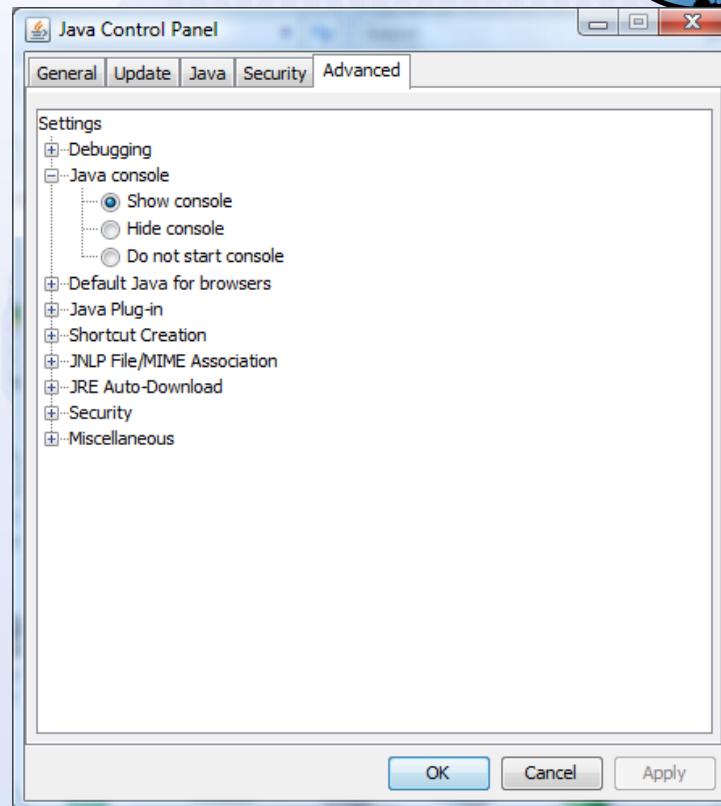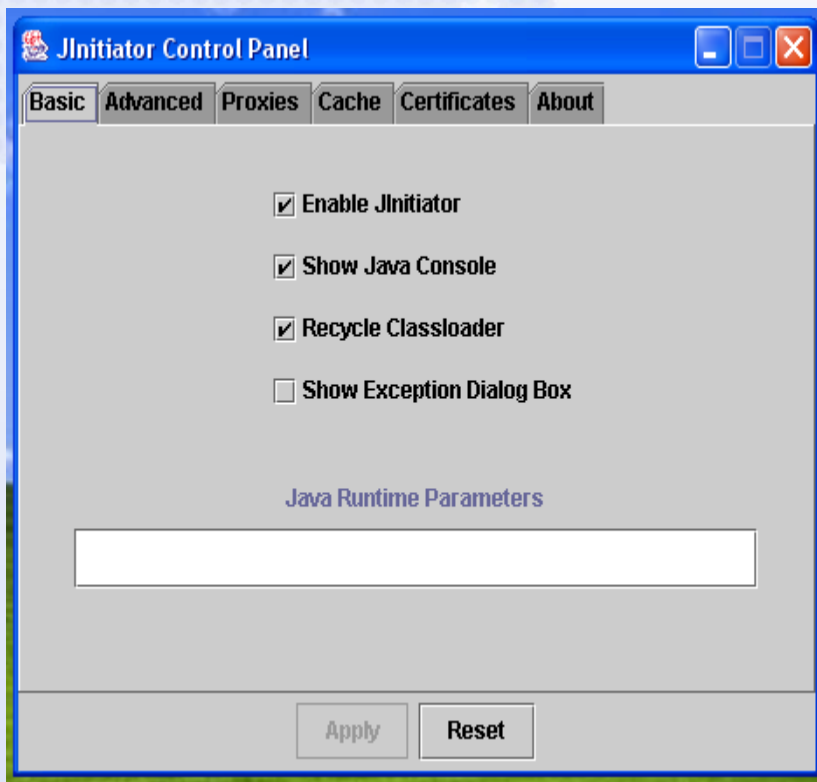
Desktop Tier

- Review Jinit/Java console
  - Look for exceptions, excessive logging, OutOfMemoryErrors.
    - Exceptions or errors can translate into poor user perceived performance or "hangs".
  - Ensure JARs are being cached.
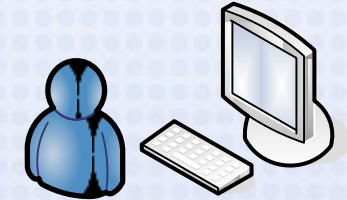
```
Java Console

Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/fndforms.jar from JAR cache
Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/fndformsi18n.jar from JAR cache
Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/fndewt.jar from JAR cache
Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/fndswing.jar from JAR cache
Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/fndbalishare.jar from JAR cache
Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/fndaol.jar from JAR cache
Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/fndctx.jar from JAR cache
Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/fndlist.jar from JAR cache
Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/170mvoavd.jar from JAR cache
Loading http://ebiz:8400/OA_JAVA/oracle/apps/fnd/jar/fndutil.jar from JAR cache
OS Name = Windows XP 5.1
connectMode=Socket
serverPort=9400
Forms Applet version is : 60825
```

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Desktop Tier

- Upgrade to the latest Java Plug-in
  - ➢ Use JRE 1.6
  - ➢ Improves runtime performance for Forms java bean based clients including Dispatch Center, UWQ, etc..
  - ➢ Refer to Support ID 290807.1 (11i)
  - ➢ Refer to Support ID 393931.1 (Release 12)
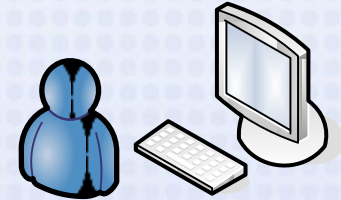
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Application Tier

Application Tier - Forms

- Keep Forms patchset current
  - Current patchset
    - (11i): 6.0.8.28 (19)
    - (R12): 10.1.2.3.0
  - Refer to Support IDs
    - 125767.1 (11i)
    - 437878.1 (R12)

- Use Socket Mode
  - AutoConfig context variable (s_frmConnectMode=socket)
  - Reduces client network traffic (as compared to servlet mode)
  - Eliminates the need to run Forms Servlet JVMs
  - Support ID 384241.1 (R12)

Application Tier - Forms

- Environment variable which restricts LOV fetch set
  - ➤ FORMS60_RECORD_GROUP_MAX (11i -- PS 15 or higher)
  - ➤ FORMS_RECORD_GROUP_MAX (R12)
  - ➤ Avoids large footprint of forms runtime process associated with non-selective LOV queries.

Choices in list, limited by maximum rows: 5000

Record: 1/1 | | ... | List of Valu... | | <OSC>

Application Tier - Forms

- Purge/archive Forms runtime log files as part of Forms server restart:
  - 11i:
    - $FORMS60_RTI_DIR/*.rti
    - $FORMS60_TRACE_PATH/*.log
  - R12
    - $FORMS_RTI_DIR/*.rti
    - $FORMS_TRACE_PATH/*.log

- Schedule purge program "Purge Obsolete Generic File Manager Data" if the Forms Export function is being used.
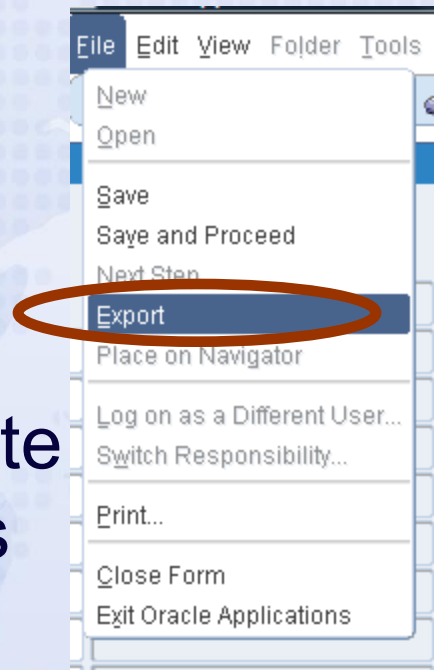
Application Tier - Forms

- Cancel Query
  - ➢ Useful for cases where users regularly or occasionally perform "accidental queries."
  - ➢ Not useful for cases where users have no intention of canceling the query or functionally require the results of the expensive query.
  - ➢ Increases forms and DB session CPU utilization.
  - ➢ Increases network traffic between client and forms tier.
  - ➢ Set Profile "FND: Enable Cancel Query" to "No" at the site level.
    - Enable cancel query at the application or responsibility level (where required).

Application Tier - Forms

- Utilize About Oracle Applications Information

Application Tier - Apache

- Use a hardware load balancer if available

Users

https://ebiz:8500/OA_HTML/AppsLocalLogin.jsp

Load Balancer

Public Network

App node1   **App node2**   **App node3**
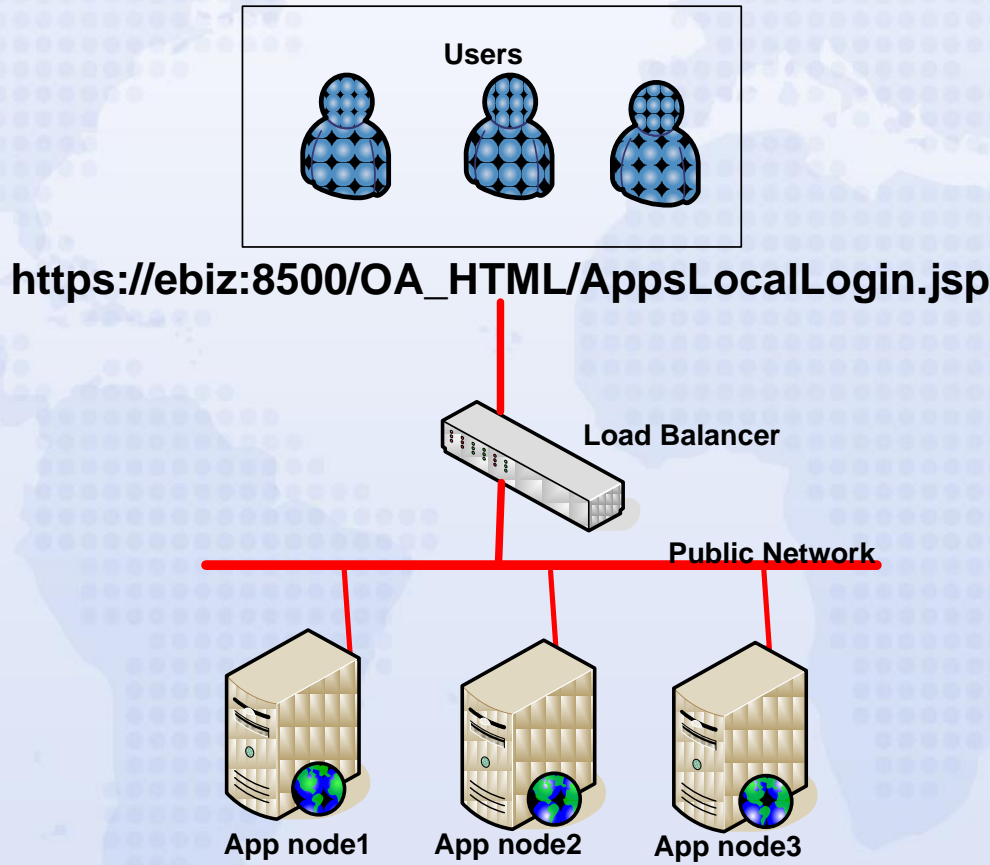
Application Tier - Apache

- Hardware load balancer
  - ➤ Select round-robin balancing method
  - ➤ Enable cookie persistence
  - ➤ Leverage hardware SSL acceleration
    - Eliminates Apache SSL overhead

- Ensure keep alive is enabled
  - ➤ KeepAlive ON (httpd.conf)
  - ➤ KeepAliveTimeout 15 (httpd.conf)

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Application Tier - Apache

- Ensure log level is set to warning
  - ➤ httpd.conf
    - LogLevel warn
    - SSLLogLevel warn

- Disable DNS lookups
  - ➤ HostnameLookups Off (httpd.conf)

- Rotate logs
  - ➤ TransferLog "|/applmgr/prod/iAS/Apache/Apache/bin/rotatelogs /applmgr/prod/iAS/Apache/Apache/logs/access_log 86400"

Application Tier - Apache

- Review access log file
  - ➤ Check for frequent downloads or timestamp checks of:
    - images, javascript, or style sheets.
    - JAR files
  - ➤ http codes
    - 200 (request for document)
    - 304 (timestamp check)
    - 404 (document not found)
  - ➤ Log entry format
    - <IP address> <date/time> <command> <URL> <status code> <bytes> <elapsed time>

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Application Tier - Apache

- Review access log file

  - Log entry format
    - <IP address> <date/time> <command> <URL> <status code> <bytes> <elapsed time>

  - Add %T in LogFormat option in $IAS_CONFIG_HOME/Apache/Apache/conf/httpd.conf:
    - LogFormat "%h %l %u %t \"%r\" %>s %b %T \"%{Referer}i\" \"%{User-Agent}i\" combined
    - Records elapsed time in access log file.
    - Helps determine page response time.

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Application Tier - Apache

- Review access log file
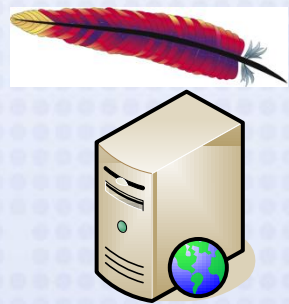
```
12.10.103.18 - - [14/Dec/2009:18:59:27 -0800] "GET
/OA_HTML/OA.jsp?OAFunc=OAHOMEPAGE&akRegionApplicationId=0&navRespId=50846
&navRespAppId=0&navSecGrpId=0&transactionid=848034726&oapc=2&oas=ZvnmjkxSz_v1yFfzqN5Cig.. HTTP/1.1" 200 24314
12.10.103.18 - - [14/Dec/2009:18:59:28 -0800] "GET /OA_HTML/cabo/styles/cache/oracle-desktop-custom-2_2_24_1-en-
ie-6-windows.css HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:28 -0800] "GET /OA_HTML/cabo/jsLibs/Common2_2_24_1.js HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:28 -0800] "GET /OA_HTML/cabo/oajsLibs/oafcoreRUP5.js HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:28 -0800] "GET /OA_HTML/cabo/images/t.htm HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:28 -0800] "GET /OA_HTML/blank.html HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:28 -0800] "GET /OA_MEDIA/FNDSSCORP.gif HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:28 -0800] "GET /OA_HTML/cabo/images/pbs.gif HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:28 -0800] "GET /OA_HTML/cabo/images/t.gif HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:28 -0800] "GET /OA_HTML/cabo/images/cache/cghes.gif HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:29 -0800] "GET /OA_HTML/cabo/images/cache/cghec.gif HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:29 -0800] "GET /OA_HTML/cabo/images/cache/cghee.gif HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:29 -0800] "GET /OA_HTML/cabo/images/cache/en/bCustomAppsNavLinkgPPb.gif
HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:29 -0800] "GET /OA_MEDIA/fwkhp_folder.gif HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:29 -0800] "GET /OA_MEDIA/fwkhp_formsfunc.gif HTTP/1.1" 304 -
12.10.103.18 - - [14/Dec/2009:18:59:29 -0800] "GET /OA_HTML/cabo/images/cache/en/bCustomLinkgPLN.gif HTTP/1.1" 304
-
12.10.103.18 - - [14/Dec/2009:22:05:00 -0500] "POST /oa_servlets/oracle.apps.bne.webui.BneApplicationService
HTTP/1.1" 200 6492
```

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JVM Tuning

Application Tier – Servlet Logging

- Set logging level to warning
  - ➤ ApJServLogLevel warn (jserv.conf)
  - ➤ jserv.properties
    - log.channel.warning=true
    - log.channel.critical=true
    - log.channel.debug=false
  - ➤ Review jserv and JVM log files for exceptions or errors
    - 11i: $IAS_CONFIG_HOME/Apache/Jserv/logs
      - – jserv.log
      - – mod_jserv.log
    - 11i: $IAS_CONFIG_HOME/Apache/Jserv/logs/jvm
      - – OACoreGroup.*.stderr
      - – OACoreGroup.*.stdout
    - R12: $INST_TOP/logs/ora/10.1.3/opmn/*oacore*

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Application Tier - JVM

- Ensure you are running a current version of the JDK as well as current patch set.

JDK Version	Current Patchset	Support ID	Applications Version
5.0 (*)	Update 22	304099.1 (11i) 384249.1 (R12)	11.5.10 Release 12
6.0	Update 18	401561.1 (11i) 455492.1 (R12)	11.5.10 CU2 Release 12

- Note(*): The EOL transition period for JDK 1.5 started on April 8, 2008 and will end on October 30, 2009.

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Application Tier - JVM

- JDK 1.5 provides JVM monitoring tools
  - ➢ jps
  - ➢ jstat
  - ➢ jconsole
  - ➢ jmap (utility to obtain heap information)

- JDK 1.6
  - ➢ jhat (Memory Analysis tool)
  - ➢ jmap enhanced to specify heap dump file name/path.

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Architecture
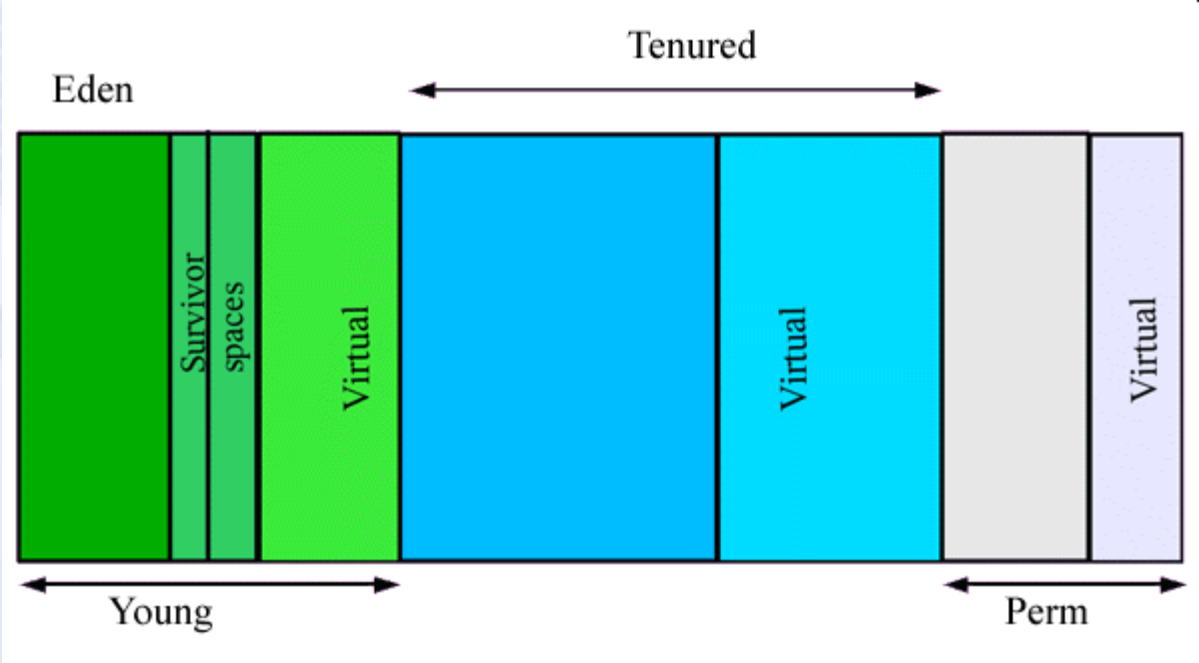
- Java Heaps

Architecture

- Java Heaps (-Xmx/-Xms)
  - -Xmx (maximum heap size)
  - -Xms (minimum heap size at startup)
    - Heap segment is typically memory mapped.
  - Young Generation
    - Eden (Nursery)
      - NewRatio or NewSize/MaxNewSize
    - Survivor Space
      - Can be tuned via SurvivorRatio
  - Tenured Generation (Old Generation)
  - Permanent Generation
    - PermSize and MaxPermSize
    - Code Cache (classes)
    - Constants
    - Intern strings

Application Tier - JVM

- Enable verbose GC
  - ➢ java.sh, jserv.properties (11i),
    $INST_TOP/ora/10.1.3/opmn/conf/opmn.xml (R12)
    - -verbose:gc
    - XX:+PrintGCTimeStamps
    - -XX:+PrintGCDetails
  - ➢ Direct verbosegc output to a specific file
    - 11i: $IAS_CONFIG_HOME/Apache/Apache/bin/java.sh
    - R12: $INST_TOP/admin/scripts/java.sh
    - -Xloggc:$JVMLOGDIR/$jsgrpid.$jsgrpindex.gc (11i -- JServ)

Application Tier - JVM

- Review verbose GC data

Type of GC

New Space

Perm. Gen

```
 263888.839: [GC [PSYoungGen: 378131K->9061K(393280K)] 1175648K->807594K(1212480K), 0.0249310 secs] [Times:
user=0.19 sys=0.01, real=0.02 secs]
 264062.955: [GC [PSYoungGen: 385509K->2107K(392768K)] 1184042K->807774K(1211968K), 0.0263420 secs] [Times:
user=0.24 sys=0.00, real=0.02 secs]
 264062.982: [Full GC[Unloading class sun.reflect.GeneratedMethodAccessor443]
  [PSYoungGen: 2107K->0K(392768K)] [PSOldGen: 805666K->247375K(819200K)] 807774K->247375K(1211968K) [PSPermGen:
54677K->53972K(71680K)], 2.6600860 secs] [Times: user=2.63 sys=0.03, real=2.66 secs]
 264164.928: [GC [PSYoungGen: 376448K->5127K(393600K)] 623823K->252503K(1212800K), 0.0142250 secs] [Times:
user=0.10 sys=0.00, real=0.01 secs]
 264273.025: [GC [PSYoungGen: 382215K->2381K(393088K)] 629591K->252854K(1212288K), 0.0193010 secs] [Times:
user=0.13 sys=0.00, real=0.02 secs]
 264393.122: [GC [PSYoungGen: 379469K->11043K(392320K)] 629942K->262082K(1211520K), 0.0258080 secs] [Times:
```

Size Before GC

Size After GC

GC Elapsed Time

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Application Tier - JVM

- ## Jstat
  - S0C Current survivor space 0 capacity (KB).
  - S1C Current survivor space 1 capacity (KB).
  - S0U Survivor space 0 utilization (KB).
  - S1U Survivor space 1 utilization (KB).
  - EC Current eden space capacity (KB).
  - EU Eden space utilization (KB).
  - OC Current old space capacity (KB).
  - OU Old space utilization (KB).
  - PC Current permanent space capacity (KB).
  - PU Permanent space utilization (KB).
  - YGC Number of young generation GC Events.
  - YGCT Young generation garbage collection time.
  - FGC Number of full GC events.
  - FGCT Full garbage collection time.
  - GCT Total garbage collection time.

- jstat -gc 10098

S0C	S1C	S0U	S1U	EC	EU	OC	OU	PC	PU	YGC	YGCT	FGC	FGCT	GCT
2816.0	3008.0	824.0	0.0	22848.0	6580.0	118400.0	115426.7	64640.0	64183.8	4970	56.516	55	35.031	91.547

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Application Tier - Servlet

- Set the Servlet session timeout to 30 minutes
  - ➢ 11i: zone.properties
    - session.timeout=1800000
  - ➢ R12: orion-web.xml
    - <session-timeout>30</session-timeout>
  - ➢ Larger timeout values increase overall JVM memory footprint.

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Application Tier – Web Applications

➢ Ensure the users are trained to use the Logout or Home global links when completing their transactions.

- Ensure users do not use the browser close ("x") link.

➢ Logging out gracefully releases the memory and corresponding resources (i.e. connections, etc..)

- Avoids memory leaks and timeout based invalidation.
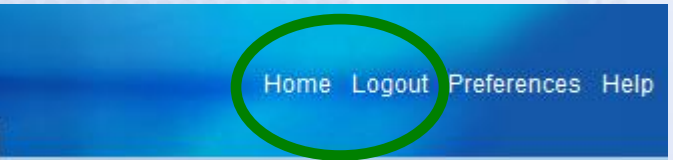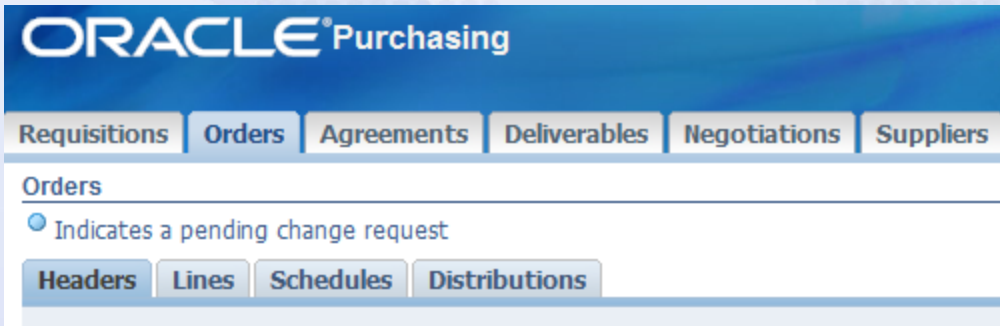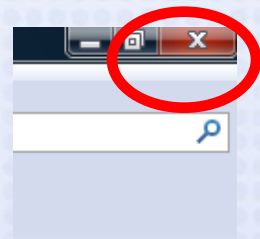
Application Tier – Java Object Cache

- Java Object Cache (JOC) is an iAS Component which provides a caching framework for Java based applications.

- E-Business Suite uses JOC for many of the core caches:

  - Page Metadata Cache (MDS)

  - AOL Caches
    - Menus
    - Responsibilities
    - Profiles
    - Function Security

Application Tier - JOC

- JOC Provides local caching (i.e. per JVM) as well as distributed caching (i.e. all JVMs)
  - Java System Property LONG_RUNNING_JVM specifies the caching behavior
    - TRUE – Distributed Caching
    - FALSE – Local Caching
  - LONG_RUNNING_JVM is set in jserv.properties in 11i and oc4j.properties in R12.

Application Tier - JOC

- JOC Distributed Caching
  - ➢ Endpoint Receiver threads are created on all OACore JVMs, GSM JVMs, and XML Services JVMs to each other on all App-tiers.

```
"EndPoint Receiver [192.168.26.123:35847]" daemon prio=1 tid=0x08166ca0 nid=0x717d runnable
[87c38000..87c3887c]
        at java.net.SocketInputStream.socketRead0(Native Method)
        at java.net.SocketInputStream.read(SocketInputStream.java:129)
        at java.net.SocketInputStream.read(SocketInputStream.java:182)
        at java.io.ObjectInputStream$PeekInputStream.peek(ObjectInputStream.java:2133)
        at java.io.ObjectInputStream$BlockDataInputStream.peek(ObjectInputStream.java:2423)
        at
java.io.ObjectInputStream$BlockDataInputStream.peekByte(ObjectInputStream.java:2433)
        at java.io.ObjectInputStream.readObject0(ObjectInputStream.java:1245)
        at java.io.ObjectInputStream.readObject(ObjectInputStream.java:324)
        at oracle.ias.cache.group.StreamHandler.read(Unknown Source)
        at oracle.ias.cache.group.EndPoint.read(Unknown Source)
        at oracle.ias.cache.group.Receiver.run(Unknown Source)
```

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Application Tier - JOC

- Monitor JOC log file for exceptions/errors
  - ➢ $APPLRGF/javacache.log
  - ➢ Memory leaks and JVM instability can occur if JOC loses contact with other JVMs.
  - ➢ NoClassDef errors involving the Profiles class can occur during user login if JOC errors occur.

- Ensure you are running the latest JOC patch
  - ➢ 7527878 (11i)
  - ➢ 7484199 (R12)

Application Tier – Connection Pool

- AOLJ Connection Pool (dbc configuration)
  - ➤ Disable sanity checks in production environments
    - FND_JDBC_USABLE_CHECK=false
    - FND_JDBC_PLSQL_RESET=false
  - ➤ Start with a reasonable default such as 200.
    - FND_JDBC_MAX_CONNECTIONS=200
  - ➤ Tune FND_JDBC_MAX_CONNECTIONS as per the amount of user concurrency (per JVM).
  - ➤ AOLJ automatically decays idle connections and resizes the pool

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Application Tier – Connection Pool

- AOLJ Connection Pool Monitoring
  - ➢ Use the AOL/J Database Connection Pool Status Page to monitor the connection pool status.
    - System Administration Responsibility
    - AOL/J Database Connection Pool Status (Function)

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Application Tier – Connection Pool

- AOL/J Database Connection Pool Status Page

AOL/J Diagnostic Tests

ORACLE
E-BUSINESS SUITE

AOL/J Database Connection Pool Status
January 19, 2010 7:59:49 PM GMT

[Configuration Tips]

Pool Created: Jan 19, 2010 6:31:27 AM GMT
Configuration Parameters
FND_JDBC_MAX_CONNECTIONS: 500
FND_JDBC_BUFFER_MIN: 1
FND_JDBC_BUFFER_MAX: 5
FND_JDBC_BUFFER_DECAY_INTERVAL: 300
FND_JDBC_BUFFER_DECAY_SIZE: 5
FND_JDBC_USABLE_CHECK: false
FND_JDBC_CONTEXT_CHECK: true
FND_JDBC_PLSQL_RESET: false
Current Statistics
available connections: 4
locked connections: 6
leaked connections: 1
connections currently being created: 0
pool size counter: 10
clients waiting: 0
Lifetime Statistics

Lifetime Statistics

request: 2302
request successful: 2302
request timed out: 0
connection creation failed: 0
connection created: 26
connection created by thread: 23
connection creation by thread failed: 0
connection destroyed: 16
connection destroyed by thread: 16
closed connections: 0
abandoned connections: 0
removed available connection 0
pool at maximum size: 0
buffer empty: 3
context mismatch: 793
not usable: 0

Application Tier – Connection Pool

- AOL/J Database Connection Pool Status Page

```
January
19,
2010      [oracle.jdbc.driver.T4CConnection@a7166f]
6:33:44
AM GMT  oracle.apps.fnd.security.CallStack 800, 0xa7166f, 2010-01-19+06:33:44.673+0000, Thread[PageFlow Logger,5,HTTPThreadGroup]
            at oracle.apps.fnd.security.CallStack.getInstance(CallStack.java:109)
            at oracle.apps.fnd.security.DBConnObj.setBorrowingThread(DBConnObj.java:981)
            at oracle.apps.fnd.security.DBConnObj.setBorrowingThread(DBConnObj.java:964)
            at oracle.apps.fnd.common.Pool.costBasedSelection(Pool.java:1885)
            at oracle.apps.fnd.common.Pool.selectObject(Pool.java:1686)
            at oracle.apps.fnd.common.Pool.borrowObject(Pool.java:950)
            at oracle.apps.fnd.security.DBConnObjPool.borrowObject(DBConnObjPool.java:584)
            at oracle.apps.fnd.security.AppsConnectionManager.borrowConnection(AppsConnectionManager.java:301)
            at oracle.apps.fnd.common.Context.borrowConnection(Context.java:1719)
            at oracle.apps.fnd.common.AppsContext.getPrivateConnectionFinal(AppsContext.java:2266)
            at oracle.apps.fnd.common.AppsContext.getPrivateConnection(AppsContext.java:2203)
            at oracle.apps.fnd.common.AppsContext.getJDBCConnection(AppsContext.java:2061)
            at oracle.apps.fnd.common.AppsContext.getLocalJDBCConnection(AppsContext.java:2442)
            at oracle.apps.fnd.common.AppsContext.getLocalJDBCConnection(AppsContext.java:2377)
            at oracle.apps.fnd.common.AppsContext.getLocalJDBCConnection(AppsContext.java:2358)
            at oracle.apps.fnd.common.AppsProfileStore.getProfile(AppsProfileStore.java:111)
            at oracle.apps.jtf.activity.PageLogManager.getRepository(PageLogManager.java:192)
            at oracle.apps.jtf.activity.repository.RepositoryWriterFactory.getRepositoryWriter(RepositoryWriterFactory.java:17)
            at oracle.apps.jtf.activity.PageLogThread.flushBuffer(PageLogThread.java:217)
            at oracle.apps.jtf.activity.PageLogThread.run(PageLogThread.java:112)
```

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Application Tier – Connection Pool

- Monitor the number of JDBC connections for both APPS and APPLSYSPUB to check for leaks or excessive connection usage.
  - ➤ Bug 6841295 (APPLSYSPUB connection leak)

- General rule of thumb is that the total number of connections should not exceed 2*<peak number of users>.
  - ➤ Keep in mind that each JVM will create ~10 connections for background threads and bootstrapping at JVM startup time.

- Query GV$SESSION and group by module to determine which modules are consuming the connections.

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Application Server – JVM Monitoring

- Application Server (Grid Control) – JVM Metrics

JVM - Memory Usage (MB): JVM Index 2: Last 24 hours

JVM Index 2

Statistics

Last Known Value	1251.68
Average Value	1241.85
High Value	1309.65
Low Value	1144.87
Warning Threshold	Not Defined
Critical Threshold	Not Defined
Occurrences Before Alert	2
Corrective Action	None
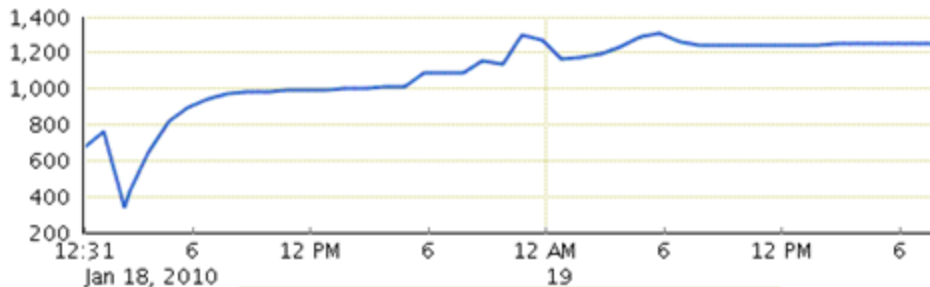
Page Refreshed Jan 19, 2010 3:19:04 PM EST [Refresh] View Data
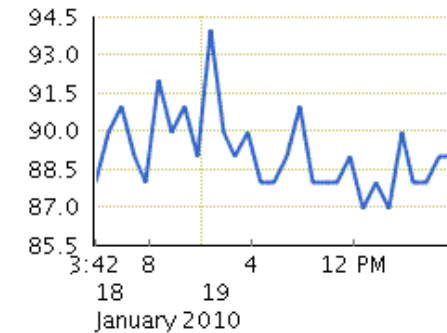
Active Threads

Metric Value

Concurrent Manager

Application Tier – Concurrent Manager

- Avoid enabling an excessive number of standard or specialized managers.

- Use specialization rules and work shifts to bind specific jobs to specific time windows.
  - Helps avoid scheduling resource intensive batch requests during peak activity.

- Tune the sleep time for queues with a large number of target processes.
  - Define dedicated queues for short and frequent requests and increase the sleep times for managers which do not require near real-time job execution.

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Application Tier – Concurrent Manager

- Transaction Managers (TM)
  - Set the profile "Concurrent:Wait for Available TM" to 1 (second) to minimize TM latency.
  - Set Sleep time on Transaction Managers to 30 minutes.
  - TMs use Pipes by default
  - ATG RUP3 (4334965) or higher provides an option to use AQs in place of Pipes.
    - Profile "Concurrent:TM Transport Type"
      - Can be set to PIPE or QUEUE
    - Pipes are more efficient but require a Transaction Manager to be running on each DB Instance (RAC).

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Application Tier – Concurrent Manager

- Utilize Parallel Concurrent Processing (PCP) to leverage the Cluster (RAC).
  - Environment variable APPLDCP=ON (context variable s_appldcp)
  - Configure Multiple Concurrent Manager Instances
  - Each CM Instance points to a specific DB instance (in the RAC Cluster).
    - Set s_cp_twotask to the respective DB instance TNS entry on each CM Instance.
      - TWO_TASK is then set correctly on each CM Instance.

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Application Tier – Concurrent Manager

- Parallel Concurrent Processing (PCP)
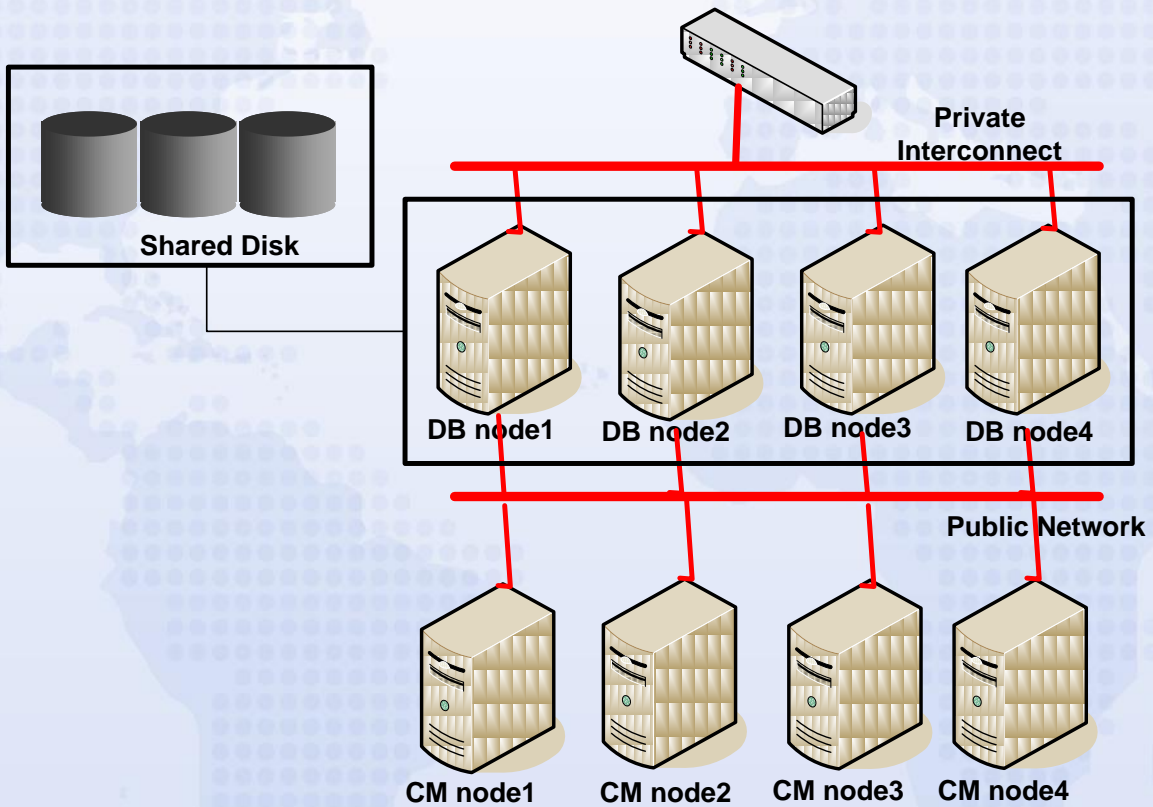
Application Tier – Concurrent Manager

- Employ Application affinity for concurrent manager jobs to minimize Interconnect traffic and maximize the performance of the concurrent request.

  - Order Import request runs on Standard Manager1 which connects to DB Node1

  - Workflow Background Engine which processes Order related Item types (OEOH and OEOL) should also be scheduled on DB Node 1 to minimize RAC InterConnect traffic.

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Application Tier – Concurrent Manager

- ## Application Affinity
  - Use Specialization Rules via Inclusion/Exclusion at the Application level to implement affinity.
  - Organize jobs first by Application, and then by dependency based on your knowledge of the Application usage.
  - Example:
    - Order Import (Order Management)
    - Pick Release (Inventory)
    - Since one of the first major items of work of Pick release is to fetch the "pickable" order lines, co-locating Pick Release with Order Import or Sales Order Creation minimizes Interconnect traffic.

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Application Tier – Concurrent Manager

- Workflow Background Engines (FNDWFBG)
  - ➢ Specify Item Type in order to minimize contention as well as RAC traffic
    - Example:
      - Process Order related Item types (OEOH and OEOL) on DB Instance 1
      - Process Service Request related item type (SERVEREQ) on DB Instance 2

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RAC Load Balancing

Application Tier – RAC Load Balancing

- Application Affinity Mode
  - Application Tiers connect to specific DB Instances
    - Context variables s_tools_twotask and s_weboh_twotask reference a TNS entry which points to a particular service.

Shared Disk

Private Interconnect

DB node1   DB node2   DB node3   DB node4

Public Network

App node1   App node2   App node3   App node4

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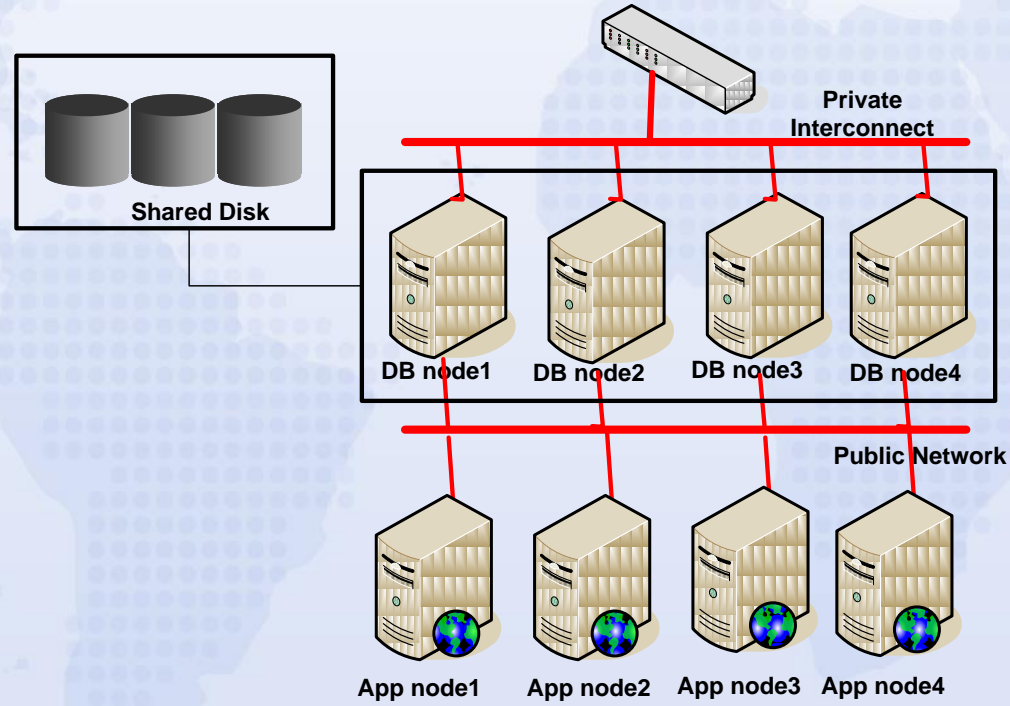
Application Tier – RAC Load Balancing

- Application Affinity Mode

  - Application Tiers can also connect to specific DB Instances via profiles:
    - Applications Database ID
      - Name of DBC file to be used for the Web Applications.
    - Database Instance
      - TNS entry to be used for Forms connections.

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Application Tier – RAC Load Balancing

- Application Affinity Mode
  - ➢ Application Affinity can also be implemented at a higher level via the Agent related profiles.
    - Application Framework Agent
    - Applications JSP Agent
    - Apps Servlet Agent
    - Applications Web Agent
  - ➢ In this mode, the profiles can be set at the Application or Responsibility level to point to a specific set of web-tiers which then directly connect to specific Application/Responsibility specific services.

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Application Tier – RAC Load Balancing

- Application Affinity Mode
  - Reduces RAC traffic caused by load balancing sessions across the Cluster.
  - Shared pool utilization is specific to the modules being used per instance.
    - In the load balancing scenario, more PL/SQL packages and cursors need to be loaded since all the code being used is being executed on all instances.
  - Increases manual maintenance of profiles and Application/Responsibility mapping.

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Application Tier – RAC Load Balancing

- Load Balanced Mode
  - ➢ Utilizes Server Side Load balancing via the init.ora parameters local_listener and remote_listener.
    - AutoConfig generates the load balanced TNS entries as follows:

```
EBIZ_BALANCE=
       (DESCRIPTION=
           (LOAD_BALANCE=YES)
           (FAILOVER=YES)
           (ADDRESS_LIST=
               (ADDRESS=(PROTOCOL=tcp)(HOST=proddb1-vip)(PORT=8521))
               (ADDRESS=(PROTOCOL=tcp)(HOST=proddb2-vip)(PORT=8521))
)
           (CONNECT_DATA=
               (SERVICE_NAME=EBIZ)
           )
       )
```

Tuning Workflow

Tuning Workflow

- Workflow
  - Background Engines (FNDWFBG)
    - Background Engines which run frequently such as every 5 or 10 minutes should disable the timeout and stuck process checks.
      - Process Timeout=> No
      - Process Stuck=> No
    - Configure a separate background engine which runs a few times per day to check for timed-out and stuck processes.

Tuning Workflow

- Workflow
  - ➤ Disable retention on the Workflow Queues
    - Improves overall performance.
    - Stablizes queue sizes.

```
select name,queue_table,retention
 from dba_queues
where owner='APPLSYS' and retention != '0';



select 'exec dbms_aqadm.alter_queue (queue_name=>''' || name ||
''',retention_time=>0);'
from dba_queues
where owner='APPLSYS' and
      retention != '0'
order by name;
```

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Tuning Workflow

- Workflow
  - ➢ Ensure underlying documents are being closed properly such as Orders, Purchase Orders, etc..
  - ➢ Schedule the purge program "Purge Obsolete Workflow Runtime Data" to run based on the volume of Workflow data being generated.
    - Specify an Item Type
    - Commit Frequency => 1000
  - ➢ Review the need to rebuild the Workflow runtime tables following a mass purge.
  - ➢ Rebuild indexes as needed as repeated purges will create holes in indexes.

Tuning Workflow

- Workflow
  - ➢ Agent Listeners
    - Avoid specifying a correlation ID when launching the agent listeners as dequeue by message ID is more efficient.
    - If dequeue by correlation is needed for certain critical messages, configure a dedicated listener to dequeue by correlation.
    - Monitor performance of Agent Listeners.
    - Monitor log file of Agent Listeners
      - – Review errors and exceptions.
    - If dequeuing by message ID, poorly performing subscriptions can impact entire queue performance and can result in queue pile-up.

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Tuning Workflow

- Ensure Workflow processes are streamlined
  - Eliminate unnecessary sub-processes and flatten the workflow.
  - Significantly reduces amount of Workflow records generated.
  - Example: Order Management:
    - Line Flow –Generic: Performance
  - Remove branches and activities which do not apply and will never be used.
  - Minimize attribute list and default values.
  - Avoid using timers inside processes. Use status and/or result codes in place of timers.

Tuning Workflow

- Optimize Workflow Calls
  - ➤ Generate Static calls for Workflow activities
    - Edit $FND_TOP/sql/wffngen.sql
      - – Add item types (OEOH and OEOL)
        - `l_all_itemtypes itemtypeList_t :=`
          `itemtypeList_t('WFSTD','FNDFFWK','OEOH','OEOL');`
    - Run wffngen.sql
      - – Generates a file (wffncal2b.pls) in utl_file_dir which contains the static calls
      - – Run the file wffncal2b.pls to create the package body which includes the static calls.
        - Depending on the version of wffngen.sql, you may need to manually edit the file wffncal2b.pls and remove any invalid calls (if the package body fails to compile).
  - ➤ Note: This should be done only during a maintenance window.

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Tuning Workflow

- Purchase Orders
  - ➤ Ensure profile "PO: Set Debug Workflow ON" to No.
  - ➤ Ensure Purchase Orders are closed (i.e. finally closed).
  - ➤ Set "PO:Workflow Processing Mode" to Background if possible to improve document creation performance.

Tuning Workflow

- Deferred Queue
  - ➤ Ensure deferred queue is not abused or mis-used to mask poorly performing subscriptions.
  - ➤ Avoid flooding the queue and use bulk events if possible.
  - ➤ Ensure the underlying tables of the WF_DEFERRED queue are as slim as possible.
  - ➤ Rebuild the WF_DEFERRED queue (if needed)
    - Refer to Support ID 286394.1: "How to rebuild the WF_DEFERRED queue."

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Tuning Workflow

- Agent Listeners and Mailer
  - Tune JVM Heap sizes
  - $APPL_TOP/admin/adovars.env:
    - ADJREOPTS="-Xmx512M"
    - ADJRIOPTS="-mx512m"
    - APPSJREOPT="-verbosegc -Xmx512M -Xms512M -DJTFDBCFILE=/app/prod/fnd/11.5.0/secure/ebizprd.dbc"
  - Review Agent Listeners and Mailer log files
    - Review any errors/exceptions.

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Tuning Workflow

- Agent Listeners and Mailer
  - ➤ Set Maximum Error Count:
    - Max Error Count = 10K
  - ➤ Tune Thread Count as per transaction rates
    - Inbound Thread Count
  - ➤ Consider creating dedicated Listeners for critical item types.
    - Specify Correlation ID.

Tuning Workflow

- Mailer
  - ➤ Ensure ICX Session limits are set high enough to avoid session invalidation and/or associated Mailer errors.
  - ➤ Set the relevant profiles at the user level (Mailer Framework User) [e.g. SYSADMIN]
    - ICX:Session Timeout
    - ICX: Limit time
    - ICX: Limit connect

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Tuning Workflow

- DB Initialization parameters
  - ➤ aq_tm_processes
    - If Workflow queue retention is disabled, a value of 1 or 2 should be sufficient.
  - ➤ job_queue_processes
    - Review active DB jobs to determine optimal setting.
    - Workflow Business Event Control Queue cleanup job (WF_BES_CLEANUP.CLEANUP_SUBSCRIBERS).

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Network Performance

Network Performance

- Ensure the Application server hosts and Data server hosts are connected to the same network switch

  - Minimizes network latency between Application tier and Database tier.
    - Validate via traceroute that a direct route is being used.
    - Latency should be less than 1 ms. Validate via a ping test.
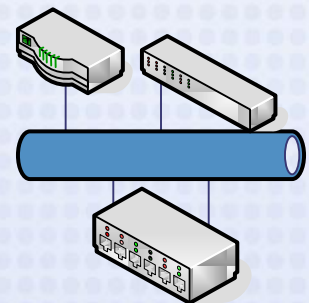
```
{apptier-host}-> ping -s 2048 -c 5 proddb
PING proddb (10.67.12.45) 2048(2076) bytes of data.
2056 bytes from proddb (10.67.12.45): icmp_seq=0 ttl=255 time=0.307 ms
2056 bytes from proddb (10.67.12.45): icmp_seq=1 ttl=255 time=0.375 ms
2056 bytes from proddb (10.67.12.45): icmp_seq=2 ttl=255 time=0.366 ms
2056 bytes from proddb (10.67.12.45): icmp_seq=3 ttl=255 time=0.266 ms
2056 bytes from proddb (10.67.12.45): icmp_seq=4 ttl=255 time=0.340 ms
```

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Network Performance

- Determine the number of hops and network latency for the end users.
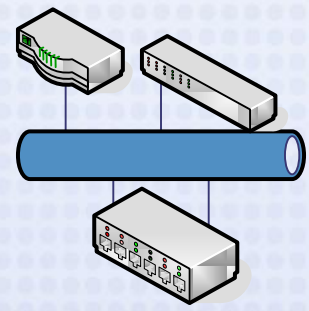
```
C:\>tracert apptier1

Tracing route to apptier1 [10.12.85.23]
over a maximum of 30 hops:

  1     42 ms      37 ms      36 ms   10.64.23.2
  2     42 ms      49 ms      56 ms   192.10.236.141
  3    127 ms     131 ms     133 ms   192.10.245.177
  4    140 ms     134 ms     143 ms   192.10.245.178
  5    152 ms     132 ms     133 ms   10.12.85.1
  6    159 ms     134 ms     138 ms   apptier1
```

```
C:\> ping apptier1 -n 5 -l 512

Pinging apptier1 [10.12.85.23] with 512 bytes of data:

Reply from 10.12.85.23: bytes=512 time=148ms TTL=58
Reply from 10.12.85.23: bytes=512 time=150ms TTL=58
Reply from 10.12.85.23: bytes=512 time=153ms TTL=58
Reply from 10.12.85.23: bytes=512 time=149ms TTL=58
Reply from 10.12.85.23: bytes=512 time=154ms TTL=58
```

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Network Performance

- Utilize WebCache 10g
  - ➤ Page compression rule can reduce web html page sizes by 3-4X.
    - Improves end-user response time for WAN users with high latencies and/or low bandwidth.
  - ➤ Can cache images and other HTML resources.
  - ➤ Refer to Support ID 306653.1 (11i) / 380486.1 (R12) for instructions on installing and configuring WebCache with the E-Business Suite.
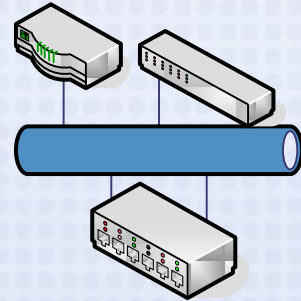
Database Tier

Database Tier

- Ensure SGA is "wired-down" and using OS large pages
  - AIX
    - chuser capabilities=CAP_BYPASS_RAC_VMM, CAP_PROPAGATE o_vvprod
    - vmo -p -o lgpg_regions=<n> -o lgpg_size=16777216
    - vmo –p –o v_pinshm=1
    - lock_sga=TRUE [init.ora]
  - Linux
    - Need to configure huge pages
      - /etc/sysctl.conf: vm.nr_hugepages=<n>
      - /etc/security/limits.conf: memlock setting
    - x86 – 2 MB pages
    - Itanium – 256 MB pages

Database Tier

- Review AWR or StatsPack Reports from peak windows
  - ➤ Top 5 Timed Events
  - ➤ Load Profile
  - ➤ Top SQL sections

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Database Tier

- Pin Top Apps PL/SQL packages by executions
  - ➤ Use a Startup and Shutdown trigger to pin the packages upon startup and capture any new packages in the PIN_LOG table upon shutdown.
  - ➤ Avoids shared pool fragmentation and reloads.

- Check for cursor leaks.

- Monitor number of connections and check for connection Leaks.

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Database Tier

- Check for SQL statements using literals with a large number of occurrences.
  - ➤ Leverage ASH Report (Top SQL using literals)

- Cursor leaks/literals can result in ORA-4031 errors.

- Adopt the Oracle Applications Tablespace Model (OATM)
  - ➤ Organizes tablespaces by category rather than by product.
  - ➤ Co-locates large transaction based objects.
  - ➤ Refer to Support ID 248857.1.

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Database Tier

- Space Management
  - ➤ Ensure large transaction tables are placed in locally managed tablespaces with auto segment management enabled (ASSM).
    - If UNIFORM extent size is being used, use an extent size of at least 10 MB for the large tables. Larger extent sizes such as 128MB can be used as well provided the very large tables are located in a dedicated tablespace.
      - RA_CUSTOMER_TRX_LINES_ALL
      - OE_PRICE_ADJUSTMENTS
      - OE_PRICE_ADJ_ATTRIBS
      - GL_IMPORT_REFERENCES
      - RA_CUST_TRX_LINE_GL_DIST_ALL
  - ➤ Ensure tablespace quotas are set to unlimited
    - Avoids frequent update of TS quota information.

Database Tier

- Space Management

  - Monitor frequency of waits for space management related events such as "enq: HW – contention".

  - Monitor execution frequency of space management related SQL statements.

```
select type#,blocks,extents,minexts,maxexts,extsize,extpct,
       user#,iniexts,NVL(lists,65535),NVL(groups,65535),
       cachehint,hwmincr, NVL(spare1,0),NVL(scanhint,0)
from seg$
where ts#=:1 and
      file#=:2 and
      block#=:3


select file# from file$ where ts#=:1
```

Database Tier

- Undo Tablespace
  - ➢ Disable Auto Undo retention
    - _undo_autotune = FALSE
  - ➢ Tune undo_retention
    - Start with a reasonable setting such as 12 hours and adjust as necessary.
    - Value should be based on transaction lengths, not maximum query length.
  - ➢ Query v$UNDOSTAT or review AWR undo statistics section to determine undo usage as well as undo traffic.
  - ➢ Monitor EXPIRED/UNEXPIRED extents via dba_undo_extents.

Database Tier

- Gathering Statistics

  - Utilize the FND_STATS interface or equivalent Concurrent Programs
    - (Gather Schema Statistics, Gather Table Statistics).

  - Use the Gather Auto Option
    - Gather Statistics on tables which have changed as per the modification threshold.
    - Table Monitoring is required
      - Enabled by default in 10g and above.
      - Can be enabled in 9iR2:
        - `exec fnd_stats.ENABLE_SCHEMA_MONITORING ('ALL');`
    - Specify 'GATHER AUTO' for the options parameter
      - `fnd_stats.gather_schema_stats (. . .,options=>'GATHER AUTO');`

Database Tier

- Gathering Statistics – Gather Auto Option

Database Tier

- Gathering Statistics – Histograms
  - ➢ Custom histograms can be seeded in the table FND_HISTOGRAM_COLS by calling the API

```
begin
FND_STATS.LOAD_HISTOGRAM_COLS(
action=>'INSERT'
,appl_id=>&custom_application_id
,tabname=>&table_name
,colname=>&column_name
);
FND_STATS.GATHER_TABLE_STATS(
ownname=>&owner_name
,tabname=>&table_name
);
end;
/
```

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Database Tier

- If using Automatic SGA memory management (sga_target != 0), ensure minimum cache sizes are set.
  - ➢ db_cache_size
  - ➢ shared_pool_size
  - ➢ java_pool_size (300MB)
  - ➢ large_pool_size (300MB)

- Consider using spfile so that graduated sizes are persisted.

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Database Tier

- Multi-block Auto Mode

  ➢ If running 10gR2 or higher, do not set db_file_multiblock_read_count
    - Remove explicit entry from initialization parameter file (init.ora or spfile).

  ➢ In Auto mode, Oracle uses 8 for table scan costing, and uses the maximum I/O size supported by the platform at execution time.

  ➢ Improves performance of statements performing multiblock I/Os such as full table scans, index rebuilds, table moves, etc..

  ➢ Does not impact table scan costing since optimizer uses a value of 8 for FTS costing.

Database Tier

- Resource Manager
  - Allows an administrator to constrain the amount of CPU resources used by a concurrent program or online user.
  - Activate the Consumer Group by setting the profile "FND: Resource Consumer Group" at the user, responsibility, or application level.
  - Useful for Discoverer users or ad-hoc reporting users.
  - CANCEL_SQL option can be used to abort long running queries
    - User receives the error "ORA-40: active time limit exceeded - call aborted."

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Database Tier

- Plan for an upgrade to 11gR2 (11.2.0)

- Leverage 11gR2 new features:
  - In-Memory Parallel Execution.
  - Auto DOP
  - MV Refresh Performance Improvements
  - Online maintenance
    - Edition-based Redefinition
  - Partitioning Improvements
  - AWR and ASH improvements
    - RAC configuration information and additional RAC Statistics.

- Refer to Support ID 881505.1 (11i) and 881506.1 (R12).

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Database Tier - RAC

- Interconnect Options
  - ➤ Ethernet
    - Gigabit Network Interfaces with an Interconnect switch
    - Typically UDP protocol is used.
  - ➤ InfiniBand (IB)
    - IPoIB
      - Transparent to TCP/IP applications
    - IB/RDS
      - Reliable Datagram Sockets
      - More efficient than UDP (offload driver)
      - Refer to Support ID 751343.1.

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Database Tier - RAC

- Enable Jumbo Frames for the Interconnect
  - ➤ Increase MTU to ~9000
    - Minimizes number of packets needed to transfer data blocks.
    - Since Oracle Applications requires an 8K block size, jumbo frames reduces the number of packets overall.

```
$ /sbin/ifconfig bond1
bond1 Link encap:Ethernet HWaddr 00:1E:4A:06:4E:8A
. . . . . .
UP BROADCAST RUNNING MASTER MULTICAST MTU:1500 Metric:1

$ ifconfig bond1 mtu 9000
```

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Database Tier - RAC

- Monitor the Interconnect network traffic and latencies via AWR.

RAC Statistics

	Begin	End
Number of Instances:	2	2

Global Cache Load Profile

	Per Second	Per Transaction
Global Cache blocks received:	626.54	9.56
Global Cache blocks served:	403.51	6.16
GCS/GES messages received:	6,141.98	93.70
GCS/GES messages sent:	5,860.43	89.41
DBWR Fusion writes:	5.61	0.09
Estd Interconnect traffic (KB)	10,584.64	

Global Cache Efficiency Percentages (Target local+remote 100%)

Buffer access - local cache %:	98.36
Buffer access - remote cache %:	0.23
Buffer access - disk %:	1.41

Global Cache and Enqueue Services - Workload Characteristics

Avg global enqueue get time (ms):	2.2
Avg global cache cr block receive time (ms):	4.7
Avg global cache current block receive time (ms):	2.3
Avg global cache cr block build time (ms):	0.2
Avg global cache cr block send time (ms):	0.2
Global cache log flushes for cr blocks served %:	17.1
Avg global cache cr block flush time (ms):	10.7
Avg global cache current block pin time (ms):	0.0
Avg global cache current block send time (ms):	0.2
Global cache log flushes for current blocks served %:	0.1
Avg global cache current block flush time (ms):	10.0

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Database Tier - RAC

- Use Services in place of port/host/sid.
  - ➢ Increases availability
  - ➢ Leverages Server side load balancing

- Use VIP in the listener.ora and tnsnames.ora including the client hosts.
  - ➢ Improves failover time
  - ➢ Avoids long waits upon failover due to physical host TCP timeouts

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Database Tier - RAC

- Use VIP in the listener.ora and tnsnames.ora

```
Listener.ora:

EBIZ_proddb3 =
  (DESCRIPTION_LIST =
    (DESCRIPTION =
      (ADDRESS_LIST =
        (ADDRESS = (PROTOCOL = TCP)(HOST = proddb3-vip)(PORT = 8521)(IP = FIRST)))
      (ADDRESS_LIST =
        (ADDRESS = (PROTOCOL = TCP)(HOST = proddb3)(PORT = 8521)(IP = FIRST)))
      (ADDRESS_LIST =
        (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROCEBIZ3)))
    )
  )

tnsnames.ora:

EBIZ=
        (DESCRIPTION=
                (ADDRESS=(PROTOCOL=tcp)(HOST=proddb3-vip)(PORT=8521))
            (CONNECT_DATA=
                (SERVICE_NAME=EBIZ)
                (INSTANCE_NAME=EBIZ3)
            ))
```

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Database Tier - RAC

- Ensure PX requests do not span instances
  - ➢ Set the init.ora parameters instance_groups and parallel_instance_group on each instance.
    - Example:
      - Instance 1:
        - instance_groups=EBIZ1
        - parallel_instance_group=EBIZ1
      - Instance 2:
        - instance_groups=EBIZ2
        - parallel_instance_group=EBIZ2

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Database Tier - RAC

- Minimize the use of ad-hoc GV$ queries.

- For ad-hoc queries, connect to the relevant instance if analyzing or debugging a specific issue involving a particular instance and use V$ views rather than GV$ views via a remote session.

Database Tier - RAC

- Tune sequence cache sizes for hot sequences (e.g. 1,000 or higher) in order to minimize index key contention for the Apps surrogate keys.

- Consider disabling Dynamic Resource Mastering (DRM) if Application Affinity mode is being used.

  - _gc_affinity_time=0
  - _gc_undo_affinity=FALSE

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Database Tier - RAC

- Review Top SQL sections of the AWR Report including the Cluster Wait section.
  - ➢ Tune SQLs causing a large amount of InterConnect traffic.
    - Leverage Application Affinity (if applicable).

SQL ordered by Cluster Wait Time

Cluster Wait Time (s)	CWT % of Elapsd Time	Elapsed Time(s)	CPU Time(s)	Executions	SQL Id	SQL Module	SQL Text
409.85	35.28	1,161.66	527.78	84	5qb5t43ta7kcn	RVCTP	begin RCV_ROI_PREPROCESSOR . P...
392.98	45.51	863.49	263.38	10	7ww82b140c3hh	RVCTP	UPDATE MTL_SERIAL_NUMBERS SET ...
284.69	35.95	791.80	479.60	83	11tjp32q6ar24	asn.dashboard.server.DashboardAM	/* Formatted on 2005/11/28 23:...
212.15	12.07	1,758.15	815.73	0	7vwyarjak0kga	EJTFGNTP	/* MV_REFRESH (INS) */INSERT /...
212.15	12.07	1,758.15	815.73	0	888vpnc2qnh6q	EJTFGNTP	BEGIN JTF_TERR_ENGINE_GEN_PVT....
160.53	5.23	3,068.43	843.77	543	g0q2sj2by3p75	JDBC Thin Client	BEGIN WF_EVENT.LISTEN (p_ag...
110.75	22.88	484.05	200.36	1	14ypv7qvt4ubu		SELECT cs . incident_id INCID...
105.76	16.77	630.66	280.80	1	ahb2hhsd99x0n	TSP	declare n number; cursor cn...
105.75	16.77	630.56	280.74	1	dx77rtkc3y5ju	TSP	SELECT COUNT(*) FROM SYS.DBA_S...
99.89	18.69	534.50	338.45	2,483	dsphq1qsnymv8	JDBC Thin Client	BEGIN WF_EVENT_OJMSTEXT_QH.DEQ...

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Tuning the Application

- Order Management
  - ➢ Use the Streamlined Workflows
    - Eliminates unnecessary sub-processes and flattens the workflow.
    - Significantly reduces amount of Workflow records generated.
    - Line Flow –Generic: Performance
  - ➢ Ensure debugging is disabled
    - OM: Debug Level = 0
    - QP: Debug = Request Viewer Off
    - WSH: Debug Level = Error

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Tuning the Application

- Order Management
  - ➤ Optimize Item LOV
    - Use Internal items by creating a defaulting rule for the Item Identifier Type (Internal Item Number).
    - Eliminates expensive view oe_items_v.
  - ➤ Use Quick Sales Order Form (OEXOETEL)
    - Allows pricing and tax calculations to be deferred.
  - ➤ Availability Check (ATP)
    - Set the profile MRP: Calculate Supply Demand to No.
    - Avoids inserting into SD temp tables
  - ➤ Utilize new pattern base search for Advanced Pricing (Refer to Support ID 948900.1).