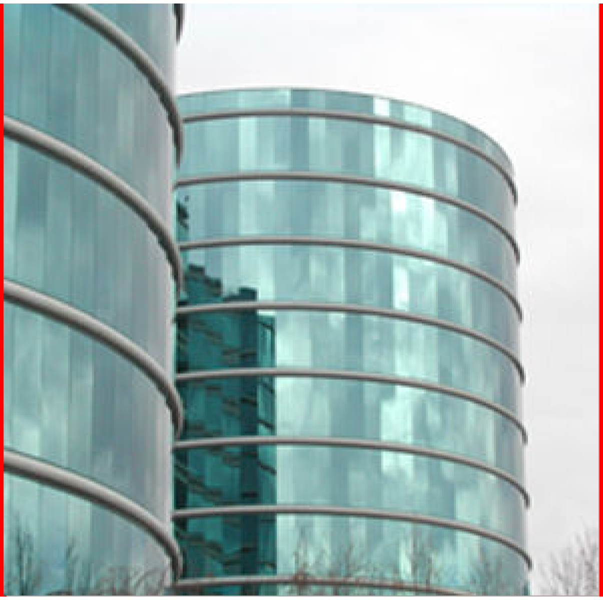


ORACLE®

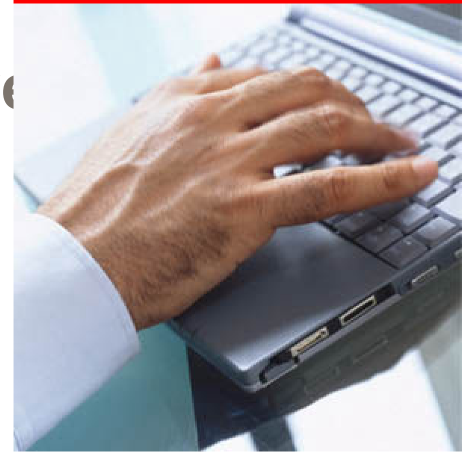
RAC Performance Tuning Best Practices

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions.

The development, release, and timing of any features or functionality described for Oracle’s products remains at the sole discretion of Oracle.

Agenda

Practical RAC Performance Analysis Reve



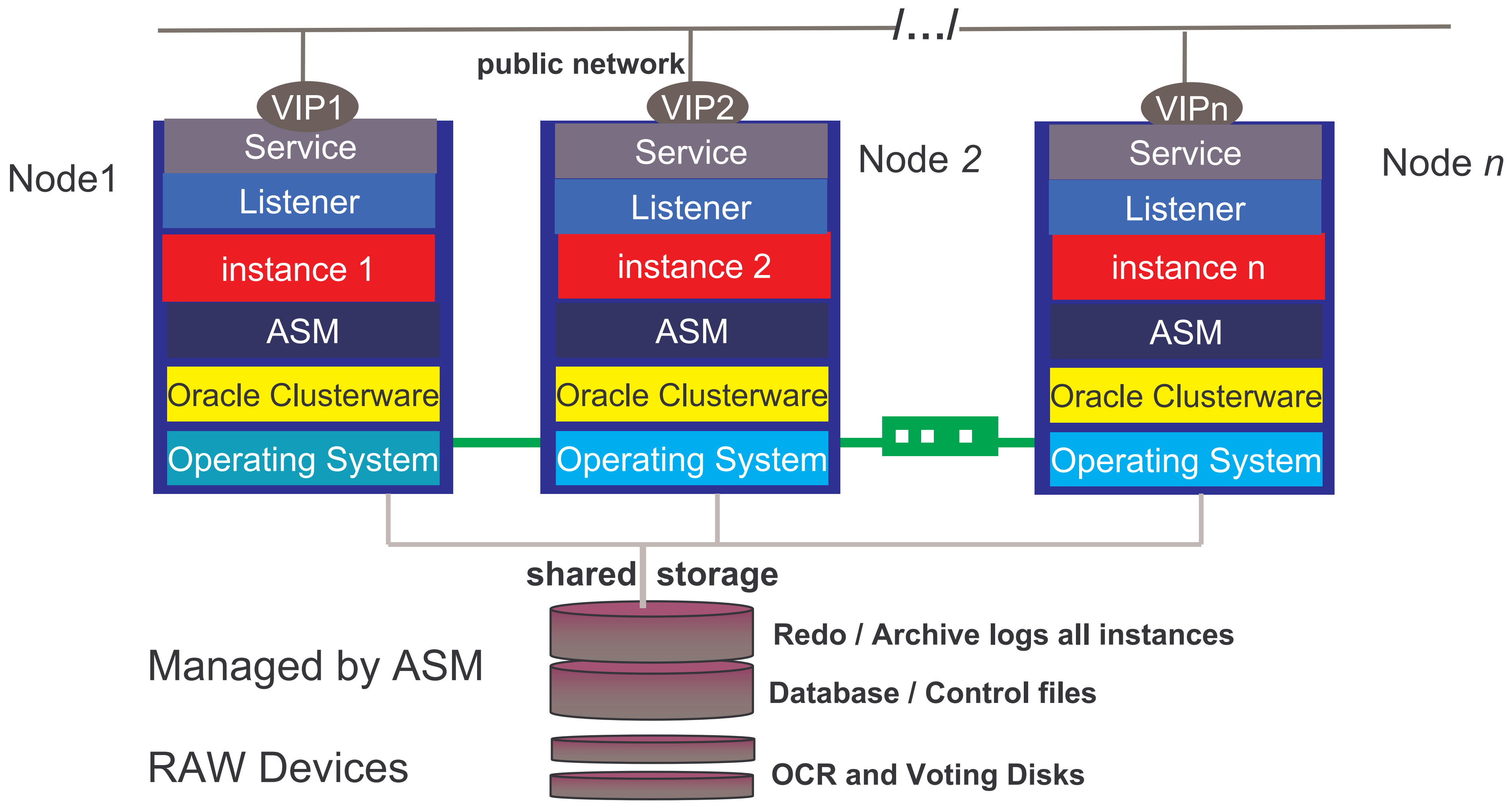
- RAC Architecture Overview
- Common Problems and Symptoms
- Application and Database Design
- Diagnostics and Problem Determination
- Summary: Practical Performance Analysis
- Appendix

OBJECTIVE

- Realize that RAC performance does not requires "Black Magic"
- General system and SQL analysis and tuning experience is practically sufficient for RAC
- Problems can be identified with a minimum of metrics and effort
- Diagnostics framework and Advisories are efficient

RAC Architecture Overview

RAC 10g Architecture



public network

/…/

Node1

VIP1

Service

Listener

instance 1

ASM

Oracle Clusterware

Operating System

Node 2

VIP2

Service

Listener

instance 2

ASM

Oracle Clusterware

Operating System

Node *n*

VIPn

Service

Listener

instance n

ASM

Oracle Clusterware

Operating System

shared storage

Managed by ASM

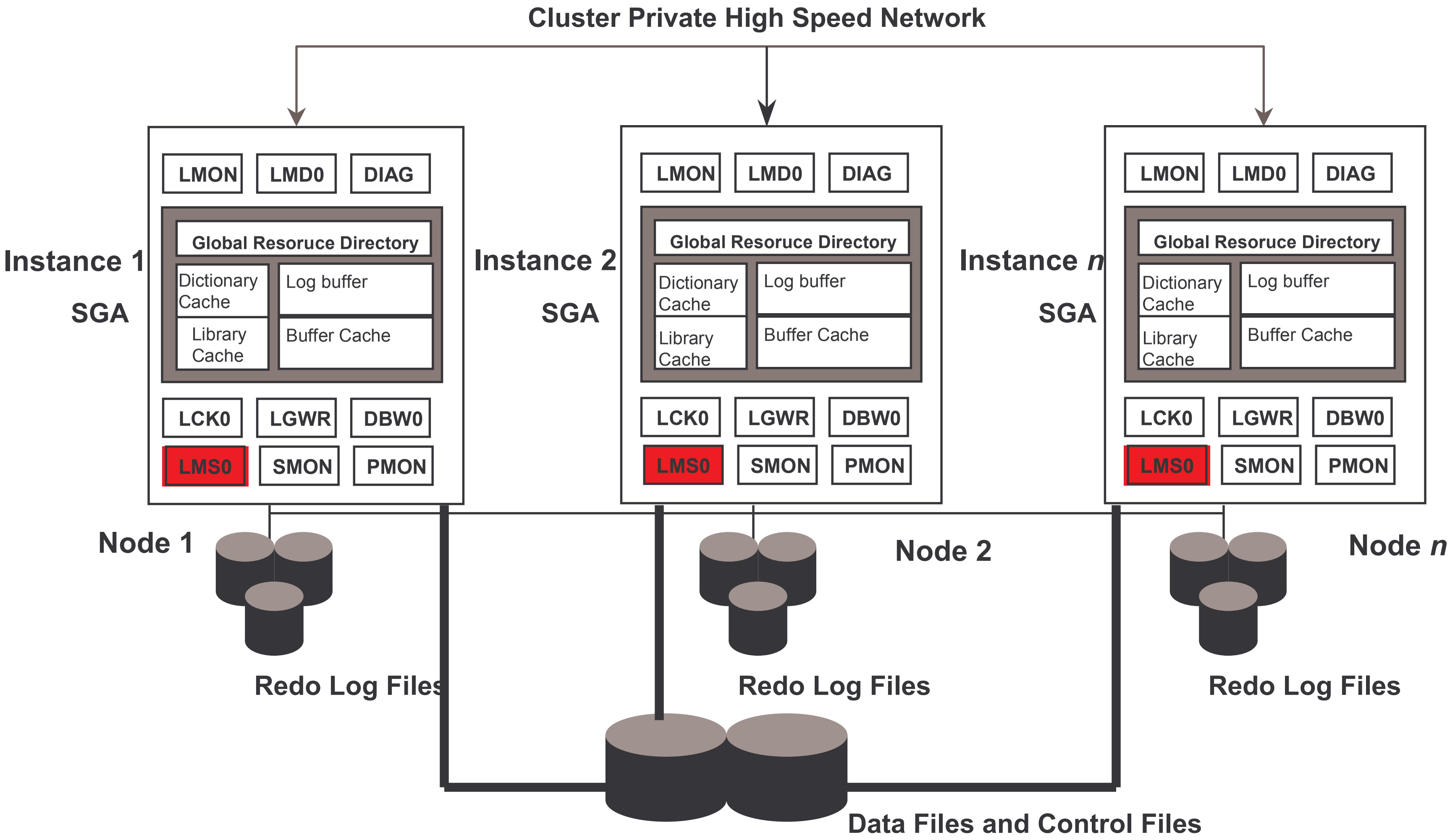
Redo / Archive logs all instances

Database / Control files

RAW Devices

OCR and Voting Disks

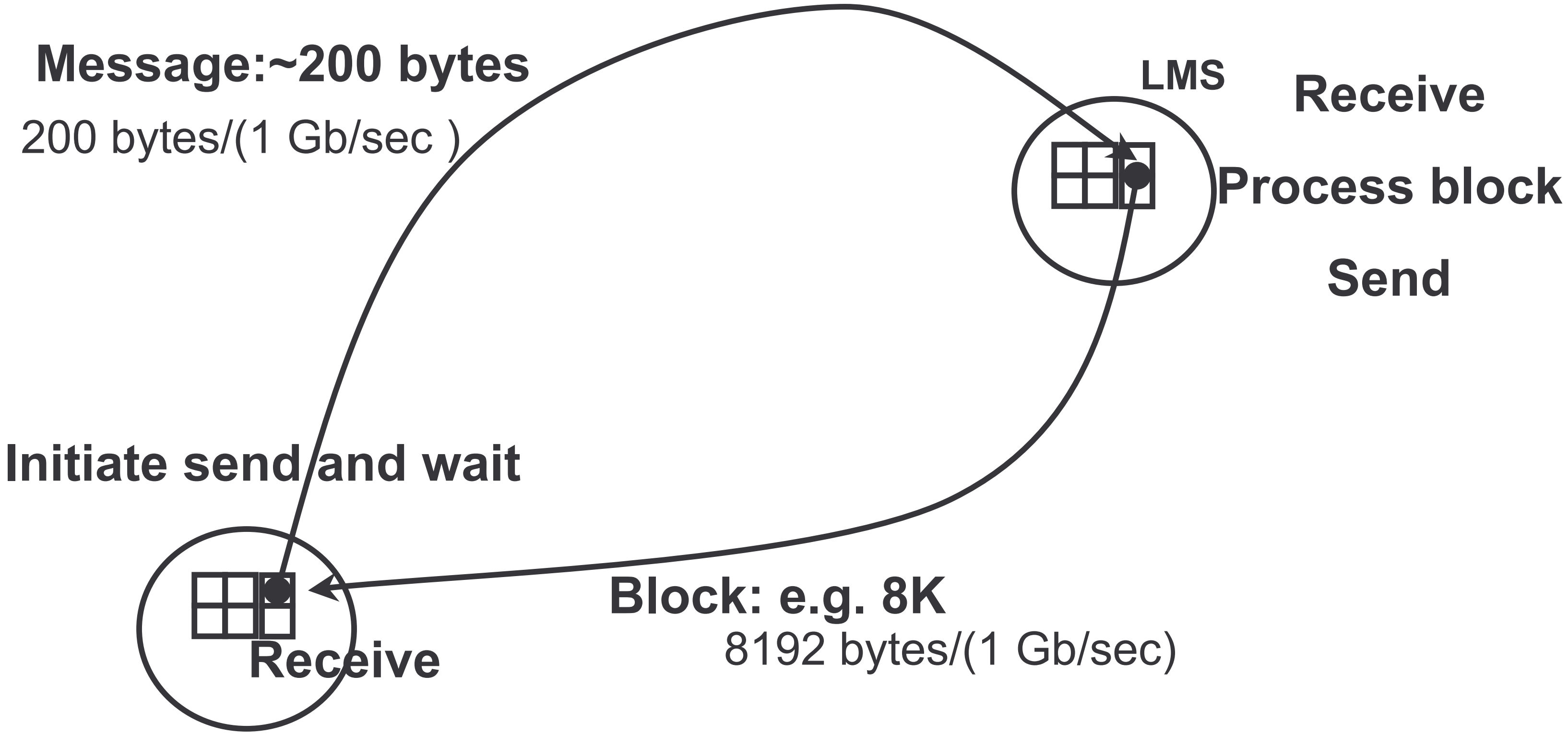
Under the Covers



Global Cache Service (GCS)

- Guarantees cache coherency
- Manages caching of shared data via Cache Fusion
- Minimizes disk access to data which is not in local cache by remotely transferring blocks
- Implements fast direct memory access over high-speed interconnects for all data blocks and types
- Uses an efficient and scalable messaging protocol

GCS Processing



Message:~200 bytes

200 bytes/(1 Gb/sec)

LMS

Receive

Process block

Send

Initiate send and wait

Receive

Block: e.g. 8K

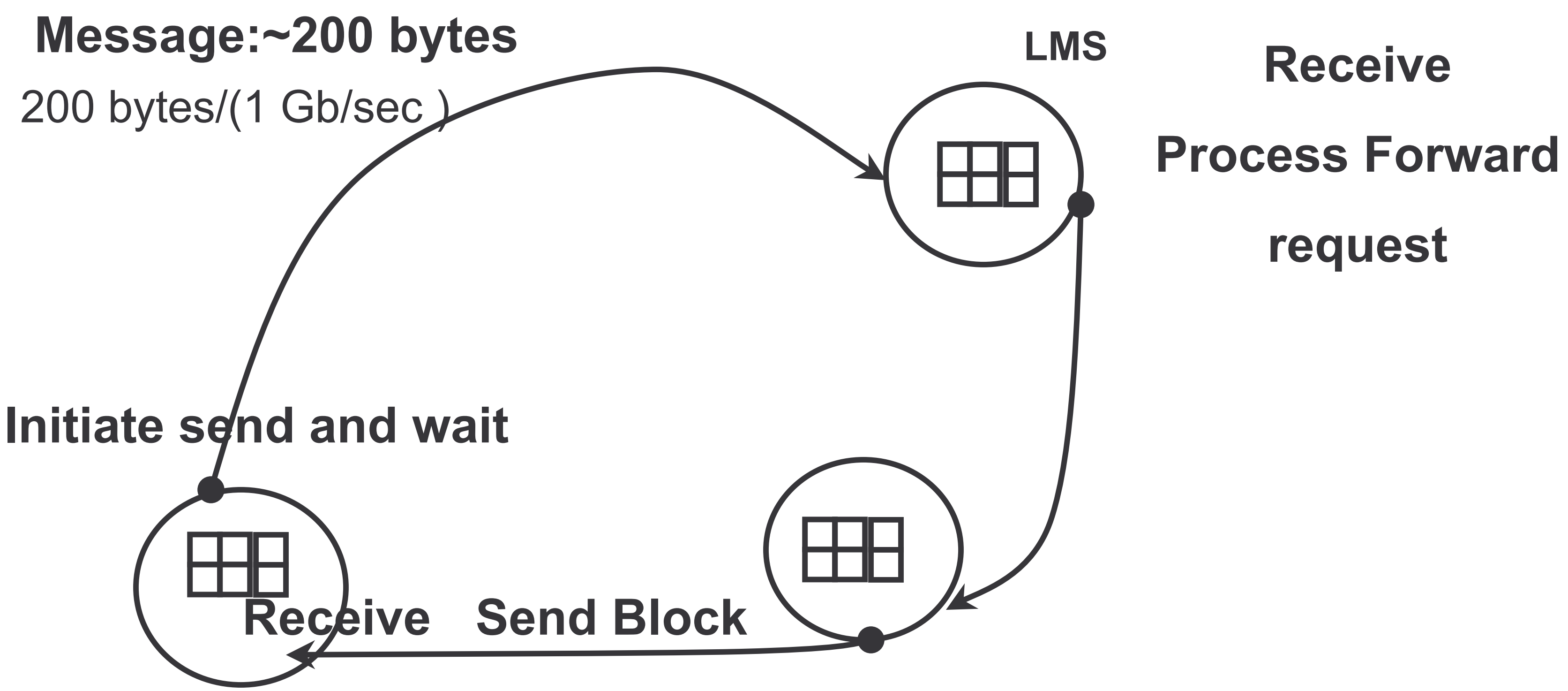
8192 bytes/(1 Gb/sec)

Total access time: e.g. ~360 microseconds (UDP over GBE)

Network propagation delay (“wire time”) is a minor factor for roundtrip time

(approx.: 6% , vs. 52% in OS and network stack)

GCS Processing



Message:~200 bytes

200 bytes/(1 Gb/sec)

LMS

Receive

Process Forward

request

Initiate send and wait

Receive

Send Block

Network propagation delay (“wire time”) is a minor factor for roundtrip time (approx.: 6% , vs. 52% in OS and network stack)

Block Transfer Time

Determined by

- Network Transmit Time – aka wire speed
- HOST CPU
    - Send/Receive Network packet processing
    - LMS processing
- Operating System scheduling
- LMS load
- Interconnect stability

- Oracle statistics report Round-trip Time

Block Transfer Latency

- ~300 microseconds is lowest measured with UDP over Gigabit Ethernet and 2K blocks
- ~ 120 microseconds is lowest measured with RDS over Infiniband and 2K blocks

Block size RT (ms)	2K	4K	8K	16K
UDP/GE	0.30	0.31	0.36	0.46
RDS/IB	0.12	0.13	0.16	0.20

Infrastructure: Private Interconnect

- Network between the nodes of a RAC cluster MUST be private
- Supported links: GbE, IB (IPoIB: 10.2)
- Supported transport protocols: UDP, RDS (10.3)
- Use multiple or dual-ported NICs for redundancy and increase bandwidth with NIC bonding
- Large (Jumbo) Frames for GbE recommended

Infrastructure: Interconnect Bandwidth

- Bandwidth requirements depend on
  - CPU power per cluster node
  - Application-driven data access frequency
  - Number of nodes and size of the working set
  - Data distribution between PQ slaves
- Typical utilization approx. 10-30% in OLTP
  - 10000-12000 8K blocks per sec to saturate 1 x Gb Ethernet (75-80% of theoretical bandwidth)
- Multiple NICs generally not required for performance and scalability

Infrastructure: IPC configuration

- Settings:
  - Socket receive buffers (256 KB – 1MB)
  - Negotiated top bit rate and full duplex mode
  - NIC ring buffers
  - Ethernet flow control settings
- Verify your setup:
  - CVU does checking
  - Load testing eliminates potential for problems

Infrastructure: Operating System

- Remote Block access latencies increase when CPU(s) busy and run queues are long
- Immediate LMS scheduling is critical for predictable block access latencies when CPU > 80% busy
- Real Time or fixed priority for LMS is supported
    - Implemented by default with 10.2

Infrastructure: IO capacity

- Disk storage is shared by all nodes, i.e the aggregate IO rate is important
- Log file IO latency can be important for block transfers
- Parallel Execution across cluster nodes requires a well-scalable IO subsystem
  - Disk configuration needs to be responsive and scalable
  - Get I/O baseline with ORION

Common Problems and Symptoms

Misconfigured or Faulty Interconnect Can Cause:

- Dropped packets/fragments
- Buffer overflows
- Packet reassembly failures or timeouts
- Ethernet Flow control issues
- TX/RX errors

“gc lost blocks”responsible for large no of escalations

“Lost Blocks”: NIC Receive Errors

Db_block_size = 8K

```
ifconfig –a:
eth0 Link encap:Ethernet  HWaddr 00:0B:DB:4B:A2:04
     inet addr:130.35.25.110  Bcast:130.35.27.255  Mask:255.255.252.0
     UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
     RX packets:21721236 errors:135 dropped:0 overruns:0 frame:95
     TX packets:273120 errors:0 dropped:0 overruns:0 carrier:0
     …
```

“Lost Blocks”: IP Packet Reassembly Failures

```
netstat –s

Ip:
   84884742 total packets received
   …
  1201 fragments dropped after timeout
   …
   3384 packet reassembles failed
```

Finding a Problem with the Interconnect or IPC

```
Top 5 Timed Events                                 Avg  %Total
~~~~~~~~~~~~~~~~~~                                wait   Call
Event                    Waits    Time(s) (ms)    Time      Wait Class
------------------------------------------------------------------------------

log file sync      286,038   49,872   174   41.7        Commit

gc buffer busy     177,315   29,021   164   24.3       Cluster

gc cr block busy   110,348    5,703    52    4.8       Cluster

gc cr block lost     4,272    4,953  1159    4.1       Cluster

cr request retry     6,316    4,668   739    3.9         Other
```

Should never be here

Impact of IO capacity issues or bad SQL execution on RAC

- Log flush IO delays can cause “busy” buffers
- “Bad” queries on one node can saturate the link
- I/O is issued from ALL nodes to shared storage (beware of one-node “myopia”)

Cluster-wide impact of IO or query plan issues responsible substantial no of escalations

Cluster-Wide IO Impact

Node 1

```
Top 5 Timed Events                              Avg  %Total
~~~~~~~~~~~~~~~~~~~~                           wait  Call
Event                       Waits    Time(s)   (ms)  Time
--------------------------- ------------ ----------- ------ ------
log file sync             286,038       49,872    174    41.7
gc buffer busy            177,315       29,021    164    24.3
gc cr block busy          110,348        5,703     52     4.8
```

Node 2

```
Load Profile
~~~~~~~~~~~~~~~~~~           Per Second
                        ---------------
Redo size:                    40,982.21
Logical reads:                81,652.41
Physical reads:               51,193.37
```

IO and bad SQL problem fixed

```
Top 5 Timed Events                                Avg   %Total
~~~~~~~~~~~~~~~~~~                                wait   Call
Event                         Waits    Time (s)   (ms)   Time Wait Class
--------------------------- --------- ----------- ---- ------ ----------

CPU time                      4,580         65.4
log file sync               276,281      1,501      5   21.4    Commit
log file parallel write     298,045        923      3   13.2  System I/O
gc current block 3-way      605,628        631      1    9.0    Cluster
gc cr block 3-way           514,218        533      1    7.6    Cluster
```

CPU Saturation or Memory Depletion

```
Top 5 Timed Events                      Avg %Total
~~~~~~~~~~~~~~~~~~                     wait  Call
Event                 Waits     Time(s) (ms) Time   Wait Class
-----------------     --------- ------- ---- -----  ----------

db file sequential    1,312,840   21,590 16  21.8  User I/O
read

gc current block        275,004  21,054  77  21.3  Cluster
congested

gc cr grant congested   177,044  13,495  76  13.6  Cluster

gc current block      1,192,113   9,931   8  10.0  Cluster
2-way

gc cr block congested    85,975   8,917 104   9.0  Cluster
```

"Congested": LMS could not process block transfer request fast enough

Cause : Long run-queues and paging on the cluster nodes

Health Check

Look for:

- High impact of “lost blocks” , e.g.

```
gc cr block lost                    1159
```

- IO capacity saturation , e.g.

```
gc cr block busy                      52 ms
```

- Overload and memory depletion, e.g

```
gc current block congested          14 ms
```

Application and Database Design

General Principles

- No fundamentally different design and coding practices for RAC
- Badly tuned SQL and schema will not run better
- Serializing contention makes applications less scalable
- Standard SQL solves > 80% of performance problems
- Follow RAC Best Practices – Accumulation of Real-world knowledge

Scalability Pitfalls

- Serializing contention on a small set of data/index blocks
  - monotonically increasing key
  - frequent updates of small cached tables
  - segment without ASSM or Free List Group (FLG)
- Full table scans
- Frequent hard parsing
- Concurrent DDL (e.g. truncate/drop)

Index Block Contention: Optimal Design

- Monotonically increasing sequence numbers
  - Randomize or cache
  - Large ORACLE sequence number caches
- Hash or range partitioning
  - Local indexes

Data Block Contention: Optimal Design

- Small tables with high row density and frequent updates and reads can become “globally hot” with serialization e.g.
  - Queue tables
  - session/job status tables
  - last trade lookup tables
- Higher PCTFREE for table reduces # of rows per block

Large Contiguous Scans

- Query Tuning
- Use parallel execution
  - Intra- or inter instance parallelism
  - Direct reads
  - GCS messaging minimal

Health Check

Look for:

- Indexes with right-growing characteristics
  - Eliminate indexes which are not needed
- Frequent updated and reads of “small” tables
  - “small”=fits into a single buffer cache
- SQL which scans large amount of data
  - Bad execution plan
  - More efficient when parallelized

Diagnostics and Problem Determination

Performance Checks and Diagnosis

- Traditionally done via AWR or Statspack reports
- “Time-based” paradigm, i.e. identify which events consume the highest proportion of the database time
- Global cache (“gc”) events are typical for RAC
- Drill-down to SQL and Segment Statistics

Event Statistics to Drive Analysis

- Global cache (“gc”) events and statistics
  - Indicate that Oracle searches the cache hierarchy to find data fast
  - as “normal” as an IO (e.g. db file sequential read)
- GC events tagged as “busy” or “congested” consuming a significant amount of database time should be investigated
  - At first, assume a load or IO problem on one or several of the cluster nodes

Global Cache Event Semantics

All Global Cache Events will follow the following format:

GC …

- CR, current
  - Buffer requests and received for read or write
- block, grant
  - Received block or grant to read from disk
- 2-way, 3-way
  - Immediate response to remote request after N-hops
- busy
  - Block or grant was held up because of contention
- congested
  - Block or grant was delayed because LMS was busy or could not get the CPU

“Normal” Global Cache Access Statistics

```
Top 5 Timed Events                                Avg %Total
~~~~~~~~~~~~~~~~~~                                wait Call
Event                 Waits     Time(s)    (ms) Time   Wait Class
----------------- --------- ----------    ---- ----   ----------

CPU time              4,580       65.4

log file sync       276,281      1,501       5 21.4      Commit

log file parallel   298,045        923       3 13.2     System I/O
write
gc current block    605,628        631       1  9.0     Cluster
3-way

gc cr block 3-way   514,218        533       1  7.6     Cluster
```

Reads from remote cache instead of disk

Avg latency is 1 ms or less

“Abnormal” Global Cache Statistics

```
Top 5 Timed Events            Avg %Total
~~~~~~~~~~~~~~~~~~           wait  Call
Event             Waits  Time(s) (ms)  Time Wait Class
------------------------------ ------------ -----------
------ ------ ----------

log file sync    286,038  49,872  174  41.7    Commit
gc buffer busy   177,315  29,021  164  24.3    Cluster
gc cr block busy 110,348   5,703   52   4.8    Cluster
```

“busy” indicates contention

Avg time is too high

Checklist for the Performance Analyst (AWR based)

- Check where most of the time in the database is spend (“Top 5”)
- Check whether gc events are “busy”, “congested”
- Check the avg wait time
- Drill down
  - SQL with highest cluster wait time
  - Segment Statistics with highest block transfers

Drill-down: An IO capacity problem

```
Top 5 Timed Events                                  Avg %Total
                                                   wait Call
Event                        Waits     Time(s)     (ms) Time Wait Class
------------------        ---------  --------  ---- ---- ----------
db file scattered read    3,747,683  368,301     98  33.3  User I/O
gc buffer busy            3,376,228  233,632     69  21.1  Cluster
db file parallel read     1,552,284  225,218    145  20.4  User I/O
gc cr multi block        35,588,800  101,888      3   9.2  Cluster
request
read by other session     1,263,599   82,915     66   7.5  User I/O
```

Symptom of Full Table Scans

IO contention

Drill-down: SQL Statements

"Culprit": Query that overwhelms IO subsystem on one node

```
Physical Reads  Executions    per Exec   %Total
--------------  -----------  ----------- ------
  182,977,469        1,055   173,438.4    99.3
```

SELECT SHELL FROM ES_SHELL WHERE MSG_ID = :msg_id ORDER BY ORDER_NO ASC

The same query reads from the interconnect:

```
Cluster         CWT % of      CPU
Wait Time (s)   Elapsd Tim    Time(s)       Executions
-------------   ----------    -----------   --------------
  341,080.54      31.2         17,495.38        1,055
```

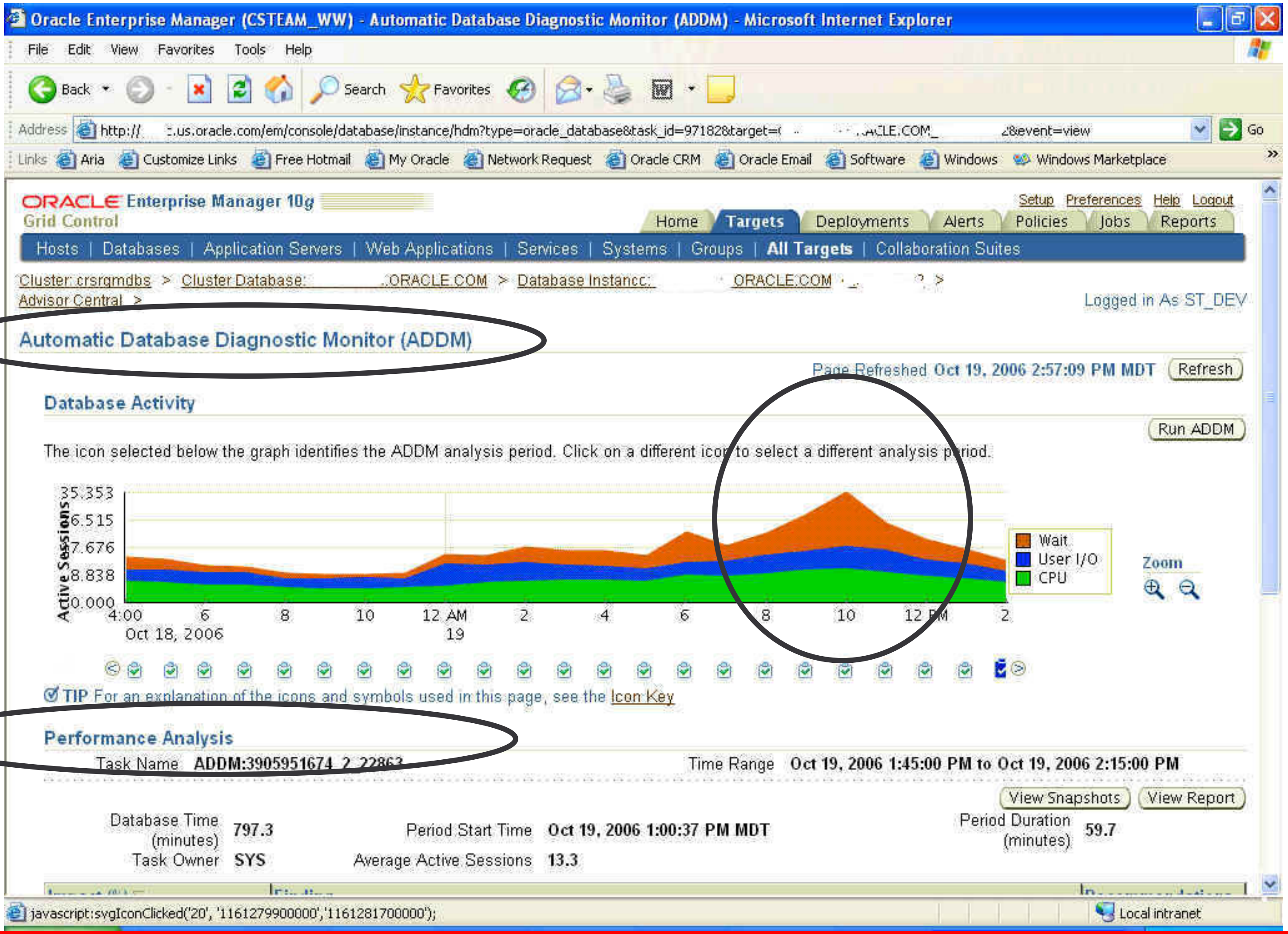
SELECT SHELL FROM ES_SHELL WHERE MSG_ID = :msg_id ORDER BY ORDER_NO ASC

Drill-Down: Top Segments

```
                                                       GC
Tablespace                        Subobject  Obj.      Buffer        % of
Name        Object Name           Name       Type      Busy          Capture
----------  --------------------  ---------- -----     ------------  -------
ESSMLTBL    ES_SHELL              SYS_P537   TABLE     311,966       9.91
ESSMLTBL    ES_SHELL              SYS_P538   TABLE     277,035       8.80
ESSMLTBL    ES_SHELL              SYS_P527   TABLE     239,294       7.60
…
```

Apart from being the table with the highest IO demand
it was the table with the highest number of block transfers
AND global serialization

… and now for something different: Automated Performance Analysis



Oracle Enterprise Manager (CSTEAM_WW) - Automatic Database Diagnostic Monitor (ADDM) - Microsoft Internet Explorer

File Edit View Favorites Tools Help
Back Search Favorites
Address http:// :.us.oracle.com/em/console/database/instance/hdm?type=oracle_database&task_id=97182&target=(.ACLE.COM_ 2&event=view Go
Links Aria Customize Links Free Hotmail My Oracle Network Request Oracle CRM Oracle Email Software Windows Windows Marketplace
ORACLE Enterprise Manager 10g Grid Control
Setup Preferences Help Logout
Home Targets Deployments Alerts Policies Jobs Reports
Hosts | Databases | Application Servers | Web Applications | Services | Systems | Groups | All Targets | Collaboration Suites

Cluster: crsrgmdbs > Cluster Database: .ORACLE.COM > Database Instance: ORACLE.COM > Advisor Central >

Logged in As ST_DEV

Automatic Database Diagnostic Monitor (ADDM)

Page Refreshed Oct 19, 2006 2:57:09 PM MDT

Database Activity

The icon selected below the graph identifies the ADDM analysis period. Click on a different icon to select a different analysis period.

TIP For an explanation of the icons and symbols used in this page, see the Icon Key

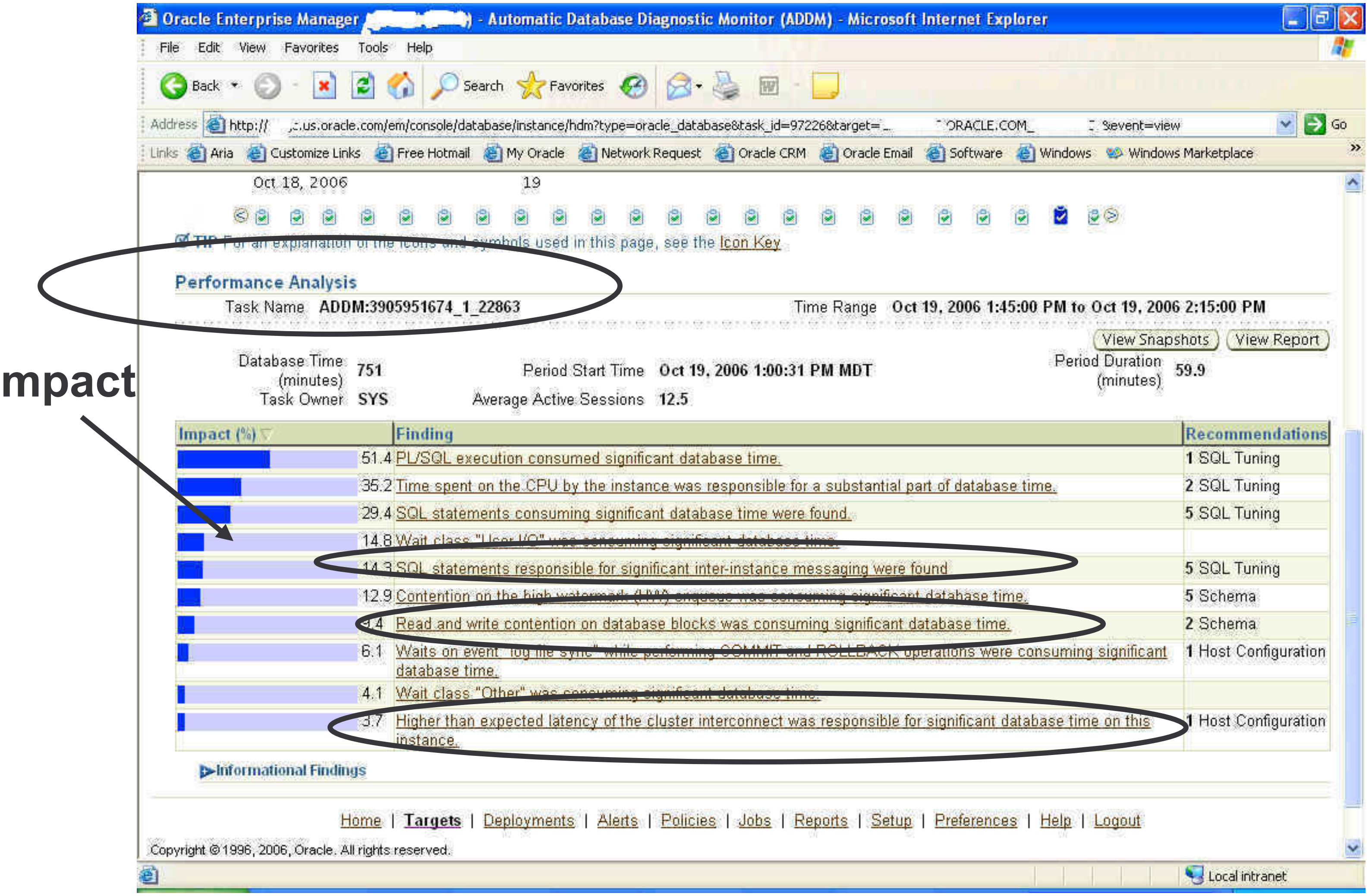
Performance Analysis

Task Name	ADDM:3905951674_2_22863	Time Range	Oct 19, 2006 1:45:00 PM to Oct 19, 2006 2:15:00 PM

Database Time (minutes)	797.3	Period Start Time	Oct 19, 2006 1:00:37 PM MDT	Period Duration (minutes)	59.7
Task Owner	SYS	Average Active Sessions	13.3		

javascript:svgIconClicked('20', '1161279900000','1161281700000');

Impact of RAC Findings



Oracle Enterprise Manager [redacted] - Automatic Database Diagnostic Monitor (ADDM) - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http:// [redacted].us.oracle.com/em/console/database/instance/hdm?type=oracle_database&task_id=97226&target=[redacted]ORACLE.COM_[redacted]&event=view Go
Links Aria Customize Links Free Hotmail My Oracle Network Request Oracle CRM Oracle Email Software Windows Windows Marketplace

Oct 18, 2006 19

TIP For an explanation of the icons and symbols used in this page, see the Icon Key

Performance Analysis

Task Name ADDM:3905951674_1_22863

Time Range Oct 19, 2006 1:45:00 PM to Oct 19, 2006 2:15:00 PM

View Snapshots | View Report

Database Time (minutes) 751

Task Owner SYS

Period Start Time Oct 19, 2006 1:00:31 PM MDT

Average Active Sessions 12.5

Period Duration (minutes) 59.9

Impact (%)	Finding	Recommendations
51.4	PL/SQL execution consumed significant database time.	1 SQL Tuning
35.2	Time spent on the CPU by the instance was responsible for a substantial part of database time.	2 SQL Tuning
29.4	SQL statements consuming significant database time were found.	5 SQL Tuning
14.8	Wait class "User I/O" was consuming significant database time.	
14.3	SQL statements responsible for significant inter-instance messaging were found	5 SQL Tuning
12.9	Contention on the high watermark (HW) enqueue was consuming significant database time.	5 Schema
9.4	Read and write contention on database blocks was consuming significant database time.	2 Schema
6.1	Waits on event "log file sync" while performing COMMIT and ROLLBACK operations were consuming significant database time.	1 Host Configuration
4.1	Wait class "Other" was consuming significant database time.	
3.7	Higher than expected latency of the cluster interconnect was responsible for significant database time on this instance.	1 Host Configuration

▶Informational Findings

Home | Targets | Deployments | Alerts | Policies | Jobs | Reports | Setup | Preferences | Help | Logout

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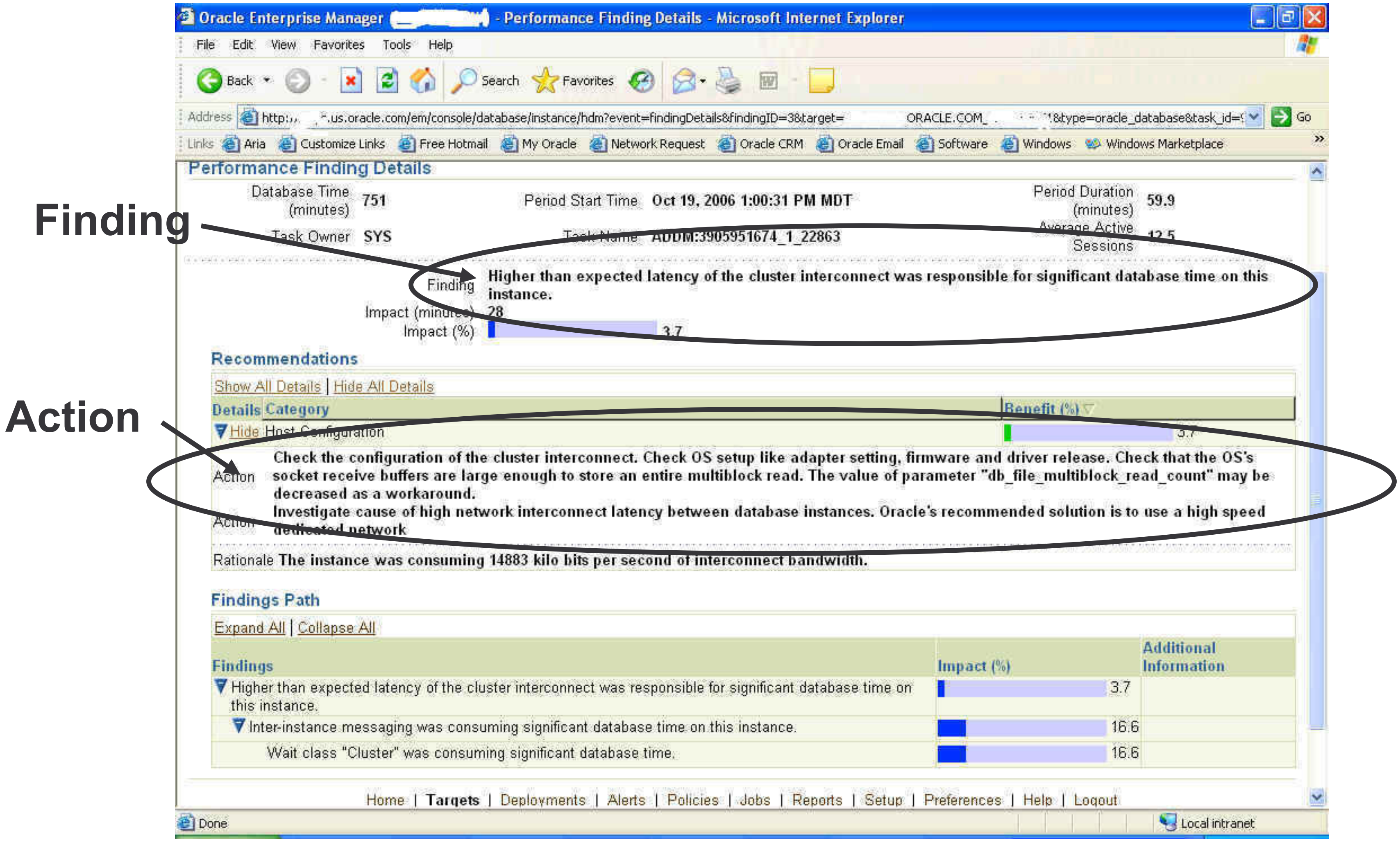
Impact

Automated Findings and Actions: Interconnect



Finding

Action

Oracle Enterprise Manager [redacted] - Performance Finding Details - Microsoft Internet Explorer

Address: http://[redacted].us.oracle.com/em/console/database/instance/hdm?event=findingDetails&findingID=38&target=[redacted]ORACLE.COM_[redacted]1&type=oracle_database&task_id=

Performance Finding Details

Database Time (minutes)	751	Period Start Time	Oct 19, 2006 1:00:31 PM MDT	Period Duration (minutes)	59.9
Task Owner	SYS	Task Name	ADDM:3905951674_1_22863	Average Active Sessions	12.5

Finding: Higher than expected latency of the cluster interconnect was responsible for significant database time on this instance.

Impact (minutes): 28

Impact (%): 3.7

Recommendations

Show All Details | Hide All Details

Details	Category	Benefit (%)
▼ Hide	Host Configuration	3.7

Action: Check the configuration of the cluster interconnect. Check OS setup like adapter setting, firmware and driver release. Check that the OS's socket receive buffers are large enough to store an entire multiblock read. The value of parameter "db_file_multiblock_read_count" may be decreased as a workaround.

Action: Investigate cause of high network interconnect latency between database instances. Oracle's recommended solution is to use a high speed dedicated network

Rationale: The instance was consuming 14883 kilo bits per second of interconnect bandwidth.

Findings Path

Expand All | Collapse All

Findings	Impact (%)	Additional Information
▼ Higher than expected latency of the cluster interconnect was responsible for significant database time on this instance.	3.7	
▼ Inter-instance messaging was consuming significant database time on this instance.	16.6	
Wait class "Cluster" was consuming significant database time.	16.6	

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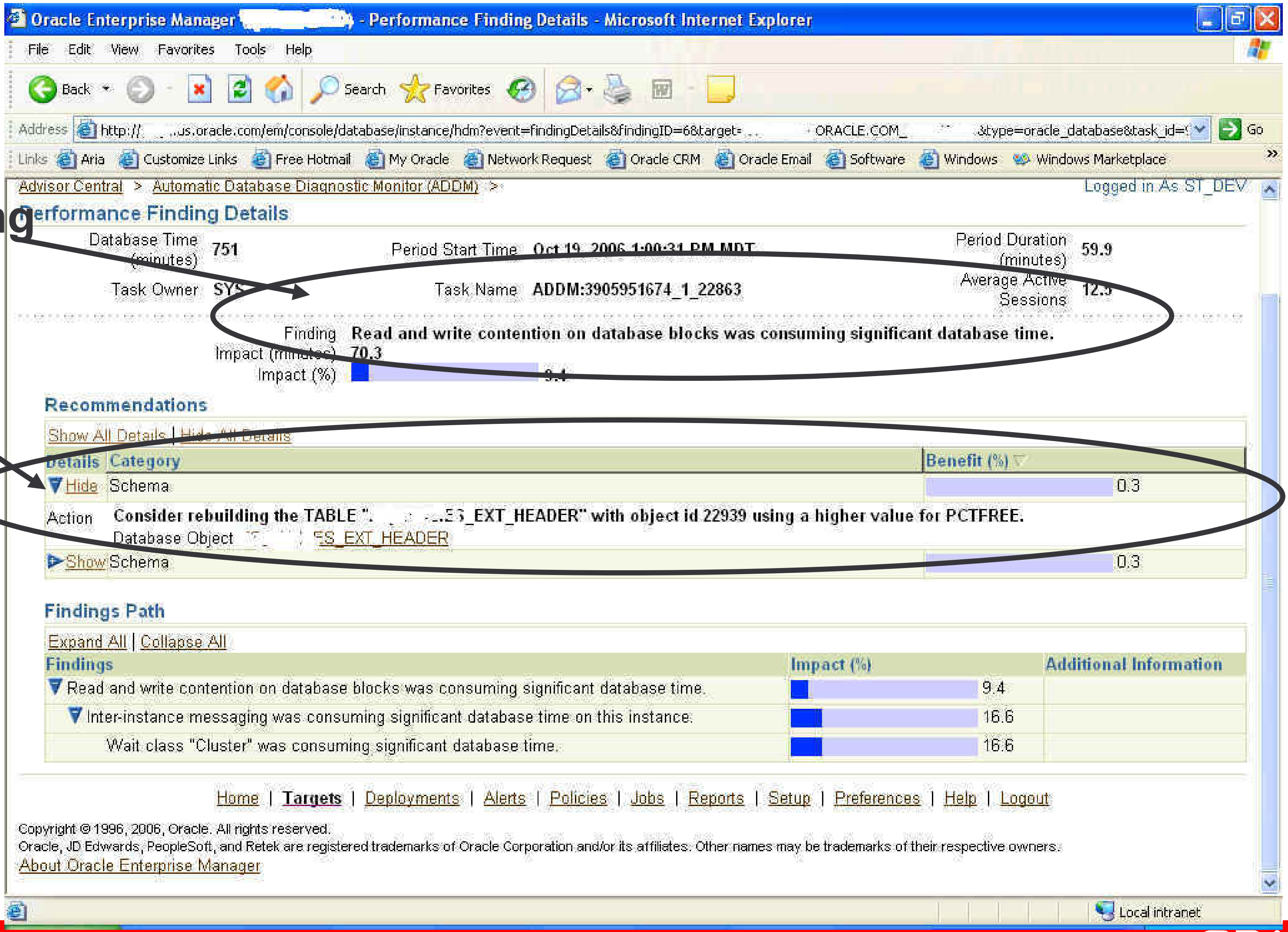
Favorites
Go
Links Aria Customize Links Free Hotmail My Oracle Network Request Oracle CRM Oracle Email Software Windows Windows Marketplace
Home | Targets | Deployments | Alerts | Policies | Jobs | Reports | Setup | Preferences | Help | Logout
Done
Local intranet

Automated Findings and Actions: Block Contention



Oracle Enterprise Manager [redacted] - Performance Finding Details - Microsoft Internet Explorer

File Edit View Favorites Tools Help
Back Search Favorites
Address http://[redacted]us.oracle.com/em/console/database/instance/hdm?event=findingDetails&findingID=6&target=[redacted]ORACLE.COM_[redacted]&type=oracle_database&task_id=[redacted] Go
Links Aria Customize Links Free Hotmail My Oracle Network Request Oracle CRM Oracle Email Software Windows Windows Marketplace

Advisor Central > Automatic Database Diagnostic Monitor (ADDM) >

Logged in As ST_DEV

Finding

Performance Finding Details

Database Time (minutes)	751	Period Start Time	Oct 19, 2006 1:00:31 PM MDT	Period Duration (minutes)	59.9
Task Owner	SYS	Task Name	ADDM:3905951674_1_22863	Average Active Sessions	12.5

Finding Read and write contention on database blocks was consuming significant database time.
Impact (minutes) 70.3
Impact (%) 9.4

Action

Recommendations

Show All Details | Hide All Details

Details	Category	Benefit (%) ▽
▼ Hide	Schema	0.3
Action	Consider rebuilding the TABLE "[redacted]ES_EXT_HEADER" with object id 22939 using a higher value for PCTFREE. Database Object [redacted]ES_EXT_HEADER	
▶ Show	Schema	0.3

Findings Path

Expand All | Collapse All

Findings	Impact (%)	Additional Information
▼ Read and write contention on database blocks was consuming significant database time.	9.4	
▼ Inter-instance messaging was consuming significant database time on this instance.	16.6	
Wait class "Cluster" was consuming significant database time.	16.6	

Home | Targets | Deployments | Alerts | Policies | Jobs | Reports | Setup | Preferences | Help | Logout

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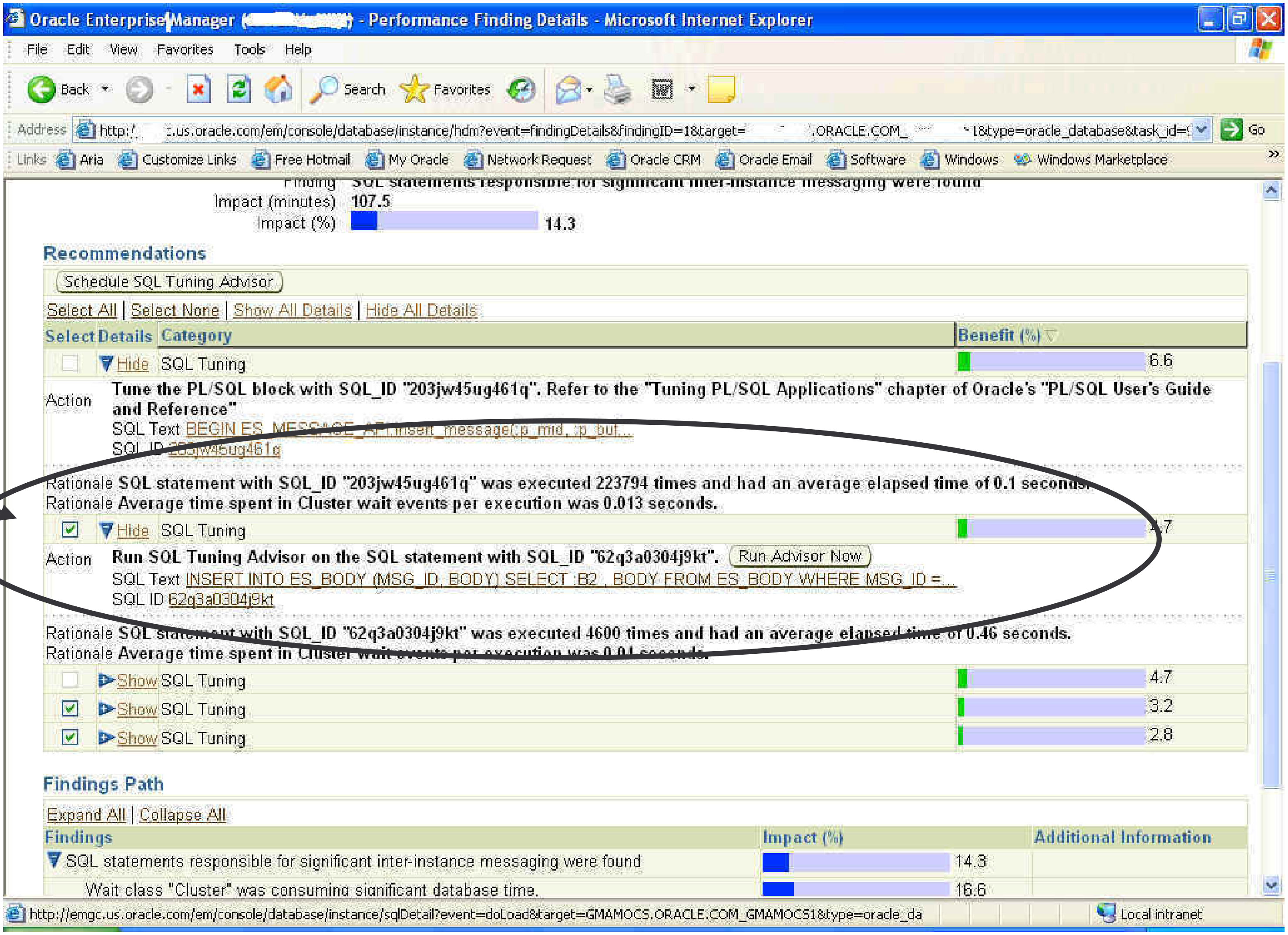
About Oracle Enterprise Manager

Automated Findings and Actions: SQL

Action



Oracle Enterprise Manager ([redacted]) - Performance Finding Details - Microsoft Internet Explorer

Address http:/. :.us.oracle.com/em/console/database/instance/hdm?event=findingDetails&findingID=1&target= .ORACLE.COM_ 1&type=oracle_database&task_id=

Finding SQL statements responsible for significant inter-instance messaging were found

Impact (minutes) 107.5

Impact (%) 14.3

Recommendations

Schedule SQL Tuning Advisor

Select All | Select None | Show All Details | Hide All Details

Select	Details	Category	Benefit (%)
□	Hide	SQL Tuning	6.6

Action Tune the PL/SQL block with SQL_ID "203jw45ug461q". Refer to the "Tuning PL/SQL Applications" chapter of Oracle's "PL/SQL User's Guide and Reference"
SQL Text BEGIN ES_MESSAGE_API.insert_message(:p_mid, :p_buf...
SQL ID 203jw45ug461q

Rationale SQL statement with SQL_ID "203jw45ug461q" was executed 223794 times and had an average elapsed time of 0.1 seconds.
Rationale Average time spent in Cluster wait events per execution was 0.013 seconds.

Select	Details	Category	Benefit (%)
☑	Hide	SQL Tuning	4.7

Action Run SQL Tuning Advisor on the SQL statement with SQL_ID "62q3a0304j9kt". Run Advisor Now
SQL Text INSERT INTO ES_BODY (MSG_ID, BODY) SELECT :B2 , BODY FROM ES_BODY WHERE MSG_ID =...
SQL ID 62q3a0304j9kt

Rationale SQL statement with SQL_ID "62q3a0304j9kt" was executed 4600 times and had an average elapsed time of 0.46 seconds.
Rationale Average time spent in Cluster wait events per execution was 0.01 seconds.

Select	Details	Category	Benefit (%)
□	Show	SQL Tuning	4.7
☑	Show	SQL Tuning	3.2
☑	Show	SQL Tuning	2.8

Findings Path

Expand All | Collapse All

Findings	Impact (%)	Additional Information
SQL statements responsible for significant inter-instance messaging were found	14.3	
Wait class "Cluster" was consuming significant database time.	16.6	

http://emgc.us.oracle.com/em/console/database/instance/sqlDetail?event=doLoad&target=GMAMOCS.ORACLE.COM_GMAMOCS1&type=oracle_da

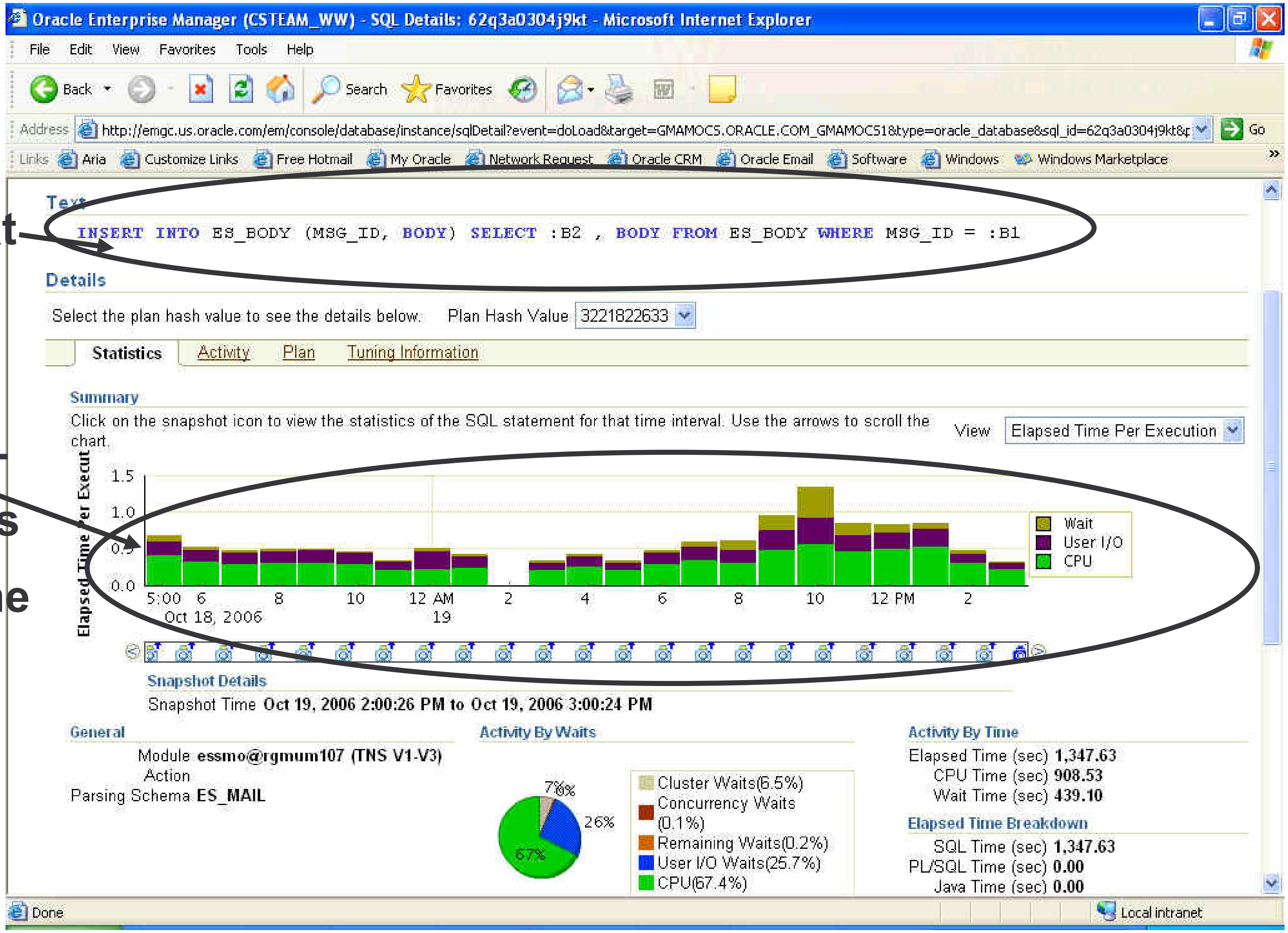
Automated SQL Drill-Down

SQL Text

Per SQL

Statistics

Over Time



Oracle Enterprise Manager (CSTEAM_WW) - SQL Details: 62q3a0304j9kt - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://emgc.us.oracle.com/em/console/database/instance/sqlDetail?event=doLoad&target=GMAMOCS.ORACLE.COM_GMAMOCS1&type=oracle_database&sql_id=62q3a0304j9kt&p
Go
Links Aria Customize Links Free Hotmail My Oracle Network Request Oracle CRM Oracle Email Software Windows Windows Marketplace
Elapsed Time Per Execut
1.5
1.0
0.5
0.0
5:00
6
Oct 18, 2006
8
10
12 AM
19
2
4
6
8
10
12 PM
2
Wait
User I/O
CPU
7%
0%
26%
67%
Done
Local intranet

Text

```
INSERT INTO ES_BODY (MSG_ID, BODY) SELECT :B2 , BODY FROM ES_BODY WHERE MSG_ID = :B1
```

Details

Select the plan hash value to see the details below. Plan Hash Value 3221822633

Statistics | Activity | Plan | Tuning Information

Summary

Click on the snapshot icon to view the statistics of the SQL statement for that time interval. Use the arrows to scroll the chart.

View: Elapsed Time Per Execution

Snapshot Details

Snapshot Time Oct 19, 2006 2:00:26 PM to Oct 19, 2006 3:00:24 PM

General

Module essmo@rgmum107 (TNS V1-V3)
Action
Parsing Schema ES_MAIL

Activity By Waits

- Cluster Waits(6.5%)
- Concurrency Waits (0.1%)
- Remaining Waits(0.2%)
- User I/O Waits(25.7%)
- CPU(67.4%)

Activity By Time

Elapsed Time (sec) 1,347.63
CPU Time (sec) 908.53
Wait Time (sec) 439.10

Elapsed Time Breakdown

SQL Time (sec) 1,347.63
PL/SQL Time (sec) 0.00
Java Time (sec) 0.00

Summary: Practical Performance Analysis

Diagnostics Flow

- Start with simple validations :
  - Private Interconnect used ?
  - Lost blocks and failures ?
  - Load and load distribution issues ?
- Check avg latencies, busy, congested events and their significance
- Check OS statistics (CPU, disk , virtual memory)
- Identify SQL and Segments

MOST OF THE TIME, A PERFORMANCE PROBLEM IS NOT A RAC PROBLEM

Actions

- Interconnect issues must be fixed first
- If IO wait time is dominant , fix IO issues
  - At this point, performance may already be good
- Fix “bad” plans
- Fix serialization
- Fix schema

Checklist for Practical Performance Analysis

- ADDM provides RAC performance analysis of significant metrics and statistics
  - ADDM findings should always be studied first
  - It provides detailed findings for SQL, segments and blocks
- AWR for detailed statistics and historical performance analysis
  - Export statistics repository long-term
- ASH provides finer-grained session specific data
  - Catches variation in snapshot data
  - Stored in AWR repository
  - Used by ADDM

Recommendations

- Most relevant data for analysis can be derived from the wait events
- ***Always use EM and ADDM reports for performance health checks and analysis***
- ASH can be used for session-based analysis of variation
- Export AWR repository regularly to save all of the above

For More Information

http://search.oracle.com

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