

The Best Oracle Database 11g New Features

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Audience Knowledge / Versions

- Oracle7 Experience ?
- Oracle8i Experience ?
- Oracle9i Experience ?
- Oracle10g Experience?
- Oracle Database 11g Experience?



- Goals

- Present NEW features in an EASY way
 - Focus on a few nice features of Oracle11g



- Non-Goals

- Learn ALL aspects of Oracle11g





Overview



- Start Me Up – Using Memory Target
- The Result Cache
- Invisible Indexes & Online Index Rebuilds
- Nice Developer Features
- ADDM Enhancements
- SQL Plan Management and SQL Plan Baselines
- SQL Query Repair Advisor
- SQL Performance Analyzer
- Real Application Testing (Database Capture and Replay)
- Interval Partitioning & Partition Compression
- DBA Tools and DBMS_STATS Enhancements
- Grid Control & EM
- Security Enhancements & the Future Sizes
- Summary



Know the Oracle

"I admire risk takers. I like leaders – people who do things before they become fashionable or popular. I find that kind of integrity inspirational."



LAWRENCE J. ELLISON | *Chairman & Chief Executive Officer, 2003*



Oracle Firsts – *Innovation!*

- 1979 First commercial SQL relational database management system
- 1983 **First 32-bit** mode RDBMS
- 1984 First database with read consistency
- 1987 **First client-server** database
- 1994 First commercial and multilevel secure database evaluations
- 1995 **First 64-bit** mode RDBMS
- 1996 First to break the 30,000 TPC-C barrier
- 1997 **First Web** database
- 1998 First Database - Native **Java** Support; Breaks 100,000 TPC-C
- 1998 First Commercial RDBMS ported to **Linux**
- 2000 First database with **XML**
- 2001 First middle-tier database cache
- 2001 First RDBMS with **Real Application Clusters**
- 2004 First **True Grid Database**
- 2005 First **FREE Oracle Database** (10g Express Edition)
- 2006 First **Oracle Support for LINUX Offering**
- 2007 **Oracle 11g Released!**



2007: Version 11g Arrive

ORACLE®
DATABASE 11^g

- The Focus has been Acquisitions and gaining **Market Share**
- Oracle 11g Database extends an already large lead
 - Easier to Manage the Database – Better Grid Control
 - Self Tuning through a variety of tools (Makes 1 person equal 10)
 - Better Security/Encryption & Recoverability via Flashback
 - Better Testing Tools (Real Application Testing)
- Andy Mendelsohn is still the database lead
- New releases of Siebel, PeopleSoft and Oracle12 Apps.
- New Oracle BI Suite & **Acquisition of Hyperion**



Testing the **Future** Version

Version 11.1.0.6.0 of the Database





Oracle Database 11g Release 1: Upgrade Paths

Direct Upgrade Path

| Source Database | Target Database |
|------------------------|-----------------|
| 9.2.0.4.0 (or higher) | 11.1.x |
| 10.1.0.2.0 (or higher) | 11.1.x |
| 10.2.0.1.0 (or higher) | 11.1.x |

In-Direct Upgrade Path

| Source Database | Upgrade Path for Target Database | Target Database |
|----------------------|-------------------------------------|-----------------|
| 7.3.3.0.0 (or lower) | 7.3.4.x --> 9.2.0.8 | 11.1.x |
| 8.0.5.0.0 (or lower) | 8.0.6.x --> 9.2.0.8 | 11.1.x |
| 8.1.7.0.0 (or lower) | 8.1.7.4 --> 9.2.0.8 | 11.1.x |
| 9.0.1.3.0 (or lower) | 9.0.1.4 --> 9.2.0.8 | 11.1.x |



Database Upgrade Assistant (DBUA)

- Command Line Option to Auto Extend System Files
- Express Edition Upgrade to others
- Integration with Oracle Database 11g Pre-upgrade Tool
- Moving Data Files into ASM, SAN, and Other File Systems
- Oracle Base and Diagnostic Destination Configuration



Database Upgrade Assistant (DBUA)

- DBUA checks before the upgrade:
 - Invalid user accounts or roles
 - Invalid data types or invalid objects
 - De-supported character sets
 - Adequate resources (rollback segments, tablespaces, and free disk space)
 - Missing SQL scripts needed for the upgrade
 - Listener running (if Oracle Enterprise Manager Database Control upgrade or configuration is requested)
 - Oracle Database software linked with Database Vault option. If Database Vault is enabled, Disable Database Vault before upgrade.



The New Version – Life is Good!



```
$ sqlplus ***/**
```

SQL*Plus: Release 11.1.0.6.0 - Production on Tue Oct 30 11:21:04 2007

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Connected to:

Oracle Database 11g Enterprise Edition Release 11.1.0.6.0 - Production

With the Partitioning, OLAP, Data Mining and **Real Application Testing** options

```
SQL> startup
```

ORACLE instance started.

Total System Global Area 422670336 bytes

Fixed Size 1300352 bytes

Variable Size 306186368 bytes

Database Buffers 109051904 bytes

Redo Buffers 6131712 bytes

Database mounted.

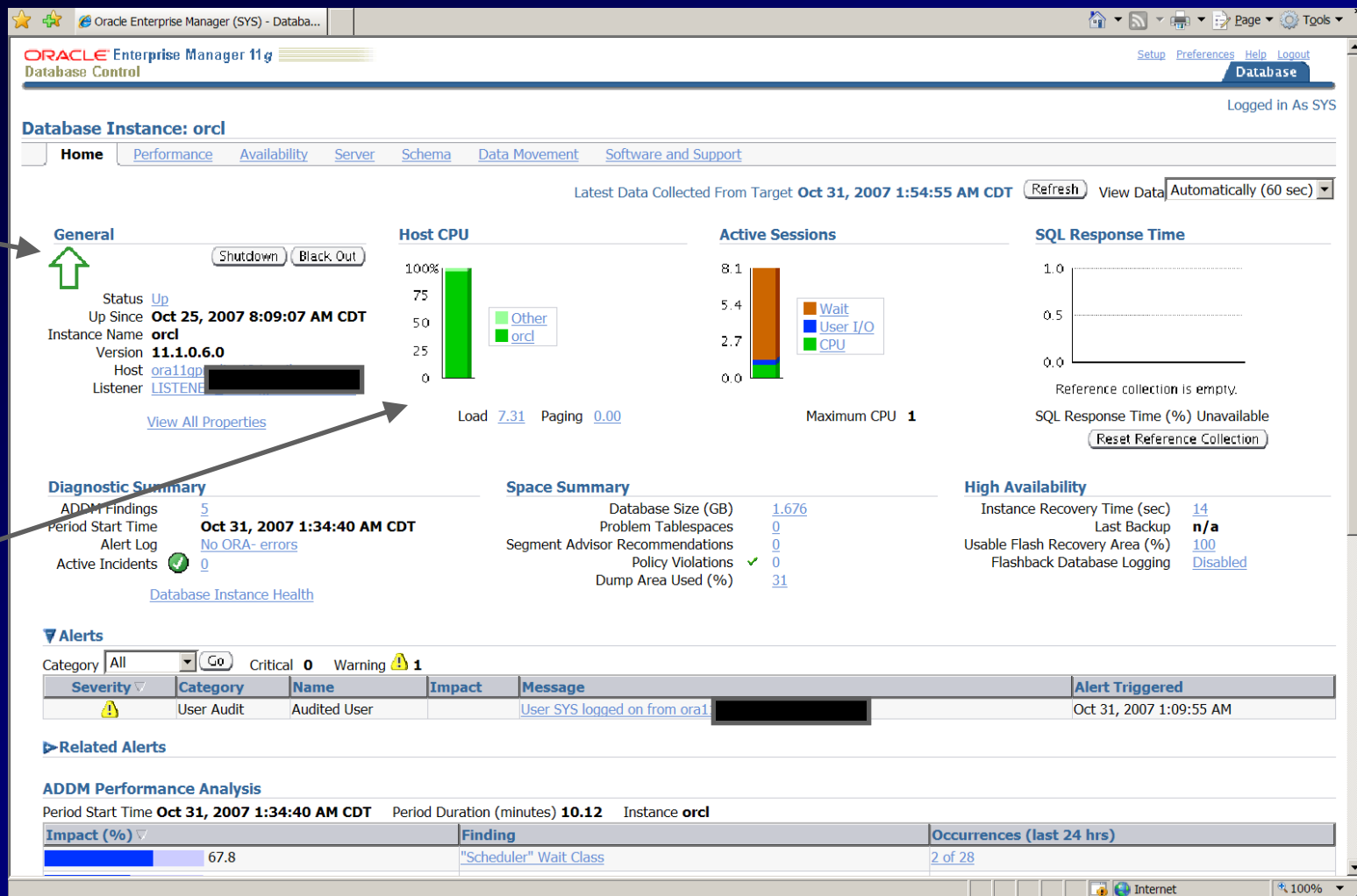
Database opened.



Database Information - UP!

Monitor
Database
(UP)

Users are
Definitely
Using it!





MEMORY_TARGET & Automatic Memory Management



Automatic Memory Management (AMM)



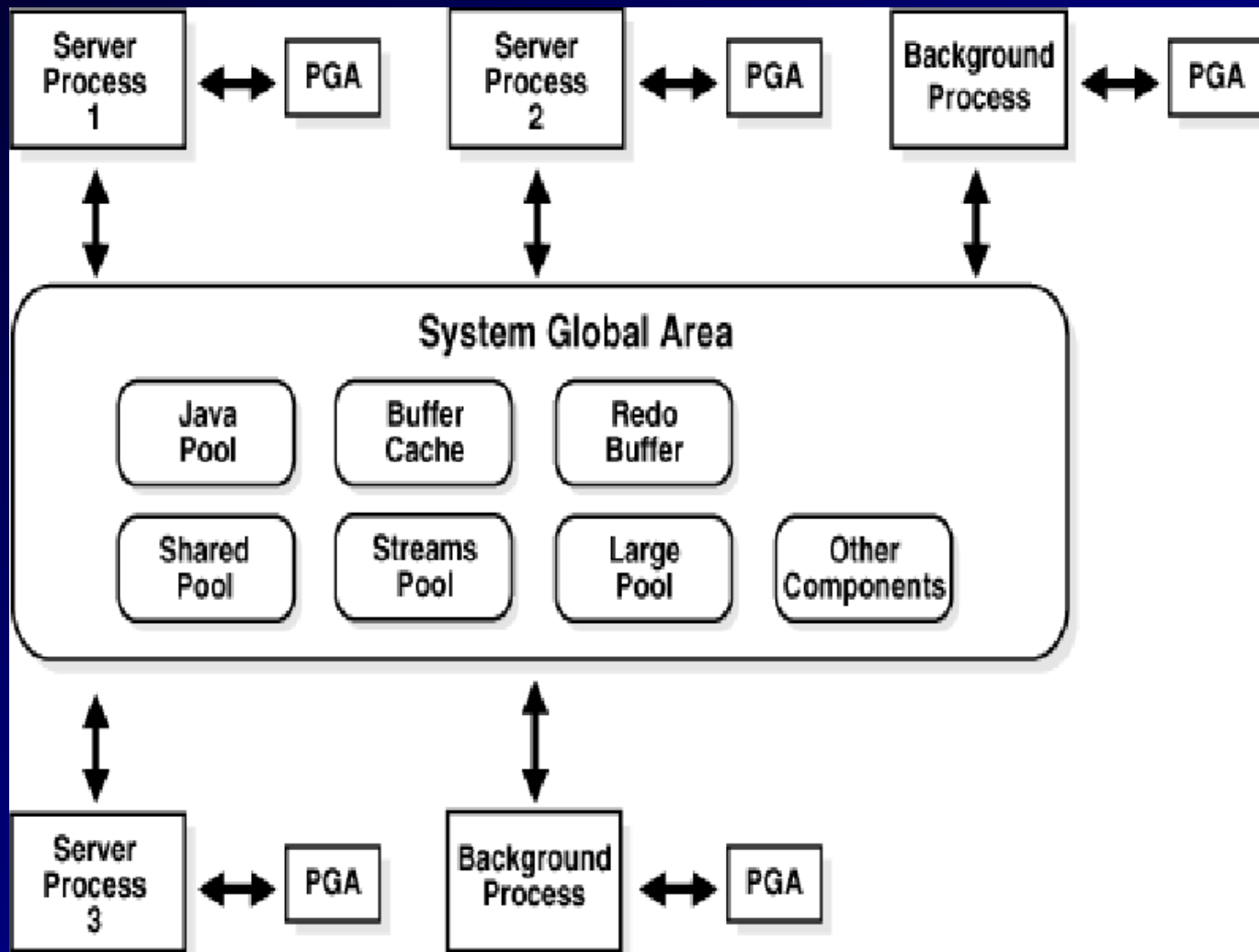
MEMORY_TARGET in 11g



- First there was some Automatic Memory Mgmt - 9i
 - **SGA_MAX_SIZE** introduced in 9i – Dynamic Memory
 - No more Buffers – **DB_CACHE_SIZE**
 - Granule sizes introduced - **_ksm_granule_size**
- Then came **SGA_TARGET** – 10g
 - Oracle Applications recommends setting this for SGA
 - Set minimums for key values (Data Cache / Shared



SGA & PGA will be MEMORY_TARGET



Moving from SGA_TARGET to: MEMORY_TARGET - EM



Oracle Enterprise Manager (SYSTEM) - Memory Advisors

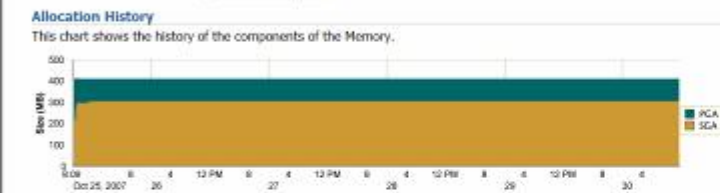
Page Refreshed: October 30, 2007 11:34:33 AM CDT [Refresh] [Show SQL] [Revert] [Apply]

When Automatic Memory Management is enabled, the database will automatically set the optimal distribution of memory. The distribution of memory will change from time to time to accommodate changes in the workload.

Automatic Memory Management: **Enabled** [Disable]

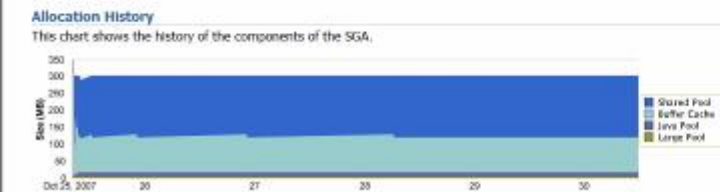
Total Memory Size: 404 MB [Advice]

Maximum Memory Size: 104 MB



SGA **PGA**

The System Global Area (SGA) is a group of shared memory structures that contains data and control information for one Oracle database. The SGA is allocated in memory when an Oracle database instance is started.



Oracle Enterprise Manager (SYSTEM) - Memory

SGA **PGA**

The System Global Area (SGA) is a group of shared memory structures that contains data and control information for one Oracle database. The SGA is allocated in memory when an Oracle database instance is started.

Allocation History

This chart shows the history of the components of the SGA.

The chart shows the size in MB of the components of the SGA over time. The y-axis ranges from 0 to 300 MB. The x-axis shows dates from Oct 25, 2007 to Oct 30, 2007. The components are Shared Pool (blue), Buffer Cache (light blue), Java Pool (dark blue), and Large Pool (yellow).

Current Allocation

Automatic Shared Memory Management: **Enabled**

Total SGA Size (MB) 304

| SGA Component | Current Allocation (MB) |
|---------------|-------------------------|
| Shared Pool | 180 |
| Buffer Cache | 104 |
| Large Pool | 4 |
| Java Pool | 12 |
| Other | 4 |

The pie chart shows the distribution of the SGA components: Shared Pool (59.21%), Buffer Cache (34.21%), Large Pool (1.31%), Java Pool (3.95%), and Other (1.31%).

☐ Apply changes to SPFILE only

The changes are made to both the SPFILE and the running instance which requires that you restart the database to invoke static parameters.

[Show SQL] [Revert] [Apply]

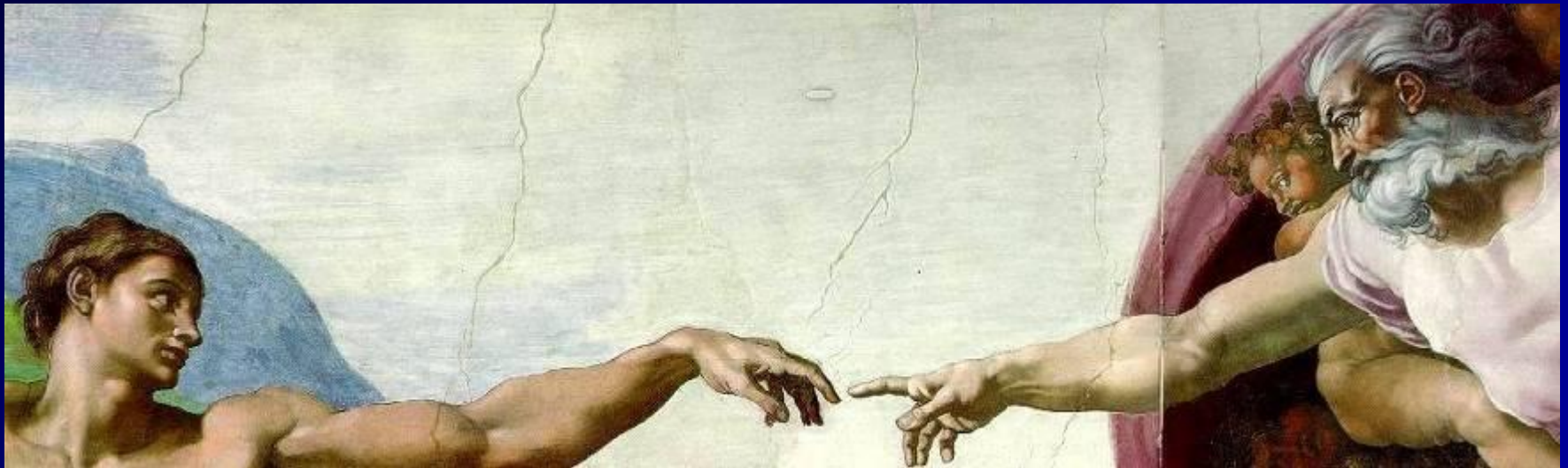
Database | Setup | Preferences | Help | Logout

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About Oracle Enterprise Manager



ADDMM Enhancements

(Automatic Database Diagnostic Monitor)





ADDM enhancements

- Global ADDM so that Diagnostics are done across the entire cluster
- Emergency ADDM for use when database is hung
- On any granularity
 - Database Cluster
 - Database Instance
 - Specific Target (such as host, ASM...etc.)
- Over a specified time **NOT** tied to a pair of



ADDM Briefly

Specific
Database
Instance

We have 5
ADDM
Findings

Check them
Here

Oracle Enterprise Manager (SYS) - Databa...

ORACLE Enterprise Manager 11g
Database Control

Setup Preferences Help Logout
Database

Logged in As SYS

Database Instance: orcl

Home Performance Availability Server Schema Data Movement Software and Support

Latest Data Collected From Target Oct 31, 2007 1:54:55 AM CDT Refresh View Data Automatically (60 sec)

General

Status Up
Up Since Oct 25, 2007 8:09:07 AM CDT
Instance Name orcl
Version 11.1.0.6.0
Host ora11gp
Listener LISTENER

Shutdown Black Out

View All Properties

Host CPU

Load 7.31 Paging 0.00

Maximum CPU 1

Active Sessions

8.1
5.4
2.7
0.0

Wait
User I/O
CPU

SQL Response Time

1.0
0.5
0.0

Reference collection is empty.
SQL Response Time (%) Unavailable
Reset Reference Collection

Diagnostic Summary

ADDM Findings 5
Period Start Time Oct 31, 2007 1:34:40 AM CDT
Alert Log No ORA- errors
Active Incidents 0

Database Instance Health

Space Summary

Database Size (GB) 1.676
Problem Tablespaces 0
Segment Advisor Recommendations 0
Policy Violations 0
Dump Area Used (%) 31

High Availability

Instance Recovery Time (sec) 14
Last Backup n/a
Usable Flash Recovery Area (%) 100
Flashback Database Logging Disabled

Alerts

Category All Go Critical 0 Warning 1

| Severity | Category | Name | Impact | Message | Alert Triggered |
|----------|------------|--------------|--------|------------------------------|-------------------------|
| Warning | User Audit | Audited User | | User SYS logged on from ora1 | Oct 31, 2007 1:09:55 AM |

Related Alerts

ADDM Performance Analysis

Period Start Time Oct 31, 2007 1:34:40 AM CDT Period Duration (minutes) 10.12 Instance orcl

| Impact (%) | Finding | Occurrences (last 24 hrs) |
|------------|------------------------|---------------------------|
| 67.8 | "Scheduler" Wait Class | 2 of 28 |

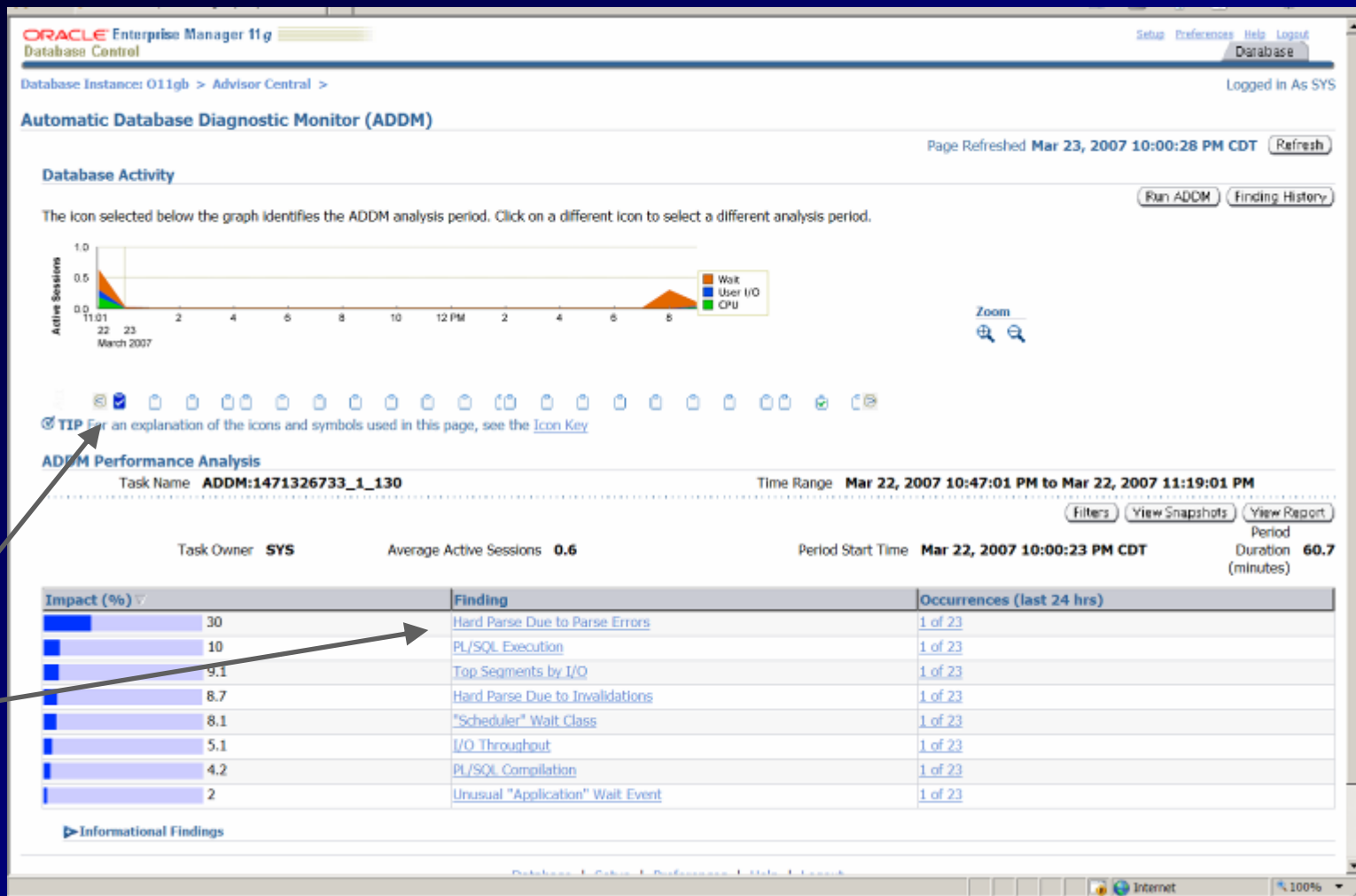


ADDM Briefly

Top
ADDM
Findings

Click a
Single
Timeframe

Let's
Check the
Hard Parse
Issue





ADDM Briefly

Detailed
Info
&
Findings

Add'l
Info

ORACLE Enterprise Manager 11g
Database Control

Database Instance: O11gb > Advisor Central > Automatic Database Diagnostic Monitor (ADDM):SYS.ADDM:1471326733_1_130 > Logged in As SYS

Performance Finding Details: Hard Parse Due to Parse Errors

Finding **Hard parsing SQL statements that encountered parse errors was consuming significant database time.** (Finding History)

Impact (Active Sessions) **.19**
Impact (%) **30**
Period Start Time **Mar 22, 2007 10:00:23 PM CDT**
Period Duration (minutes) **60.7**
Filtered **No** (Filters)

Recommendations

[Show All Details](#) | [Hide All Details](#)

| Details | Category | Benefit (%) |
|----------------------|----------------------|-------------|
| Hide | Application Analysis | 30 |

Action **Investigate application logic to eliminate parse errors.**

Findings Path

[Expand All](#) | [Collapse All](#)

| Findings | Impact (%) | Additional Information |
|--|------------|--|
| Hard parsing SQL statements that encountered parse errors was consuming significant database time. | 30 | |
| Hard parsing of SQL statements was consuming significant database time. | 41.2 | |
| Contention for latches related to the shared pool was consuming significant database time. | 6.5 | Additional Information |
| Wait class "Concurrency" was consuming significant database time. | 6.5 | |

[Database](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

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[About Oracle Enterprise Manager](#)

Additional Information

Waits for "library cache lock" amounted to 6% of database time.

Done

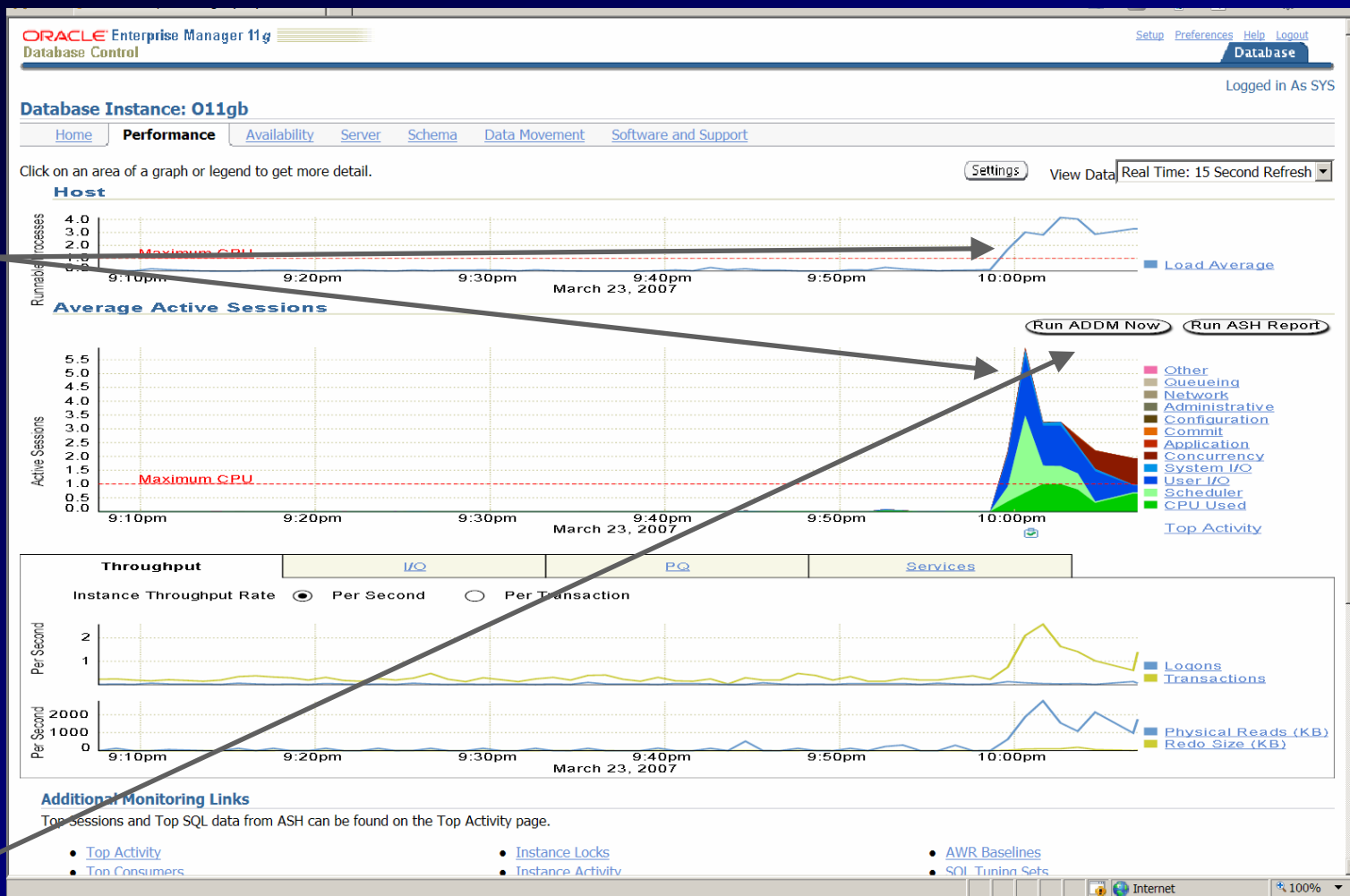
Internet 100%



ADDM - Run NOW!

A Big Problem Occurs

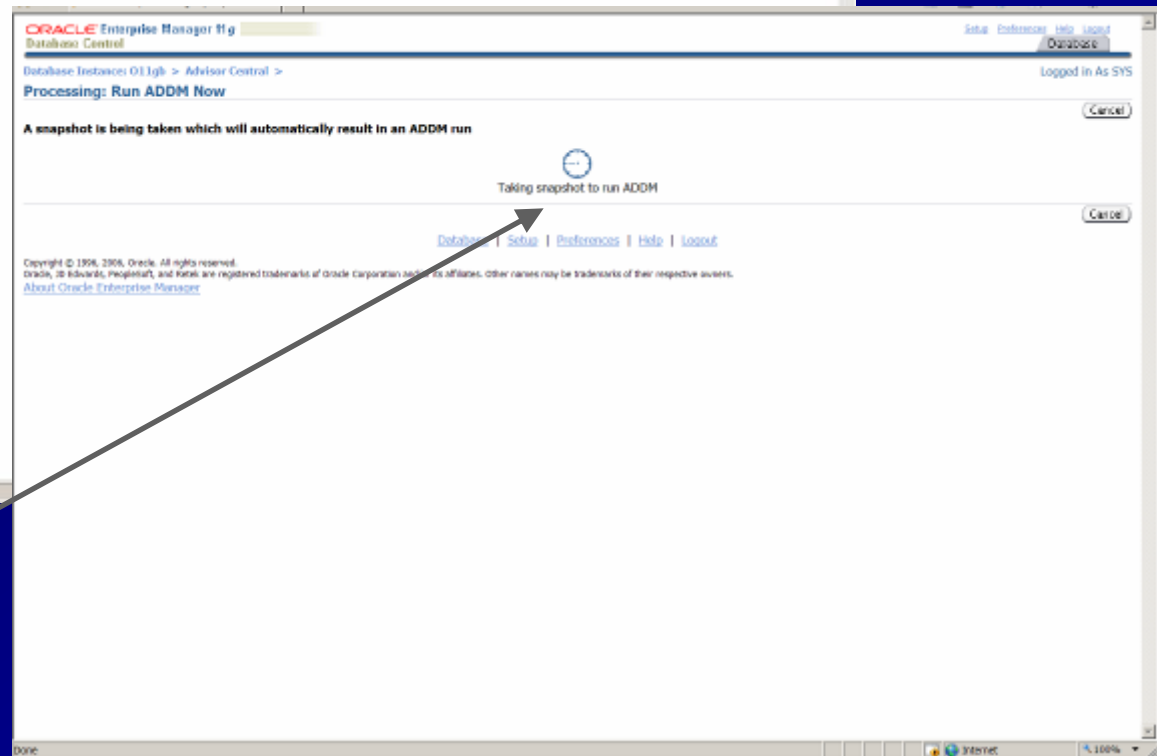
Run ADDM NOW!





ADDM - Run NOW!

Are you
Sure?



Running



ADDM – Run NOW!

ORACLE Enterprise Manager 11g
Database Control

Database Instance: O11gb > Advisor Central > Logged in As SYS

Confirmation
ADDM has been run successfully

Automatic Database Diagnostic Monitor (ADDM) Page Refreshed Mar 23, 2007 10:11:03 PM CDT Refresh

Database Activity Run ADDM Finding History

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

Zoom

☒ For an explanation of the icons and symbols used in this page, see the [Icon Key](#)

ADDM Performance Analysis

Task Name: **ADDM:1471326733_1_154 (End Time: Mar 23, 2007 10:08:55 PM)** Time Range: Mar 23, 2007 9:50:01 PM to Mar 23, 2007 10:22:01 PM

Filters View Snapshots View Report

Task Owner: **SYS** Average Active Sessions: 3.5 Period Start Time: Mar 23, 2007 10:00:46 PM CDT Duration: 8.2 (minutes)

| Impact (%) | Finding | Occurrences (last 24 hrs) |
|------------|---|---------------------------|
| 100 | CPU Usage | 1 of 25 |
| 36.9 | Top SQL by DB Time | 3 of 25 |
| 25.6 | Hard Parse Due to Parse Errors | 3 of 25 |
| 22.9 | "User I/O" wait Class | 3 of 25 |
| 18.9 | PL/SQL Execution | 2 of 25 |
| 15.3 | "Scheduler" Wait Class | 3 of 25 |
| 8.6 | Hard Parse Due to Invalidations | 2 of 25 |
| 7.4 | Top Segments by I/O | 2 of 25 |

Done.

CPU Issue



ADDM – Run NOW!

Detail
on CPU
Issue?

Suggested
Fixes

ORACLE Enterprise Manager 11g
Database Control

Database Instance: O11gb > Advisor Central > Automatic Database Diagnostic Monitor (ADDM):SYS.ADDM:1471326733_1_154 > Logged in As SYS

Performance Finding Details: CPU Usage

Finding **Host CPU was a bottleneck and the instance was consuming 80% of the host CPU. All wait times will be inflated by wait for CPU.** [Finding History](#)

Impact (Active Sessions) **3.52**
Impact (%) **100**
Period Start Time **Mar 23, 2007 10:00:46 PM CDT**
Period Duration (minutes) **8.2**
Filtered **No** [Filters](#)

Recommendations

[Show All Details](#) | [Hide All Details](#)

| Details | Category | Benefit (%) |
|----------------------|--|-------------|
| Hide | Host Configuration | 100 |
| Action | Consider adding more CPUs to the host or adding instances serving the database on other hosts. | |
| Action | Session CPU consumption was throttled by the Oracle Resource Manager. Consider revising the resource plan that was active during the analysis period. | |
| Show | SQL Tuning | 27.8 |
| Show | Application Analysis | 4 |

Additional Information

Host CPU consumption was 86%. CPU runqueue statistics are not available from the host's OS. This disables ADDM's ability to estimate the impact of this finding.

Findings Path

[Expand All](#) | [Collapse All](#)

| Findings | Impact (%) | Additional Information |
|---|------------|--|
| Hide Host CPU was a bottleneck and the instance was consuming 80% of the host CPU. All wait times will be inflated by wait for CPU. | 100 | Additional Information |

[Database](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

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[About Oracle Enterprise Manager](#)



ADDM – Run NOW!

View
The
Report

ORACLE Enterprise Manager 11g
Database Control

Database Instance: O11gb > Advisor Central > Automatic Database Diagnostic Monitor (ADDM):SYS.ADDM:1471326733_1_154 >

Logged in As SYS

View Report Save to File

ADDM Report for Task 'ADDM:1471326733_1_154'

Analysis Period

AMR snapshot range from 153 to 154.
Time period starts at 23-MAR-07 10.00.46 PM
Time period ends at 23-MAR-07 10.08.55 PM

Analysis Target

Database 'O11GB' with DB ID 1471326733.
Database version 11.1.0.3.0.
ADDM performed an analysis of instance O11gb, numbered 1 and hosted at
orallg [REDACTED]

Activity During the Analysis Period

Total database time was 1721 seconds.
The average number of active sessions was 3.52.

Summary of Findings

| Description | Active Sessions Percent of Activity | Recommendations |
|-----------------------------------|--|-----------------|
| 1 CPU Usage | 3.52 100 | 3 |
| 2 Top SQL by DB Time | 1.3 36.86 | 2 |
| 3 Hard Parse Due to Parse Errors | .9 25.56 | 1 |
| 4 "User I/O" wait Class | .81 22.89 | 0 |
| 5 PL/SQL Execution | .66 18.87 | 2 |
| 6 "Scheduler" Wait Class | .54 15.28 | 0 |
| 7 Hard Parse Due to Invalidations | .3 8.6 | 1 |
| 8 Top Segments by I/O | .26 7.44 | 1 |
| 9 Undersized instance memory | .18 5 | 1 |

Findings and Recommendations

Done

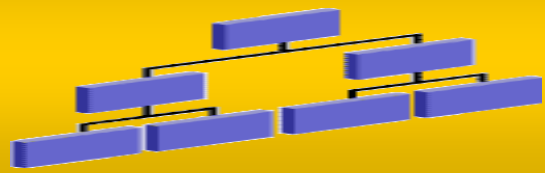


ADDM for RAC

Database-Level
ADDM
11g



Self-Diagnostic Engine



Instance-Level
ADDM



Inst 1

Inst 2

Inst 3



- Performance expert in a box
 - Now RAC specialist too!
- Identifies the most “Globally Significant” performance issues for the entire RAC database
- Database-wide and instance-level analysis
- Database-wide analysis of:
 - Global cache interconnect issues
 - Lock manager congestion issues
 - Global resource contention, e.g. IO bandwidth, hot blocks
 - Globally high-load SQL
 - Skew in instance response times
- Allows drill down to instances
- **Runs proactively** every hour when taking AWR Snapshots (default)



ADDM Considerations:

- CPU Bottlenecks
- Undersized Memory Structures – SGA / PGA
- I/O Capacity Issues
- High Load SQL statements
- High Load PL/SQL
- RAC specific issues – Global hot block/interconnect
- Application issues such as parsing, locks...etc.
- Concurrency (buffer busy) or hot object issues
- Configuration issues – Redo Archive



SQL Tuning Advisors & SQL Plan Management (**SPM**)





SQL Plan Management

- **SQL Plan Management** is a mechanism that records/evaluates execution plan of SQL statements (good & bad) over time and builds SQL Plan baselines (replaces stored outlines) of existing plans known to be efficient.
- Events that cause the need for SQL Plan baselines:
 - New version of Oracle (New optimizer version – Use capture replay to test effect)
 - Changes to optimizer statistics or data changes
 - Schema, application or metadata changes (use SQL Advisor to get suggestions)
 - System settings changes (Use SQL Replay to find what works)
 - SQL Profile (statistics – data skews & correlated columns) creation
- **Stored outlines are deprecated (discouraged) in Oracle Database 11g.** Oracle highly recommends migrating existing stored outlines to SQL plan baselines. A **SQL Profile contains additional STATISTICS** for this SQL statement for the query optimizer to generate a better execution plan. **An outline/baseline contains 30 HINTS** for this SQL statement for query optimizer to generate a



SQL Plan Management

- **SQL Profile stores STATISTICS** for a SQL statement for the query optimizer to generate a better execution plan.
- **A Stored Outline/SQL Plan Baseline contains HINTS** for this SQL statement for query optimizer to generate a better execution plan.
- A SQL Plan Baseline should evolve with changes in the system to analyze good/bad plans over time.
- View these in `DBA_PLAN_BASELINES`
- You can also export a SQL Tuning Set and import it to new system. **Capture baselines for Tuning Set with DBMS_SPM** (see later slide on entire syntax). Can also use a `pack/unpack` function to pack/unpack all plans in a system for transporting.

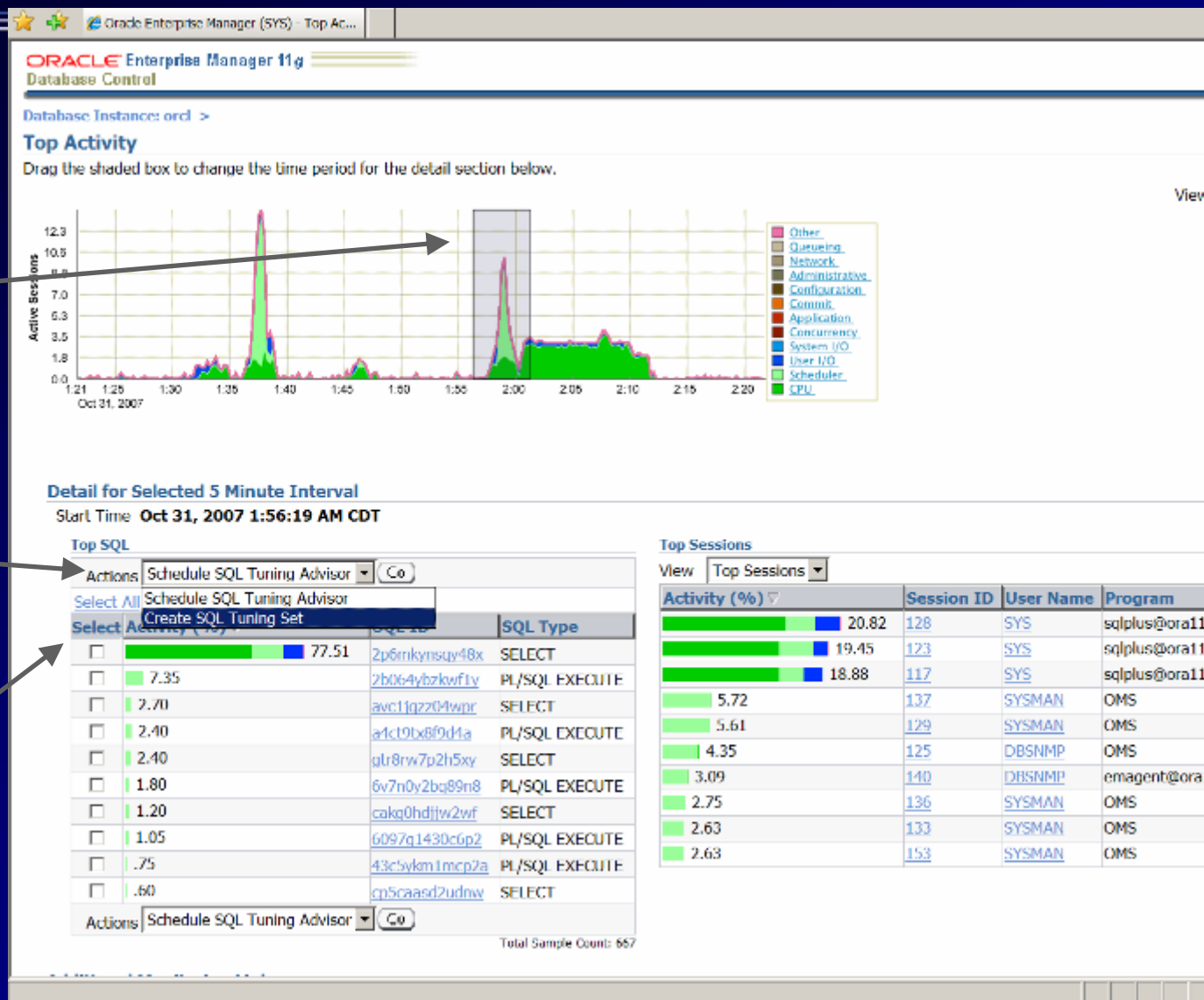


SQL Plan Management

Create a SQL Tuning Set

Tuning
Issue

Create a
Tuning
Set from
Top 10
SQL





SQL Plan Management

Create a SQL Tuning Set

Tuning
Set Name

Queries

Oracle Enterprise Manager (SYS) - SQL Tu...

ORACLE Enterprise Manager 11g
Database Control

Database Instance: orcl > SQL Tuning Sets >
Create SQL Tuning Set

Cancel OK

* Name: TOP_SQL_1193815473707
Description: Automatically generated by Top SQL

| SQL Text | Parsing Schema |
|---|----------------|
| SELECT de.owner ' ' de.segment_name segment_name, de.segment_type segment_type, de.extent_id extent#, bh.dbablk - de.block_id + 1 block#, bh.lru_flag, ... | SYS |
| BEGIN EMD_NOTIFICATION.QUEUE_READY(:1, :2, :3); END; | SYSMAN |
| SELECT 'x' FROM DUAL | SYSMAN |
| begin execute immediate 'alter session set NLS_NUMERIC_CHARACTERS = ".,"; end; | SYSMAN |
| SELECT event#, sql_id, sql_plan_hash_value, sql_opcode, session_id, session_serial#, module, action, client_id, DECODE(wait_time, 0, 'W', 'C'), 1, time_waited, service_hash, user_id, program, sample_t... | DBSNMP |
| BEGIN EMDW_LOG.set_context(MGMT_JOB_ENGINE.MODULE_NAME, :1); MGMT_JOB_ENGINE.get_scheduled_steps(:2, :3, :4, :5); EMDW_LOG.set_context; END; | SYSMAN |
| select value from v\$sysmetric where group_id = 2 and metric_id = :1 | DBSNMP |
| BEGIN MGMT_PAF_AQ.DEQUEUE_REQUEST(p_node_id => :1, p_wait => :2, x_xml_data => :3, x_request_id => :4, x_timestamp => :5, x_return_status => :6); END; | SYSMAN |
| begin dbms_application_info.set_module(:1, :2); dbms_application_info.set_client_info(:3); dbms_session.set_identifier(:4); end; | SYSMAN |
| /* OracleOEM */ SELECT TO_CHAR(CAST(md.end_time AS TIMESTAMP) AT TIME ZONE 'GMT', 'YYYY-MM-DD HH24:MI:SS TZD') time, md.user_wait_time_pct, ... | DBSNMP |

Previous 1-10 of 10 Next

Cancel OK

Database | Setup | Preferences | Help | Logout

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https://ora11gprodtest2.tuscl.com:1158/em/console/logon/logoff?event=load



SQL Plan Management

Viewing a SQL Tuning Set

Tuning
Set Name

Queries
& Stats

Oracle Enterprise Manager 11g
Database Control

Database Instance: orcl > SQL Tuning Sets >
SQL Tuning Set: TOP_SQL_1193815473707

Schema: SYS
Created: 10/31/07 2:25 AM
Number of Statements: 10

Description: Automatically generated by Top SQL
Last Modified: 10/31/07 2:25 AM
Total DB Time (H:M:S): 0:46:33

SQL Statements

[Delete](#) [Schedule SQL Advisor](#) [Search for SQL within tuning set](#) [Add More SQL](#)

| Select | SQL ID | SQL Text | Plan Hash Value | Parsing Schema | Executions | Elapsed Time (seconds) | CPU Time (seconds) | Buffer Gets | Disk Reads | Module |
|-------------------------------------|-----------------|--|-----------------|----------------|------------|------------------------|--------------------|-------------|------------|--------------------------|
| <input type="checkbox"/> | 5c9aasd2udjrw | /* OracleOEM */ SELECT TO_CHAR(CAST (md.end_time AS ... | 3838994914 | DBSNMP | 252 | 12.24 | 9.97 | 12 | 1.00 | emagent@orcl (TNS V1-V3) |
| <input checked="" type="checkbox"/> | qtr8rw7p2h5xy | SELECT sql_id, sql_plan_hash_value, sql_text, sql_text ... | 3098115615 | DBSNMP | 260 | 18.03 | 2.78 | 119 | 7.00 | Realtime Connection |
| <input checked="" type="checkbox"/> | colkr0hdi1w2vrf | select value from v\$sysmetric where group_id = 2 and m... | 1716221123 | DBSNMP | 247 | 47.82 | 4.19 | 4 | 0.00 | Realtime Connection |
| <input checked="" type="checkbox"/> | 2p6mkynsqv48x | SELECT de.owner '.' de.segment_name segment_name, ... | 1668994723 | SYS | 18 | 2298.80 | 784.59 | 9948946 | 1159982.00 | sqlplus@orcl (TNS V1-V3) |
| <input checked="" type="checkbox"/> | awc1jazzMwpr | SELECT 'x' FROM DUAL | 1388734953 | SYSMAN | 4668 | 33.95 | 2.51 | 0 | 0.00 | OMS |
| <input checked="" type="checkbox"/> | 2b064v0zkvfly | BEGIN EMD_NOTIFICATION.QUEUE_READY(:1, :2, :3); END; | 0 | SYSMAN | 1659 | 135.19 | 9.78 | 51685 | 57.00 | OEM.SystemPool |
| <input checked="" type="checkbox"/> | 43c5ykm1mcp2a | begin dbms_application_info.set_module (:1, :2); dbms_applica... | 0 | SYSMAN | 5239 | 11.70 | 4.76 | 336 | 26.00 | OMS |
| <input checked="" type="checkbox"/> | 6097q1430c6p2 | BEGIN MGMT_PAF_AQ.DEQUEUE_REQUEST (a_node_id => :1, p_wait =... | 0 | SYSMAN | 3328 | 53.77 | 15.39 | 30876 | 25.00 | OEM.SystemPool |
| <input checked="" type="checkbox"/> | 6v7n0y2bq89n8 | BEGIN EMDW_LOG.set_context (MGMT_JOB_ENGINE.MODULE_NAME, :1);... | 0 | SYSMAN | 39648 | 181.89 | 153.30 | 369828 | 336.00 | OEM.SystemPool |
| <input checked="" type="checkbox"/> | a4ct9b8f9d4a | begin execute immediate 'alter session set NLS_NUMERIC_CHARA... | 0 | SYSMAN | 4668 | 5.45 | 5.29 | 0 | 0.00 | OMS |

[Delete](#)

Database | Setup | Preferences | Help | Logout

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SQL Plan Management

Create a SQL Tuning Set

Run the
Tuning
Advisor
on this
SQL
Tuning
Set (STS)

Run it
NOW

The screenshot shows the Oracle Enterprise Manager 11g Database Control interface. The breadcrumb navigation is: Database Instances: orcl > Advisor Central > SQL Advisors > Schedule SQL Tuning Advisor. The page is titled "Schedule SQL Tuning Advisor" and shows the parameters for scheduling a job to run the SQL Tuning Advisor.

Specify the following parameters to schedule a job to run the SQL Tuning Advisor.

- Name: **SQL_TUNING_1193815570422**
- Description: **rjn_test**
- SQL Tuning Set: **SYS.TOP_SQL_1193815473707**

SQL Tuning Set Description: **Automatically generated by Top SQL**
SQL Statements Counts: **10**

SQL Statements

Scope

Total Time Limit (minutes): **30**

Scope of Analysis: ☐ Limited
The analysis is done without SQL Profile recommendation and takes about 1 second per statement.

☒ **Comprehensive**
This analysis includes SQL Profile recommendation, but may take a long time.

Time Limit per Statement (minutes): **5**

Schedule

Time Zone: **America/Chicago**

☒ **Immediately**

☐ Later

Date: **Oct 31, 2007**
(example: Oct 31, 2007)

Time: **2:26:10** ☒ AM ☐ PM

Buttons: Cancel Submit

Database | Setup | Preferences | Help | Logout

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[About Oracle Enterprise Manager](#)



SQL Plan Management

Create a SQL Tuning Set

Results

Select
One query
And click
View

Oracle Enterprise Manager (SYS) - SQL Tu...

ORACLE Enterprise Manager 11g
Database Control

Database Instance: orcl > Advisor Central >
SQL Tuning Results:SQL_TUNING_1193815570422

Page Refreshed Oct 31, 2007 2:27:55 AM CDT [Refresh]

Status **COMPLETED**
Started Oct 31, 2007 2:26:32 AM
Completed Oct 31, 2007 2:27:43 AM

Tuning Set Owner **SYS**
Tuning Set Name **TOP_SQL_1193815473707**
Time Limit (seconds) **1800**
Running Time (seconds) **71**

Recommendations

View Implement All Profiles

| Select | SQL Text | Parsing Schema | SQL ID | Statistics | SQL Profile | Index | Restructure SQL | Miscellaneous | Error |
|----------------------------------|---|----------------|-------------------------------|------------|-------------|-------|-----------------|---------------|-------|
| <input checked="" type="radio"/> | SELECT de.owner '.' de.segment_name segment_name, de.segment_type segment_type, ... | SYS | 2p6mkynsqy48x | ✓ | ✓ | | | ✓ | |
| <input type="radio"/> | BEGIN EMDW_LOG.set_context(MGMT_JOB_ENGINE.MODULE_NAME, :1); MGMT_JOB_ENGINE.get_scheduled_steps(:2,... | SYSMAN | 6v7n0y2bq89n8 | | | | | ✓ | |
| <input type="radio"/> | BEGIN EMD_NOTIFICATION.QUEUE_READY(:1, :2, :3); END; | SYSMAN | 2b064ybzkwf1y | | | | | ✓ | |
| <input type="radio"/> | BEGIN MGMT_PAF_AQ.DEQUEUE_REQUEST(p_node_id => :1 , p_wait => :2 , x_xml_data => :3, x_request_id => ... | SYSMAN | 6097q1430c6p2 | | | | | ✓ | |
| <input type="radio"/> | select value from v\$sysmetric where group_id = 2 and metric_id = :1 | DBSNMP | cakq0hdjw2wf | | | | | | |
| <input type="radio"/> | SELECT 'x' FROM DUAL | SYSMAN | avc1jqz04wpr | | | | | | |
| <input type="radio"/> | SELECT event#, sql_id, sql_plan_hash_value, sql_opcode, session_id, session_serial#, module, action,... | DBSNMP | qtr8rw7p2h5xy | | | | | ✓ | |
| <input type="radio"/> | /* OracleOEM */ SELECT TO_CHAR(CAST(md.end_time AS TIMESTAMP) AT TIME ZONE 'GMT', ... | DBSNMP | cp5caasd2udnw | | | | | | |
| <input type="radio"/> | begin dbms_application_info.set_module(:1, :2); dbms_application_info.set_client_info(:3); dbms_sess... | SYSMAN | 43c5ykm1mcp2a | | | | | ✓ | |
| <input type="radio"/> | begin execute immediate 'alter session set NLS_NUMERIC_CHARACTERS = ",,"; end; | SYSMAN | a4ct9xb8f9d4a | | | | | ✓ | |

View Implement All Profiles

Database | Setup | Preferences | Help | Logout

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[About Oracle Enterprise Manager](#)

Internet 100%

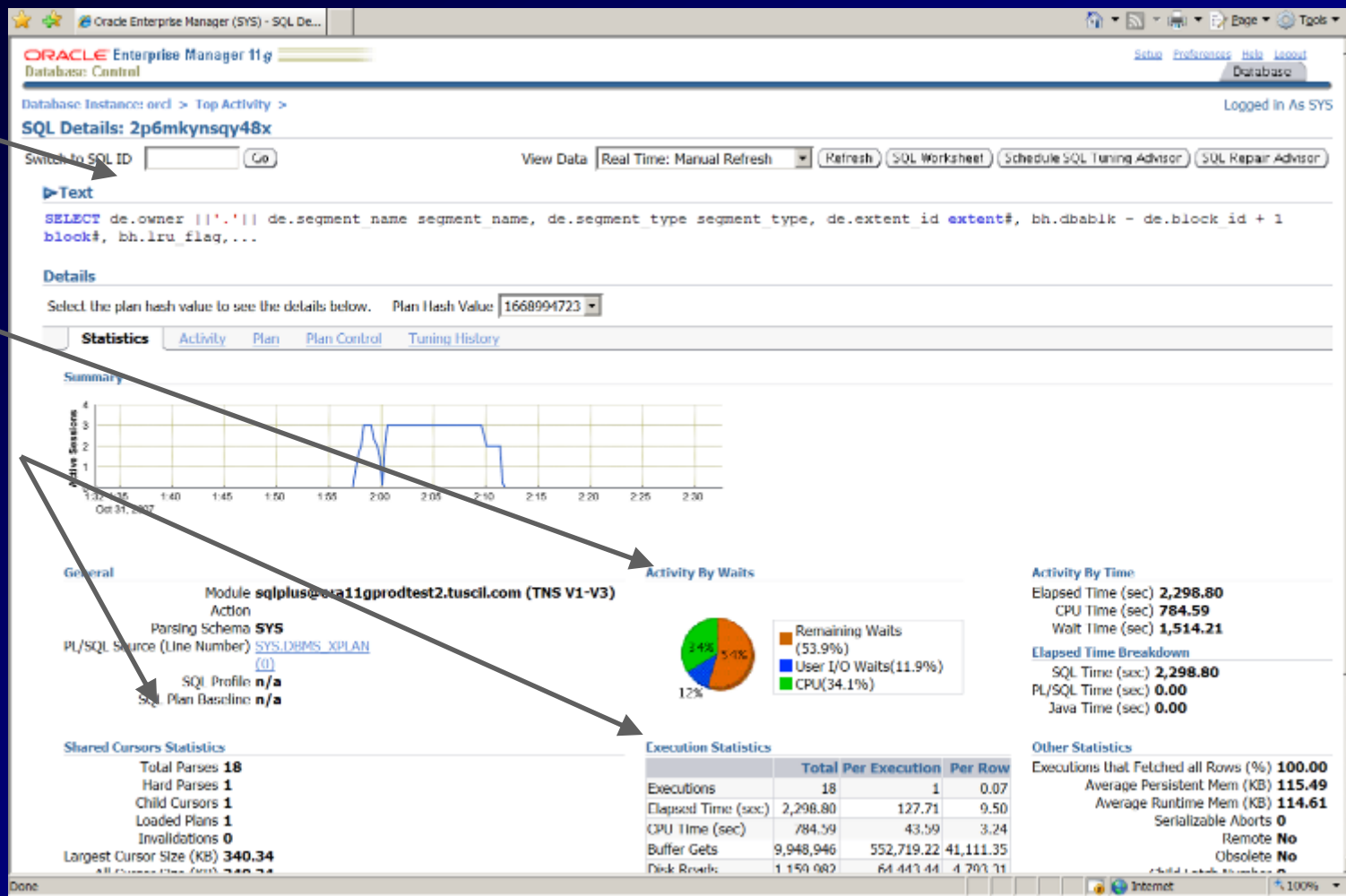


SQL Plan Management

Click on any SQL ID

SQL
Text

Waits
&
Statistics





SQL Plan Management

Create a SQL Tuning Set

SQL
Profile
Will
Help 99%

Oracle Enterprise Manager (SYS) - Recom...

ORACLE Enterprise Manager 11g
Database Control

Database Instances: orcl > Advisor Central > SQL Tuning Results: TASK_179 > Logged in As SYS

Recommendations for SQL ID: 1gf8p004gdjcq

Only one recommendation should be implemented.

SQL Text
SELECT /*+ ordered */ de.owner || '.' || de.segment_name segment_name, de.segment_type segment_type, de.extent_id extent_id, de.block_id - de.block_id + 1 block_id, ...

Select Recommendation
(Original Explain Plan (Annotated))

(Implement)

| Select Type | Findings | Recommendations | Rationale | Benefit New Explain (%) Plan | Compare Explain Plans |
|--|---|--|--|------------------------------|-----------------------|
| <input type="radio"/> Statistics | Optimizer statistics for table "SYS"."LOBFRAG\$" and its indices are stale. | Consider collecting optimizer statistics for this table. | The optimizer requires up to date statistics for the table in order to select a good execution plan. | | |
| <input type="radio"/> Statistics | Optimizer statistics for table "SYS"."UET\$" and its indices are stale. | Consider collecting optimizer statistics for this table. | The optimizer requires up to date statistics for the table in order to select a good execution plan. | | |
| <input checked="" type="radio"/> SQL Profile | A potentially better execution plan was found for this statement. | Consider accepting the recommended SQL profile. | | 99.79 | 100 |

Database | Setup | Preferences | Help | Logout

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SQL Plan Management

Create a SQL Tuning Set

Compare
Before
&
After

Oracle Enterprise Manager (SYS) - Explain ...

Database Instance: orcl > Advisor Central > SQL Tuning Results: TASK_179 > Recommendations for SQL ID: 1gf8p004gdjcq > Logged in As SYS

Compare Explain Plans

Original Explain Plan (Annotated)

Indicates an adjustment from the original plan by the SQL Tuning Advisor
Plan Hash Value **2347322369**

[Expand All](#) | [Collapse All](#)

| Operation | Line ID | Object | Object Type | Order | Rows | Bytes | Cost | Time | CPU Cost | I/O Cost |
|------------------|---------|------------------------|---------------|-------|---------|-------|---------|--------|--------------------|----------|
| SELECT STATEMENT | 0 | | | 121 | | 0.270 | 983,655 | 11,804 | 12,350,714,281,984 | 168,630 |
| SORT ORDER BY | 1 | | | 120 | | 0.270 | 983,655 | 11,804 | 12,350,714,281,984 | 168,630 |
| NESTED LOOPS | 2 | | | 119 | | 0.270 | 983,654 | 11,804 | 12,350,698,553,344 | 168,630 |
| HASH JOIN | 3 | | | 7 | | 1.708 | 1 | 1 | 8,647,788 | 0 |
| NESTED LOOPS | 4 | | | 5 | | 0.176 | 0 | 1 | 710,600 | 0 |
| VIEW | 5 | | | 3 | | 0.013 | 0 | 1 | 355,300 | 0 |
| SORT AGGREGATE | 6 | | | 2 | | 0.059 | | | | |
| FIXED TABLE FULL | 7 | SYS.X\$KSLLTR_CHILDREN | TABLE (FIXED) | 1 | 120,000 | 0 | 1 | 1 | 355,300 | 0 |
| FIXED TABLE FULL | 8 | SYS.X\$KSLLTR_CHILDREN | TABLE (FIXED) | 4 | 7,670 | 0 | 1 | 1 | 355,300 | 0 |
| FIXED TABLE FULL | 9 | SYS.X\$BH | TABLE (FIXED) | 6 | 6,738 | 0 | 1 | 1 | 350,000 | 0 |
| VIEW | 10 | SYS.DBA_EXTENTS | VIEW | 118 | | 0.114 | 89,423 | 1,074 | 1,122,790,014,976 | 15,330 |

New Explain Plan With SQL Profile

Plan Hash Value **2138758942**

[Expand All](#) | [Collapse All](#)

| Operation | Line ID | Object | Object Type | Order | Rows | Bytes | Cost | Time | CPU Cost | I/O Cost |
|------------------|---------|------------------------|---------------|-------|---------|--------|-------|------|-------------|----------|
| SELECT STATEMENT | 0 | | | 124 | | 0.262 | 1,972 | 24 | 702,635,712 | 1,926 |
| SORT ORDER BY | 1 | | | 123 | | 0.262 | 1,972 | 24 | 702,635,712 | 1,926 |
| HASH JOIN | 2 | | | 122 | | 0.262 | 1,971 | 24 | 687,481,920 | 1,926 |
| HASH JOIN | 3 | | | 7 | | 1.568 | 1 | 1 | 8,647,788 | 0 |
| NESTED LOOPS | 4 | | | 5 | | 0.176 | 0 | 1 | 710,600 | 0 |
| VIEW | 5 | | | 3 | | 0.013 | 0 | 1 | 355,300 | 0 |
| SORT AGGREGATE | 6 | | | 2 | | 0.059 | | | | |
| FIXED TABLE FULL | 7 | SYS.X\$KSLLTR_CHILDREN | TABLE (FIXED) | 1 | 120,000 | 0 | 1 | 1 | 355,300 | 0 |
| FIXED TABLE FULL | 8 | SYS.X\$KSLLTR_CHILDREN | TABLE (FIXED) | 4 | 7,670 | 0 | 1 | 1 | 355,300 | 0 |
| FIXED TABLE FULL | 9 | SYS.X\$BH | TABLE (FIXED) | 6 | 5,469 | 0 | 1 | 1 | 350,000 | 0 |
| VIEW | 10 | SYS.DBA_EXTENTS | VIEW | 121 | | 18.229 | 1,970 | 24 | 671,240,320 | 1,926 |
| UNION-ALL | 11 | | | 120 | | | | | | |
| NESTED LOOPS | 12 | | | 72 | | 0.222 | 235 | 3 | 14,023,343 | 234 |



SQL Plan Control

SQL Profiles stored in the system

SQL
Profiles

SQL
Plan
Baselines

Oracle Enterprise Manager 11g
Database Control

Database Instances: orcl >

SQL Plan Control

[SQL Profile](#) [SQL Patch](#) [SQL Plan Baseline](#)

Refresh

A SQL Profile contains additional information(auxiliary statistics) that aids the optimizer to select the optimal execution plan of a particular SQL statement.

Search

SQL Text Go

By default, the search returns all uppercase matches beginning with the string you entered. To run an exact or case-sensitive match, double quote the search string. You can use the wildcard symbol (%) in a double quoted string.

Unpack

Enable Disable Drop Change Category Pack

Select All Select None

| Select Name | SQL Text | Category | Status | Created | Last Modified |
|---|--|----------|---------|-------------------------|-------------------------|
| <input type="checkbox"/> SYS_SQLPROF_01457d34c0854000 | SELECT /*+ ordered */ de.owner '.' ... | DEFAULT | ENABLED | Oct 31, 2007 1:50:10 AM | Oct 31, 2007 1:50:10 AM |

TIP The table will display maximum of 2000 rows. Use search criteria to get the desired results.

[SQL Profile](#) [SQL Patch](#) [SQL Plan Baseline](#)

Database | Setup | Preferences | Help | Logout

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[About Oracle Enterprise Manager](#)



SQL Advisors

Tuning
Advisors

Repair
Advisor
(next)

A screenshot of the Oracle Enterprise Manager 11g web interface. The browser window title is 'Oracle Enterprise Manager (SYS) - SQL Ad...'. The page header shows 'ORACLE Enterprise Manager 11g' and 'Database Control'. The breadcrumb trail is 'Database Instances: orcl > Advisor Central >'. The page is titled 'SQL Advisors' and includes a description: 'The SQL Advisors address several important use cases having to do with SQL: identify physical structures optimizing a SQL workload, tune individual statements with heavy execution plans, identify and correct result set divergence, build test cases for failed SQL.' There are three main sections: 'SQL Access Advisor' (with a link to 'SQL Access Advisor'), 'SQL Tuning Advisor' (with links to 'SQL Tuning Advisor' and 'Automatic SQL Tuning Results'), and 'SQL Repair Advisor' (with a description: 'The SQL Repair Advisor can analyze and potentially patch failing SQL statements.'). Under 'SQL Repair Advisor', there are two sub-sections: 'SQL Incident Analysis' (with a link to 'Click here to go to Support Workbench.') and 'SQL Failure Analysis' (with a link to 'Click here to go to SQL Worksheet.'). The footer includes 'Copyright © 1996, 2007, Oracle. All rights reserved.' and 'About Oracle Enterprise Manager'. The browser status bar shows 'Done' and 'Internet'.



The SQL Repair Advisor



ORA-600



SQL Repair Advisor

- Used to Repair Problem SQL – Oracle Errors
- Reloads and recompiles SQL statements to gather diagnostics information to fix.
- Uses the diagnostic information to repair the problem SQL statement (**DBMS_SQLDIAG**)
- **Will fix error going through compilation, execution and trying different routes (could be a slower route for now) to come up with a temporary SQL Patch without error until fixed.**



SQL Repair Advisor – Go straight from Alerts

Go to the
Database
Instance

Click Alert
(ORA-600)
message
text to see
details

ORACLE Enterprise Manager 11g
Database Control

Database

Logged in As SYS

Database Instance: database

Home Performance Availability Server Schema Data Movement Software and Support

Latest Data Collected From Target Apr 9, 2007 1:46:42 PM PDT Refresh View Data Automatically (60 sec)

General Shutdown Black Out

Status Up
Up Since Mar 26, 2007 9:53:59 AM PDT
Instance Name demosa
Version 11.1.0.4.0
Host [REDACTED]
Listener [REDACTED]

[View All Properties](#)

Host CPU

Load 5.04 Paging 0.11

Active Sessions

Maximum CPU 2

SQL Response Time

SQL Response Time (%) 101.04

[Edit Reference Collection](#)

Diagnostic Summary

ADDM Findings 4
Period Start Time Apr 9, 2007 12:00:51 PM PDT
Alert Log No ORA-errors
Active Incidents 0

[Database Instance Health](#)

Space Summary

Database Size (GB) 1.405
Problem Tablespace 0
Segment Advisor Recommendations 0
Policy Violations 6
Dump Area Used (%) 55

High Availability

Instance Recovery Time (sec) 19
Last Backup n/a
Flashback Database Logging Disabled

Alerts

Category All Go Critical 2 Warning 1

| Severity | Category | Name | Impact | Message | Alert Triggered |
|----------|----------|------------------------|---------------------------------|--|-------------------------|
| × | Incident | Out of Memory | POSSIBLE INSTANCE FAILURE | Out of memory detected in /ade/hsu_demosa/oracle/log/diag/rdbms/demosa/demosa/alert/log.xml at time/line number: Wed Mar 28 17:07:48 2007/75917. | Mar 28, 2007 5:09:41 PM |
| × | Incident | Generic Internal Error | | Internal error (ORA-600[dbgxtvHTTbParse:1]) detected in /ade/hsu_demosa/oracle/log/diag/rdbms/demosa/demosa/alert/log.xml at time/line number: Mon Mar 26 14:49:55 2007/62426. | Mar 26, 2007 2:54:41 PM |
| ! | Response | User Logon Time (msec) | | User logon time is 1485.76 msec. | Apr 9, 2007 12:36:35 PM |



SQL Repair Advisor – View Problem Details

Click on
View
Problem
Details to
go to the
Support
Bench

ORACLE Enterprise Manager 11g Database Control

Database Instance: database > All Metrics > Generic Internal Error >
Incident - Generic Internal Error: Within 31 Days

Last Updated Mar 26, 2007 2:54:41 PM PDT
View Data Within 31 Days

Problem Summary

| Problem Information | | Incident Information | |
|--------------------------------------|-------------------------------|--|-------------------------------|
| Problem Key | ORA 600 [dbgxtvHTTbParse:1] | Timestamp | March 26, 2007 2:49:55 PM PDT |
| SR# | n/a | Impact | n/a |
| Bug# | n/a | Recommended Actions | |
| Last Incident | March 26, 2007 2:49:55 PM PDT | View Problem Details View All Problems | |
| Number of Incidents (Within 31 Days) | 1 | | |

Performance and Critical Error

● other
● ORA 600 [dbgxtvHTTbParse:1]
● system_performance

Alert Details

Metric **Generic Internal Error**
Time/Line Number **Mon Mar 26 14:49:55 2007/62426**
Severity **Critical**
Timestamp **Mar 26, 2007 2:54:41 PM**
Administrator **<SYSTEM>**



Support Workbench - Details

Database Instance: database > Support Workbench >
Problem Details: ORA 600 [13011]

Logged in As SYSTEM

Page Refreshed March 20, 2007 9:05:15 PM PDT [Refresh](#)

Summary

SR# -- [Edit](#)
Bug# -- [Edit](#)
Active **Yes**
Packaged **No**
Number of Incidents **1**

Last Incident

Timestamp [March 20, 2007 8:18:05 PM PDT](#)
Incident Source **System Generated**
Impact
Checkers Run **0**
Checker Findings **0**

Investigate and Resolve

[Go to Metalink](#) [Quick Package](#)

Self Service

[Oracle Support](#)

Assess Damage

[Run Checkers](#)
[Database Instance Health](#)

Diagnose

[Alert Log](#)
[Related Problems Across Topology](#)
[Diagnostic Dumps for Last Incident](#)
[Go to Metalink and Research](#)

Resolve

[SQL Repair Advisor](#)

[Incidents](#)

[Activity Log](#)

Click on
SQL
Repair
Advisor



Results from SQL Repair Advisor

SQL Repair Results: [SQL_DIAG_1174506262358](#)

Page Refreshed **Mar 21, 2007 12:45:50 PM PDT** [Refresh](#)

Status **COMPLETED**
SQL ID **9m7mvytc4d14**
Time Limit (seconds) **1800**

Started **Mar 21, 2007 12:45:28 PM PDT**
Completed **Mar 21, 2007 12:45:46 PM PDT**
Running Time (seconds) **18**

Recommendations

[View](#)

| Select | SQL Text | Parsing Schema | SQL ID | SQL Patch |
|----------------------------------|---|----------------|--------------|-----------|
| <input checked="" type="radio"/> | delete from t t1 where t1.a = 'a' and rowid <> (select max(rowid) from t t2 where t1.a= t2.a and t1.... | | 9m7mvytc4d14 | ✓ |

Click on
View to
Get the
Detail
finding of
the Advisor

Note a SQL
Patch (FIX for
the SQL) has
been generated



SQL Repair Advisor

Recommendation / Confirmation

Click on
Implement
To accept
the SQL
Patch

Repair Recommendations for SQL ID: 9m7mvytc4d14

[Return](#)

Page Refreshed Mar 21, 2007 12:48:42 PM PDT

Select the desired recommendation and then click on the Implement button to apply the SQL patch, which is a special type of SQL Profile that will repair the SQL statement.

SQL Text

[delete from t t1 where t1.a = 'a' and rowid <> \(select max\(rowid\) from t t2 where t1.a = t2.a and t1.b = t2.b and t1.d=t2.d\)](#)

Findings and Recommendations

SQL Repair Results: SQL_DIAG_1174506262358

Confirmation

The recommended SQL Patch was implemented successfully. Verify results by executing SQL in SQL Worksheet.

[Verify using SQL Worksheet](#)

Page Refreshed Mar 21, 2007 12:52:29 PM PDT

[Refresh](#)

Status **COMPLETED**
SQL ID **9m7mvytc4d14**
Time Limit (seconds) **1800**

Started **Mar 21, 2007 12:45:28 PM PDT**
Completed **Mar 21, 2007 12:45:46 PM PDT**
Running Time (seconds) **18**

Recommendations

[View](#)

| Select | SQL Text | Parsing Schema | SQL ID | SQL Patch |
|----------------------------------|--|----------------|--------------|-----------|
| <input checked="" type="radio"/> | delete from t t1 where t1.a = 'a' and rowid <> (select max(rowid) from t t2 where t1.a = t2.a and t1.... | | 9m7mvytc4d14 | ✓ |



SQL Performance Analyzer





SQL Performance Analyzer



- Measure and report on **performance before and after a change!** DBMS_SQLTUNE package.

Great for:

- Database Upgrades
- Application Upgrades
- Hardware Changes
- Database or Schema Changes
- Best for SQL Tuning – Especially Batches



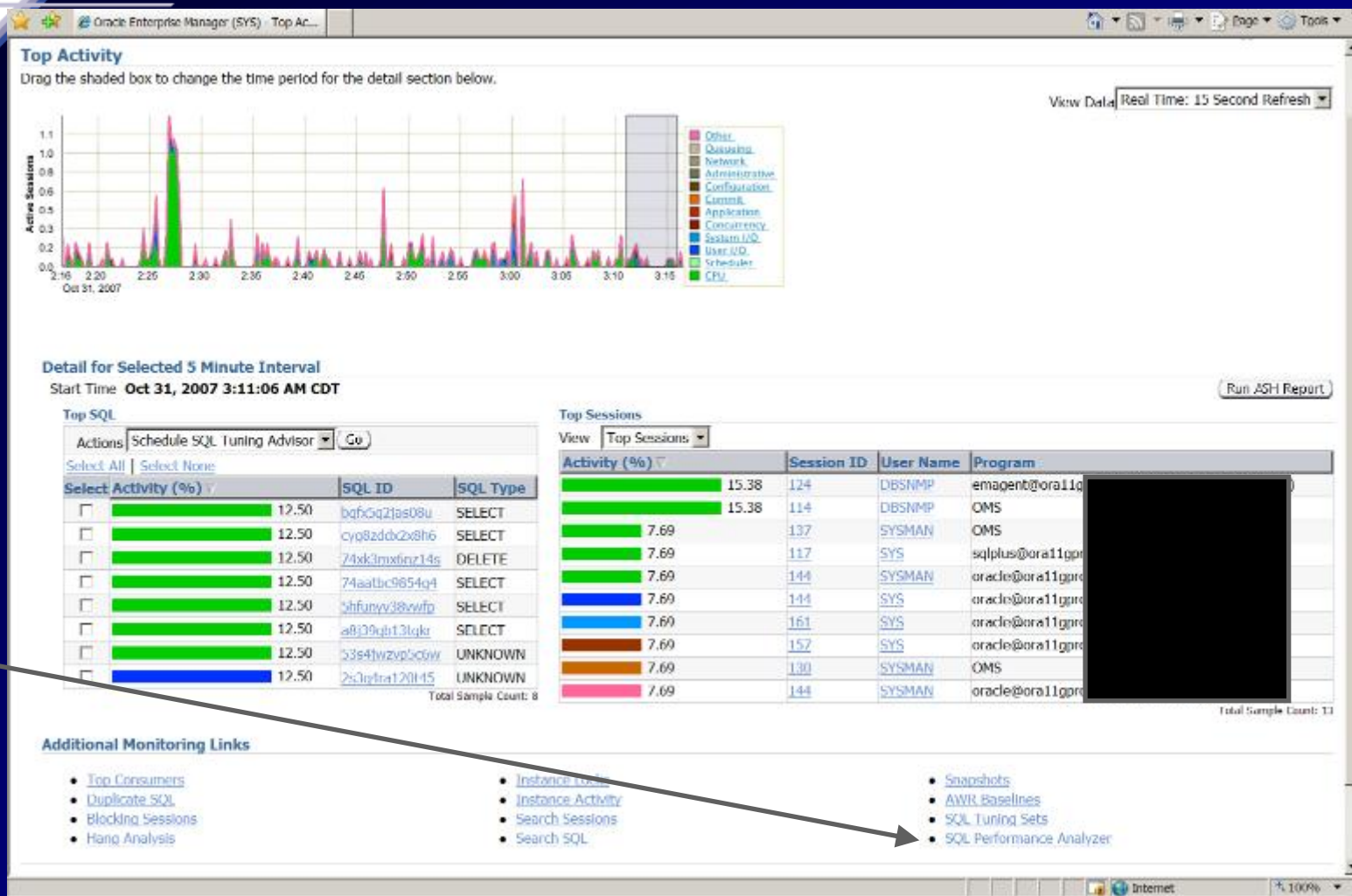
SQL Performance Analyzer

Easy to run – SQL Focus (Test SGA settings):

- Capture SQL
- Transport SQL
- Create a Replay Task
- Set up the environment to Test
- Make any changes to Test (such as SGA/Optimizer)
- Compare before and after performance
- Tune the problems!

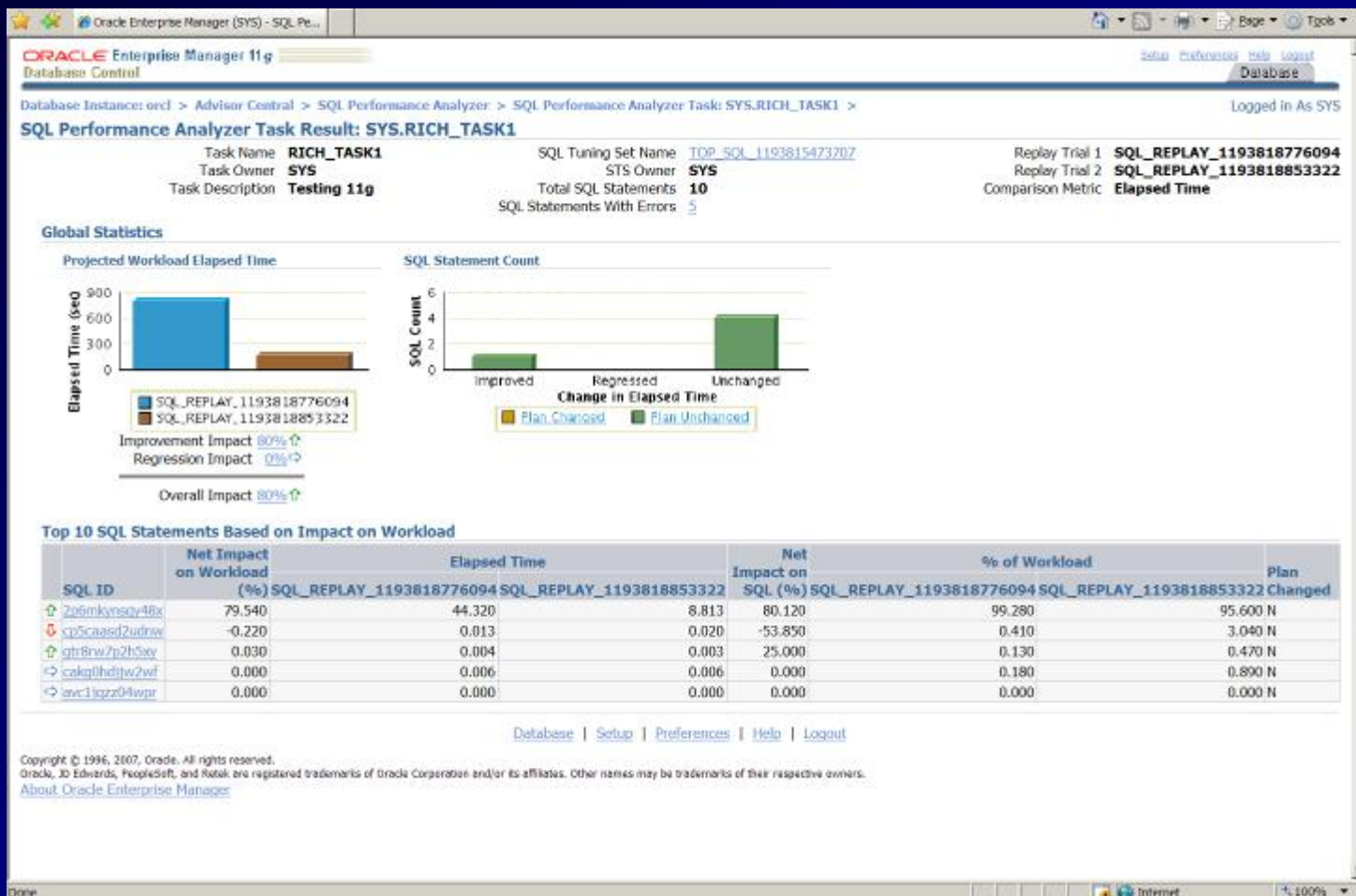


SQL Performance Analyzer



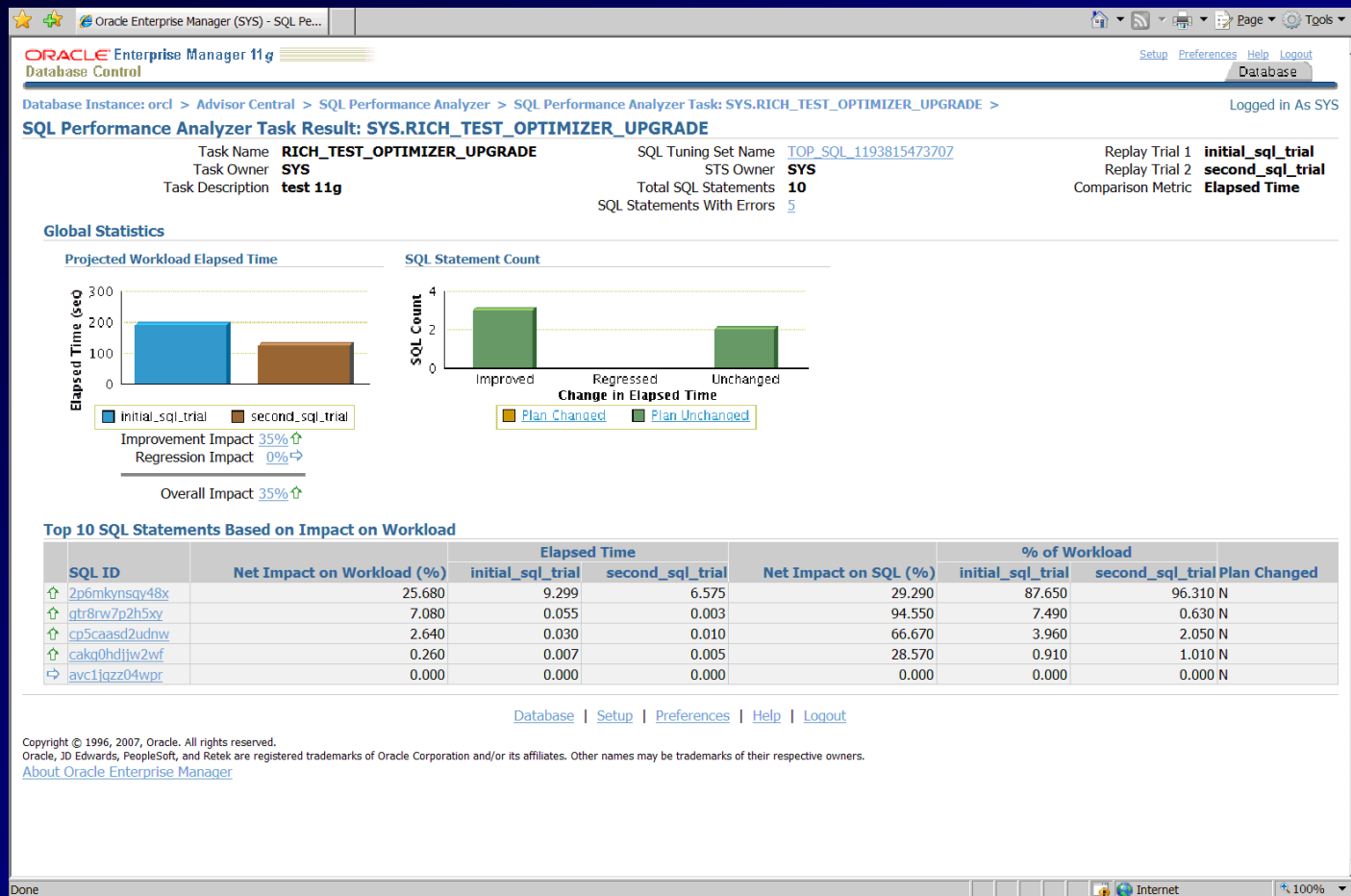


SQL Performance Analyzer Guided Workflow





SQL Performance Analyzer Optimizer Upgrade (10g vs. 11g)





Real Application Testing!

Database workload capture and replay



Database workload capture and replay



- Used to capture **database workload** on one system and replay later on a different system. Useful to compare two different systems.
- Could rival LoadRunner in the future (may be more precise!)

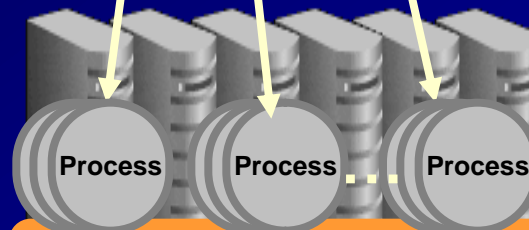
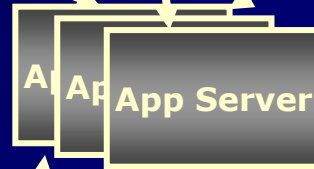
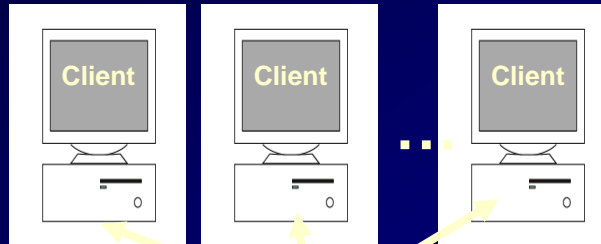
Brief Steps:

- **Capture** workload on a database even from 10gR2
- **Restore** the database on a **test system** to the SCN when capture begins
- Perform **upgrade** and make changes to the test system as needed
- **Preprocess** the captured **workload** if it is not preprocessed
- **Configure** the **test system** for replay (I don't do this here)
- **Replay workload** on the restored database (I don't have this in this presentation, but will show some of the screens to do it)

Pre-Change Production System

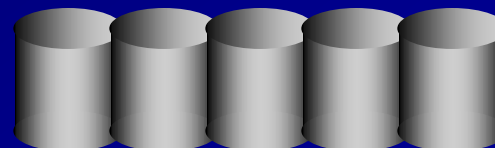
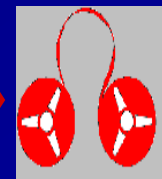


Changes
Unsupported



Capture Workload

Captured
Workload



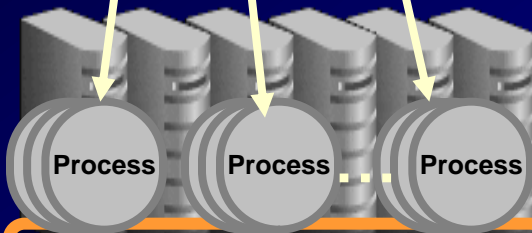
Backup



- 11g Changes Supported**
- Database Upgrades, Patches
 - Schema, Parameters
 - RAC nodes, Interconnect
 - OS Platforms, OS Upgrades
 - CPU, Memory
 - Storage
 - Etc.



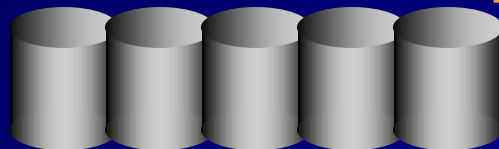
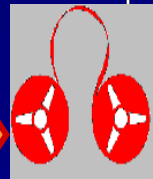
Pre-Change (could be 10gR2) Production System



Capture Workload

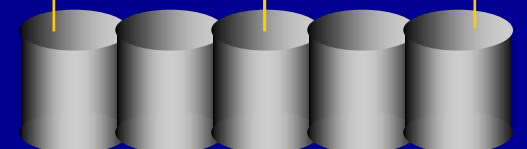
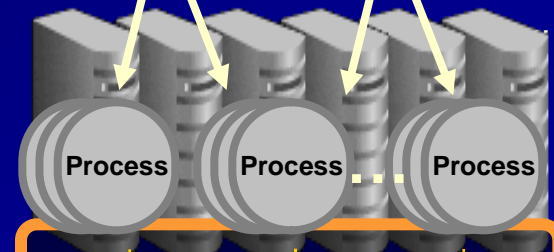
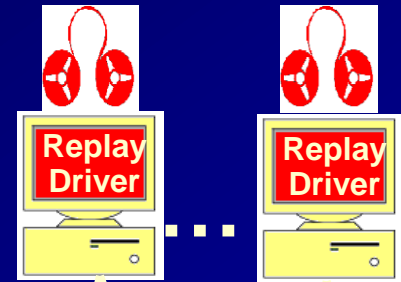


Processed
Captured
Workload



Can use Snapshot Standby as
test system

Post-Change Test System





Database Replay

FYI Only – Download to view in detail

Real App
Testing:

Database
Replay

The screenshot shows the Oracle Enterprise Manager 11g Database Control web interface. The browser title is 'Oracle Enterprise Manager (SYS) - Databa...'. The page header includes 'ORACLE Enterprise Manager 11g Database Control' and 'Setup Preferences Help Logout'. The user is logged in as 'As SYS'. The main navigation bar has tabs for 'Home', 'Performance', 'Availability', 'Server', 'Schema', 'Data Movement', and 'Software and Support'. The 'Software' section is expanded, showing links for 'Configuration' (Collection Status, Clone Oracle Home, Host Configuration, Oracle Home Inventory), 'Real Application Testing' (Database Replay, SQL Performance Analyzer), 'Database Software Patching' (Patch Advisor, View Patch Cache, Patch Prerequisites, Stage Patch, Apply Patch), and 'Deployment Procedure Manager' (Getting Started with Deployment Procedure Manager, Deployment Procedures, Procedure Completion Status, Deployment and Provisioning Software Library). The 'Support' section has a link for 'Support Workbench'. The 'Related Links' section is divided into three columns: 'Access' (Alert Log Contents, Blackouts, Metric and Policy Settings, Monitor in Memory Access Mode, SQL Worksheet), 'Advisor Central' (Advisor Central, All Metrics, EM SQL History, Metric Collection Errors, Policy Groups, Target Properties), and 'Alert History' (Alert History, Baseline Metric Thresholds, Jobs, Monitoring Configuration, Scheduler Central, User-Defined Metrics). The footer contains copyright information and a link to 'About Oracle Enterprise Manager'. The browser status bar at the bottom shows 'Internet' and '100%' zoom.



Capture Workload – FYI Only

The screenshot shows the Oracle Enterprise Manager 11g Database Control interface. The 'Capture Workload: Review' page is displayed, showing the following details:

- Job Parameters:**
 - Database: orcl
 - Logged In As: SYS
 - Job Name: CAPTURE-ORCL-20071031041852
 - Capture Name: CAPTURE-orcl-20071031041852
 - Directory Object: LOG_FILE_DIR
 - Start Time: Immediately
 - Capture Duration: Not Specified
- Database Restart:**
 - Restart Database: No
- Workload Filters: Excluded Sessions**

| Filter Name | Type | Session Attribute | Value |
|-------------------------------------|----------|-------------------|------------|
| Oracle Management Service (DEFAULT) | Excluded | Program | OMS |
| Oracle Management Agent (DEFAULT) | Excluded | Program | emagent%\$ |

Navigation links: Database | Setup | Preferences | Help | Logout



Capture Workload – FYI Only

Oracle Enterprise Manager 11g Database Control

Database Instance: orcl > Logged in As SYS

Confirmation

Job 'CAPTURE-ORCL-20071031041852' to capture the workload has been created successfully.

[View Job](#)

Once the capture is complete you will need to do the following prior to replaying the workload on a different system:

1. Optionally export the AWR data.
2. Restore the replay database on a test system to match the capture database at the start of the workload capture.
3. Make changes (such as perform an upgrade) to the test system as needed.
4. Copy the workload to the test system.
5. Preprocess the captured workload.

Database Replay

The Database Replay feature allows database workload to be captured on one system and replayed later on a different system. Replaying a captured workload can be useful to compare two different systems.

Page Refreshed Oct 31, 2007 4:24:12 AM CDT [Refresh](#)

| Task Name | Description | Go to Task |
|--------------------------------|--|----------------------------|
| 1 Capture Workload | Choose this option to capture workload on this database. | Go to Task |
| 2 Preprocess Captured Workload | Preprocessing will prepare a captured workload for replay. This must be done once for every captured workload. | Go to Task |
| 3 Replay Workload | Choose this option to replay a preprocessed workload on this database. | Go to Task |

[View Workload Capture History](#)

Active Capture and Replay

| Select Name | Type | Directory Object | Start Time |
|----------------|------|------------------|------------|
| No items found | | | |

Overview

The following are the typical steps to perform Database Replay:

1. Capture the workload on a database. (Task 1)
2. Optionally export the AWR data. (Task 1)
3. Restore the replay database on a test system to match the capture database at the start of the workload capture.
4. Make changes (such as perform an upgrade) to the test system as needed.
5. Copy the workload to the test system.
6. Preprocess the captured workload. (Task 2)
7. Configure the test system for the replay.
8. Replay the workload on the restored database. (Task 3)

[Database](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

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[About Oracle Enterprise Manager](#)



Database workload – Preprocess FYI Only

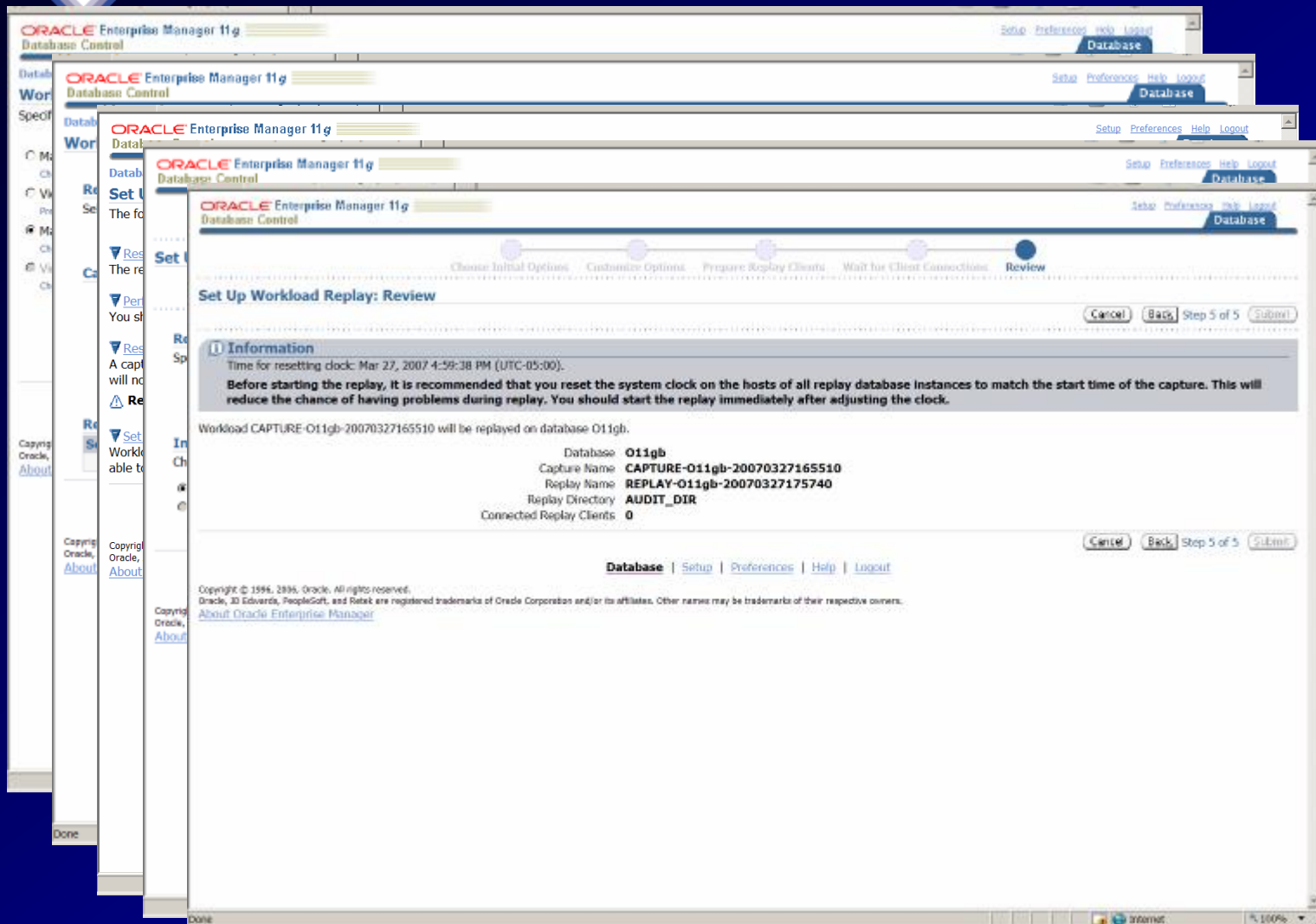
The screenshot displays the Oracle Enterprise Manager 11g Database Control interface. The main window is titled 'Job Activity' and shows a confirmation message: 'The job was created successfully' for the job 'PREPROCESS-011GB-20070327175207'. The job status is 'Active' and the view is set to 'Runs'. A table below lists the job's execution details.

| Select | Name | Status (Executions) | Scheduled | Targets | Target Type | Owner | Job Type |
|-------------------------------------|---------------------------------|---------------------|-------------------------------------|---------|-------------------|-------|------------|
| <input checked="" type="checkbox"/> | PREPROCESS-011GB-20070327175207 | 1 Scheduled | Mar 27, 2007 5:34:16 PM (UTC-05:00) | Q11gb | Database Instance | SYS | SQL Script |

Related Links: [Job Library](#)

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[About Oracle Enterprise Manager](#)

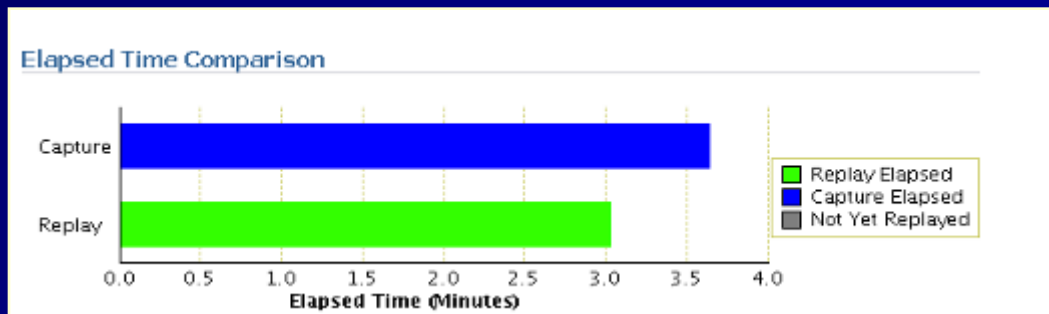
Database workload capture and replay On NEW system (shortened) – FYI Only





Replay Options...

- Synchronized Replay
 - Exact Concurrency, commits & data divergence minimal
- Unsynchronized Replay
 - Not the same concurrency or commits
 - Data divergence can be large depending on load test performed
- Creates Report
 - Data Divergence
 - Error Divergence
 - Performance Divergence





Partitioning: (Briefly Only)

- Tables can be split into many pieces (10g).
- Only a subset of the data is queried
- All of the data COULD be queried
- Leads to enhanced performance of large tables
- Re-orgs & backups can be done on a partition level
- 4 quick examples follow (many many rules for each)
- **WHAT'S NEW IN ORACLE 11G**





Range Partitioning (V8)



```
CREATE TABLE DEPT
(DEPTNO          NUMBER(2),
DEPT_NAME        VARCHAR2(30))
PARTITION BY RANGE(DEPTNO)
(PARTITION D1 VALUES LESS THAN (10) TABLESPACE DEPT1,
PARTITION D2 VALUES LESS THAN (20) TABLESPACE DEPT2,
PARTITION D3 VALUES LESS THAN (MAXVALUE) TABLESPACE
DEPT3);
```

```
INSERT INTO DEPT VALUES (1, 'DEPT 1');
INSERT INTO DEPT VALUES (7, 'DEPT 7');
INSERT INTO DEPT VALUES (10, 'DEPT 10');
INSERT INTO DEPT VALUES (15, 'DEPT 15');
INSERT INTO DEPT VALUES (22, 'DEPT 22');
```



Range Partitioning (8i) (Multi-Column)



```
create table cust_sales (  
acct_no number(5),  
cust_name char(30),  
sale_day integer not null,  
sale_mth integer not null,  
sale_yr integer not null)  
partition by range (sale_yr, sale_mth, sale_day)  
(partition cust_sales_q1 values less than (1998, 04, 01) tablespace users1,  
partition cust_sales_q2 values less than (1998, 07, 01) tablespace users2,  
partition cust_sales_q3 values less than (1998, 10, 01) tablespace users3,  
partition cust_sales_q4 values less than (1999, 01, 01) tablespace users4,  
partition cust_sales_qx values less than (maxvalue, maxvalue, maxvalue)  
tablespace users4);
```



Hash Partitioning (8i) (Multi-Column)



```
create table cust_sales_hash (  
  acct_no      number(5),  
  cust_name char(30),  
  sale_day integer not null,  
  sale_mth integer not null,  
  sale_yr integer not null)  
partition by hash (acct_no)  
partitions 4  
store in (users1, users2, users3, users4);
```



Composite Partitioning v (8)



```
CREATE TABLE test5 (data_item INTEGER, length_of_item INTEGER,  
storage_type VARCHAR(30), owning_dept NUMBER,  
storage_date DATE) PARTITION BY RANGE (storage_date) SUBPARTITION BY  
HASH(data_item) SUBPARTITIONS 4  
STORE IN (data_tbs1, data_tbs2,  
data_tbs3, data_tbs4) (PARTITION q1_1999 VALUES LESS  
THAN (TO_DATE('01-apr-1999', 'dd-mon-yyyy')), PARTITION q2_1999  
VALUES LESS THAN (TO_DATE('01-jul-1999', 'dd-mon-yyyy')),  
PARTITION q3_1999  
VALUES LESS THAN (TO_DATE('01-oct-1999', 'dd-mon-yyyy'))  
(SUBPARTITION q3_1999_s1 TABLESPACE data_tbs1,  
SUBPARTITION q3_1999_s2 TABLESPACE data_tbs2),  
PARTITION q4_1999  
VALUES LESS THAN (TO_DATE('01-jan-2000', 'dd-mon-yyyy'))  
SUBPARTITIONS 8  
STORE IN (q4_tbs1, q4_tbs2, q4_tbs3, q4_tbs4,  
q4_tbs5, q4_tbs6, q4_tbs7, q4_tbs8), PARTITION q1_2000  
VALUES LESS THAN (TO_DATE('01-apr-2000', 'dd-mon-yyyy')));
```




List Partitioning (Allowed since 9i)



```
create table dept_part  
(deptno number(2),  
dname varchar2(14),  
loc varchar2(13))  
partition by list (dname)  
(partition d1_east values ('BOSTON', 'NEW YORK'),  
partition d2_west values ('SAN FRANCISCO', 'LOS ANGELES'),  
partition d3_south values ('ATLANTA', 'DALLAS'),  
partition d4_north values ('CHICAGO', 'DETROIT'));
```

Table created.



Interval Partitioning – 11g

- This is a helpful addition to range partitioning where Oracle automatically creates a partition when the inserted value exceeds all other partition ranges. **11g also has Ref & Virtual Column Partitioning (not covered here).**

There are the following restrictions:

- You can only specify one partitioning key column, and it **must be of NUMBER or DATE type.**
- Interval partitioning is **NOT supported for index-organized tables.**
- You can **NOT** create a domain index on an interval-partitioned table.



Interval Partitioning – 11g

```
CREATE TABLE DEPT_new  
(DEPTNO      NUMBER(2),  
DEPT_NAME VARCHAR2(30))  
PARTITION BY RANGE(DEPTNO)  
  (PARTITION D1 VALUES LESS THAN (10),  
   PARTITION D2 VALUES LESS THAN (20),  
   PARTITION D3 VALUES LESS THAN (30));
```

Table created.

```
SQL> insert into dept_new values(40, 'test2');  
insert into dept_new values(40, 'test2')  
      *
```

ERROR at line 1:

ORA-14400: inserted partition key does not map to any partition



Interval Partitioning – 11g

```
select segment_name, partition_name  
from dba_segments  
where segment_name = 'DEPT_NEW';
```

| SEGMENT NAME | PARTITION NAME |
|--------------|----------------|
|--------------|----------------|

| | |
|----------|----|
| DEPT_NEW | D1 |
| DEPT_NEW | D2 |
| DEPT_NEW | D3 |



Interval Partitioning – 11g

```
CREATE TABLE DEPT_NEW2  
(DEPTNO      NUMBER(2),  
 DEPT_NAME  VARCHAR2(30))  
PARTITION BY RANGE(DEPTNO)  
INTERVAL(10)  
  (PARTITION D1 VALUES LESS THAN (10),  
   PARTITION D2 VALUES LESS THAN (20),  
   PARTITION D3 VALUES LESS THAN (30))
```

Table created.

```
SQL> insert into dept_new2 values(40, 'test2');  
1 row created.
```



Interval Partitioning – 11g

```
insert into dept_new2 values(40,null);  
insert into dept_new2 values(50,null);  
insert into dept_new2 values(99,null);
```

```
select segment_name, partition_name  
from dba_segments  
where segment_name = 'DEPT_NEW2'
```

| SEGMENT_NAME | PARTITION_NAME |
|--------------|----------------|
|--------------|----------------|

| | |
|-----------|---------|
| DEPT_NEW2 | D1 |
| DEPT_NEW2 | D2 |
| DEPT_NEW2 | D3 |
| DEPT_NEW2 | SYS_P41 |
| DEPT_NEW2 | SYS_P42 |
| DEPT_NEW2 | SYS_P43 |



Partition Compression

- You can now **COMPRESS** individual partitions
- Compression as high as 3.5 to 1 is possible
- Compressed Tables now support
 - DML Statements
 - Add and Drop Column
 - Partition level COMPRESS or NOCOMPRESS
- ALTER TABLE... COMPRESS (old compress)
- ALTER TABLE... NOCOMPRESS
- Table compression now supported for OLTP
- New Advanced Compression Option (chargeable):
 - **CREATE TABLE *t1* COMPRESS FOR ALL OPERATIONS**



Partition Compression

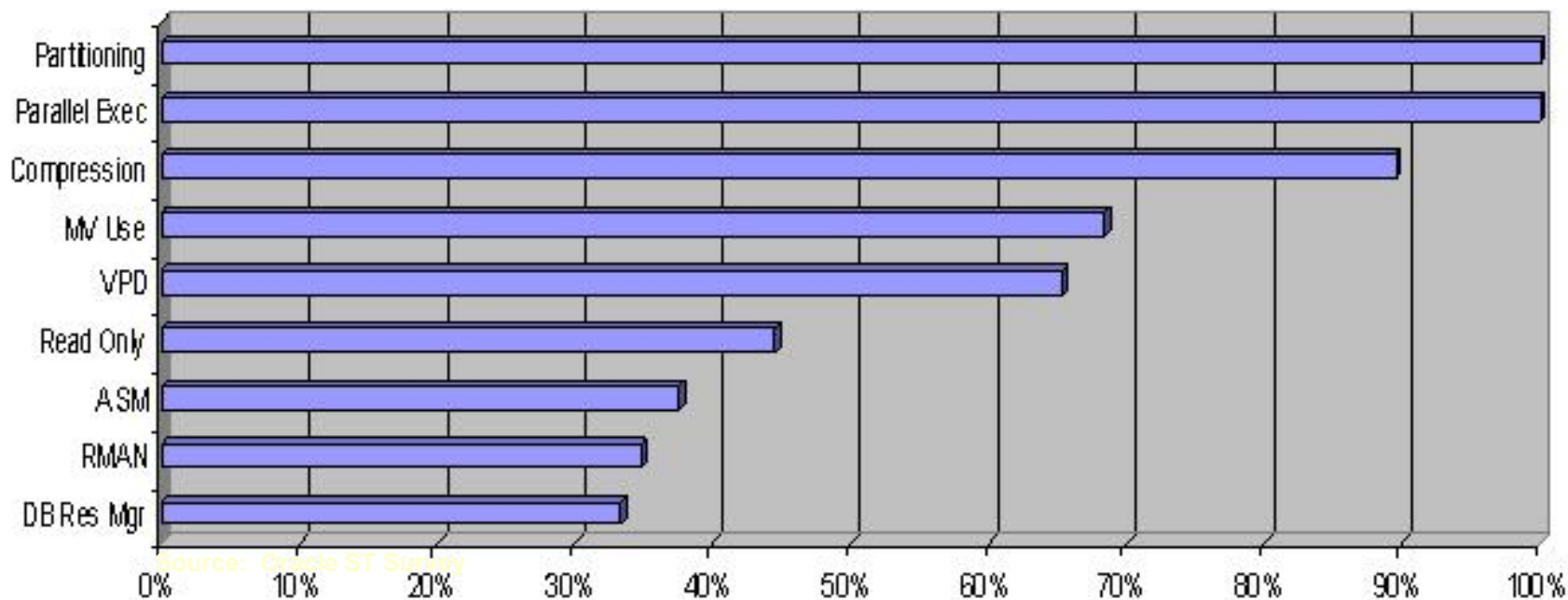
```
CREATE TABLE DEPT_new3  
(DEPTNO          NUMBER(2),  
 DEPT_NAME       VARCHAR2(30))  
  COMPRESS  
 PARTITION BY RANGE(DEPTNO)  
 interval(10)  
 (PARTITION D1 VALUES LESS THAN (10),  
  PARTITION D2 VALUES LESS THAN (20)  
  NOCOMPRESS,  
  PARTITION D3 VALUES LESS THAN (30))
```

Table created.



Large-Scale Data Warehouses*

Feature Usage



* Oracle Survey



Nice DBA Feature



Oracle Secure Files
FYI Only



Oracle SecureFiles

High-Performance Large Objects

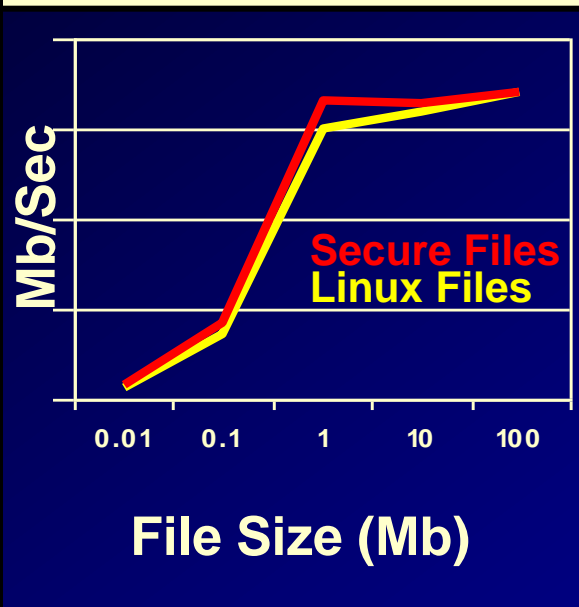
- **High-performance** transactional access to large object data
 - RFID, DICOM medical, CAD, images, 3D spacial
 - low-latency, high throughput, concurrent access
 - space-optimized storage
- Protect your valuable data ... **Keep large objects in the database!**
 - transactions
 - transparent encryption
 - compression and de-duplication
 - database-quality security, reliability, and scalability
- **Better security**, single view and management of data
- Superset of LOB interfaces – **easy migration**



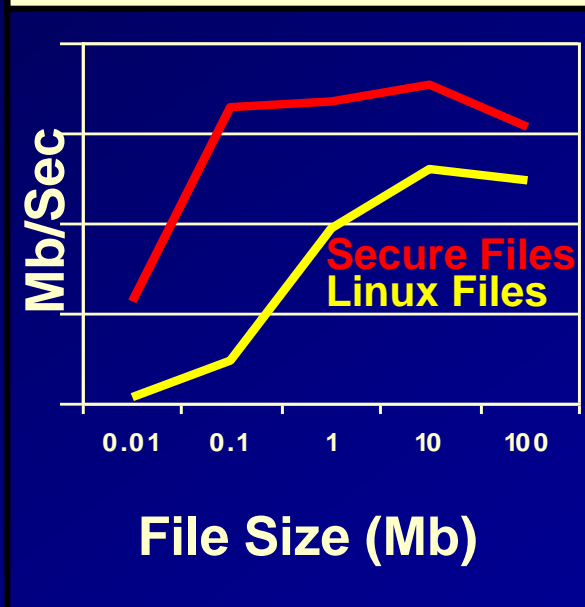
Oracle Secure Files

Better Performance than LOBs...

Read Performance



Write Performance



Adding Files using New Disk Space – **2x faster than LOBs**

Adding Files using Deleted Space – **22x faster than LOBs**

PL/SQL Reads – **6x Faster than LOBs**

Your mileage will vary....

Nice Developer Tools/Improvements



Result Cache
Invisible Indexes
PL/SQL Expressions



The Result Cache

- **Function Results** of queries and query fragments can be cached in memory for **future executions**.
 - Choose calculations that frequently run
 - Choose data that does NOT frequently change
- **RESULT_CACHE & RELIES_ON** clauses
- **Takes its memory from the Shared Pool**
 - Set with RESULT_CACHE_SIZE
 - **RESULT_CACHE_MODE=force** (manual) – no auto
- DBMS_RESULT_CACHE.FLUSH to clear
- Is NOT passed between RAC/Grid nodes
- Check the docs for other Restrictions & Rules!!

Result Cache Performance

Example Query (1M Row Test)



```
select *  
from (select *  
      from (select t.country_name, t.city_name,  
                  sum(t.salary) a_sum, max(t.salary)  
                  a_max  
            from emps t  
            group by t.country_name, t.city_name)  
      order by a_max desc)  
where rownum < 2;
```



Result Cache Example Performance

Step 1 - In Session 1

Executed query with the RESULT_CACHE hint
and it returned an elapsed time of **3.18 seconds**
(cache it).

Step 2 - In Session 2

Executed query without the RESULT_CACHE
hint, but with **RESULT_CACHE_MODE=force**
and it returned an elapsed time of **0.86 seconds**



The Result Cache – Autotrace

select count(*) from emp; (note the result cache)

COUNT(*)

14

Execution Plan

Plan hash value: 2937609675

| Id | Operation | Name | Rows | Cost (%CPU) | Time |
|----|---------------------|----------------------------|------|-------------|----------|
| 0 | SELECT STATEMENT | | 1 | 1 (0) | 00:00:01 |
| 1 | RESULT CACHE | 4ntcq5q3m4ayb26wqthu7pbn17 | | | |
| 2 | SORT AGGREGATE | | 1 | | |
| 3 | INDEX FULL SCAN | PK_EMP | 14 | 1 (0) | 00:00:01 |



The Invisible Index

- Set an index to VISIBLE or INVISIBLE
 - ALTER INDEX idx INVISIBLE;
 - ALTER INDEX idx VISIBLE;
 - CREATE INDEX... INVISIBLE;
- Great to turn off indexes for a while when you think they're not being used, but BEFORE you drop them.
- Can use NO_INDEX (to override visibility).
- The index IS MAINTAINED during DML
- Great for testing!



Allow Sequences in PL/SQL Expressions

- In Previous Versions needed to retrieve the value of a sequence (CURRVAL / NEXTVAL) by invoking a cursor (explicit or implicit).

In 11g:

- **No cursor is needed** so the code is more efficient.
- For big jobs – Saves MANY cursors



Allow Sequences in PL/SQL Expressions

OLD Way

DECLARE

V_NEW_VAL NUMBER;

BEGIN

SELECT MY_SEQ.NEXTVAL INTO V_NEW_VAL
FROM DUAL;

END;

NEW Way

DECLARE

V_NEW_VAL NUMBER;

BEGIN

V_NEW_VAL := MY_SEQ.NEXTVAL;

END;



Create & Rebuild Index Online





Create & Rebuild Index Online

- You can create/rebuild indexes even when doing DML on the base table, but it's better to do during low DML activity.
- **Prior to Oracle 11g**, this required an exclusive lock at the beginning and end of the rebuild. This lock could cause DML delays and performance spike. This lock is no longer required for this operation.
- Rebuild is faster than a DROP and CREATE
- Basic Syntax:

CREATE INDEX *index_name* ON *table* (*col1*,...) ONLINE;
Index created.

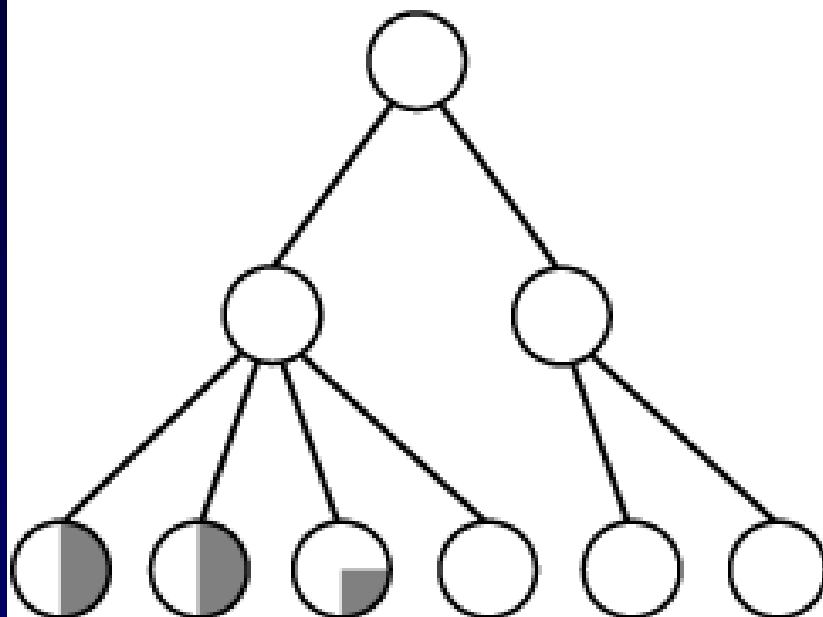
ALTER INDEX *index_name* **REBUILD ONLINE**;
Index altered.



Rebuild Index or Coalesce (FYI)

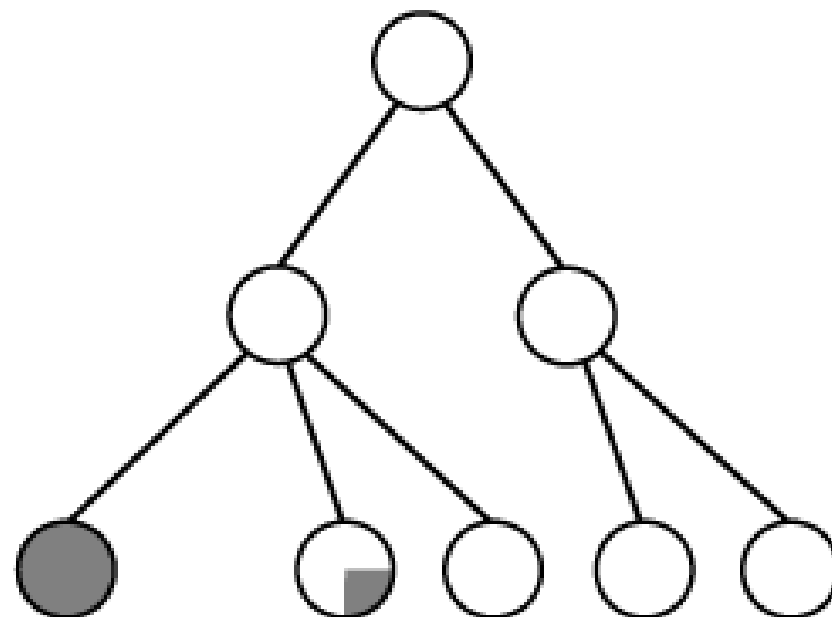
Coalesce Example from Oracle Doc.

B-tree Index



Before ALTER INDEX vmoore COALESCE;

B-tree Index



After ALTER INDEX vmoore COALESCE;



Rebuild Index or Coalesce

Rebuild:

- Quickly **move index to another tablespace**
- Requires more disk space
- **Creates new index tree and shrinks heights**
- Change storage/tblspc w/o

Coalesce

- Can't move to another tablespace
- Requires much less space than rebuild
- Coalesces leaf blocks that are in the same branch
- Quickly frees index leaf blocks for use



Optimizer Statistics & Other Optimizer Advances



Special Thanks: Maria Colgan, Penny Avril & Debbie
Migliore

Improved SPEED and Quality Gathering Stats – AUTO-SAMPLING



- Manually gather stats: Impossible to find sample size that works for ALL tables - need COMPUTE
- Especially hard to find a good sample size when the data distribution is very skewed.
- **NEW Auto-sampling**: “Discovers” the best sample size for every table in your system for you.
 - Get the **Quality** of a **COMPUTE** with **SPEED** of a **SAMPLE**
 - Oracle’ goal is to OBSOLETE the need and use of⁹⁵

Incremental Statistics Maintenance - Stats by Partition vs. table



- In 10g, if you gather stats on one partition after a bulk load it causes a full scan of all partitions to gather global table statistics which is extremely time consuming
- In 10g, you have to manually copy statistics to new partition
- In 11g Gather stats for TOUCHED PARTITIONS only!
- Table stats are refreshed WITHOUT scanning the un-touched partitions.



Manage New Statistics

Gather Stats but make **PENDING**

- Currently DBAs are scared to gather stats on a table that is changing for fear of unpredictable execution plans.
- You have to 'FREEZE' critical plans or stats.
- In 11g, gather stats and save as **PENDING**.
- Verify the new stats won't adversely affect things by checking them with a single user using an alter session or try them out on a different system.
- When everything looks good – then, **PUBLISH** them for all to use!



Gather Stats but make them PENDING

```
select dbms_stats.get_prefs('PUBLISH', 'SH', 'CUST') publish from  
dual;
```

PUBLISH

TRUE

```
exec dbms_stats.set_table_prefs('SH', 'CUST', 'PUBLISH', 'false');
```

PL/SQL procedure successfully completed.

```
select dbms_stats.get_prefs('PUBLISH', 'SH', 'CUST') publish from  
dual;
```

PUBLISH



Gather Stats but make them PENDING

```
select table_name, last_analyzed analyze_time, num_rows, blocks, avg_row_len
from user_tables
where table_name = 'CUST';
```

| TABLE_NAME | ANALYZE_T | NUM_ROWS | BLOCKS | AVG_ROW_LEN |
|------------|-----------|----------|--------|-------------|
| ----- | ----- | ----- | ----- | ----- |
| CUST | | | | |

```
execute dbms_stats.gather_table_stats('SH', 'CUST');
PL/SQL procedure successfully completed.
```

```
select table_name, last_analyzed analyze_time, num_rows, blocks, avg_row_len
from user_tables
where table_name = 'CUST';
```

| TABLE_NAME | ANALYZE_T | NUM_ROWS | BLOCKS | AVG_ROW_LEN |
|------------|-----------|----------|--------|-------------|
| ----- | ----- | ----- | ----- | ----- |
| CUST | | | | |



Manage New Statistics

PUBLISH Stats after Testing Complete

```
alter session set optimizer_use_pending_statistics = true;
```

(Then run your query – If ready/better – publish the new stats)

```
exec dbms_stats.publish_pending_stats('SH', 'CUST');
```

PL/SQL procedure successfully completed.

```
select table_name, last_analyzed analyze_time, num_rows, blocks,  
       avg_row_len  
from user_tables  
where table_name = 'CUST';
```

| TABLE_NAME | ANALYZE_T | NUM_ROWS | BLOCKS | AVG_ROW_LEN |
|------------|-----------|----------|--------|-------------|
| ----- | ----- | ----- | ----- | ----- |
| CUST | 13-OCT-07 | 55500 | 1485 | 180 |

```
exec dbms_stats.delete_table_stats('SH', 'CUST');
```



Extended Optimizer Statistics: New Multi-Column Statistics

- Corporate data often has **correlations between different columns of a table**. For example:
 - A job title is correlated to the salary.
 - The **season affects the sold amounts** of items such as **swim suits** sell more in the summer and **snow shoes** sell more in the winter.
 - The make of a car and color are often used together but are not really correlated well so the filter doesn't reduce the result set.
- Optimizer has to estimate the correct cardinality
 - *Will the additional column condition reduce the result set or not? Should it be used.*
- Oracle calculates correlated statistics so the optimizer will make great decisions. Single column statistics and



Example

```
SELECT make, price, color
FROM   cars_dot_com
WHERE  make = 'CORVETTE';
```

| | | |
|----------|--------|--------|
| CORVETTE | 40,000 | RED |
| CORVETTE | 60,000 | BLACK |
| CORVETTE | 50,000 | SILVER |

- Three records selected.
- Single column statistics are accurate



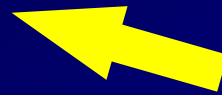
| Make | Price | Color |
|----------|--------|--------|
| CORVETTE | 40,000 | RED |
| CORVETTE | 60,000 | BLACK |
| CORVETTE | 50,000 | SILVER |
| CADILLAC | 90,000 | RED |
| JEEP | 35,000 | BLACK |
| JEEP | 45,000 | SLIVER |



Example, cont.

```
SELECT make, price, color
FROM   cars_dot_com
WHERE  make = 'CORVETTE'
AND    COLOR = 'RED';
```

| | | |
|----------|--------|-----|
| CORVETTE | 40,000 | RED |
|----------|--------|-----|



- One record selected.
 - No correlated columns
 - Additional predicate **reduces result set**
 - Single column statistics are STILL sufficient

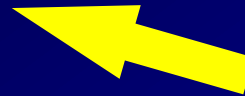
| Make | Price | Color |
|----------|--------|--------|
| CORVETTE | 40,000 | RED |
| CORVETTE | 60,000 | BLACK |
| CORVETTE | 50,000 | SILVER |
| CADILLAC | 90,000 | RED |
| JEEP | 35,000 | BLACK |
| JEEP | 45,000 | SLIVER |



Example, cont.

```
SELECT make, price, color
FROM   cars_dot_com
WHERE  make = 'CORVETTE'
AND    PRICE = 50000;
```

| | | |
|----------|--------|--------|
| CORVETTE | 50,000 | RED |
| CORVETTE | 50,000 | BLACK |
| CORVETTE | 50,000 | SLIVER |



| Make | Price | Color |
|----------|--------|--------|
| CORVETTE | 50,000 | RED |
| CORVETTE | 50,000 | BLACK |
| CORVETTE | 50,000 | SILVER |
| CADILLAC | 90,000 | RED |
| JEEP | 35,000 | BLACK |
| JEEP | 45,000 | SLIVER |

- Three records selected.
 - Correlated columns
 - Additional predicate has no effect
 - **Single column statistics are NOT sufficient**
 - **Must use '=' and not < or >**



Manage New Statistics – FYI Only

EXTENDED Statistic Group

- Provides a way to collect stats on a group of columns
- Full integration into existing statistics framework
 - Automatically maintained with column statistics
 - Instantaneous and transparent benefit for any application
- Accurate cardinalities for inter-related columns
 - Multiple predicates on the same table are estimated correctly



Manage New Statistics – FYI Only

After normal Statistics Creation

```
select column_name, num_distinct, histogram
from user_tab_col_statistics where table_name =
'CUSTOMERS';
```

| COLUMN_NAME | NUM_DISTINCT | HISTOGRAM |
|---------------------|--------------|-----------------|
| ----- | ----- | ----- |
| CUST_VALID | 2 | NONE |
| COUNTRY_ID | 19 | FREQUENCY |
| CUST_STATE_PROVINCE | 145 | NONE |
| CUST_CITY_ID | 620 | HEIGHT BALANCED |
| CUST_CITY | 620 | NONE |
| CUST_LAST_NAME | 908 | NONE |
| CUST_FIRST_NAME | 1300 | NONE |
| CUST_ID | 55500 | NONE |
| ... | | |

23 rows selected.



Manage New Statistics – FYI Only

Create EXTENDED Statistic Group

- Now lets create the **extended statistics group** & re-gather statistics on the CUSTOMER table (query user_tab_col_statistics to see new column):

```
select dbms_stats.create_extended_stats('SH','CUSTOMERS',  
    '(country_id, cust_state_province)') from dual;
```

```
DBMS_STATS.CREATE_EXTENDED_STATS('SH','CUSTOMERS','(CO
```

```
-----  
SYS_STUJGVLRVH5USVDU$XNV4_IR#4
```

```
exec dbms_stats.gather_table_stats('SH','CUSTOMERS', method_opt  
    => 'for all columns size skewonly');
```

```
PL/SQL procedure successfully completed.
```



Manage New Statistics – FYI Only

Now there are Extended Statistics

```
select column_name, num_distinct, histogram
from user_tab_col_statistics where table_name = 'CUSTOMERS';
```

| COLUMN_NAME | NUM_DISTINCT | HISTOGRAM |
|---------------------------------|--------------|-----------------|
| ----- | ----- | ----- |
| SYS_STUJGVLRVH5USVDU\$XNV4_IR#4 | 145 | FREQUENCY |
| CUST_VALID | 2 | FREQUENCY |
| COUNTRY_ID | 19 | FREQUENCY |
| CUST_STATE_PROVINCE | 145 | FREQUENCY |
| CUST_CITY_ID | 620 | HEIGHT BALANCED |
| CUST_CITY | 620 | HEIGHT BALANCED |
| CUST_LAST_NAME | 908 | HEIGHT BALANCED |
| CUST_FIRST_NAME | 1300 | HEIGHT BALANCED |
| CUST_ID | 55500 | HEIGHT BALANCED |
| ... | | |

24 rows selected.



Manage New Statistics – FYI Only

DROP Extended Statistics

```
exec dbms_stats.drop_extended_stats('SH', 'CUSTOMERS', '(country_id,  
cust_state_province)');
```

PL/SQL procedure successfully completed.

```
select column_name, num_distinct, histogram  
from user_tab_col_statistics where table_name = 'CUSTOMERS';
```

| COLUMN_NAME | NUM_DISTINCT | HISTOGRAM |
|---------------------|--------------|-----------------|
| ----- | ----- | ----- |
| CUST_VALID | 2 | NONE |
| COUNTRY_ID | 19 | FREQUENCY |
| CUST_STATE_PROVINCE | 145 | NONE |
| CUST_CITY_ID | 620 | HEIGHT BALANCED |
| CUST_CITY | 620 | NONE |
| CUST_LAST_NAME | 908 | NONE |
| CUST_FIRST_NAME | 1300 | NONE |
| CUST_ID | 55500 | NONE |

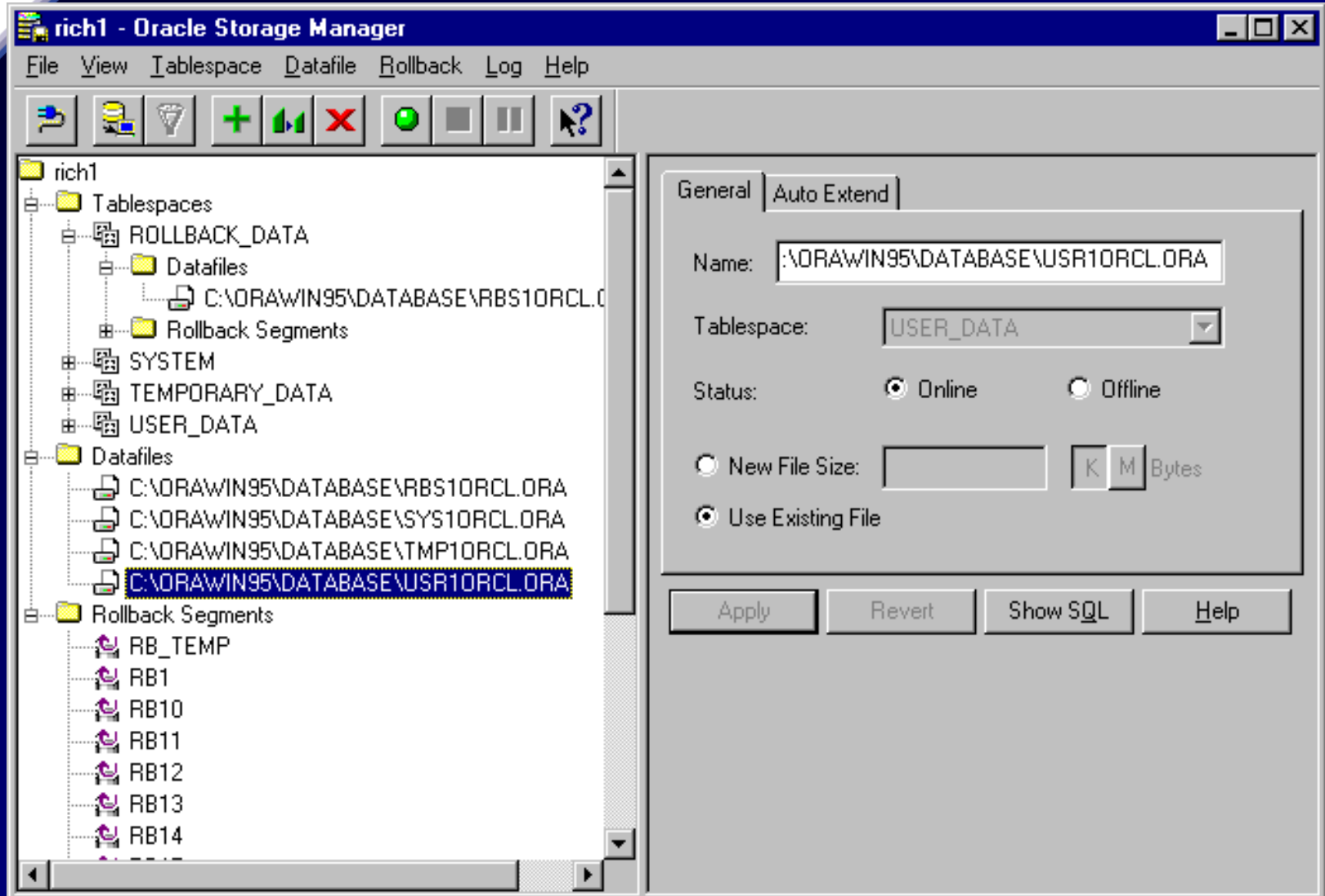
...

23 rows selected.



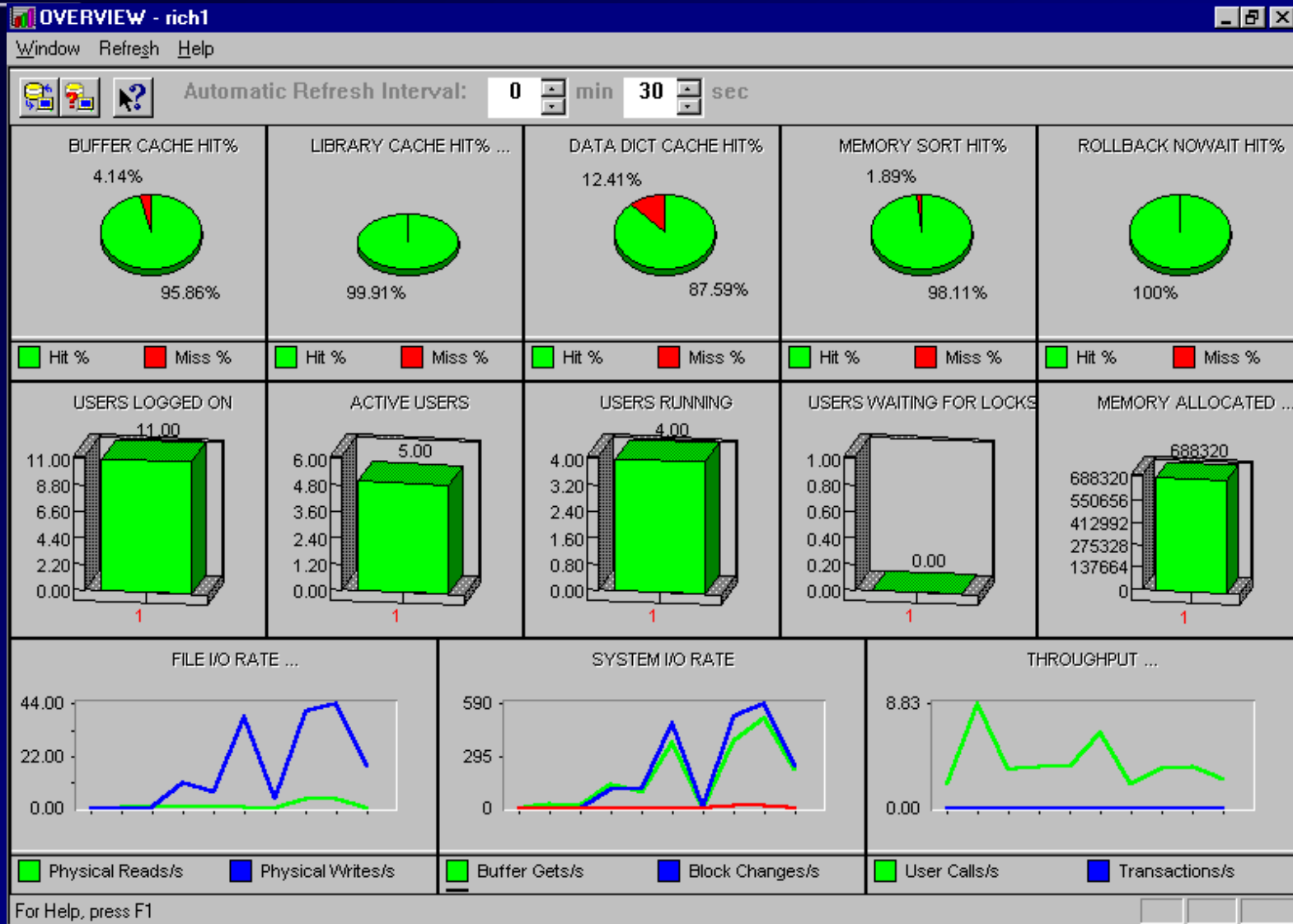
Enterprise Manager for the Grid

Enterprise Manager: Back in Time!





Performance Manager : Back in Time!



Oracle Enterprise Manager (SYSMAN) - Oracle Enterprise Manager Console Homepage - Microsoft Internet Explorer

Oracle Enterprise Manager (SYSMAN) - All Targets - Microsoft Internet Explorer

Oracle Enterprise Manager (SYSMAN) - All Targets - Microsoft Internet Explorer

Oracle Enterprise Manager (SYSMAN) - Databases - Microsoft Internet Explorer

Oracle Enterprise Manager (SYSMAN) - Cluster Database: ioug - Microsoft Internet Explorer

Oracle Enterprise Manager (SYSMAN) - Cluster Database: ioug - Microsoft Internet Explorer

Oracle Enterprise Manager (SYSMAN) - Cluster Database: ioug - Microsoft Internet Explorer

Oracle Enterprise Manager (SYSMAN) - Cluster Database: ioug - Microsoft Internet Explorer

Oracle Enterprise Manager (SYSMAN) - Cluster Database: ioug - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address: http://atlmidi8.us.oracle.com:7777/em/console/rac/racSiteMap?type=rac_database&target=ioug&pageNum=5

Cluster: IOUG >

Cluster Database: ioug

Latest Data Collected From Target Apr 23, 2006 11:19:22 AM EDT Refresh

Home Performance Administration Maintenance Topology

Cluster Database topology presents the host view of a cluster database. Database instances, ASM instances, listeners, and interfaces information is available. You can optionally view configuration information. These views can also be used to launch various administration and configuration functions.

☒ Show Only Hosts With Instances ☐ Show Configuration Details

View Data Manually

Overview

Selection Details

Nothing Selected

Summary

Status Up

Up Instances 6 (↑6)

Cluster IOUG

Alerts 5 8

abnlas.tg1

abnlas.tg1

abnlas.tg1

abnlas.tg1

abnlas.tg1

abnlas.tg1

Name: ioug_ioug1

Type: Database Instance

Host: atlmidi1.us.oracle.com

Critical Alerts: 1

Warning Alerts: 1

Status: Up

ASM: +ASM1_atlmidi1.us.oracle.com

Internet

gR2;

ns!

ORACLE 10g DATABASE

113



Enterprise Manager 11g

Just a bit of changes...

Specific
Database
Instance

We have 5
ADDM
Findings

Check them
Here

Oracle Enterprise Manager (SYS) - Databa...

ORACLE Enterprise Manager 11g
Database Control

Setup Preferences Help Logout
Database

Logged in As SYS

Database Instance: orcl

Home Performance Availability Server Schema Data Movement Software and Support

Latest Data Collected From Target Oct 31, 2007 1:54:55 AM CDT Refresh View Data Automatically (60 sec)

General

Status Up
Up Since Oct 25, 2007 8:09:07 AM CDT
Instance Name orcl
Version 11.1.0.6.0
Host ora11gp
Listener LISTENER

Shutdown Black Out

Host CPU

100%
75
50
25
0

Other
orcl

Load 7.31 Paging 0.00

Active Sessions

8.1
5.4
2.7
0.0

Wait
User I/O
CPU

Maximum CPU 1

SQL Response Time

1.0
0.5
0.0

Reference collection is empty.
SQL Response Time (%) Unavailable
Reset Reference Collection

Diagnostic Summary

ADDM Findings 5
Period Start Time Oct 31, 2007 1:34:40 AM CDT
Alert Log No ORA- errors
Active Incidents 0

View All Properties

Space Summary

Database Size (GB) 1.676
Problem Tablespaces 0
Segment Advisor Recommendations 0
Policy Violations 0
Dump Area Used (%) 31

High Availability

Instance Recovery Time (sec) 14
Last Backup n/a
Usable Flash Recovery Area (%) 100
Flashback Database Logging Disabled

Alerts

Category All Go Critical 0 Warning 1

| Severity | Category | Name | Impact | Message | Alert Triggered |
|----------|------------|--------------|--------|------------------------------|-------------------------|
| Warning | User Audit | Audited User | | User SYS logged on from ora1 | Oct 31, 2007 1:09:55 AM |

Related Alerts

ADDM Performance Analysis

Period Start Time Oct 31, 2007 1:34:40 AM CDT Period Duration (minutes) 10.12 Instance orcl

| Impact (%) | Finding | Occurrences (last 24 hrs) |
|------------|------------------------|---------------------------|
| 67.8 | "Scheduler" Wait Class | 2 of 28 |



Security Enhancements



Security Enhancements

- 11g is more restrictive
 - Password lock time (1), password grace time (7) and password life time (180) all more restrictive; Failed login attempts stays the same (10).
 - Passwords will be case sensitive now! (on by default)
 - Enhanced hashing algorithm for passwords / DES still available.
 - Strong passwords (set via password complexity verification in EM or SQL):
 - Minimum 8 characters
 - At least one letter and one digit
 - Not servername or servername(1-100)
 - Not a common password (i.e. welcome1)
 - Must differ from previous password by 3 characters minimum



Security Enhancements

AUDIT_TRAIL=DB (default)

- Audit Trail is ON by default (was off in 10g),
- AUDIT_TRAIL=DB is now the default.
- Things that will be audited by default include:
 - CREATE USER, CREATE SESSION, CREATE ANY TABLE, CREATE ANY PROCEDURE, CREATE ANY JOB, CREATE EXTERNAL JOB, CREATE ANY LIBRARY, CREATE PUBLIC DB LINK
 - ALTER USER, ALTER ANY TABLE, ALTER ANY PROCEDURE, ALTER PROFILE, ALTER DATABASE, ALTER SYSTEM, AUDIT SYSTEM
 - DROP USER, DROP ANY TABLE, DROP ANY PROCEDURE, DROP PROFILE
 - GRANT ANY PRIVILEGE, GRANT ANY OBJECT PRIVILEGE
 - EXEMPT ACCESS POLICY
 - AUDIT SYSTEM
- Cost of Auditing improved to be 1-2% cost on TPCC benchmark

Oracle Database Security

Built over MANY years...

ORACLE
DATABASE **11^g**



Oracle Audit Vault

Oracle Database Vault

DB Security Evaluation #19

Transparent Data Encryption

EM Configuration Scanning

Fine Grained Auditing (9i)

Secure application roles

Client Identifier / Identity propagation

Oracle Label Security (2000)

Proxy authentication

Enterprise User Security

Global roles

Virtual Private Database (8i)

Database Encryption API

Strong authentication (PKI, Kerberos, RADIUS)

Native Network Encryption (Oracle7)

Database Auditing

2007

1977 Government customer





The Future: 8 Exabytes

Look what fits in one 10g Database!



- 2K – A typewritten page
- 5M – The complete works of Shakespeare
- 10M – One minute of high fidelity sound
- 2T – Information generated on YouTube in one day
- 10T – 530,000,000 miles of bookshelves at the Library of Congress
- 20P – All hard-disk drives in 1995 (or your database in 2010)
- 700P – Data of 700,000 companies with Revenues less than \$200M
- 1E – Combined Fortune 1000 company databases (average 1P each)
- 1E – Next 9000 world company databases (average 100T each)
- 8E – Capacity of ONE Oracle10g Database (CURRENT)
- 12E to 16E – Info generated before 1999 (memory resident in 64-bit)
- 16E – Addressable memory with 64-bit (CURRENT)
- 161E – New information in 2006 (mostly images not stored in DB)
- 1Z – 1000E (Zettabyte - Grains of sand on beaches -125 Oracle DBs)
- 100TY - 100T-Yottabytes – Addressable memory 128-bit (FUTURE)¹¹⁹



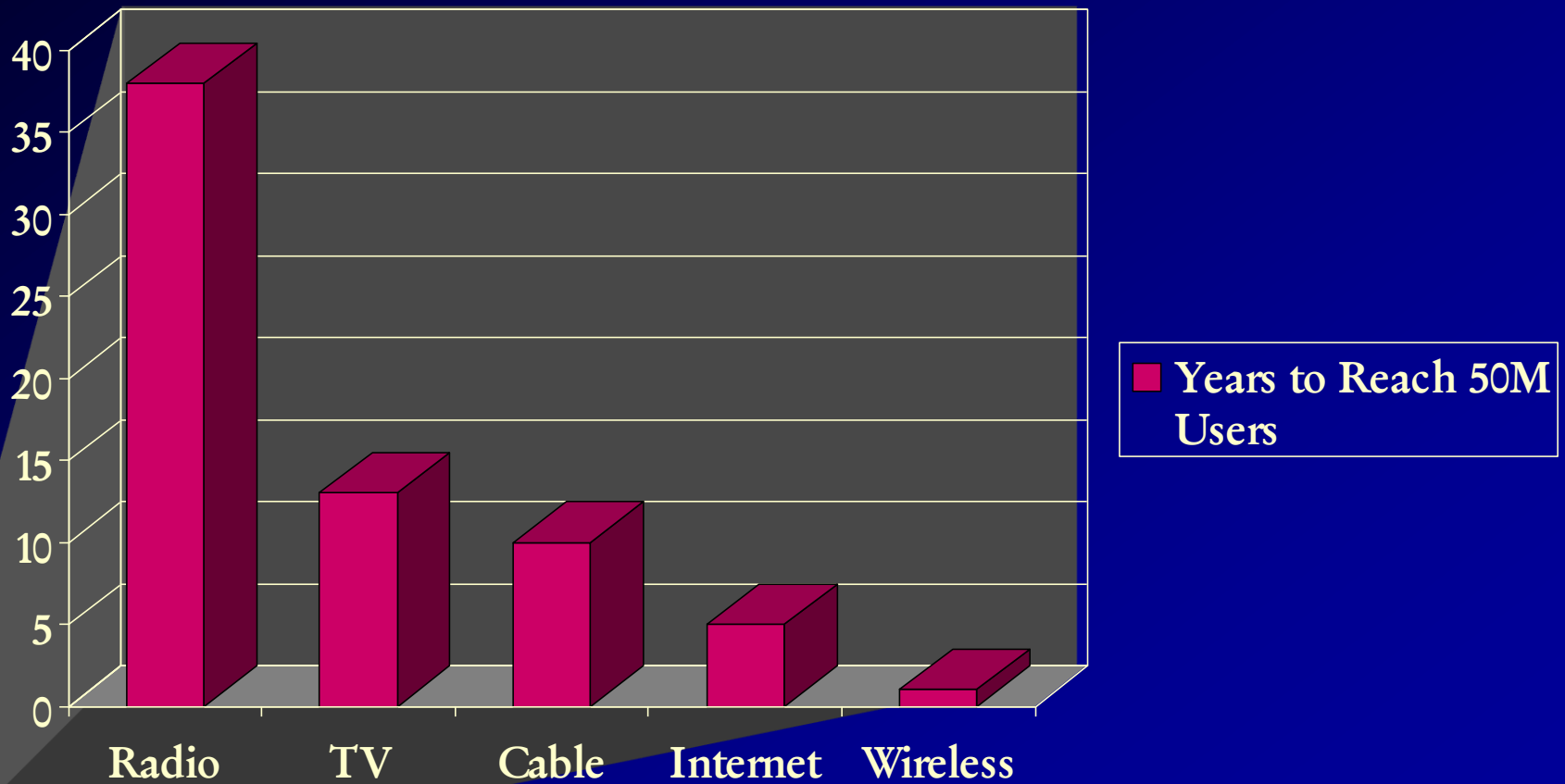
8 Exabytes:

Look what fits in one 10g Database!

- All databases of the largest 1,000,000 companies in the world (3E).
- or*
- All Information generated in the world in 1999 (2E)
- or*
- All Information generated in the world in 2003 (5E)
- or*
- All Email generated in the world in 2006 (6E)
- or*
- 1 Mount Everest filled with Documents (approx.)



Compelling Technology Statistics!





Friedman's 6 Dimensions of Understanding Globalization*

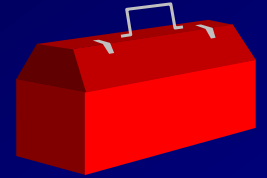
- Politics (Merging)
- Culture (Still disparate)
- Technology (Merging/Merged)
- Finance (Merging/Merged)
- National security (Disparate)
- Ecology (Merging)



* Sited from Mark Hasson, PSU, *Global Pricing and International Marketing*.



V\$ Views over the years



| <u>Version</u> | <u>V\$ Views</u> | <u>X\$ Tables</u> |
|-----------------|-------------------|-------------------|
| 6 | 23 | ? (35) |
| 7 | 72 | 126 |
| 8.0 | 132 | 200 |
| 8.1 | 185 | 271 |
| 9.0 | 227 | 352 |
| 9.2 | 259 | 394 |
| 10.1.0.2 | 340 (+31%) | 543 (+38%) |
| 10.2.0.1 | 396 | 613 |
| 11.1.0.6 | 484 (+22%) | 798 (+30%) |



Summary



- Start Me Up – Using Memory Target
- The Result Cache
- Invisible Indexes & Online Index Rebuilds
- Other Nice Developer Tools
- ADDM Enhancements
- SQL Plan Management & SQL Plan Baseline
- SQL Query Repair Advisor
- SQL Performance Analyzer
- Real Application Testing (Capture & Replay)
- Interval Partitioning & Partition Compression
- DBA Tools and DBMS_STATS Enhancements
- Grid Control & EM
- Security Enhancements & the Future Sizes
- Summary

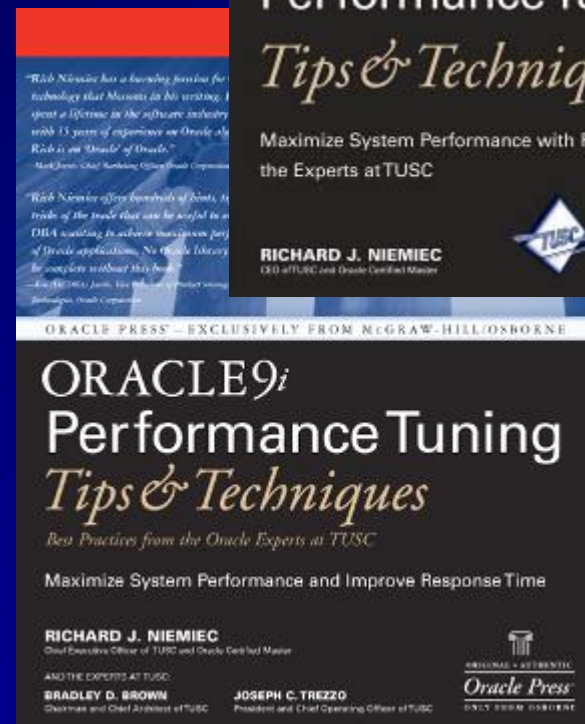




For More Information

- www.tusc.com
- *Oracle9i Performance Tuning Tips & Techniques; Richard J. Niemiec; Oracle Press (May 2003)*
- *Oracle 10g Tuning (June 11, 2007)*

“If you are going through hell, keep going” - Churchill

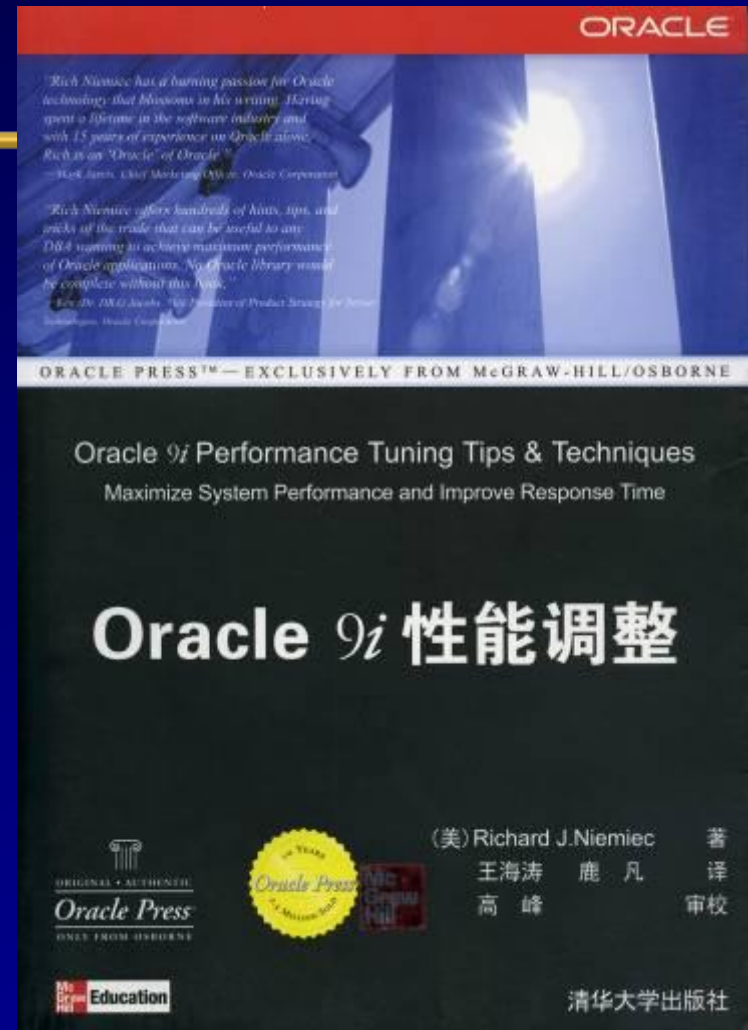


更多信息



- www.tusc.com
- *Oracle9i Performance Tuning Tips & Techniques; Richard J. Niemiec; Oracle Press (May 2003)*
- *Oracle 10g Tuning (June 11, 2007)*

“成功只访问那些没空追求它的人。”





“Life is not measured by the number of breaths we take, but by the moments that take our



-Dr.

Macomber



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Save the Date!



May 3-7, 2009

Orange County Convention Center
West; Orlando, Florida



www.tusc.com



“Success usually comes to those that are too busy to be looking for it.”

- Henry David Thoreau



References

- www.tusc.com. www.roltatusc.com
- *Oracle10g Performance Tuning Tips & Techniques*; Richard J. Niemiec; Oracle Press
- Database Secure Configuration Initiative: Enhancements with Oracle Database 11g, www.oracle.com
- All Oracle11g Documentation from Oracle Beta Site
- Introduction to Oracle Database 11g, Ken Jacobs
- Oracle Database 11g New Features, Linda Smith
- New Optimizer Features in 11g, Maria Colgan
- www.ioug.org, www.oracle.com & technet.oracle.com
- Thanks Dan M., Bob T., Brad, Joe, Heidi, Mike K., Debbie, Maria, Linda
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- **Dedicated to the memory of Stan Yellott Mark Beaton Ray Mansfield**



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- “The Oracle Experts” since 1988
 - Oracle Partner of the Year, 2002, 2004, 2007 & 2008
 - Editors Choice – Consultant of the Year 2002 & 2004
 - Authorship, User Groups and Various Awards
 - One of the first 6 Oracle Masters in the World
 - Certified Advantage Partner

ORACLE CERTIFIED ADVANTAGE
PARTNER





Rich's Overview (rich@tusc.com)



- President of TUSC – A Rolta Company:
 - Inc. 500 Company (Fastest Growing 500 Private Companies)
 - 7 Offices in the United States (U.S.); Based in Chicago
 - Oracle Advantage Partner in Tech & Applications
- Author (3 Oracle Best Sellers):
 - Oracle Performing Tips & Techniques (Covers Oracle7 & 8i)
 - Oracle9i Performance Tips & Techniques
 - Oracle Database 10g Performance Tips & Techniques
- Former President of the International Oracle Users Group
- Current President of the Midwest Oracle Users Group
- Chicago Entrepreneur Hall of Fame - 1998
- Entrepreneur of the Year & National Hall of Fame - 2001
- IOUG Top Speaker in 1991, 1994, 1997, 2001, 2006, 2007
- MOUG Top Speaker Twelve Times
- National Trio Achiever award - 2006
- Oracle Certified Master & Oracle Ace Director
- Purdue Outstanding Electrical & Computer and Engineer - 2007

