Best Practices for Tuning the Oracle E-Business Suite

Session ID: S290717

Ahmed Alomari
Performance Specialist
aalomari@cybernoor.com

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Agenda

- Desktop Tier

- Network

- Application Tier

- Database Tier

- Tuning the Application

- Q & A

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Desktop Tier

- If possible, shutdown other non-essential "heavy" client side applications
  - Office
  - Outlook Client
    - Use Outlook Web Mail

- Schedule automatic virus scans for off-shift hours

- Remove non-essential programs from the Windows Startup cycle.

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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:
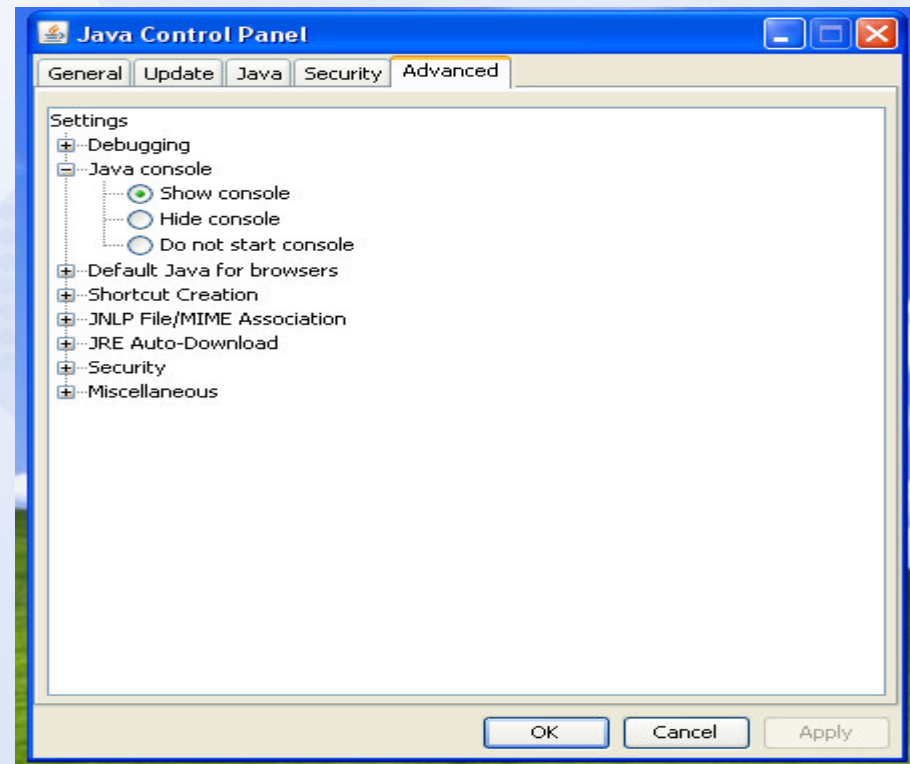   - -mx512m
    - -ms256m

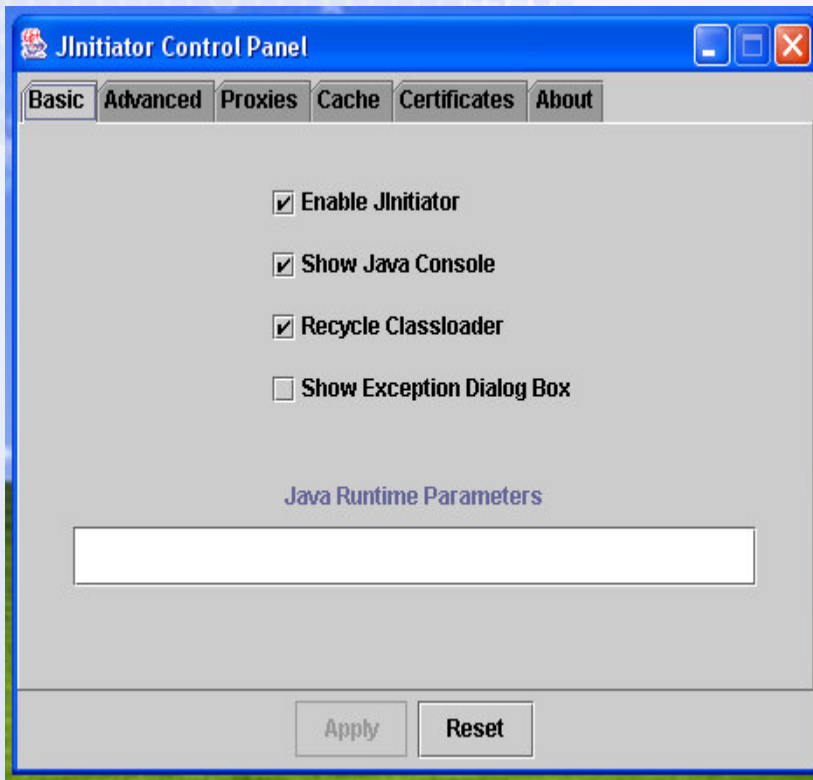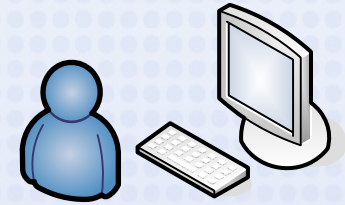cybernoor
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Desktop Tier

- Tune Jinitiator/Java Plug-in options
  - ➤ Set the JAR Cache size to 200 MB
    - Accounts for users accessing multiple environments such as test, QA, and production.
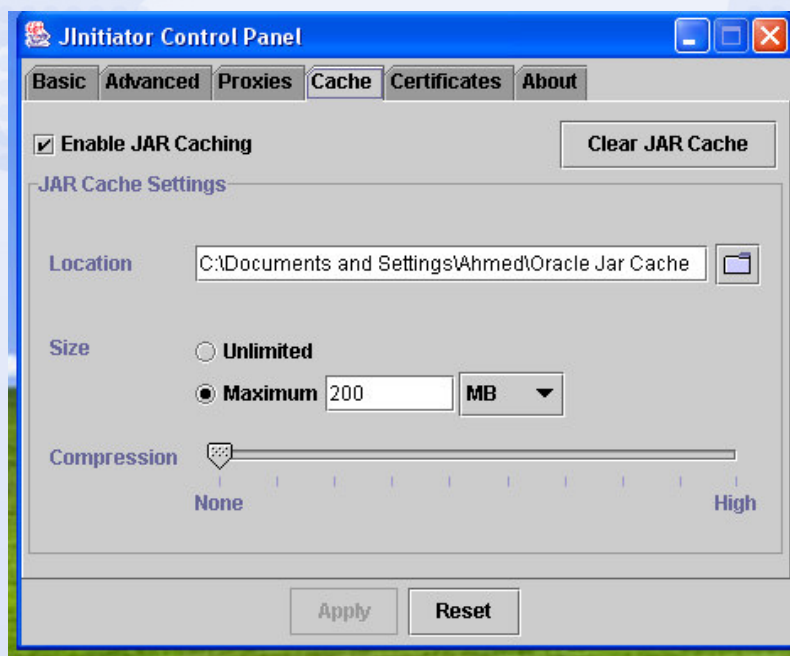
Desktop Tier

- Enable Jinit/Java Console.
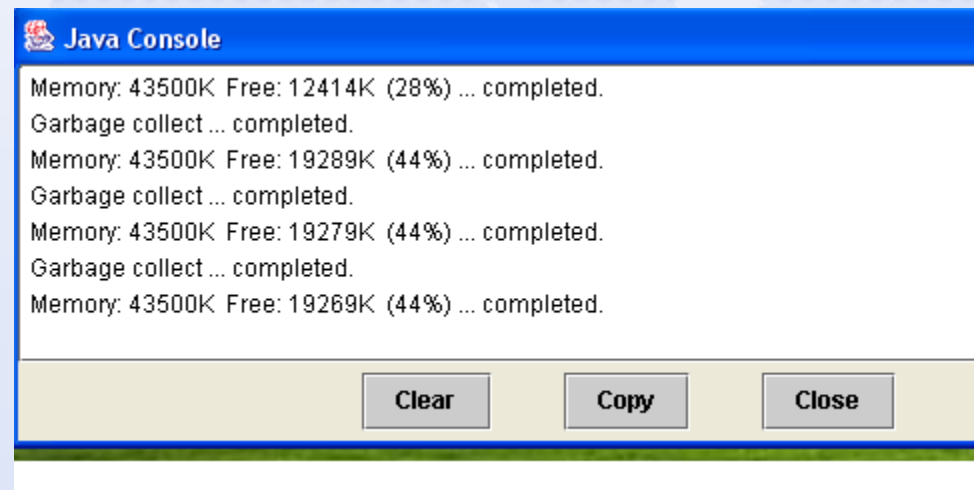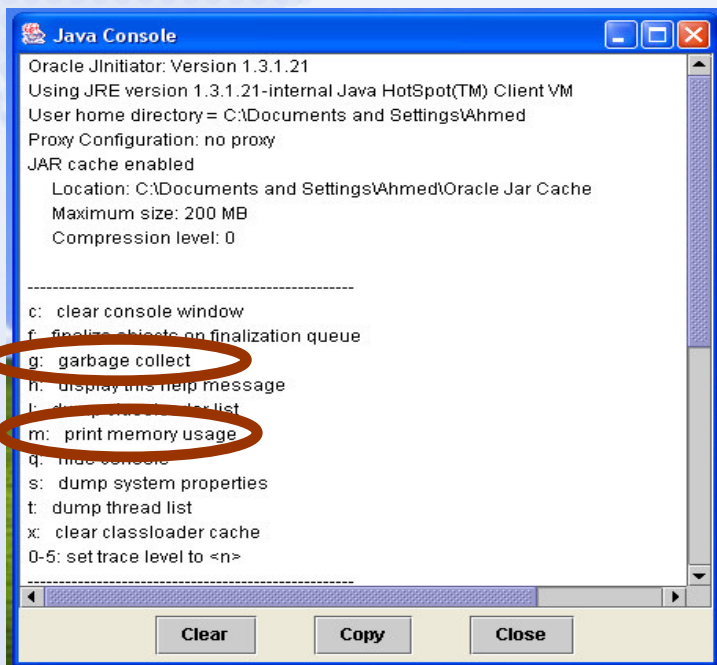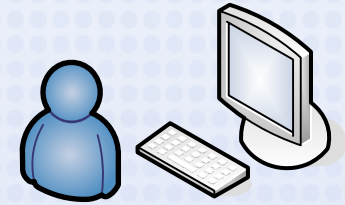
Desktop Tier

- **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

- ## Review Jinit/Java console

  - ### Use "g" and "m" options to track applet memory consumption.

Desktop Tier

- Upgrade to the Java Plug-in
  - Uses JRE 1.5
  - Improves runtime performance for Forms java bean based clients including Dispatch Center, UWQ, etc..
  - Refer to MetaLink note 290807.1

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Application Tier

Application Tier - Forms

- Keep Forms patchset current
  - ➤ Current patchset: 6.0.8.27 (18)
  - ➤ Refer to MetaLink note 125767.1

- 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

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Application Tier - Forms

- Enable dead client detection
  - FORMS60_TIMEOUT (s_f60time context variable)
  - Set to 5 or 10 minutes

- Use forms termination handler
  - FORMS60_CATCHTERM (s_f60catchterm)
  - Set to 1

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

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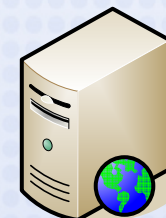
Application Tier - Forms

- Purge/archive Forms runtime log files as part of Forms server restart:
  - $FORMS60_RTI_DIR/*.rti
  - $FORMS60_RTI_DIR/f60webmx_dump*
  - $FORMS60_TRACE_PATH/*.log

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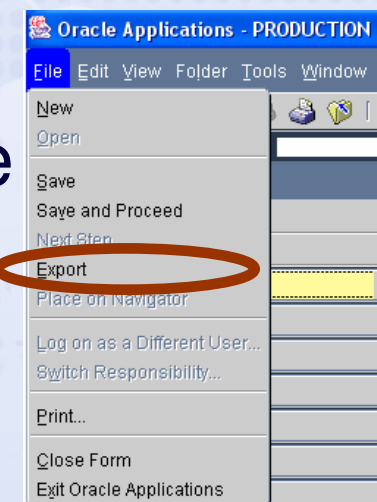
Application Tier - Forms

- 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

- ## Review Network traffic

  - ➢ Reports cumulative bytes and round trips (between Forms process and the client applet) in the Forms message bar.

  - ➢ URL parameter netStats=true

  - ➢ Output format <bytes>:<round trips>

  - ➢ ICX: Forms Launcher
    - http://ebiz:9500/dev60cgi/f60cgi?netStats=true

Application Tier - Forms

- Review Network traffic

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**

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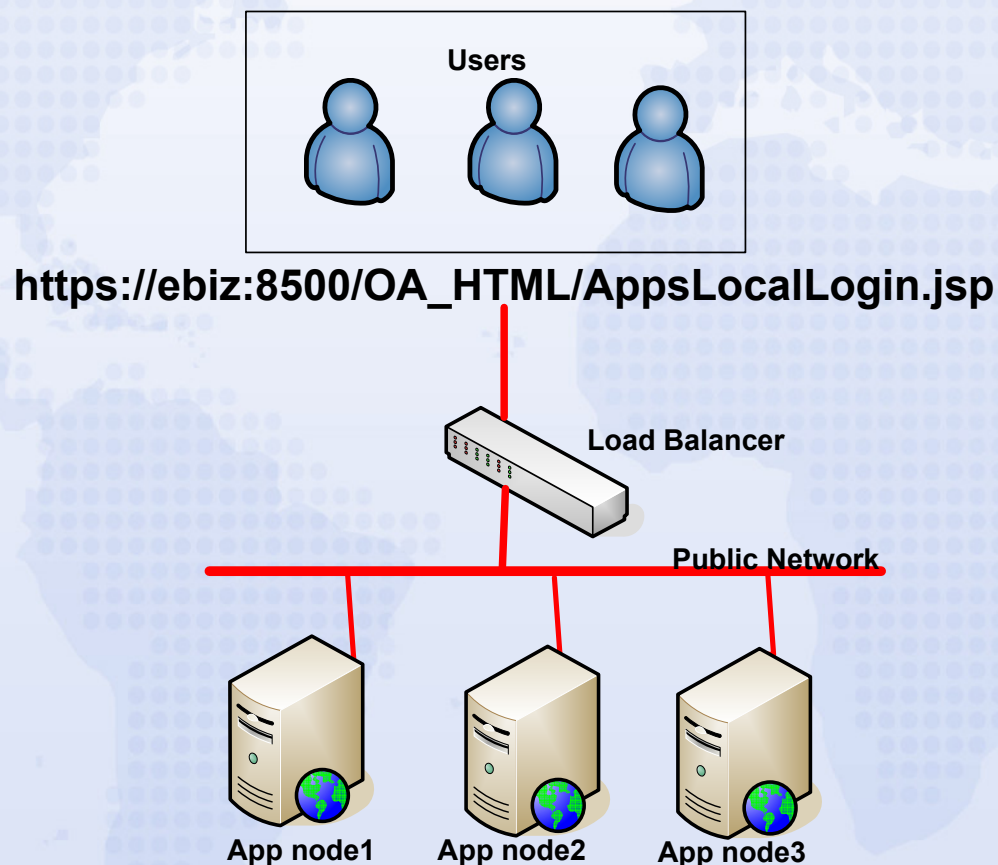
Application Tier - Apache

- 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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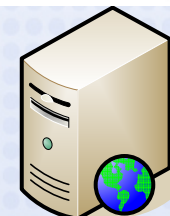
Application Tier - Apache

- ## Set logging level 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"

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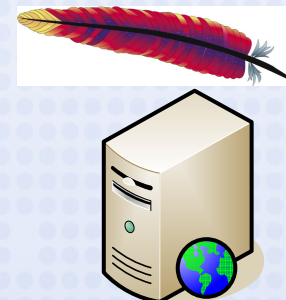
Application Tier - Apache

- **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
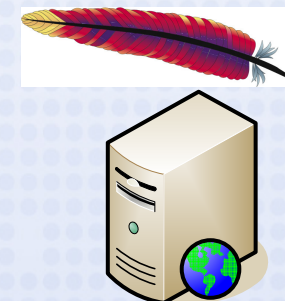
```
10.12.105.22 - - [13/Nov/2007:18:59:27 -0800] "GET
/OA_HTML/OA.jsp?OAFunc=OAHOMEPAGE&akRegionApplicationId=0&navRespId=50846
 &navRespAppId=0&navSecGrpId=0&transactionid=848034726&oapc=2&oas=ZvnmjkxSz_v1yFfzqN5Cig.. HTTP/1.1" 200 24314
10.12.105.22 - - [13/Nov/2007:18:59:28 -0800] "GET /OA_HTML/cabo/styles/cache/oracle-desktop-custom-2_2_24_1-en-
ie-6-windows.css HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:28 -0800] "GET /OA_HTML/cabo/jsLibs/Common2_2_24_1.js HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:28 -0800] "GET /OA_HTML/cabo/oajsLibs/oafcoreRUP5.js HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:28 -0800] "GET /OA_HTML/cabo/images/t.htm HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:28 -0800] "GET /OA_HTML/blank.html HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:28 -0800] "GET /OA_MEDIA/FNDSSCORP.gif HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:28 -0800] "GET /OA_HTML/cabo/images/pbs.gif HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:28 -0800] "GET /OA_HTML/cabo/images/t.gif HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:28 -0800] "GET /OA_HTML/cabo/images/cache/cghes.gif HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:29 -0800] "GET /OA_HTML/cabo/images/cache/cghec.gif HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:29 -0800] "GET /OA_HTML/cabo/images/cache/cghee.gif HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:29 -0800] "GET /OA_HTML/cabo/images/cache/en/bCustomAppsNavLinkgPPb.gif
HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:29 -0800] "GET /OA_MEDIA/fwkhp_folder.gif HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:29 -0800] "GET /OA_MEDIA/fwkhp_formsfunc.gif HTTP/1.1" 304 -
10.12.105.22 - - [13/Nov/2007:18:59:29 -0800] "GET /OA_HTML/cabo/images/cache/en/bCustomLinkgPLN.gif HTTP/1.1" 304
-
10.12.105.22 - - [13/Nov/2007:22:05:00 -0500] "POST /oa_servlets/oracle.apps.bne.webui.BneApplicationService
HTTP/1.1" 200 6492
```

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Application Tier - JServ

- 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
    - $IAS_CONFIG_HOME/Apache/Jserv/logs
      - jserv.log
      - mod_jserv.log
    - $IAS_CONFIG_HOME/Apache/Jserv/logs/jvm
      - OACoreGroup.*.stderr
      - OACoreGroup.*.stdout

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Application Tier - JServ

- Enable verbose GC
  - ➤ java.sh or jserv.properties
    - -verbose:gc
    - XX:+PrintGCTimeStamps
    - -XX:+PrintGCDetails
  - ➤ Direct verbosegc output to a specific file
    - $IAS_CONFIG_HOME/Apache/Apache/bin/java.sh
    - -Xloggc:$JVMLOGDIR/$jsgrpid.$jsgrpindex.gc

Application Tier - JServ

- Review verbose GC data

New Space

Perm. Gen

```
31.159: [GC 31.159: [DefNew: 36272K->2898K(39104K), 0.0234976 secs]
31.183: [Tenured: 497251K->385459K(520028K), 0.7442950 secs] 532024K->385459K(559132K), 0.7688641 secs]
31.970: [GC 31.970: [DefNew: 36864K->0K(48256K), 0.0299090 secs] 422323K->422323K(690692K), 0.0299842 secs]
32.045: [GC 32.045: [DefNew: 36864K->0K(48256K), 0.0264582 secs] 459187K->459187K(690692K), 0.0265352 secs]
32.117: [GC 32.117: [DefNew: 36864K->0K(48256K), 0.0709633 secs] 496051K->496051K(690692K), 0.0710417 secs]
32.199: [Full GC (System)
32.199: [Tenured: 496051K->412083K(642436K), 0.7434953 secs] 505267K->412083K(690692K), [Perm : 8020K-
>8020K(12288K)], 0.7439619 secs]
33.304: [GC 33.304: [DefNew: 45888K->1967K(51584K), 0.0135528 secs] 457971K->414050K(738392K), 0.0136379 secs]
33.670: [GC 33.671: [DefNew: 47855K->3947K(51584K), 0.0307019 secs] 459938K->416031K(738392K), 0.0307840 secs]
40.333: [GC 40.333: [DefNew: 49887K->3993K(51584K), 0.0299252 secs] 493658K->449753K(738392K), 0.0300036 secs]
49.000: [GC 49.000: [DefNew: 49881K->4072K(51584K), 0.0476520 secs] 495641K->451842K(738392K), 0.0477337 secs]
55.864: [GC 55.864: [DefNew: 49960K->1566K(51584K), 0.0229575 secs] 497730K->450838K(738392K), 0.0230370 secs]
```

Size Before
GC

Size After
GC

GC
Elapsed Time

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Application Tier - JServ

- Ensure you are running a current version of the JDK

JDK Version	Current Patchset	MetaLink Note	Applications Version
5.0	Update 14	304099.1	11.5.10
6.0	Update 3	401561.1	11.5.9 CU2 or 11.5.10 CU2

Application Tier - JServ

- ## Upgrade to JDK 6.0
  - ➤ 10% performance improvement.
  - ➤ Thread synchronization optimization.
  - ➤ Adaptive Spinning.
  - ➤ Large page support for x86 platform.
  - ➤ Faster HashMap and arraycopy implementations.
  - ➤ Updated class list for system jars.
  - ➤ Dtrace probes included in JVM.
  - ➤ Refer to MetaLink note 401561.1 for instructions on how to upgrade to JDK 6.0.

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Application Tier - JServ

- Set the servlet session timeout to 30 minutes
  - zone.properties
    - session.timeout=1800000
  - Larger timeout values increase overall JVM memory footprint.

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Application Tier - JServ

- Upgrade to ATG RUP6
  - ➤ Patch 5903765
  - ➤ Numerous performance and scalability fixes including memory leak fixes.

Application Tier - JServ

- OutofMemoryErrors
  - ➤ Trigger a heap dump when an OutofMemoryError occurs
    - -XX:+HeapDumpOnOutOfMemoryError
    - -XX:HeapDumpPath=<path>
  - ➤ Can use tools such as jhat to view the heap dump file and drill-down
    - jhat starts an http server on port 7000

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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)
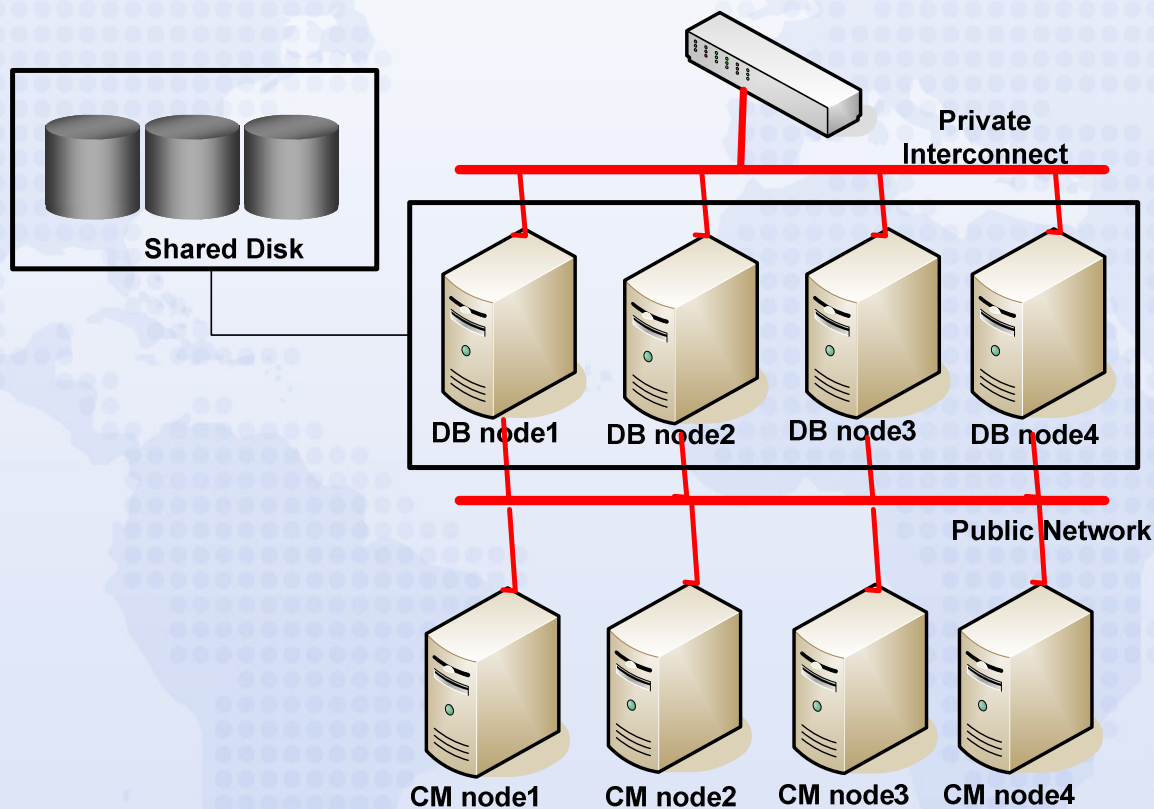
Application Tier – Concurrent Manager

- **Parallel Concurrent Processing (PCP)**
  - Each CM Instance points to a specific DB instance (in the RAC Cluster).
    - Certain Interfaces such as the Transaction Managers and the Planning Manager utilize DB Pipes which requires these programs to be collocated.
    - Do not use a load balanced TNS entry for the value of s_cp_twotask.
      - The request may hang if the sessions are load balanced. Worker 1 connected to DB Instance 1 places a message in the pipe, and expects Worker 2 (which is connected to DB Instance 2) to consume the message. However, Worker 2 never gets the message since pipes are instance private.

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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 avoid having to ship the OM related blocks to another node.

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Application Tier – Concurrent Manager

- Example: Application Affinity
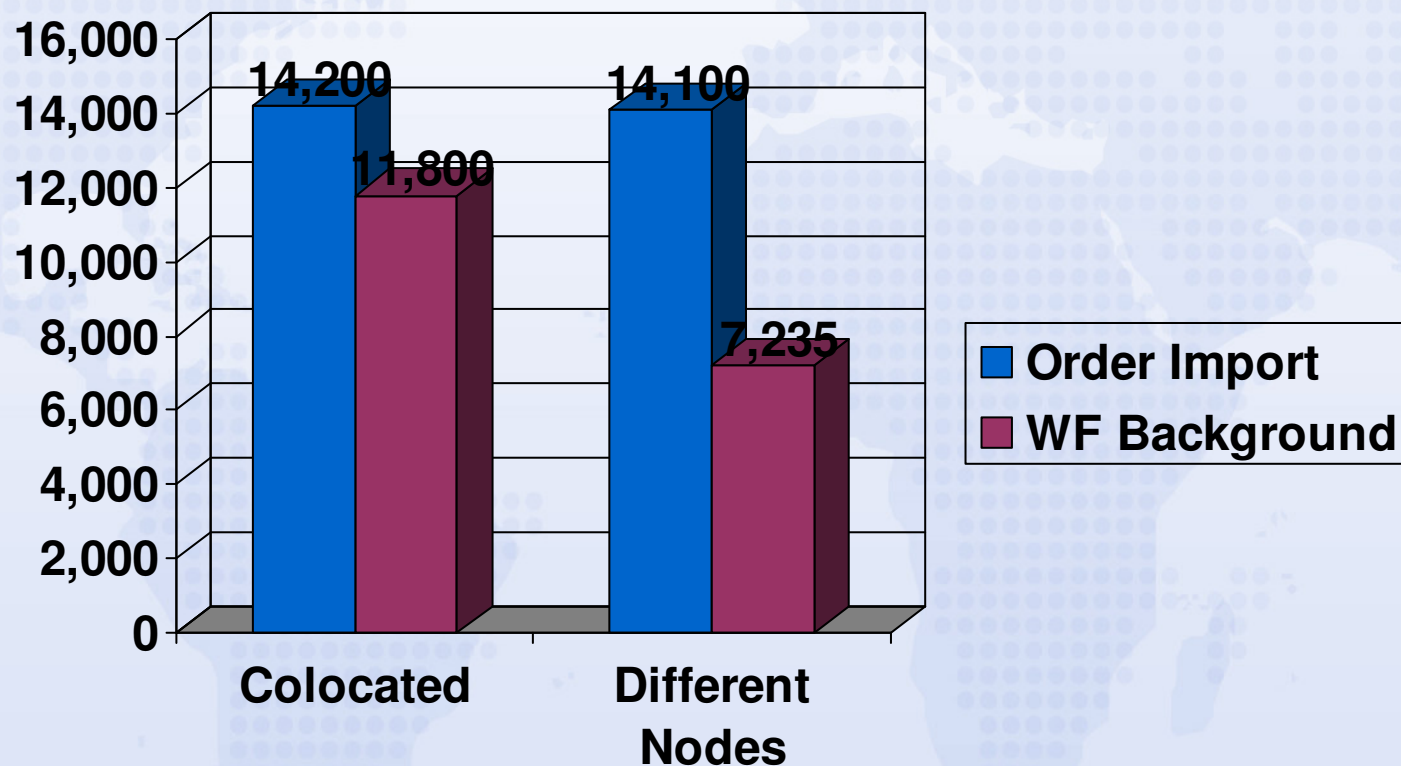
Application Tier – Concurrent Manager

- **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
  - Make sure you have the fix for RDBMS bug 4519477 applied in your environment when specifying the Item Type. The fix is included in 9.2.0.8 and 10.2.0.2.

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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.

Private Interconnect

Shared Disk

DB node1 DB node2 DB node3 DB node4

Public Network

App node1 App node2 App node3 App node4

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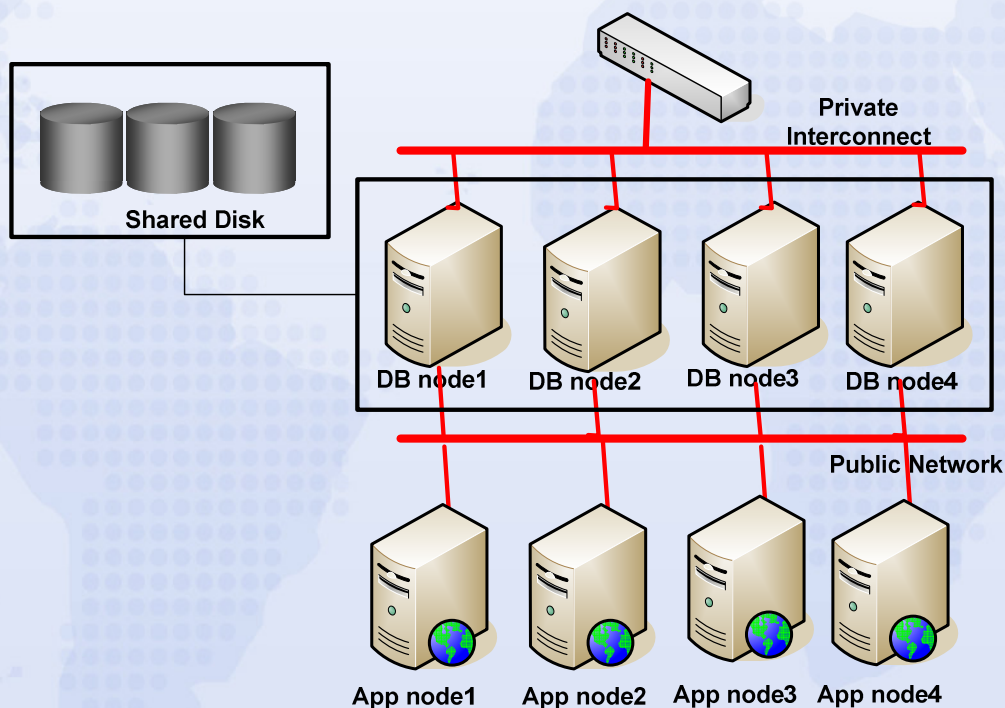
Application Tier – RAC Load Balancing

- **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)
            )
      )
```

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Application Tier – RAC Load Balancing

- ## Load Balanced Mode – AutoConfig entries

```
EBIZ_806_BALANCE=
    (DESCRIPTION_LIST=
        (DESCRIPTION=
            (ADDRESS=(PROTOCOL=tcp)(HOST=proddb1-vip)(PORT=8521))
            (CONNECT_DATA=
                (SERVICE_NAME=EBIZ)
                (INSTANCE_NAME=EBIZ1)))
        (DESCRIPTION=
            (ADDRESS=(PROTOCOL=tcp)(HOST=proddb2-vip)(PORT=8521))
            (CONNECT_DATA=
                (SERVICE_NAME=EBIZ)
                (INSTANCE_NAME=EBIZ2))))


APPS_JDBC_URL=jdbc:oracle:thin:@
            (DESCRIPTION=(LOAD_BALANCE=YES)(FAILOVER=YES)
            (ADDRESS_LIST=(ADDRESS=(PROTOCOL=tcp)
             (HOST=proddb1-vip)(PORT=8521))(ADDRESS=(PROTOCOL=tcp)
             (HOST=proddb2-vip)(PORT=8521))(ADDRESS=(PROTOCOL=tcp)
             (HOST=proddb5-vip)(PORT=8521))(ADDRESS=(PROTOCOL=tcp)
             (HOST=proddb3-vip)(PORT=8521))(ADDRESS=(PROTOCOL=tcp)
             (HOST=proddb4-vip)(PORT=8521)))(CONNECT_DATA=(SERVICE_NAME=EBIZ)))
```

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Application Tier – RAC Load Balancing

- **Load Balanced Mode – AutoConfig entries**
  - ➢ TWO_TASK on the Application tier hosts is set to the _806_BALANCE entry such as EBIZ_806_BALANCE.
    - The _806_BALANCE entry uses the old 806 Client side load balancing which results in connection skew.
  - ➢ Edit the Forms startup script ($COMMON_TOP/admin/scripts/$CONTEXT_NAME/ adfrmctl.sh) and add an entry for TWO_TASK
    - TWO_TASK=EBIZ_BALANCE
    - This allows Forms connections to utilize server side load balancing and minimize the connection skew.
  - ➢ Web based Java Applications correctly utilize server side load balancing via the _BALANCE TNS entry.

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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.
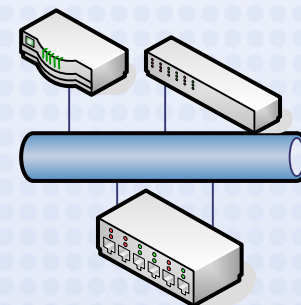
```
{apptier-host}-> ping -s 2048 -c 5 proddb
PING proddb (10.67.12.45) 2048(2076) bytes of data.
2056 bytes from proddb (10.67.12.45): icmp_seq=0 ttl=255 time=0.307 ms
2056 bytes from proddb (10.67.12.45): icmp_seq=1 ttl=255 time=0.375 ms
2056 bytes from proddb (10.67.12.45): icmp_seq=2 ttl=255 time=0.366 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.
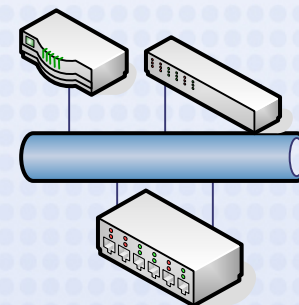
```
C:\>tracert apptier1

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 MetaLink Note 306653.1 for instructions on installing and configuring WebCache with the E-Business Suite.
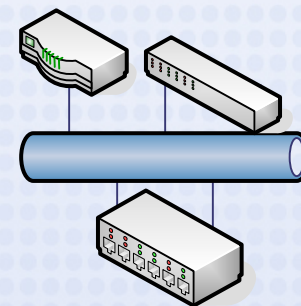
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Database Tier

Database Tier

- Ensure kernel asynchronous I/O is enabled and supported for the underlying file system (if file systems are being used for the DB files).

- 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

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Database Tier

- If currently running 9iR2, ensure StatsPack is installed and enabled for hourly snapshots.
  - ➤ $ORACLE_HOME/rdbms/admin/spcreate.sql
  - ➤ $ORACLE_HOME/rdbms/admin/spauto.sql

- 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

```
select oc.sid,oc.hash_value,oc.sql_text,count(*)
from v$open_cursor oc,
     v$session ss
where
     oc.sid = ss.sid and
     oc.sql_text not like '%COMMIT%'
group by oc.sid,oc.hash_value,oc.sql_text
having count(*) > 5
order by 4;
```

Database Tier

- Check for SQL statements using literals with a large number of occurrences

- 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 MetaLink Note 248857.1.

Database Tier

- ## Gathering Statistics

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

  - ➤ Use the Gather Auto Option (FND.H)

    - Gather Statistics on tables which have changed as per the modification threshold.
    - Table Monitoring is required
      - Enabled by default in 10g
      - 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

- ## 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."

Database Tier

- If currently running 9iR2, plan for an upgrade to 10gR2 (10.2.0.3)
  - ➢ Significant performance improvements overall.
  - ➢ Manageability improvements including
    - Automatic Workload Repository (AWR)
      - – Automatically captures Snapshots
        - New Compare Period ("diff") option in 10gR2
    - Automatic Database Diagnostic Monitor (ADDM)
    - Active Session History (ASH)
      - – Allows DBAs to drill-down into historical performance issues.
    - Grid Control and DB Console.
  - ➢ Refer to MetaLink Note 362203.1

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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)
      - Supported on Linux platforms via 10.2.0.3

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Database Tier - RAC

- ## Tune the relevant network buffer sizes
  - ### Linux
    - net.core.rmem_default = 262144
    - net.core.rmem_max   = 262144
    - net.core.wmem_default = 262144
    - net.core.wmem_max   = 262144
  - ### Solaris
    - ndd -set /dev/udp udp_xmit_hiwat 65536
    - ndd -set /dev/udp udp_recv_hiwat 65536

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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 11i 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 latency via ping to ensure optimal latencies.

  ➢ Use an 8K ping packet size

```
{racnode1}-> ping racnode4-priv -s 8192 -c 10
PING racnode4-priv (10.10.21.8) 8192(8220) bytes of data.
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=0 ttl=64 time=0.585 ms
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=1 ttl=64 time=0.595 ms
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=2 ttl=64 time=0.567 ms
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=3 ttl=64 time=0.585 ms
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=4 ttl=64 time=0.607 ms
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=5 ttl=64 time=0.598 ms
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=6 ttl=64 time=0.402 ms
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=7 ttl=64 time=0.424 ms
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=8 ttl=64 time=0.509 ms
8200 bytes from racnode4-priv (10.10.21.8): icmp_seq=9 ttl=64 time=0.488 ms
```

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Database Tier - RAC

- Monitor the Interconnect network traffic via sar or netstat

```
{racnode1}->  sar –n DEV 1 10 | grep eth4
```

11:09:57 PM	IFACE	rxpck/s	txpck/s	rxbyt/s	txbyt/s	rxcmp/s	txcmp/s	rxmcst/s
11:09:58 PM	eth4	15.15	11.11	3082.83	1380.81	0.00	0.00	0.00
11:09:59 PM	eth4	16.33	6.12	2425.51	1204.08	0.00	0.00	0.00
11:10:00 PM	eth4	20.41	12.24	2340.82	9327.55	0.00	0.00	0.00
11:10:01 PM	eth4	19.39	5.10	2677.55	880.61	0.00	0.00	0.00
11:10:02 PM	eth4	86.60	77.32	9876.29	8917.53	0.00	0.00	0.00
11:10:03 PM	eth4	348.98	311.22	74861.22	47782.65	0.00	0.00	0.00
11:10:04 PM	eth4	24.49	18.37	2917.35	2867.35	0.00	0.00	0.00
11:10:05 PM	eth4	39.80	17.35	4618.37	10250.00	0.00	0.00	0.00
11:10:06 PM	eth4	38.38	20.20	4565.66	2574.75	0.00	0.00	0.00
11:10:07 PM	eth4	121.65	112.37	34390.72	16051.55	0.00	0.00	0.00
Average:	eth4	72.96	58.98	14138.27	10102.24	0.00	0.00	0.00

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Database Tier - RAC

- Observed Latencies

# Nodes	Traffic Rate (MB/sec)	RAC Interconnect Latency (ms)
2	13	10-12
2	5	2-3
4	6	5-7
6	5	3-4

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Database Tier - RAC

- When you observe continuously high latencies, ensure the private Interconnect is being used rather than the public network.
  - ➢ 10g: query gv$cluster_interconnects
  - ➢ oradebug ipc

```
racnode1-> sqlplus "/ as sysdba"

SQL> oradebug setmypid
Statement processed.
SQL> oradebug ipc
Information written to trace file.
SQL> exit


SSKGXPT 0:66a20d0 flags SSKGXPT_READPENDING      socket no 7      IP 10.10.18.4    UDP 35993
```

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Database Tier - RAC

- Monitor RAC Traffic via Grid Control Database target (Performance tab) or AWR Report (RAC Section)

RAC Statistics

	Per Second	Per Transaction
Global Cache blocks received:	1,014.99	11.81
Global Cache blocks served:	650.74	7.57
GCS/GES messages received:	7,425.04	86.40
GCS/GES messages sent:	10,644.57	123.86
DBWR Fusion writes:	12.08	0.14
Estd Interconnect traffic (KB)	16,855.09	

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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)
             ))
```

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

- Prior to 10g, queries against GV$ views utilize the same slave set pool configured by parallel_max_servers

  - GV$ queries being executed by monitoring tools or adhoc queries can result in an Applications job which utilizes PX to be executed in serial due to the unavailability of slaves.

- In 10g, PZXX processes are used to execute GV$ queries.

  - ora_pz99_EBIZ1
  - ora_pz98_EBIZ1

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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.

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Database Tier - RAC

- Ensure the lms and lgwr processes are running in the real-time (RT) OS class.
  - ➢ priocntl (Solaris)
  - ➢ renice (Linux)

- Use automatic segment management (ASSM) along with uniform extent sizes (e.g. 4 MB extent size) for tablespaces containing large transaction tables/indexes.
  - ➢ Helps avoid frequent space management operations.

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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.

- Upgrade to 10gR2
  - Row CR Optimization improves performance of Apps batch jobs

- Disable 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

- Monitor top SQLs via AWR or StatsPack

- Full table scans are more expensive in RAC mode than in single instance mode.

```
Rows      Row Source Operation
-------   -------------------------------------------------
      1   SORT AGGREGATE (cr=276208 pr=10961 pw=0 time=65979778 us)
3012266     TABLE ACCESS FULL MTL_SYSTEM_ITEMS_B (cr=276208 pr=10961 pw=0 time=63258586 us)


Elapsed times include waiting on following events:
  Event waited on                             Times    Max. Wait   Total Waited
  ------------------------------------------  Waited   ----------  ------------
  SQL*Net message to client                        2     0.00          0.00
  gc current block 2-way                       20564     0.00          8.44
  gc cr multi block request                    68722     0.00         14.00
  db file parallel read                          558     0.03          3.78
  db file sequential read                       5184     0.06         25.00
  db file scattered read                        1321     0.06          5.88
  ****************************************************************************
```

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Database Tier - RAC

- Review Top SQL sections of the AWR Report including the Cluster Wait section.

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
52,890.30	88.69	59,632.80	4,885.70	1,482	3w60vwv0byqq4	pa.finplan.server.FpEditPlanAM	INSERT INTO PJI_FP_AGGR_PJP1_T...
42,416.77	88.49	47,932.87	4,016.97	90	2rbzdkvnh2fsf	pa.finplan.server.FpEditPlanAM	begin PA_BUDGET_WF.BASELINE_BU...
39,276.61	77.22	50,863.74	8,664.80	12,663	8wtrwg1u27uyy	fnd.wf.worklist.server.WorklistAM	begin WF_ENGINE.CB(:p1, :p2, ...
38,917.70	77.24	50,387.31	8,568.91	477	g9vtg5059453y	fnd.wf.worklist.server.WorklistAM	BEGIN wf_notification.respond(...
33,183.38	82.08	40,428.79	4,546.48	466	b0s14b4v6njp6	imc.ocong.root.server.ImcRootAM	begin hz_party_search.find_par

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Tuning The Application

Tuning the Application

- 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 the Application

- 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 the Application

- 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

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Tuning the Application

- Workflow
  - ➢ Agent Listeners
    - In a Non-RAC environment, avoid specifying a correlation ID when launching the agent listeners as dequeue by message ID is more efficient.
    - If you need to dequeue by correlation Id
      - Ensure you have the fix for RDBMS bug 4519477 applied in your environment when specifying a Correlation ID. The fix is included in 9.2.0.8 and 10.2.0.2.

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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

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Tuning the Application

- Order Management
  - ➤ Generate Static calls for Workflow activities
    - Edit $FND_TOP/sql/wffngen.sql
      - – Add OM 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 the Application

- Configurator
  - ➤ Use a dedicated set of JVMs for Configurator
  - ➤ Set the Profiles to point to the CZ Listener.
    - BOM:Configurator URL of UI Manager
    - ASO : Configurator URL
  - ➤ Pre-load the Model upon JVM Startup.
    - Configure cz_init.txt
    - Refer to MetaLink Note 338841.1

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Tuning the Application

- ## Web Applications
  - ➢ Ensure the users are trained to use the Logout or Home global buttons 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.

Tuning the Application

- Logging
  - ➢ FND: Debug Log Enabled
    - Prior to RUP3: Set it to No.
    - RUP3 and beyond: Set it to Yes.
  - ➢ FND: Debug Log Level
    - Should be set to Unexpected (Level=6)
  - ➢ Query fnd_log_messages to determine the logging traffic.
    - If the profiles are set as recommended above, you should not see many messages logged.
    - If the query shows a large number of rows being created, there could be exceptions and errors which need to be investigated.

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Relevant OpenWorld Sessions

- S290918 *Applications Database Optimization Panel,* Thursday 11/15/2007 11:30 AM - 12:30 PM, Marriott Golden Gate B2

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AppsPerf Event

- An annual forum dedicated to Applications Performance Tuning and Best Practices

- AppsPerf 2008 – A full day event with 14 advanced sessions.

- Visit www.appsperf.com for more information including
- registration details.

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