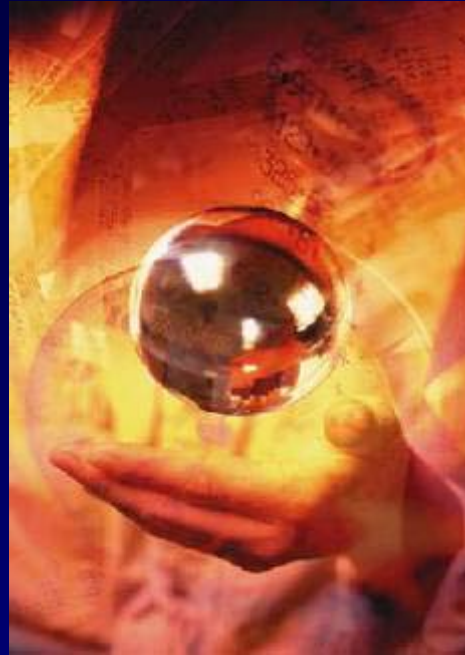


The Best 11g New Features

Collaborate 2007 (Based on 11g Beta)



Rich Niemiec, TUSC (www.tusc.com)

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Audience Knowledge / Versions

- Oracle7 Experience ?
- Oracle8*i* Experience ?
- Oracle9*i* Experience ?
- Oracle10*g* Experience?
- Oracle Database 11*g* 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

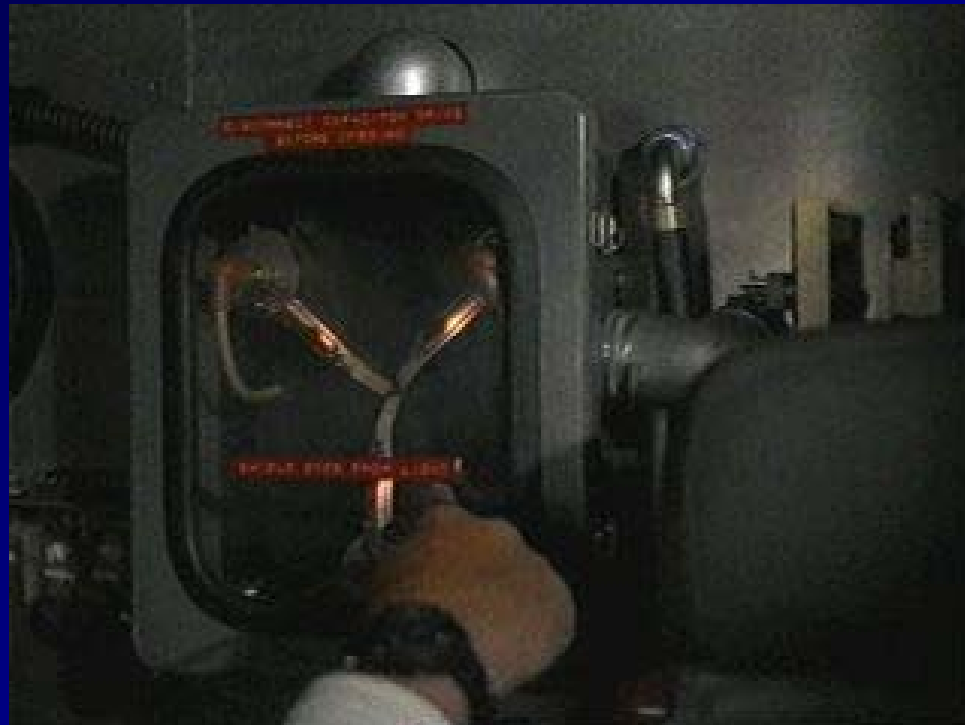


- Start Me Up – Using Memory Target
- The Result Cache
- Invisible Indexes & Online Index Rebuilds
- Virtual Columns and other Nice Developer Tools
- ADDM Enhancements
- SQL Plan Management and SQL Plan Baselines
- SQL Access Advisor & Partition Advisor
- SQL Query Repair Advisor
- SQL Replay Advisor and DB Workload Capture & Replay
- Interval Partitioning & Partition Compression
- DBA Tools, ADR and DBMS_STATS Enhancements
- Grid Control & EM
- Security Enhancements & the Future Sizes
- Summary



Testing the **Future** Version (Beta)

Version 11.1.0.3.0 Beta of the Database



The New Version – Life is Good!



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

SQL*Plus: Release 11.1.0.3.0 - Beta on Wed Mar 21 18:53:08 2007

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Connected to:

Oracle Database 11g Enterprise Edition Release 11.1.0.3.0 - Beta

With the Partitioning, OLAP and Data Mining options

```
SQL> startup
```

```
ORACLE instance started.
```

```
Total System Global Area 382779392 bytes
```

```
Fixed Size 1297580 bytes
```

```
Variable Size 363119444 bytes
```

```
Database Buffers 12582912 bytes
```

```
Redo Buffers 5779456 bytes
```

```
Database mounted.
```

```
Database opened.
```

Or... Use 11g EM...

A screenshot of the Oracle Enterprise Manager 11g console interface. The browser window title is "Oracle Enterprise Manager (SYS) - Startup/Shutdown: Specify Host and Target Database Credentials - Windows Internet Explorer". The address bar shows a URL starting with "http://1158/em/console/database/instance/changeState?event=changeState¤tStatus=1&target=O11gb&type=oracle_database&cancel". The page content includes:

- Oracle Enterprise Manager 11g Database Control
- Database Instance: O11gb >
- Startup/Shutdown: Specify Host and Target Database Credentials
- Specify the following credentials in order to change the status of the database.
- Host Credentials: Specify the OS user name and password to login to target database machine. Username: root, Password: [masked]
- Database Credentials: Specify the credentials for the target database. Username: sys, Password: [masked], Database: O11gb, Connect As: SYSDBA
- Save as Preferred Credential checkbox (unchecked)
- Note: Note that you need to login to the database as SYSDBA or SYSOPER in order to change the status of the database.
- Navigation links: Database | Setup | Preferences | Help | Logout
- Copyright © 1996, 2006, Oracle. All rights reserved.

Or... Use 11g EM...Status...



The screenshot displays the Oracle Enterprise Manager 11g Database Control interface. The main content area shows the status of a database instance and its listener. The database instance is marked as 'Down' with a red arrow pointing down, and the listener is marked as 'Up' with a green arrow pointing up. A red arrow also points to the 'Agent Connection to Instance' status, which is 'Failed'.

Database Instance: O11gb
Enterprise Manager is not able to connect to the database instance. The state of the components are listed below. Page Refreshed Mar 21, 2007 9:17:40 PM CDT [Refresh]

Database Instance

↓

Status **Down** Details: **There has been a user-initiated shutdown.**
Host [REDACTED]
Port **1521**
SID **O11gb**
Oracle Home **/u01/app/oracle/product/11.1.0/db_1**

Listener

↑

Status **Up**
Host [REDACTED]
Port **1521**
Name **LISTENER**
Oracle Home **/u01/app/oracle/product/11.1.0/db_1**
Location **/u01/app/oracle/product/11.1.0/db_1/network/admin**
Details

Agent Connection to Instance

↓

Status **Failed**
Details **ORA-01034: ORACLE not available**

Related Links

- [Recovery Settings](#)
- [Monitor in Memory Access Mode](#)
- [Support Workbench](#)

[Database](#) | [Help](#)

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[About Oracle Enterprise Manager](#)

Database Information – Back UP!



Monitor Database

We have an alert – we logged on as SYS

The screenshot displays the Oracle Enterprise Manager 11g Database Control interface for instance 'O11gb'. The interface includes a navigation menu, a 'General' section with status 'Up', a 'Health Meter' showing 1 issue, and various performance charts. A 'User Audit' alert is highlighted in the 'Alerts' section, with a message: 'User SYS logged on from [redacted]'. The alert table is as follows:

Severity	Category	Name	Impact	Message	Alert Triggered
Warning	User Audit	Audited User	Low	User SYS logged on from [redacted]	Mar 21, 2007 7:56:38 PM

Other visible sections include 'Diagnostic Summary', 'Space Summary', and 'High Availability'.



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 Pool)
- Now there is **MEMORY_TARGET** – 11g
 - SGA + PGA all in one setting; Still set minimums



Init.ora Parameter Changes: SGA_MAX_SIZE



- Dynamic Memory allocation/resizing
 - INIT.ora changes are immediate (no shutdown)
 - Set an SGA_MAX_SIZE (varies by platform):
 - _ksm_granule_size=4M (if SGA<1G)
 - _ksm_granule_size=8M (if SGA>=1G) on Windows 32-bit
 - _ksm_granule_size=16M (if SGA>=1G)
 - SGA_MAX_SIZE is NOT dynamic!
 - MEMORY_MAX_TARGET is NOT dynamic!
- Altered Sizes of SGA components such as shared pool, buffer cache... get put into multiples of a granule size & must be <SGA_MAX_SIZE



Setting a Minimum DB_CACHE_SIZE



- Upon Startup [K/M/G] with >1G SGA:
- ALTER SYSTEM SET DB_CACHE_SIZE=32M
 - Sets it to 32M (sets it to 33554432)
- ALTER SYSTEM SET DB_CACHE_SIZE=17M
 - Sets it to 32M (sets it to next highest multiple)
- ALTER SYSTEM SET DB_CACHE_SIZE=33M
 - Sets it to 48M (again sets it to next highest multiple of original size)
- ALTER SYSTEM SET DB_CACHE_SIZE=2M
 - Sets it to 16M (sets it to next highest/but at minimum of initial size)
- ALTER SYSTEM SET DB_CACHE_SIZE = 2000G
ALTER SYSTEM SET DB_CACHE_SIZE = 2000G

*

ERROR at line 1:

ORA-32017: failure in updating SPFILE

ORA-00384: Insufficient memory to grow cache



SGA & PGA will both be in: MEMORY_TARGET

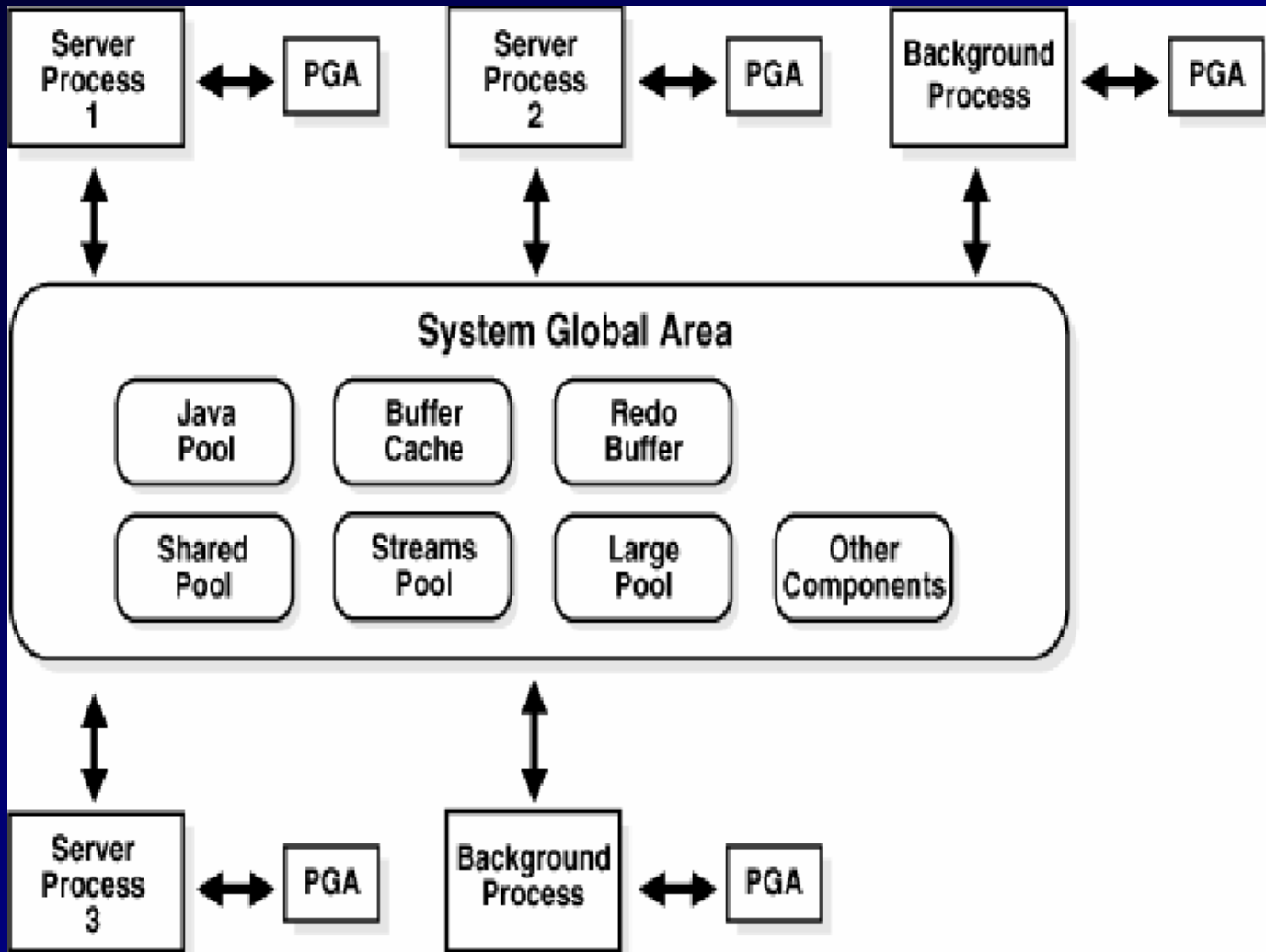


SGA: The System Global Area (SGA) are memory structures that control one instance and contain primarily the data in cache (**DB_CACHE_SIZE**) and statements (**SHARED_POOL_SIZE**).

PGA: The Program Global Area (PGA) contains the data and control information for a server PROCESS. It is non-shared memory allocated when a server process is started. Total allocated is the **PGA_AGGREGATE_TARGET**.



SGA & PGA will be MEMORY_TARGET



Automatically sized SGA Components that Use SGA_TARGET



<u>Component</u>	<u>Initialization Parameter</u>
Fixed SGA	None
Shared Pool	SHARED_POOL
Large Pool	LARGE_POOL_SIZE
Java Pool	JAVA_POOL_SIZE
Buffer Cache	DB_CACHE_SIZE
Streams Pool	STREAMS_POOL_SIZE



Manually Sized SGA Components that Use SGA_TARGET

<u>Component</u>	<u>Initialization Parameter</u>
Log buffer	LOG_BUFFER (pfile only in 10g)
Keep Pool	DB_KEEP_CACHE_SIZE
Recycle Pool	DB_RECYCLE_CACHE_SIZE
Block caches	DB_nK_CACHE_SIZE

Program Global Area (now in MEMORY_TARGET):

Aggregate PGA PGA_AGGREGATE_TARGET



Moving from to Manually Sizing to: **SGA_TARGET (Sizing SGA)**



```
SQL> COL SGA_TARGET FOR 999,999,999,999
```

```
SQL> SELECT ((select sum(value) from v$sga) -  
            (select current_size from  
             v$sga_dynamic_free_memory)) "SGA_TARGET"  
FROM DUAL;
```

```
SGA_TARGET
```

```
-----  
215,007,232
```

Automatic Memory Management (AMM)

MEMORY_TARGET in 11g



```
SQL> sho parameter sga_
```

NAME	TYPE	VALUE
sga_max_size	big integer	360M
sga_target	big integer	0

```
SQL> sho parameter memory
```

NAME	TYPE	VALUE
memory_max_target	big integer	360M
memory_target	big integer	360M



Moving from SGA_TARGET to: **MEMORY_TARGET**



SQL> sho parameter target

NAME	TYPE	VALUE
memory_max_target	big integer	0
memory_target	big integer	0
pga_aggregate_target	big integer	110M
sga_target	big integer	250M



Moving from SGA_TARGET to: MEMORY_TARGET



```
ALTER SYSTEM SET MEMORY_MAX_TARGET=360M SCOPE=SPFILE;  
(shutdown/startup)
```

```
ALTER SYSTEM SET MEMORY_TARGET=360M SCOPE=SPFILE;
```

```
ALTER SYSTEM SET SGA_TARGET=0; (or set a minimum)
```

```
ALTER SYSTEM SET PGA_AGGREGATE_TARGET=0; (or set a minimum)
```

```
SQL> sho parameter target
```

NAME	TYPE	VALUE
memory_max_target	big integer	360M
memory_target	big integer	360M
pga_aggregate_target	big integer	0
sga_target	big integer	0

Moving from SGA_TARGET to: MEMORY_TARGET (set minimums)



```
ALTER SYSTEM SET SGA_TARGET=200;  
ALTER SYSTEM SET PGA_AGGREGATE_TARGET=100;
```

```
SQL> sho parameter target
```

NAME	TYPE	VALUE
memory_max_target	big integer	360M
memory_target	big integer	360M
pga_aggregate_target	big integer	100M
sga_target	big integer	200M



Moving from SGA_TARGET to: MEMORY_TARGET - EM

The screenshot displays the Oracle Enterprise Manager (EM) interface for configuring memory parameters. It is divided into two main sections: SGA (System Global Area) and PGA (Program Global Area).

SGA Configuration

Automatic Memory Management: Enabled. Total Memory Size (MB): 360.

SGA Component Current Allocation (MB):

Component	Current Allocation (MB)
Shared Pool	120
Buffer Cache	60
Large Pool	4
Java Pool	4
Other	12

SGA Allocation History: A bar chart showing the size of SGA components over time. The total size is constant at 200 MB.

PGA Configuration

Automatic Shared Memory Management: Enabled. Total SGA Size (MB): 200.

PGA Component Current Allocation (MB):

Component	Current Allocation (MB)
Shared Pool	60%
Buffer Cache	30%
Large Pool	2%
Java Pool	2%
Other	6%

PGA Allocation History: A bar chart showing the size of PGA components over time. The total size is constant at 200 MB.



The Result Cache



First, A quick review: Flush Buffer Cache



- The new 10g feature allows the flush of the buffer cache. It is **NOT intended for production use**, but rather for system testing purposes.
- This can help you in your tuning needs or as a band-aid if you have 'free buffer' waits (there are better ways to fix this like writing more often or increasing the DB_CACHE_SIZE)
- Note that **any Oracle I/O not done in the SGA counts as a physical I/O**. If your system has O/S caching or disk caching, the actual I/O that shows up as physical may indeed be a memory read outside of Oracle.
- To flush the buffer cache perform the following:

```
SQL> ALTER SYSTEM FLUSH BUFFER_CACHE;
```

Flush Buffer Cache Example



```
select count(*) from tab1;
```

```
COUNT(*)
```

```
-----  
1147
```

Execution Plan

```
-----  
0  SELECT STATEMENT Optimizer=CHOOSE (Cost=4 Card=1)  
1  0  SORT (AGGREGATE)  
2  1  TABLE ACCESS (FULL) OF 'TAB1' (TABLE) (Cost=4 Card=1147)
```

Statistics

```
-----  
0  db block gets  
7  consistent gets  
6  physical reads
```

Flush Buffer Cache Example



select count(*) from tab1; **(Run it again and the physical reads go away)**

```
COUNT(*)
```

```
-----  
1147
```

Execution Plan

```
-----  
0  SELECT STATEMENT Optimizer=CHOOSE (Cost=4 Card=1)  
1  0  SORT (AGGREGATE)  
2  1  TABLE ACCESS (FULL) OF 'TAB1' (TABLE) (Cost=4 Card=1147)
```

Statistics

```
-----  
0  db block gets  
7  consistent gets  
0  physical reads
```


Flush Buffer Cache Example



```
ALTER SYSTEM FLUSH BUFFER_CACHE;
```

System altered.

```
select count(*) from tab1; (Flush the cache and the physical reads are back)
```

```
COUNT(*)
```

```
-----  
1147
```

Execution Plan

```
-----  
0  SELECT STATEMENT Optimizer=CHOOSE (Cost=4 Card=1)  
1  0  SORT (AGGREGATE)  
2  1  TABLE ACCESS (FULL) OF 'TAB1' (TABLE) (Cost=4 Card=1147)
```

Statistics

```
-----  
0  db block gets  
7  consistent gets  
6  physical reads
```

The Result Cache

The logo for TUSC (The University of South Carolina) is a diamond shape with the letters 'TUSC' inside. A horizontal line with a slight curve passes through the diamond, and there are three horizontal lines below it.

- 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** (auto/**manual**)
- **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 without hint and it returned an elapsed time of 3.80 seconds (not cached).

Step 2 - In Session 2 –

Executed query without hint and it returned an elapsed time of 3.20 seconds (not cached).

Result Cache

Example Performance



Step 3 - In Session 2

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

Step 4 - In Session 1

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

Result Cache Example Query From the Oracle Docs



- The **RELIES_ON Clause** specifies tables or views that the Function Results are dependent on.

-- Package specification

```
CREATE OR REPLACE PACKAGE HR IS
```

...

```
type DeptInfoRec IS RECORD (avgSal NUMBER,  
                             numberEmployees NUMBER);
```

-- Function declaration

```
FUNCTION GetDeptInfo (dept_id NUMBER) RETURN DeptInfoRec  
RESULT_CACHE;
```

...

```
END HR;
```


Result Cache Example Query From the Oracle Docs



```
PACKAGE BODY HR IS
```

```
...
```

```
-- Function definition
```

```
FUNCTION GetDeptInfo (dept_id NUMBER) RETURN DeptInfoRec  
    RESULT_CACHE RELIES_ON (EMP);
```

```
IS
```

```
    result DeptInfoRec;
```

```
BEGIN SELECT AVG(sal), count(*) INTO result  
        FROM EMP
```

```
        WHERE deptno = dept_id;
```

```
    RETURN result;
```

```
END;
```

```
...
```

```
END HR;
```

The Result Cache – V\$ Views



- **V\$RESULT_CACHE_STATISTICS** – Displays the amount of memory to help you determine memory currently allocated to the result cache.

Other V\$ views:

- **V\$RESULT_CACHE_MEMORY**
- **V\$RESULT_CACHE_OBJECTS**
- **V\$RESULT_CACHE_DEPENDENCY**



The Result Cache – FYI Only

Digging Deeper



KSPPINM	KSPSTVL	KSPDESC
<code>-----</code>	<code>-----</code>	<code>-----</code>
<code>_result_cache_auto_execution_threshold</code>	<code>1</code>	<code>result cache auto execution threshold</code>
<code>_result_cache_auto_size_threshold</code>	<code>100</code>	<code>result cache auto max size allowed</code>
<code>_result_cache_auto_time_threshold</code>	<code>1000</code>	<code>result cache auto time threshold</code>
<code>_result_cache_block_size</code>	<code>1024</code>	<code>result cache block size</code>
<code>_result_cache_bypass</code>	<code>FALSE</code>	<code>bypass the result cache</code>
<code>_result_cache_hash_buckets</code>	<code>1024</code>	<code>hash bucket count</code>
<code>_result_cache_invalid</code>	<code>0</code>	<code>post-invalidation usage allowance</code>
<code>_result_cache_max_result</code>	<code>100</code>	<code>maximum result size as percent of cache size</code>
<code>_result_cache_remote_expiration</code>	<code>0</code>	<code>maximum life time (min) for any result using a remote object</code>
<code>_result_cache_timeout</code>	<code>60</code>	<code>maximum time (sec) a session waits for a result</code>

Tuning Tools – FYI Only

DBMS_XPLAN



- Use DBMS_XPLAN to query the execution plan
 - Automatically queries the last plan in PLAN_TABLE
 - uses a TABLE() function with another pipelined function
 - Operation text truncation might be a problem
 - Will give additional information after plan
 - Highlight filter vs join conditions, if plan table is current
 - Displays warning message of old version plan table is being used
 - In 11g, a procedure for SQL Plan Baselines (we'll cover these later).

```
DBMS_XPLAN.DISPLAY_SQL_PLAN_BASELINE (  
    sql_handle IN VARCHAR2 := NULL,  
    plan_name IN VARCHAR2 := NULL,  
    format IN VARCHAR2 := 'TYPICAL') <'BASIC'/'ALL'>  
RETURN dbms_xplan_type_table;
```



Tuning Tools – FYI Only

DBMS_XPLAN



DBMS_XPLAN Example:

Select *
from table (dbms_xplan.display);

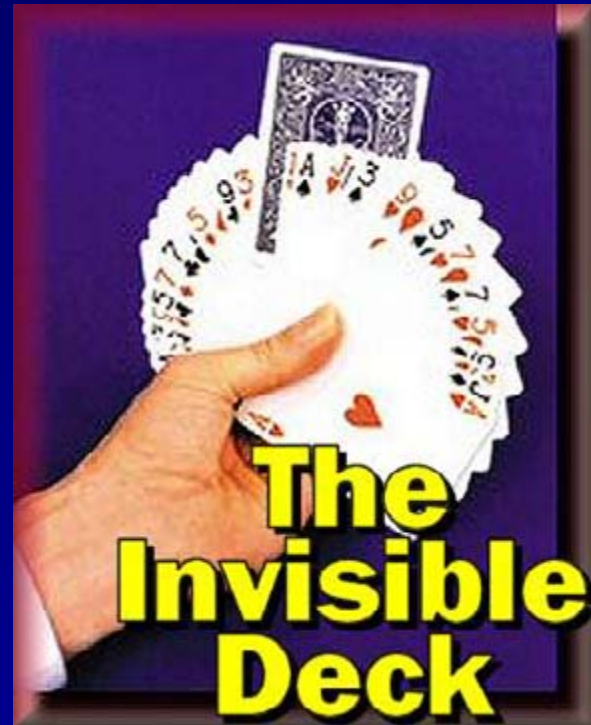
PLAN_TABLE_OUTPUT

Id	Operation	Name	Rows	Bytes	Cost	Pstart	Pstop
0	UPDATE STATEMENT		328	2296	2		
1	UPDATE	JOURNAL_LINE					
2	PARTITION RANGE ALL					1	4
3	TABLE ACCESS FULL	JOURNAL_LINE	328	2296	2	1	4

Note: cpu costing is off, 'PLAN_TABLE' is old version
11 rows selected



The Invisible Index





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 `INDEX` (to override invisibility) or `NO_INDEX` (to override visibility) hints to override either setting.
- The index `IS MAINTAINED` during DML
- Great for testing!



The Invisible Index

```
create index deptno_invisible_idx on dept_rich(deptno) invisible;  
Index created.
```

```
select count(*) from dept_rich where deptno = 30; (doesn't see the index)
```

```
COUNT(*)  
-----  
      512
```

Execution Plan

Plan hash value: 3024595593

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		1	2	4 (0)	00:00:01
1	SORT AGGREGATE		1	2		
* 2	TABLE ACCESS FULL	DEPT_RICH	512	1024	4 (0)	0:00:01



The Invisible Index

```
select /*+ index(dept_rich dept_rich_inv_idx) */ count(*)
from dept_rich where deptno = 30; (forces the index with hint)
```

```
COUNT(*)
```

```
-----
512
```

```
Execution Plan
```

```
-----
Plan hash value: 3699452051
```

```
-----
| Id | Operation                | Name                | Rows | Bytes | Cost (%CPU) | Time      |
-----
| 0  | SELECT STATEMENT         |                     |      |      |      1 (0)   | 00:00:01 |
| 1  |   SORT AGGREGATE         |                     |      |      |              |          |
|* 2  |    INDEX RANGE SCAN      | DEPT_RICH_INV_IDX  | 512  | 1024 | 1 (0)       | 00:00:01 |
-----
```



The Invisible Index (set visible)



```
alter index dept_rich_inv_idx visible;
Index altered.
```

```
select count(*) from dept_rich where deptno = 30;
(it does see the index)
```

```
COUNT(*)
-----
      512
```

Execution Plan

Plan hash value: 3699452051

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		1	2	1 (0)	00:00:01
1	SORT AGGREGATE		1	2		
* 2	INDEX RANGE SCAN	DEPT_RICH_INV_IDX	512	1024	1 (0)	00:00:01



The Invisible Index (set visible)



```
select /*+ no_index(dept_rich dept_rich_inv_idx) */ count(*)  
from dept_rich  
where deptno = 30; (forces not using the index with hint)
```

COUNT(*)

512

Execution Plan

Plan hash value: 3024595593

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		1	2	4 (0)	00:00:01
1	SORT AGGREGATE		1	2		
* 2	TABLE ACCESS FULL	DEPT_RICH		512	1024	4 (0) 0:00:01



The Invisible Index (check it)

```
alter index dept_rich_inv_idx invisible;
```

Index altered.

```
select index_name, visibility
```

```
from dba_indexes (or go to USER_INDEXES)
```

```
where index_name = 'DEPT_RICH_INV_IDX';
```

INDEX_NAME

VISIBILITY

DEPT_RICH_INV_IDX

INVISIBLE



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.
```




Create Index Online (careful)



```
select index_name, visibility
from dba_indexes
where index_name = 'DEPT_RICH_INV_IDX';
```

INDEX_NAME	VISIBILITY
DEPT_RICH_INV_IDX	INVISIBLE

```
alter index dept_rich_inv_idx rebuild tablespace users online;
```

Index altered.

```
select index_name, visibility
from dba_indexes
where index_name = 'DEPT_RICH_INV_IDX';
```

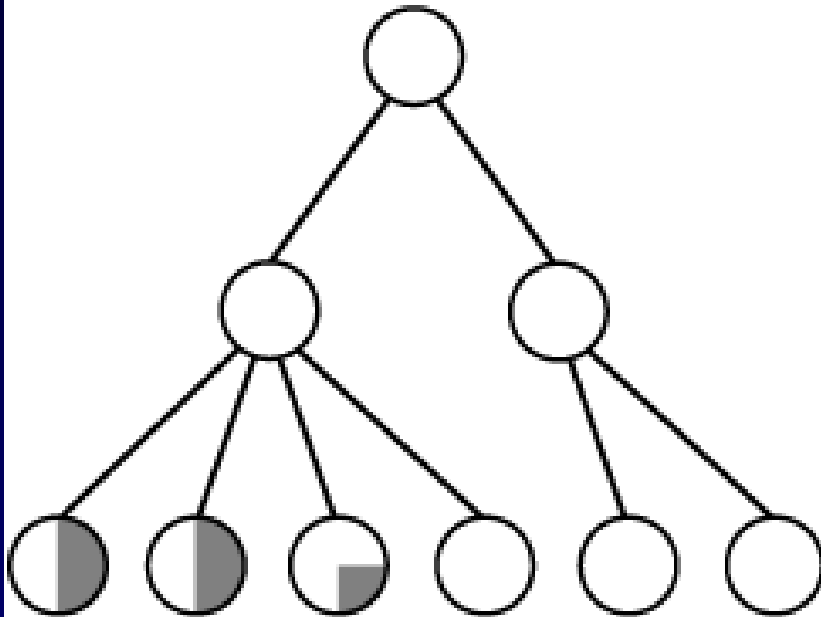
INDEX_NAME	VISIBILITY
DEPT_RICH_INV_IDX	VISIBLE

Rebuild Index or Coalesce (FYI)

Coalesce Example from Oracle Doc.

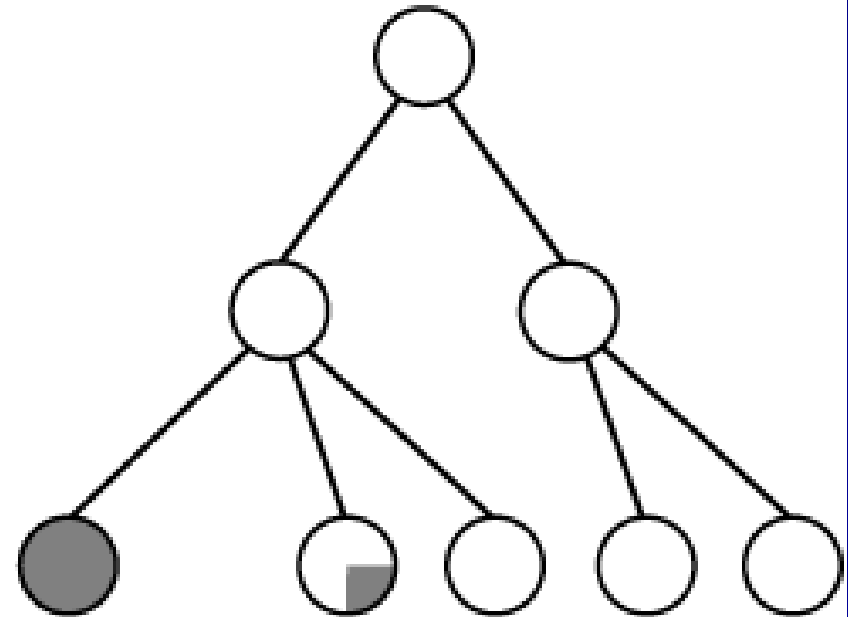


B-tree Index



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 dropping

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



Alter Index Online (careful)

```
select segment_name, segment_type, tablespace_name from dba_segments
where segment_name = 'DEPT_RICH_INV_IDX';
```

SEGMENT_NAME	SEGMENT_TYPE	TABLESPACE_NAME
DEPT_RICH_INV_IDX	INDEX	SYSTEM

```
alter index dept_rich_inv_idx rebuild tablespace users online;
```

Index altered.

```
select segment_name, segment_type, tablespace_name from dba_segments
where segment_name = 'DEPT_RICH_INV_IDX';
```

SEGMENT_NAME	SEGMENT_TYPE	TABLESPACE_NAME
DEPT_RICH_INV_IDX	INDEX	USERS



The Virtual Column



The Virtual Column



- The value of the virtual column is a derived expression.
 - Can be derived from columns of the same table
 - Can be derived from constants
 - Can include SQL or user-defined PL/SQL functions
- You can create an index or partition on a virtual column
- Index Organized and External Tables can NOT have virtual columns.
- You can NOT explicitly write to a virtual column₅₂



The Virtual Column

```
create table emp_rich  
  (empno number(4),  
   sal  number(7,2),  
   yearly_sal generated always as (sal*12),  
   deptno number(2));
```

Table created.

```
insert into emp_rich(empno, sal, deptno)  
  select empno, sal, deptno from scott.emp;
```

14 rows created.

The Virtual Column



```
select * from emp_rich;
```

EMPNO	SAL	YEARLY_SAL	DEPTNO
-------	-----	------------	--------

7369	800	9600	20
7499	1600	19200	30
7521	1250	15000	30
7566	2975	35700	20
7654	1250	15000	30
7698	2850	34200	30

...

Nice Developer Tools/Improvements



DDL_LOCK_TIMEOUT

PL/SQL Expressions

Simple Integer

New PL/SQL Packages

The DDL Lock Timeout



- DDL Statements (Create/Alter/Drop) require exclusive locks and thus sometimes fail due to bad timing.
- The parameter `DDL_LOCK_TIMEOUT` specifies the **amount of time (in seconds) the DDL statement will wait for the lock before timing out and failing.**
- The default value is 0, the max value is 100000 (27.77 hours).
- Example:

```
alter session set DDL_LOCK_TIMEOUT = 30
```

Session altered.



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;
```

Simple Integer Data Type

The logo for TUSC (The University of South Carolina) is a diamond shape with the letters 'TUSC' inside. A horizontal line with three parallel bars underneath it extends from the left side of the diamond.

- Oracle added the new **SIMPLE_INTEGER** data type to be more efficient than **PLS_INTEGER** since the **operations are done directly at the hardware level**. There is also a built-in **NOT NULL** condition for **SIMPLE_INTEGER**.
- The performance is larger when the **PLS_CODE_TYPE='NATIVE'** vs. **INTERPRETED**
- We used a PL/SQL Block to **loop through 1 million times** incrementing a numeric variable by one. We **executed the test for each of these three times**.

Results:

NUMBER: 1.26s

PLS_INTEGER: 0.88s

SIMPLE_INTEGER: 0.65s



Additional Enhancements

New PL/SQL Packages



- DBMS_AUTO_TASK_ADMIN
- DBMS_COMPARISON
- DBMS_DG
- DBMS_EDITIONS_UTILITIES
- DBMS_HM (Health Monitor)
- DBMS_HPROF
- DBMS_MGD_ID_UTL
- DBMS_NETWORK_ACL_ADMIN
- DBMS_RESCONFIG
- DBMS_RESULT_CACHE
- DBMS_SQLDIAG (SQL Repair)
- DBMS_WORKLOAD_CAPTURE
- DBMS_WORKLOAD_REPLAY
- DBMS_XA
- DBMS_XDBADMIN
- DBMS_XEVEN
- DBMS_XMLDTD
- DBMS_XMLINDEX
- DBMS_XMLTRANSLATIONS
- SDO_RDF
- SDO_RDF_INFERENCE



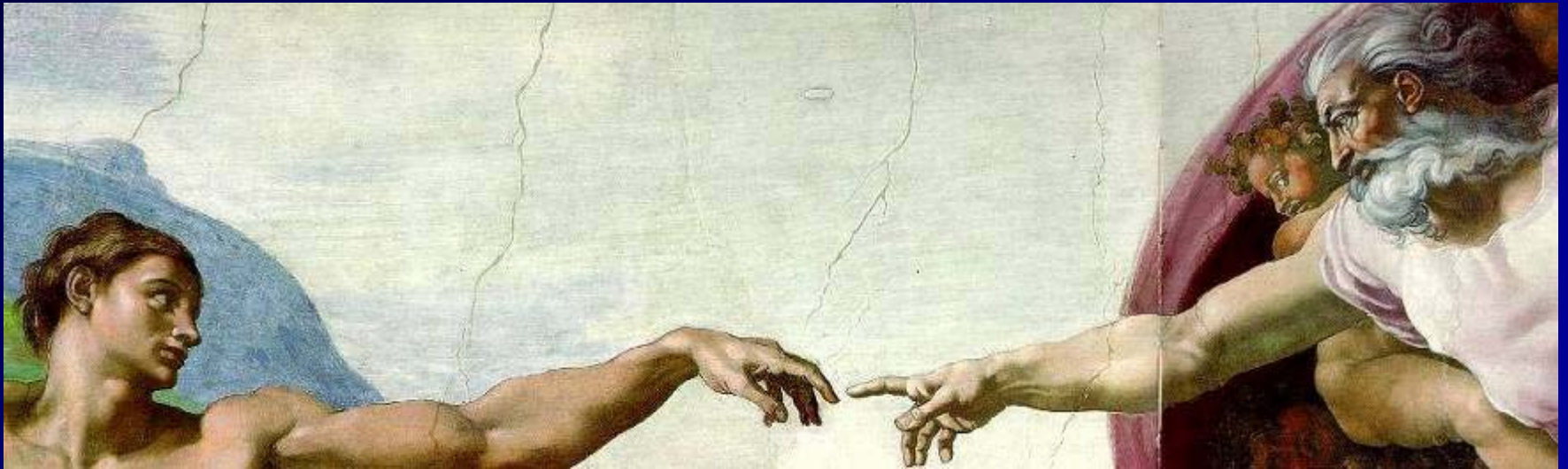
Additional Enhancements

Enhanced PL/SQL Packages

- **DBMS_ADVISOR**
- DBMS_APPLY_ADM
- DBMS_AQ
- DBMS_AQADM
- DBMS_CAPTURE_ADM
- DBMS_CDC_PUBLISH
- DBMS_CDC_SUBSCRIBE
- DBMS_CQ_NOTIFICATION
- DBMS_DATA_MINING
- DBMS_DATA_MINING_TRANSFORM
- DBMS_DATAPUMP
- DBMS_EXPFIL
- **DBMS_FLASHBACK**
- DBMS_HS_PASSTHROUGH
- DBMS_LOB
- DBMS_LOGSTDBY
- DBMS_MGWADM
- DBMS_MVIEW
- DBMS_PREDICTIVE_ANALYTICS
- DBMS_RESOURCE_MANAGER
- DBMS_RLMGR
- DBMS_RULE_ADM
- DBMS_SCHEDULER
- DBMS_SERVER_ALERT
- **DBMS_SESSION**
- **DBMS_SPACE**
- **DBMS_SQL**
- **DBMS_SQLTUNE**
- **DBMS_STATS**
- DBMS_STREAMS_ADM
- DBMS_TRACE
- DBMS_UTILITY
- DBMS_WORKLOAD_REPOSITORY
- DBMS_XDB
- DBMS_XMLSCHEMA
- **DBMS_XPLAN**
- UTL_INADDR
- UTL_RECOMP
- UTL_SMTP
- UTL_TCP



ADDM Enhancements





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 snapshots

ADDM Briefly



Specific Database Instance

We have 9 ADDM Findings

Check them Here

Oracle Enterprise Manager (SYS) - Database Instances: O11gb - Windows Internet Explorer

https://[redacted]/database/instance/!emap?event=doLoad&target=O11gb&type=oracle_database

Oracle Enterprise Manager 11g
Database Control

Database Instance: O11gb

Home Performance Availability Server Schema Data Movement Software and Support

Latest Data Collected From Target Mar 23, 2007 10:33:55 PM CDT Refresh View Data Automatically (60 sec)

General Status Up Up Since Mar 21, 2007 9:23:13 PM CDT Instance Name O11gb Version 11.1.0.3.0 Host [redacted] Listener LISTENER [redacted]

Health Meter 1 Issues 0 Incidents 1 Alerts Health History

Host CPU Load 0.00 Paging 0.00 Maximum CPU 1

Active Sessions Wait User I/O CPU

Diagnostic Summary ADDM Findings 9 Period Start Time Mar 23, 2007 10:00:46 PM Alert Log Mar 21, 2007 9:15:38 PM SQL Response Time Edit Reference Collection

Space Summary Database Size (GB) 1,516 Problem Tablespace 0 Segment Advisor Recommendations 0 Space Violations 0 Dump Area Used (%) 78

High Availability Instance Recovery Time (sec) 23 Last Backup n/a Usable Flash Recovery Area (%) 100 Flashback 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 [redacted]	Mar 23, 2007 10:03:33 PM

Related Alerts

ADDM Performance Analysis Period Start Time Mar 23, 2007 10:00:46 PM Period Duration (minutes) 8.15 Instance O11gb

Impact (%)	Finding	Occurrences (last 24 hrs)
100	CPU Usage	1 of 25
36.9	Top SQL by DB Time	3 of 25

ADDM Briefly

The screenshot displays the Oracle Enterprise Manager 11g interface for the Automatic Database Diagnostic Monitor (ADDM). The browser window title is "Oracle Enterprise Manager (SYS) - Automatic Database Diagnostic Monitor (ADDM) - Windows Internet Explorer". The URL is "http://[redacted]/console/database/instance/101/11g/ptype=oracle_database/ptageum=1&task_id=1121&event=view_result".

The page shows the "Automatic Database Diagnostic Monitor (ADDM)" section. It includes a "Database Activity" graph showing Active Sessions over time, with a legend for Wait, User I/O, and CPU. Below the graph is a "TIP For an explanation of the icons and symbols used in this page, see the [Icon Key](#)".

The "ADDM Performance Analysis" section is visible, showing the Task Name "ADDM:1471326733_1_130" and the Time Range "Mar 22, 2007 10:47:01 PM to Mar 22, 2007 11:19:01 PM". The Task Owner is "SYS" and the Average Active Sessions is "0.6". The Period Start Time is "Mar 22, 2007 10:00:23 PM CDT" and the Duration is "60.7 (minutes)".

Impact (%)	Finding	Occurrences (last 24 hrs)
30	Hard Parse Due to Parse Errors	1 of 23
10	PL/SQL Execution	1 of 23
9.1	Top Segments by I/O	1 of 23
8.7	Hard Parse Due to Invalidations	1 of 23
8.1	"Scheduler" Wait Class	1 of 23
5.1	I/O Throughput	1 of 23
4.2	PL/SQL Compilation	1 of 23
2	Unusual "Application" Wait Event	1 of 23

Below the table, there is a section for "Informational Findings".

Top
ADDM
Findings

Click a
Single
Timeframe

Let's
Check the
Hard Parse
Issue



ADDM Briefly

Detailed Info & Findings

Add'l Info

The screenshot shows the Oracle Enterprise Manager 11g interface. The main heading is "Performance Finding Details: Hard Parse Due to Parse Errors".

Finding: Hard parsing SQL statements that encountered parse errors was consuming significant database time.

Impact: Active Sessions: .19, Impact (%): 30. A bar chart shows the impact percentage.

Period Start Time: Mar 22, 2007 10:00:23 PM CDT

Period Duration (minutes): 60.7

Filtered: No

Recommendations: Investigate application logic to eliminate parse errors.

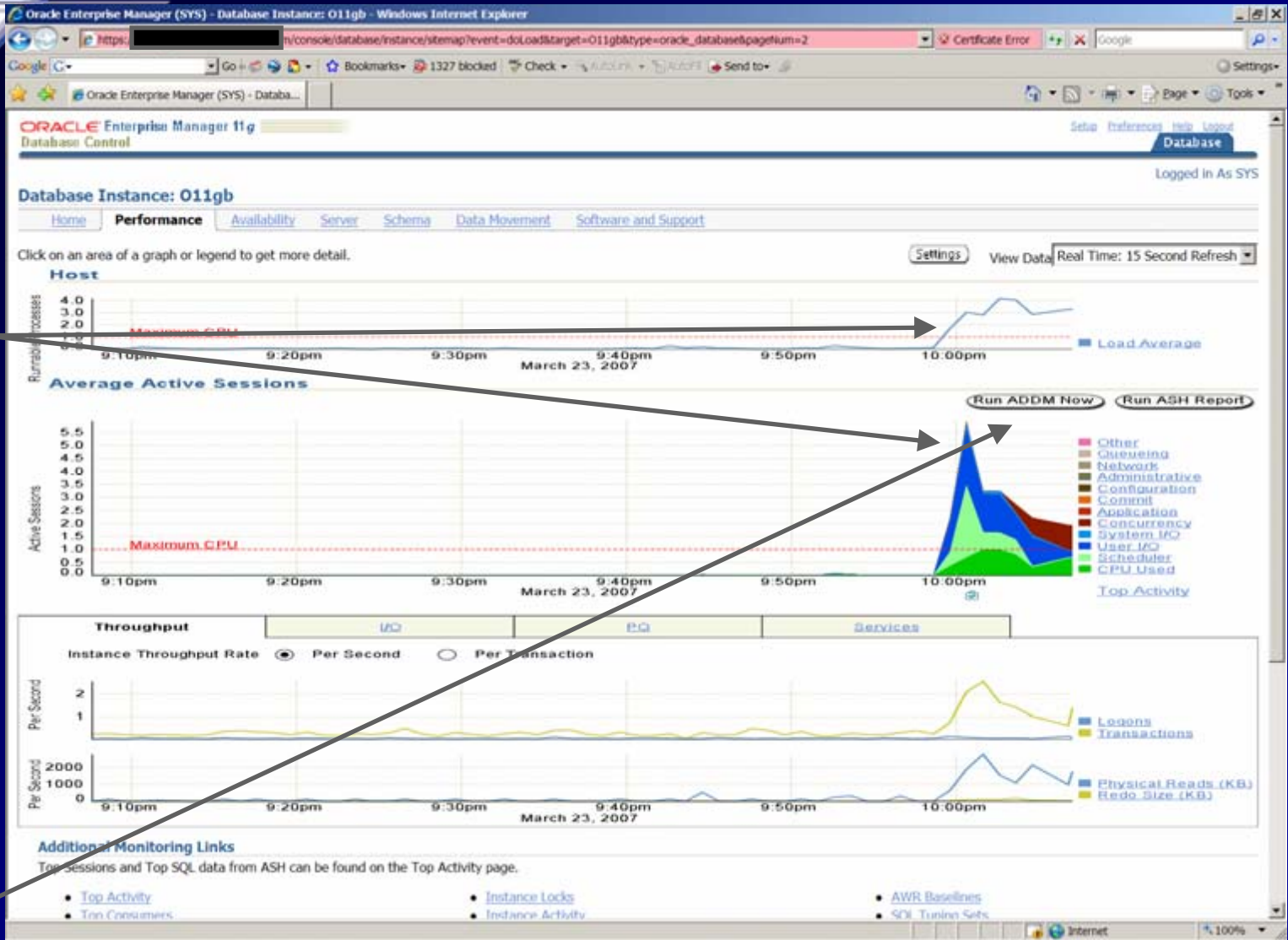
Findings Path: Expand All | Collapse All

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	

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



ADDM - Run NOW!

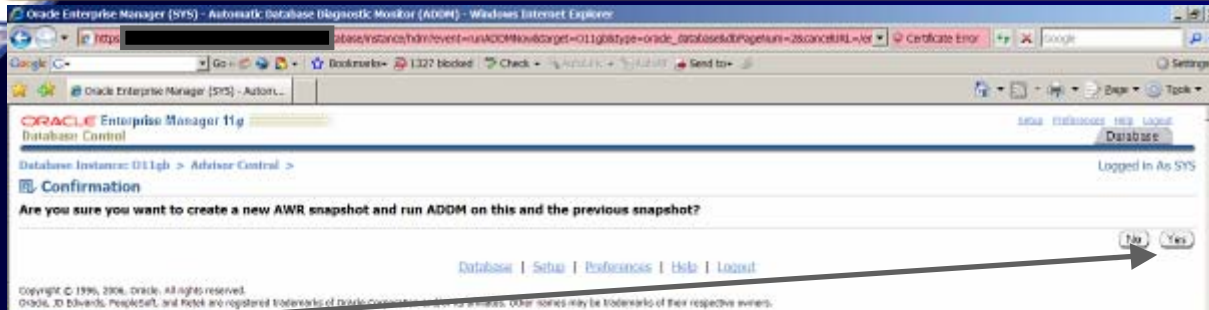


A Big Problem Occurs

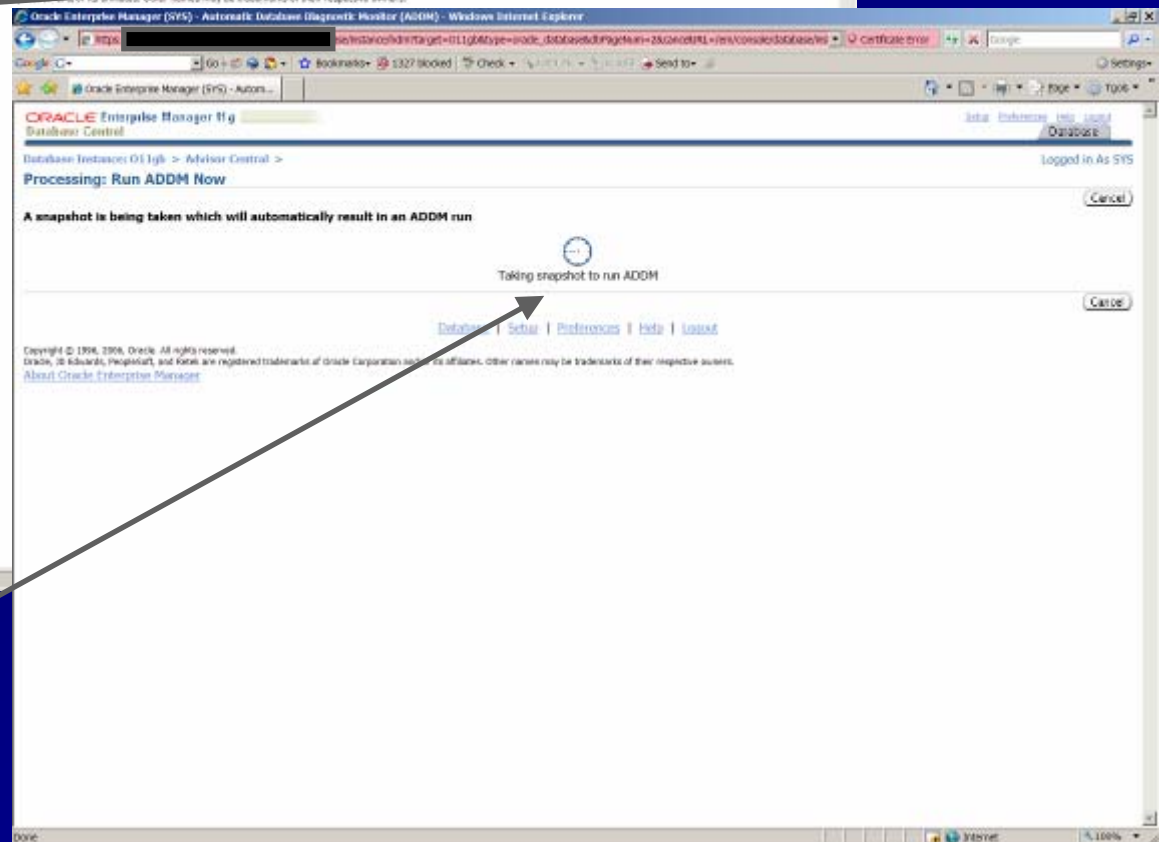
Run ADDM NOW!



ADDM - Run NOW!



Are you
Sure?



Running



ADDM – Run NOW!

Oracle Enterprise Manager (SYS) - Automatic Database Diagnostic Monitor (ADDM) - Windows Internet Explorer

https://[redacted]/oracle/database/instance/hdm?target=O11gb&type=oracle_database&dbPageItem=2&task_id=1161

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

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

Active Sessions

Legend: Wait (orange), User I/O (blue), CPU (green)

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

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!

Oracle Enterprise Manager (SYS) - Performance Finding Details - Windows Internet Explorer

Oracle Enterprise Manager 11g Database Control

Database Instance: O11g1 > 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 (%)
Host Configuration	100
SQL Tuning	27.8
Application Analysis	4

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.**

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
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](#)

Detail on CPU Issue?

Suggested Fixes

ADDM – Run NOW!



View
The
Report

Oracle Enterprise Manager (SYS) - View Report - Windows Internet Explorer

https://[redacted]/oracle/database/instance/hdm?target=O11gb&type=oracle_database&dbPageNum=28&task_id=1161

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

AWR 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 ora11gtest.tuscil.com.

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 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, Checkpoint.₇₂



SQL Plan Management





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 HINTS** for this SQL statement for query optimizer to generate a better execution plan.



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.
- A SQL Profile is automatic in 11g.
- 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

Oracle Enterprise Manager (SYS) - Top Activity - Windows Internet Explorer

ORACLE Enterprise Manager 11g Database Control

Database Instances: O11gb >

Top Activity

Drag the shaded box to change the time period for the detail section below.

View Data: Real Time: 15 Second Refresh

Detail for Selected 5 Minute Interval
Start Time: Mar 27, 2007 9:26:53 AM CDT

Top SQL

Select Activity (%)	SQL ID	SQL Type
19.72	6bukt2c29gpp	SELECT
16.90	b058ymxl1v6q	SELECT
15.49	6097a1430c6o2	PL/SQL EXECUTE
11.27	bsaux08b32tb	PL/SQL EXECUTE
7.04	q4y0bx96bn1kq	PL/SQL EXECUTE
5.63	0arwv52tbpq2am	SELECT
2.82	Sa1161u6hv9dy	SELECT
2.82	yo8zdx2x9t6	SELECT
2.82	Sa1161u6hv9dy	SELECT
2.82	q05j226resdq9s	SELECT

Top Sessions

Activity (%)	Session ID	QC Session ID	User Name	Program
17.82	161		SYS	oracle@ (CKPT)
16.36	125		SYS	OMS
8.36	134		SYSMAN	OMS
7.64	162		SYS	oracle@ (LGWR)
6.55	136		DBSNMP	OMS
6.18	127		DBSNMP	emagen om (TNS V1-V3)
6.18	132		DBSNMP	emagen om (TNS V1-V3)
5.82	158		SYS	oracle@ (CJQ0)
5.82	157		SYS	oracle@ (MMON)
4.36	163		SYS	oracle@ (DBW0)

Additional Monitoring Links

Total Sample Count: 71



SQL Plan Management

Create a SQL Tuning Set

Tuning Set Name

Queries

Oracle Enterprise Manager (SYS) - SQL Tuning Sets - Windows Internet Explorer

Database Control

Database Instances: O11g1b > SQL Tuning Sets > Create SQL Tuning Set

Name: TOP_SQL_1175007011666
Description: Automatically generated by Top SQL

SQL Text	Parsing Schema
SELECT name, owner, category, enabled, timestamp created FROM dba_outlines WHERE signature = hexoraw(:1)	SYS
SELECT sql_id,sql_text from v\$sql WHERE sql_id in (:1,:2,:3,:4,:5,:6,:7,:8,:9,:10)	SYS
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
DECLARE v_sqltext CLOB := null; v_sql_id varchar(200) := :1; v_sig_sql_profile varchar(200) := null; v_sig_outline_raw raw(40) := null; v_sig_outline varchar2(200) := null; BEGIN BEGIN SELECT sql_fu...	SYS
begin setEMUserContext(:1, :2); end;	SYSMAN
select t.task_name, t.owner, t.task_id, l.execution_start, l.execution_end, o.object_id, o.attr2 as plan_hash_value from dba_advisor_definitions d, dba_advisor_tasks t, dba_advisor_log l, dba_advisor...	SYS
select module, count(*) from v\$active_session_history where sample_time > sysdate - 1/24 and service_hash = :1 group by module order by count(*) desc	DBSNMP
select FUNCTION_NAME, SMALL_READ_MBPS, SMALL_WRITE_MBPS, LARGE_READ_MBPS, LARGE_WRITE_MBPS, SMALL_READ_IOPS, SMALL_WRITE_IOPS, LARGE_READ_IOPS, LARGE_WRITE_IOPS, AVG_WAIT_TIME from V\$IOFUNCMETRIC wher...	DBSNMP
select module, count(*) from v\$active_session_history where sample_time > sysdate - 1/24 and service_hash = :1 group by module order by count(*) desc	DBSNMP
SELECT action, name FROM audit_actions	DBSNMP

SQL Plan Management

Create a SQL Tuning Set



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

Run it
NOW

Oracle Enterprise Manager (SYS) - Schedule SQL Tuning Advisor - Windows Internet Explorer

https://[redacted].../oracle/database/instance/sqlhne/event=tunests&target=O11g&type=oracle_database&stsOwner=SYS&sts=TOP_SQL_117

Oracle Enterprise Manager 11g
Database Control

Database Instances: O11g1b > Advisor Central >
Schedule SQL Tuning Advisor

Enter the start date and time for the run of the advisor. A database job will be submitted at the time. You can also limit the amount of time for the run of the advisor. After reaching this limit, the advisor run will be interrupted and return partial results. You can check the status of any advisor run through Advisor Central.

Name:
Description:
SQL Tuning Set:

Tuning Set Description: **Automatically generated by Top SQL**
SQL Statements Counts: 9

SQL Statements

Scope

Limited. Analysis without SQL Profile recommendation. Takes about 1 second per statement.
 Comprehensive. Complete analysis including SQL Profile. May take a long time.
Per-statement Time Limit (minutes):
Total Time Limit (minutes):

Schedule

Time Zone:
 Immediately
 Later
Date:
Time: : : AM PM

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SQL Plan Management

Create a SQL Tuning Set

Oracle Enterprise Manager (SYS) - SQL Tuning Results:SQL_TUNING_1175007174184 - Windows Internet Explorer

Oracle Enterprise Manager 11g
Database Control

Database Instances: O11gb > Advisor Central >
SQL Tuning Results:SQL_TUNING_1175007174184

Status **COMPLETED**
Started **Mar 27, 2007 9:53:26 AM**
Completed **Mar 27, 2007 9:53:34 AM**

Tuning Set Owner **SYS**
Tuning Set Name **TOP_SQL_1175007011666**
Time Limit (seconds) **600**
Running Time (seconds) **8**

Page Refreshed **Mar 27, 2007 9:53:42 AM** [Refresh](#)

Recommendations

[View Recommendations](#)

Select SQL Text	Parsing Schema	SQL ID	Statistics	SQL Profile	Index	Restructure SQL	Miscellaneous Error
<input checked="" type="radio"/> SELECT name, owner, category, enabled, timestamp created FROM dba_outlines WHERE signature = hexora...	SYS	6tskt2c29jgp					
<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 sql_id,sql_text from v\$sql WHERE sql_id in (:1,:2,:3,:4,:5,:6,:7,:8,:9,:10)	SYS	b05b0md1rvkq					
<input type="radio"/> DECLARE v_sql/text CLOB := null; v_sql_id varchar(200) := :1; v_sig_sql_profile varchar(200) := nul...	SYS	bsauuz08b32tb					✓
<input type="radio"/> begin setEMUserContext(:1, :2); end;	SYSMAN	d4v0he96hn1kp					✓
<input type="radio"/> select t.task_name, t.owner, t.task_id, l.execution_start, l.execution_end, o.object_id, o.attr2 as ...	SYS	9qmw52thpq2am				✓	
<input type="radio"/> select module, count(*) from v\$active_session_history where sample_time > sysdate - 1/24 and service...	DBSNMP	5a161u6hy9dy		✓			✓
<input type="radio"/> select FUNCTION_NAME, SMALL_READ_MBPS, SMALL_WRITE_MBPS, LARGE_READ_MBPS, LARGE_WRITE_MBPS, SMALL_RE...	DBSNMP	cyn8dd6c2d8h6		✓			
<input type="radio"/> SELECT action, name FROM audit_actions	DBSNMP	q05j226ondq9s					

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

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[About Oracle Enterprise Manager](#)

Results

Select
One query
And click
View



SQL Plan Management

Click on any SQL ID

SQL
Text

Waits
&
Statistics

Oracle Enterprise Manager (SYS) - SQL Details: 5vquayx0xa4kn - Windows Internet Explorer

Database Instance: O11gh > Top Activity >
SQL Details: 5vquayx0xa4kn

Switch to SQL ID: Go

View Data: Real Time: Manual Refresh Refresh SQL Worksheet Schedule SQL Tuning Advisor Repair Advisor

Text

```
SELECT tot_occ_bufs.TotOccBufs,o.*,d_o.owner, d_o.object_name, object_type, ROUND((o.buffer/tot_occ_bufs.TotOccBufs)*100,2) || '%'
  PetOccBufs
FROM
(SELECT obj object, count(1) buffers, AVG(tch) avg_touches
FROM x$bh GROUP BY obj) o,...
```

Details

Select the plan hash value to see the details below. Plan Hash Value: 495515616

Statistics Activity Plan Tuning Information

Summary

General

Module: Oracle Enterprise Manager.pln EM plsql
 Action: start
 Parsing Schema: SYS
 PL/SQL Source (Line Number): SYS.DBMS_SPM (985)

Activity By Waits

Activity By Time

Elapsed Time (sec) **6,097.60**
 CPU Time (sec) **1,488.68**
 Wait Time (sec) **4,608.92**

Elapsed Time Breakdown

SQL Time (sec) **6,097.60**
 PL/SQL Time (sec) **0.00**
 Java Time (sec) **0.00**

Other Statistics

Executions that Fetched all Rows (%) **0.00**
 Average Persistent Mem (KB) **45.09**
 Average Runtime Mem (KB) **44.15**
 Serializable Aborts **0**
 Remote **No**
 Obsolete **No**
 Child Latch Number **0**

Shared Cursors Statistics

Total Parses **3**
 Hard Parses **1**
 Child Cursors **1**
 Child Cursors With Loaded Plans **1**
 Invalidations **0**
 Largest Cursor Size (KB) **100.57**
 All Cursor Size (KB) **100.57**
 First Load Time **Mar 27, 2007 2:12:51 PM**

Execution Statistics

	Total	Per Execution	Per Row
Executions	3	1	NA
CPU Time (sec)	1,488.68	496.23	NA
Buffer Gets	2,109	703.00	NA
Disk Reads	263	87.67	NA
Direct Writes	0	0.00	NA
Rows	0	0.00	NA

Done

SQL Plan Management

Create a SQL Tuning Set



SQL
Profile
Will
Help 90%

Oracle Enterprise Manager (SYS) - Recommendations for SQL ID:5a1j61u6hy9dy - Windows Internet Explorer

https://[redacted]/oracle/database/instance/sqltune/ovw/v%3Aselected=6&ovw%3Aack%3A0=2&ovw%3Aack%3A1=3&ovw%3Aack%3A2=4&ovw%3Aack%3A3=5

Oracle Enterprise Manager 11g
Database Control

Database Instances: O11g > Advisor Central > SQL Tuning Results:SQL_TUNING_1175007174184 > Logged In As SYS

Recommendations for SQL ID:5a1j61u6hy9dy

Only one recommendation should be implemented.

SQL Text
select module, count(*) from v\$active_session_history where sample_time > sysdate - 1/24 and service_hash = :1 group by module order by count(*) desc

Select Recommendation
Original Explain Plan (Annotated)

Implement

Select Type	Findings	Recommendations	Rationale	Benefit New Explain (%) Plan	Compare Explain Plans
<input checked="" type="radio"/> SQL Profile	A potentially better execution plan was found for this statement.	Consider accepting the recommended SQL profile.		90.0	<input checked="" type="checkbox"/>
<input type="radio"/> Miscellaneous	The optimizer could not merge the view at line ID 3 of the execution plan.				<input type="checkbox"/>

Database | Setup | Preferences | Help | Logout

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[About Oracle Enterprise Manager](#)



SQL Plan Management Create a SQL Tuning Set

Compare
Before
&
After

Oracle Enterprise Manager (SYS) - Explain Plans: SQL_TUNING_1175007174184, SQL ID: Sa1j61ufhy9d - Windows Internet Explorer

Oracle Enterprise Manager 11g
Database Control

Database Instances: O11gb > Advisor Central > SQL Tuning Results:SQL_TUNING_1175007174184 > Recommendations for SQL ID:Sa1j61ufhy9dy > Logged in As SYS

Compare Explain Plans

New Explain Plan With SQL Profile

Operation	Line ID	Object	Object Type	Order	Rows	Bytes	Cost	Time	CPU Cost	I/O Cost
SELECT STATEMENT	0			6	0.145	1	1	14,379,877.0		
SORT ORDER BY	1			5	0.145	1	1	14,379,877.0		
HASH GROUP BY	2			4	0.145	1	1	14,379,877.0		
NESTED LOOPS	3			3	0.145	0	1	1,135,615.0		
FIXED TABLE FULL	4	SYS.X\$KEWASH	TABLE (FIXED)	1	9.375	0	1	425,000.0		
FIXED TABLE INDEX	5	SYS.X\$ASH (ind:1)	TABLE (FIXED)	2	0.098	0	1	3,553.0		

Original Explain Plan (Annotated)

Indicates an adjustment from the original plan by the SQL Tuning Advisor. The following is the original explain plan for the SQL statement being tuned.

Operation	Line ID	Object	Object Type	Order	Rows	Bytes	Cost	Time
SELECT STATEMENT	0			7	0.040		1.1	
SORT ORDER BY 1	6			6	0.040		1.1	
HASH GROUP BY	2			5	0.040		1.1	
VIEW	3	SYS.GV\$ACTIVE_SESSION_HISTORY	VIEW (FIXED)	4	0.040		0.1	
NESTED LOOPS	4			3	0.209		0.1	
FIXED TABLE FULL	5	SYS.X\$KEWASH	TABLE (FIXED)	1	0.449		0.1	
FIXED TABLE INDEX	6	SYS.X\$ASH (ind:1)	TABLE (FIXED)	2	0.119		0.1	

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SQL Plan Management

SQL Profiles stored in the system



SQL Profiles

SQL Plan Baselines

Oracle Enterprise Manager (SYS) - Windows Internet Explorer

https://[redacted]/oracle/database/instance/sqlPlanManagement?target=O11gb&type=oracle_database

Oracle Enterprise Manager 11g
Database Control

Database Instance: O11gb > Logged in As SYS

SQL Plan Management

SQL Profile | SQL Patch | Plan Baseline

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
<input type="checkbox"/> SYS_SQLPROF_014464f9f8448000	select module, count(*) from v\$active_session_hist...	DEFAULT	ENABLED	Mar 27, 2007 9:58:39 AM
<input type="checkbox"/> SYS_SQLPROF_014460e809f88003	SELECT t.cnt, l.cnt, s.cnt, u.cnt, d.cnt, m.cnt FR...	DEFAULT	ENABLED	Mar 24, 2007 6:06:23 AM
<input type="checkbox"/> SYS_SQLPROF_014460e7ee7f0002	SELECT /*+ nls */ U.NAME, OT.NAME, NULL, NULL, C...	DEFAULT	ENABLED	Mar 24, 2007 6:05:54 AM
<input type="checkbox"/> SYS_SQLPROF_014460e7c9a84001	SELECT :B1 TASK_ID, F.FINDING_ID, FINDING_ID.DECODE...	DEFAULT	ENABLED	Mar 24, 2007 6:05:17 AM
<input type="checkbox"/> SYS_SQLPROF_014460e7945a8000	SELECT a.psql_entry_object_id, a.psql_entry_sub...	DEFAULT	ENABLED	Mar 24, 2007 6:04:22 AM

SQL Profile | SQL Patch | Plan Baseline

Database | Setup | Preferences | Help | Logout

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SQL Plan Management

Capturing Baselines



- Capturing baselines (migrate stored outlines - **hints**)
- Plan history is only tracked for a SQL statement that executes more than once (no ad-hoc queries)
- Automatic Plan Capture:
 - `OPTIMIZER_CAPTURE_SQL_PLAN_BASELINES`
 - (set to TRUE – the default is FALSE)
- Enable the use of SQL Plan Baselines (could be session level of a tuning set & without the capture):
 - `OPTIMIZER_USE_SQL_PLAN_BASELINES`
 - (set to TRUE – the default is TRUE)



SQL Plan Management

Capturing Baselines



```
DBMS_SPM.LOAD_PLANS_FROM_CURSOR_CACHE (  
    sql_id IN VARCHAR2,  
    plan_hash_value IN NUMBER := NULL,  
    sql_text IN CLOB,  
    fixed IN VARCHAR2 := 'NO',  
    enabled IN VARCHAR2 := 'YES')  
RETURN PLS_INTEGER;
```

- **Load one or more plans present in the cursor cache for a SQL statement.** You can also do this using the plan_handle and sql_text.



SQL Plan Management Capturing Baselines

```
DBMS_SPM.LOAD_PLANS_FROM_SQLSET (  
    sqlset_name IN VARCHAR2,  
    sqlset_owner IN VARCHAR2 := NULL,  
    basic_filter IN VARCHAR2 := NULL,  
    fixed IN VARCHAR2 := 'NO',  
    enabled IN VARCHAR2 := 'YES'  
    commit_rows IN NUMBER := 1000)  
RETURN PLS_INTEGER;
```

- **Manually load plans stored in SQL Tuning Sets (STS) into plan baselines.**
- Note that plan history is only tracked for a SQL statement that executes more than once (no ad-hoc queries)



SQL Plan Management

Capturing Baselines



- Set the retention to 100 weeks to **retain unused plans before they are purged** (53 is the default). Shown for example, 100 is not recommended, 53 is better since it will include monthly/yearly runs.

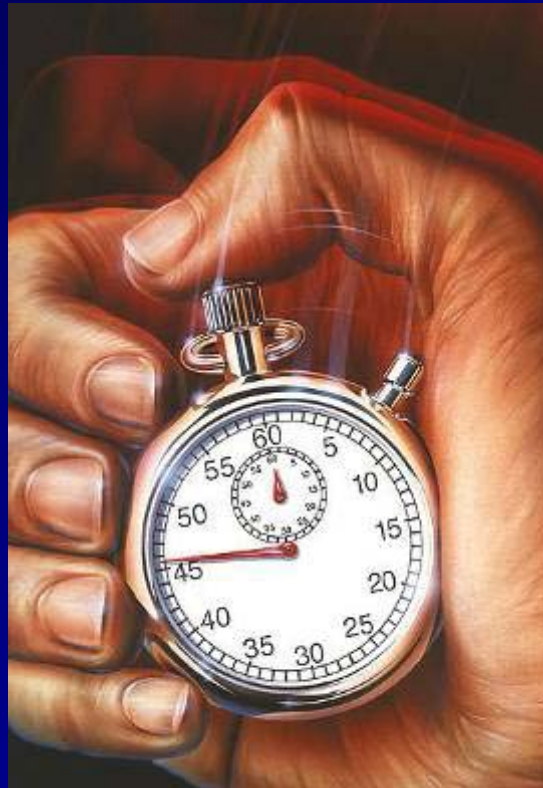
```
begin
  dbms_spm.configure('plan_retention_weeks',100);
end;
/
```

PL/SQL procedure successfully completed.

- You can also **purge individual plans** with the **purge_sql_plan_baseline** function.
- You can also query **dba_sql_plan_baselines** as well as use **DBMS_XPLAN.display_sql_plan_baseline** to view stored plans.



SQL Access Advisor NEW Partition Advisor





SQL Access Advisor & NEW Partition Advisor



- The SQL Advisor now combines the functionality of the SQL Tuning Advisor, SQL Access Advisor and the new Partition Advisor.
 - Recommends Partitioning Needs
 - Utilize a previous SQL Tuning Set
 - Take SQL straight from what's currently in the CACHE.
 - Create a hypothetical workload
 - SQL Access Advisor checks Indexes, Partitions or Materialized Views (**schema related issues**)



SQL Access Advisor & NEW Partition Advisor

Step One

Use a SQL Tuning Set

SQL Access Advisor & NEW Partition Advisor



Look at
Partitions

Quick
Solution

Oracle Enterprise Manager (SYS) - SQL Access Advisor: Recommendation Options - Windows Internet Explorer

https://[redacted]/oracle/database/sqlaccess?target=O11gb&type=oracle_database&advisoryCentralURL=/em/console/database/instance/advis... Certificate Error

Oracle Enterprise Manager 11g
Database Control

Workload Source > Recommendation Options > Schedule > Review

SQL Access Advisor: Recommendation Options
Database O11gb

Cancel Back Step 2 of 4 Next

Recommendation Types
Select the type of structures to be recommended by the advisor. The advisor performs a global analysis of the SQL workload to help improve schema design. If no recommendation types are selected the advisor will evaluate existing structures only.

- Indexes
- Materialized Views
- Partitioning

Advisor Mode
The advisor can run in one of two modes, Limited or Comprehensive. Limited Mode is meant to return quickly after processing the statements with the highest cost, potentially ignoring statements with a cost below a certain threshold. Comprehensive Mode will perform an exhaustive analysis.

- Limited Mode
Analysis will focus on highest cost statements
- Comprehensive Mode
Analysis will be exhaustive

Advanced Options

Cancel Back Step 2 of 4 Next

Database | Setup | Preferences | Help | Logout

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SQL Access Advisor & NEW Partition Advisor

Step 3
Schedule
it.

Run it
Now!

Oracle Enterprise Manager (SYS) - SQL Access Advisor: Schedule - Windows Internet Explorer

Database Control

SQL Access Advisor: Schedule

Database **O11gb**

Advisor Task Information

- Task Name: SQLACCESS277452
- Task Description: SQL Access Advisor
- Journaling Level: Basic
- Task Expiration (days): 30
- Total Time Limit (minutes): DBMS_ADVISOR_ADVISOR_UNLIMITED

Scheduling Options

Schedule Type: Standard

Time Zone: CST6CDT

Repeating

Repeat: Do Not Repeat

Start

Immediately

Later

Date: Mar 23, 2007

Time: 11:20:00 AM



SQL Access Advisor & NEW Partition Advisor

Final Review

The screenshot shows the Oracle Enterprise Manager 11g interface for the 'SQL Access Advisor: Review' task. The breadcrumb navigation at the top includes 'Workload Source', 'Recommendation Options', 'Schedule', and 'Review'. The task details are as follows:

- Database: **O11gb**
- Task Name: **SQLACCESS277452**
- Task Description: **SQL Access Advisor**
- Scheduled Start Time: **Run Immediately**

The 'Options' section contains a table with the following data:

Modified Option	Value	Description
<input checked="" type="checkbox"/> SQL Tuning Set	SYS."SQLACCESS6211938_sts"	Import Workload from SQL Repository
<input checked="" type="checkbox"/> Workload SQL Limit	25	Specifies the number of SQL statements to be analyzed
<input checked="" type="checkbox"/> Workload Source	SQL Tuning Set	The source of SQL statements to be used to create the workload



SQL Access Advisor & NEW Partition Advisor

Job Submitted

Job Running Now.

Oracle Enterprise Manager (SYS) - Advisor Central - Windows Internet Explorer

Database Control

Database Instance: O11gb > Logged in As SYS

Confirmation
SQL Access Advisor task SQLACCESS277452 created successfully.
[View Job Details](#)

Advisor Central

Advisors | Checkers

Page Refreshed Mar 23, 2007 11:23:08 PM CDT [Refresh](#)

Advisors

[ADDM](#) [Memory Advisor](#) [MTTR Advisor](#)
[Segment Advisor](#) [SQL Advisors](#) [SQL Repair Advisor](#)
[SQL Replay](#) [Undo Management](#)

Advisor Tasks [Change Default Parameters](#)

Search
Select an advisory type and optionally enter a task name to filter the data that is displayed in your results set.

Advisory Type	Task Name	Advisor Runs	Status
SQL Access Advisor		All	All

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.

Results

Select	Advisory Type	Name	Description	User	Status	Start Time	Duration (seconds)	Expires In (days)
<input checked="" type="checkbox"/>	SQL Access Advisor	SQLACCESS277452	SQL Access Advisor	SYS	RUNNING	Mar 23, 2007 11:13:08 PM		30
<input type="checkbox"/>	SQL Access Advisor	SQLACCESS6211938	SQL Access Advisor	SYS	COMPLETED	Mar 23, 2007 11:08:21 PM	24	30

Database | Setup | Preferences | Help | Logout

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SQL Access Advisor & NEW Partition Advisor

Improve I/O

Improve Execution Time

Oracle Enterprise Manager (SYS) - Results for Task: SQLACCESS277452 - Windows Internet Explorer

Oracle Enterprise Manager 11g Database Control

Advisor Central > Results for Task: SQLACCESS277452

Task Name: SQLACCESS277452
Status: COMPLETED
Advisor Mode: LIMITED
Scheduler Job: ADV_SQLACCESS277452

Started: Mar 23, 2007 11:13:08 PM CDT
Ended: Mar 23, 2007 11:13:21 PM CDT
Running Time (seconds): 13
Time Limit (seconds): UNLIMITED

Summary Recommendations SQL Statements Details

Overall Workload Performance

Potential for Improvement

Workload I/O Cost

Original Cost (273770)	273,770
New Cost (223770)	223,770

Query Execution Time Improvement

% of Statements	100%
Query Improvement Factor	1x

Recommendations

Recommendations 1
Space Requirements (MB) 0.000
User Specified Space Adjustment Unlimited

Hide Recommendation Action Counts

Index	: Create 0	Drop 0	Retain 1
Materialized View	: Create 0	Drop 0	Retain 0
Materialized View Log	: Create 0	Retain 0	Alter 0
Partitioned	: Tables 0	Indexes 0	Materialized Views 0

SQL Statements

SQL Statements 25
Statements remaining after filters were applied

Hide Statement Counts

Insert	0
Select	25
Update	0
Delete	0
Merge	0
Skipped (Parsing or Privilege Errors)	25

Database | Setup | Preferences | Help | Logout

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About Oracle Enterprise Manager

https://ora11gtest.tusc.com:1158/em/console/database/sqlaccess/sqlAccess?task_id=1178&event=view&advisoryCentralURL=/em/consol



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 (SYS) - Database Instance: database - Microsoft Internet Explorer

Database Instance: database

General

Status **Up**

Up Since **Mar 26, 2007 9:53:59 AM PDT**

Instance Name **demosa**

Version **11.1.0.4.0**

HOST **stacy25.us.oracle.com**

Listener **LISTENER_stacy25.us.oracle.com**

Host CPU

Active Sessions

SQL Response Time

Diagnostic Summary

ADDM Findings **4**

Period Start Time **Apr 9, 2007 12:00:51 PM PDT**

Alert Log **No ORA- errors**

Active Incidents **0**

Space Summary

Database Size (GB) **1,405**

Problem Tablespaces **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

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[dbqtvHTTbParse: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

The screenshot displays the Oracle Enterprise Manager 11g Database Control interface. The browser window title is "Oracle Enterprise Manager (SYS) - Incident - Generic Internal Error: Within 31 Days - Microsoft Internet Explorer". The address bar shows the URL: https://stacy25:7724/em/console/database/monitoring/metricDetail?type=oracle*_database%target=database%pageType=byDay%metricColumn=genericInternalErrStack%metric=adrAlertLogIncidentError. The page title is "Incident - Generic Internal Error: Within 31 Days". The last updated time is "Mar 26, 2007 2:54:41 PM PDT".

Problem Summary

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

Performance and Critical Error

The graph shows Active Sessions on the y-axis (0.0 to 1.5) and time on the x-axis (March 2007 to April). The legend indicates: CPU (green), User I/O (blue), and Wait (orange). The graph shows a significant spike in active sessions around March 26, 2007, corresponding to the incident.

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



SQL Repair Advisor – 2nd Method

Go Into Advisor Central

Go to the Database Instance

Scroll Down

The screenshot shows the Oracle Enterprise Manager 11g Database Control interface for instance O11gb. The page includes a navigation menu, a status overview section with a Health Meter (0 issues), Host CPU usage (Load 0.20, Paging 0.01), and Active Sessions. Below these are sections for Diagnostic Summary, Space Summary, High Availability, Alerts, Policy Violations, Security, and Job Activity. A scroll bar is visible on the right side of the page.

ADDM Findings	0
Alert Log	Mar 21, 2007 9:15:38 PM
SQL Response Time	45.20%
	0.08 sec
	0.18 sec

Database Size (GB)	1,516
Problem Tablespace	0
Segment Advisor Recommendations	0
Space Violations	0
Dump Area Used (%)	28

Instance Recovery Time (sec)	23
Last Backup	n/a
Usable Flash Recovery Area (%)	100
Flashback Logging	Disabled

Severity	Category	Name	Impact	Message	Alert Triggered
(No alerts)					

Current	9/89 2
Distinct Rules Violated	8/12 2
Compliance Score (%)	92

Last Security Evaluation	Mar 23, 2007 8:30:33 PM CDT
Compliance Score (%)	90



SQL Repair Advisor – Go Into Advisor Central

Click on
The
Advisor
Central

Oracle Enterprise Manager (SYS) - Database Instance: O11gb - Windows Internet Explorer

Diagnostic Summary

- ADDM Findings: 0
- Alert Log: Mar 21, 2007 9:15:38 PM
- SQL Response Time: 45.70%
- 0.08 sec
- 0.18 sec
- (Edit Reference Collection)

Space Summary

- Database Size (GB): 1,516
- Problem Tablespaces: 0
- Segment Advisor Recommendations: 0
- Space Violations: 0
- Dump Area Used (%): 78

High Availability

- Instance Recovery Time (sec): 23
- Last Backup: n/a
- Usable Flash Recovery Area (%): 100
- Flashback Logging: Disabled

Alerts

Category: All (Go) Critical 0 Warning 0

Severity	Category	Name	Impact	Message	Alert Triggered
(No alerts)					

Related Alerts

Policy Violations

Current 9 88 2 Distinct Rules Violated 8 12 2 Compliance Score (%) 92 Policy Trend Overview

Security

Last Security Evaluation Mar 23, 2007 8:30:33 PM CDT Compliance Score (%) 90 Enterprise Security At a Glance

Job Activity

Jobs scheduled to start no more than 7 days ago

Scheduled Executions 0 Running Executions 0 Suspended Executions 0 Problem Executions 0

Home Performance Availability Server Schema Data Movement Software and Support

Related Links

- Access
- Alert Log Content
- AWR Baseline Metric Thresholds
- Jobs
- Monitoring Configuration
- Reports
- Target Properties
- Advisor Central
- All Metrics
- Backouts
- Metric and Policy Settings
- Monitor in Memory Access Mode
- Scheduler Central
- Trace Files
- Alert History
- Archive/Purge Alert Log
- EM SQL History
- Metric Collection Errors
- Policy Groups
- SQL Worksheet
- User-Defined Metrics

Database | Setup | Preferences | Help | Logout

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About Oracle Enterprise Manager

SQL Repair Advisor – Advisor Central



Click on
the SQL
Advisor

The screenshot shows the Oracle Enterprise Manager (SYS) - Advisor Central interface in Microsoft Internet Explorer. The browser address bar shows the URL: https://stacy25:7724/em/console/database/instance/advisorTasks?event=ddlLoad&dbPageNum=1&target=database&type=oracle_database. The page title is "Advisor Central".

The interface includes a navigation menu with "Advisors" and "Checkers" tabs. Below the navigation, there is a "Page Refreshed Apr 6, 2007 11:16:19 AM PDT" message and a "Refresh" button.

The "Advisors" section lists several advisory types:

- [ADDM](#) (Automatic Undo Management)
- [Memory Advisors](#)
- [SQL Advisors](#)
- [MTTR Advisor](#)
- [SQL Performance Analyzer](#)
- [Data Recovery Advisor](#)
- [Segment Advisor](#)

The "Advisor Tasks" section includes a "Change Default Parameters" button.

The "Search" section allows users to filter advisory data. It includes a "Select an advisory type and optionally enter a task name to filter the data that is displayed in your results set." instruction. The search criteria are:

- Advisory Type: All Types
- Task Name: (empty)
- Advisor Runs: Last Run
- Status: All

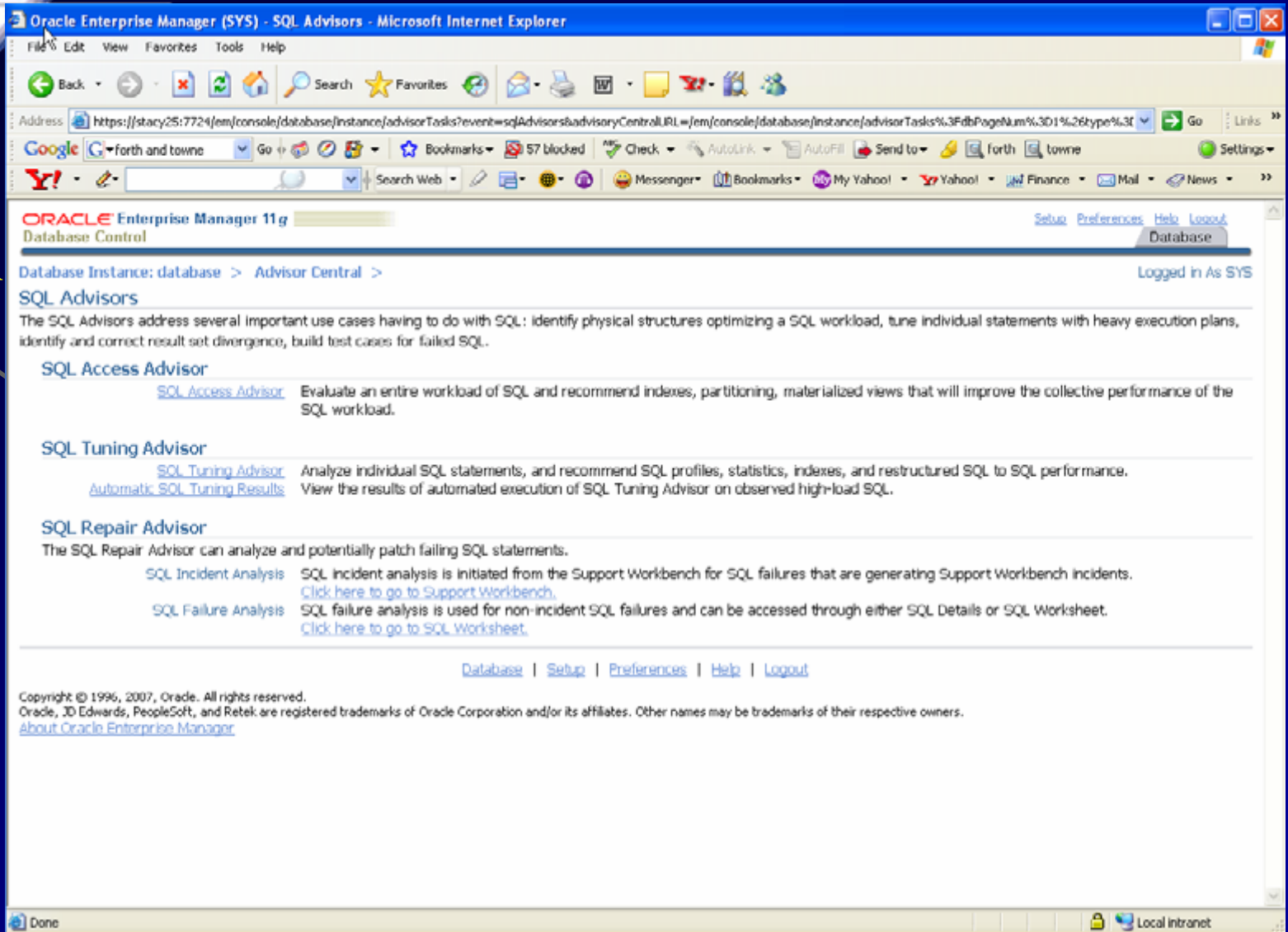
A "Go" button is present next to the search criteria.

The "Results" section displays a table of advisory tasks. The table has columns for "Select", "Advisory Type", "Name", "Description", "User", "Status", "Start Time", "Duration (seconds)", and "Expires In (days)".

Select	Advisory Type	Name	Description	User	Status	Start Time	Duration (seconds)	Expires In (days)
<input checked="" type="radio"/>	ADDM	ADDM:1621918424_1_331	ADDM auto run: snapshots [330, 331], instance 1, database id 1621918424	SYS	COMPLETED	Apr 6, 2007 11:00:28 AM	6	30
<input type="radio"/>	Segment Advisor	SYS_AUTO_SPCADV_5385642007	Auto Space Advisor	SYS	COMPLETED	Apr 5, 2007 10:08:58 PM	560	29
<input type="radio"/>	SQL Tuning Advisor	SYS_AUTO_SQL_TUNING_TASK	Automatic SQL Tuning Task	SYS	COMPLETED	Apr 5, 2007 10:03:37 PM	1278	UNLIMITED
<input type="radio"/>	SQL Performance Impact	TEST		SYSMAN	COMPLETED	Apr 3, 2007 4:12:31 PM	4	UNLIMITED
<input type="radio"/>	SQL Access Advisor	SQLACCESS259271	SQL Access Advisor	SYSMAN	COMPLETED	Mar 26, 2007 7:05:01 PM	17	19

The interface also includes a "View Result" button, a "Delete" button, and a "Re-schedule" dropdown menu with a "Go" button.

SQL Repair Advisor – SQL Advisors



The screenshot shows the Oracle Enterprise Manager 11g interface for SQL Advisors. The browser window title is "Oracle Enterprise Manager (SYS) - SQL Advisors - Microsoft Internet Explorer". The address bar shows a URL starting with "https://stacy25:7724/em/console/database/instance/advisorTasks?event=sqlAdvisors&advisoryCentralURL=/em/console/database/instance/advisorTasks%3FdbPageNum%3D1%26type%3D...". The page content includes:

- ORACLE Enterprise Manager 11g** (top right)
- Database Control** (top right)
- Database Instance: database > Advisor Central >** (top left)
- SQL Advisors** (main heading)
- 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.
- SQL Access Advisor**
 - [SQL Access Advisor](#): Evaluate an entire workload of SQL and recommend indexes, partitioning, materialized views that will improve the collective performance of the SQL workload.
- SQL Tuning Advisor**
 - [SQL Tuning Advisor](#): Analyze individual SQL statements, and recommend SQL profiles, statistics, indexes, and restructured SQL to SQL performance.
 - [Automatic SQL Tuning Results](#): View the results of automated execution of SQL Tuning Advisor on observed high-load SQL.
- SQL Repair Advisor**
 - The SQL Repair Advisor can analyze and potentially patch failing SQL statements.
 - SQL Incident Analysis**: SQL incident analysis is initiated from the Support Workbench for SQL failures that are generating Support Workbench incidents. [Click here to go to Support Workbench.](#)
 - SQL Failure Analysis**: SQL failure analysis is used for non-incident SQL failures and can be accessed through either SQL Details or SQL Worksheet. [Click here to go to SQL Worksheet.](#)
- Navigation links: [Database](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)
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Click on
The
Support
Bench

SQL Repair Advisor – Support Workbench



Support Workbench

Page Refreshed February 20, 2007 1:40:58 PM PST

Problems (4)

[Checker Findings \(10\)](#)

[Packages \(1\)](#)

New Problems in Last 24 Hours **0** All Problems **4**
New Incidents in Last 24 Hours **1** All Incidents **12**

View ▾

Search [Advanced Search](#)

[Select All](#) | [Select None](#) | [Show All Details](#) | [Hide All Details](#)

Select	Details	ID	Description	Number Of Incidents	Last Incident ▾	Last Comment	Packaged	SR#
<input type="checkbox"/>	▶ Show	3	ORA 1578 [4] [12]	1	February 19, 2007 10:01:50 PM PST	Deleted package : Id = 3 Name = Pkg_database_ORA_1578_4__12_021907232944	Yes	4465879

[▶ Performance and Critical Error](#)

Click on
The ID
number to
Open the
detail

SQL Repair Advisor – 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

Summary

SR# --
Bug# --
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

[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](#)

[Activity Log](#)

Click on
SQL
Repair
Advisor
to run it



Results from SQL Repair Advisor

SQL Repair Results: [SQL_DIAG_1174506262358](#)

Page Refreshed **Mar 21, 2007 12:45:50 PM PDT**

Status **COMPLETED**
SQL ID **9m7mvytcb4d14**
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

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....		9m7mvytcb4d14	✓

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"/>	<code>delete from t t1 where t1.a = 'a' and rowid <> (select max(rowid) from t t2 where t1.a= t2.a and t1....</code>		9m7mvytc4d14	✓



SQL Replay Advisor SQL Performance Analyzer (renamed)



SQL Replay Advisor



- 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 Replay Advisor

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 changes)
- Compare before and after performance
- Tune the problems!



SQL Replay Advisor

SQL
Replay

Oracle Enterprise Manager (SYS) - Top Activity - Windows Internet Explorer

Database Instance: O11jg > Logged in As SYS

Top Activity

Drag the shaded box to change the time period for the detail section below.

View Data: Real Time: 15 Second Refresh

Detail for Selected 5 Minute Interval

Start Time: Mar 27, 2007 3:14:26 PM CDT [Run ASH Report](#)

Top SQL

[Schedule SQL Tuning Advisor](#) [Create SQL Tuning Set](#)

[Select All](#) | [Select None](#)

Select Activity (%)	SQL ID	SQL Type
<input type="checkbox"/> 75.00	5vqeyx0xa4kn	SELECT
<input type="checkbox"/> 22.08	b6wvms1nu78s	SELECT
<input type="checkbox"/> 2.92	4z828bv227s5t	SELECT

Total Sample Count: 1,203

Top Sessions

View: Top Sessions

Activity (%)	Session ID	QC Session ID	User Name	Program
24.94	123		SYS	sqlplus@ora (TNS V1-V3)
24.94	122		SYS	sqlplus@ora (TNS V1-V3)
24.94	121		SYS	sqlplus@ora (TNS V1-V3)
24.94	170		SYS	sqlplus@ora (TNS V1-V3)
.08	135		SYSMAN	oracle@ora (J000)
.08	161		SYS	oracle@ora (CKPT)
.08	120		SYS	oracle@ora (m000)

Total Sample Count: 1,203

Additional Monitoring Links

Top Sessions and Top SQL data from ASH can be found on the Top Activity page.

- [Top Consumers](#)
- [Duplicate SQL](#)
- [Blocking Sessions](#)
- [Hang Analysis](#)
- [Instance Locks](#)
- [Instance Activity](#)
- [Search Sessions](#)
- [Search SQL](#)
- [Snapshots](#)
- [AWR Baselines](#)
- [SQL Tuning Sets](#)
- [SQL Replay](#)
- [SQL Plan Management](#)

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

SQL Replay Advisor

The screenshot displays the Oracle Enterprise Manager 11g interface. The main window shows the 'Checklist to Create SQL Replay Task: SYS.TEST_REPLAY' configuration page. The page title is 'Oracle Enterprise Manager (SYS) - Checklist to Create SQL Replay Task: SYS.TEST_REPLAY'. The breadcrumb navigation is: Database Instances: O11g > Advisor Central > SQL Replay > Checklist to Create SQL Replay Task: SYS.TEST_REPLAY > . The user is logged in as SYS.

The main heading is 'Replay SQL Tuning Set After Change: Create SQL Replay Version'. Below this, it states: 'You have completed your change. A new Replay Version will be created by replaying SQL Tuning Set.'

The configuration details are as follows:

- SQL Tuning Set Name: **TOP_SQL_1175024626831**
- STS Owner: **SYS**
- Number of SQL statements in STS: **8**
- Replay Version Name:
- Replay Version Description:

The 'Schedule' section is configured with:

- Time Zone:
- Immediately
- Later
- Date: (example: Mar 27, 2007)
- Time: AM

At the bottom right, there are 'Cancel' and 'OK' buttons. At the bottom center, there are links for 'Database', 'Setup', 'Preferences', 'Help', and 'Logout'. The footer contains copyright information: 'Copyright © 1996, 2006, Oracle. All rights reserved. Oracle, JD Edwards, PeopleSoft, and Fusion are registered trademarks of Oracle Corporation and/or its affiliates. Other names may be trademarks of their respective owners. About Oracle Enterprise Manager'.



SQL Replay Advisor

Oracle Enterprise Manager (SYS) - Checklist to Create SQL Replay Task: SYS.TEST_REPLAY - Windows Internet Explorer

Oracle Enterprise Manager (SYS) - Checklist to Create SQL Replay Task: SYS.TEST_REPLAY - Windows Internet Explorer

Oracle Enterprise Manager (SYS) - Checklist to Create SQL Replay Task: SYS.TEST_REPLAY - Windows Internet Explorer

Oracle Enterprise Manager (SYS) - Checklist to Create SQL Replay Task: SYS.TEST_REPLAY - Windows Internet Explorer

Oracle Enterprise Manager (SYS) - SQL Replay Analysis Result: TEST_REPLAY - Windows Internet Explorer

Oracle Enterprise Manager 11g
Database Control

Database Instances: O11gb > Advisor Central > SQL Replay > Logged In As SYS

SQL Replay Analysis Result: TEST_REPLAY

Task Name: TEST_REPLAY
Task Owner: SYS
Task Description: rjn replay

SQL Tuning Set Name: TOP_SQL_117502462681
STS Owner: SYS

Global Statistics

Projected Workload Elapsed Time (sec)

Improvement Impact: +2.371%
Regression Impact: -1.261%
Overall Impact: +1.050%

SQL Statement Count

Plan Changed: 1
Plan Unchanged: 6
No Plan: 0

Recommendations

Run SQL Tuning Advisor to tune regressed SQL statements.
([Run SQL Tuning Advisor](#))

Projected Workload Elapsed Time Distribution

Single Execution SQL Statement Count Distribution

Information

Current Status:	COMPLETED	Start Time:	Mar 27, 2007 4:48:03 PM
Comparison Metric:	Elapsed Time	End Time:	Mar 27, 2007 4:48:04 PM
Number of Statements:	8	Time Limit (sec):	1,800

Replay Comparisons

Name	Description	Number of SQL with Error Created	Last Modified
reply1	11g	0	Mar 27, 2007 3:53:55 PM
reply2	Lowered cache and shared pool	0	Mar 27, 2007 4:22:05 PM

Database | Setup | Preferences | Help | Logout



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 (We'll see how to do this)
- **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)
- Great to test an upgrade to 11g (Test with 10g then 11g)



Database workload capture and replay

Workload
Capture and
Replay

A screenshot of the Oracle Enterprise Manager (SYS) web interface. The browser window title is "Oracle Enterprise Manager (SYS) - Database Instance: O11gb - Windows Internet Explorer". The address bar shows a URL starting with "https://...". The page content includes a navigation menu with tabs for Home, Performance, Availability, Server, Schema, Data Movement, and Software and Support. The "Software and Support" tab is active. Under the "Software" section, there are links for "Configuration" (Collection Status, Clone Oracle Home, Host Configuration, Oracle Home Inventory) and "Software Assurance" (Workload Capture and Replay, SQL Replay). Under the "Support" section, there is a link for "Support Workbench". At the bottom, there are "Related Links" for various database management tasks like Access, Alert Log Content, AWR Baseline Metric Thresholds, Jobs, Monitoring Configuration, Reports, Target Properties, Advisor Central, All Metrics, Backouts, Metric and Policy Settings, Monitor in Memory Access Mode, Scheduler Central, Trace Files, Alert History, Archive/Purge Alert Log, EM SQL History, Metric Collection Errors, Policy Groups, SQL Worksheet, and User-Defined Metrics. The footer contains copyright information for Oracle and links for "Database", "Setup", "Preferences", "Help", and "Logout".

Database workload **capture** and replay

Oracle Enterprise Manager 11g
Database Control

Environment Check Options Parameters Schedule **Review**

Set Up Workload Capture: Review

Database: **O11gb** Cancel Back Step 5 of 5 Submit

Specify the Job Parameters

Summary

Job Name	CAPTURE-O11GB-20070327165510
Capture Name	CAPTURE-O11gb-20070327165510
Capture Directory	AUDIT_DIR
Start Date	Immediately
End Date	Not Specified

Database Restart

Restart Database	false
------------------	--------------

Workload Filters

Include All Except

Name	Type	Attribute	Value
Oracle Management Service (DEFAULT)	EXCLUDED	PROGRAM	OMS
Oracle Management Agent (DEFAULT)	EXCLUDED	PROGRAM	emagent%

Cancel Back Step 5 of 5 Submit

Database | Setup | Preferences | Help | Logout

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Database workload **capture** and replay

The screenshot displays the Oracle Enterprise Manager (OEM) interface for database O11GB. The main window is titled "View Workload Capture" and shows a "Capture Summary" for a completed capture named "CAPTURE-O11gb-20070327165510". The capture was performed on March 27, 2007, from 4:59:38 PM to 5:20:15 PM (UTC-05:00), with a duration of 00:20:37. The capture directory is "AUDIT_DIR" and the size is 0.01 MB. The database name is O11GB, with DBID 1471326733. The preprocessed version is "Unavailable", with a start SCN of 2416864 and an end SCN of 2418884. There were no errors during the capture.

Capture Summary	
Name	CAPTURE-O11gb-20070327165510
Status	COMPLETED
Start Date	Mar 27, 2007 4:59:38 PM (UTC-05:00)
End Date	Mar 27, 2007 5:20:15 PM (UTC-05:00)
Directory	AUDIT_DIR
Size (mb)	0.01
Duration (hh:mm:ss)	00:20:37
Database Name	O11GB
DBID	1471326733
Preprocessed Version	Unavailable
Start SCN	2416864
End SCN	2418884
Error Code	None
Error Message	None

Statistics	
Database Time (hh:mm:ss)	00:00:01
Average Active Sessions	0.00
Errors	0
Connects	1,281
Transactions	0
User Calls	51

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[About Oracle](#), [Enterprise Manager](#)



Database workload - Preprocess

The screenshot displays the Oracle Enterprise Manager (OEM) interface in Internet Explorer. The main content area shows a 'Job Activity' page with a confirmation message: 'Confirmation: The job was created successfully. PREPROCESS-011GB-20070327175207'. Below this, there is a table listing job details.

Select	Name	Status (Executions)	Scheduled	Targets	Target Type	Owner	Job Type
<input checked="" type="checkbox"/>	PREPROCESS-011GB-20070327175207	1 Scheduled	Mar 27, 2007 5:54:16 PM (UTC-05:00)	011job	Database Instance	SYS	SQL Script

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Database workload capture and **replay** On the **NEW** system (shortened steps)

The screenshot shows the Oracle Enterprise Manager 11g Workload Capture and Replay interface. The main window is titled "Set Up Workload Replay: Review" and is part of a wizard with five steps: Choose Initial Options, Customize Options, Prepare Replay Clients, Wait for Client Connections, and Review. The "Review" step is currently active. The interface displays the following information:

- Information:** Time for resetting clock: Mar 27, 2007 4:59:38 PM (UTC-05:00). Before starting the replay, it is recommended that you reset the system clock on the hosts of all replay database instances to match the start time of the capture. This will reduce the chance of having problems during replay. You should start the replay immediately after adjusting the clock.
- Workload:** CAPTURE-O11gb-20070327165510 will be replayed on database O11gb.
- Configuration:**
 - Database: O11gb
 - Capture Name: CAPTURE-O11gb-20070327165510
 - Replay Name: REPLAY-O11gb-20070327175740
 - Replay Directory: AUDIT_DIR
 - Connected Replay Clients: 0

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Partitioning: (FYI & 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**



The Rules – See Partitioning Guide

3 Administering Partitions - Windows Internet Explorer

perform that maintenance operation.

Table 3-1 ALTER TABLE Maintenance Operations for Table Partitions

Maintenance Operation	Range	Hash	List	Composite: Range/Hash	Composite: Range/List
Adding Partitions	ADD PARTITION	ADD PARTITION	ADD PARTITION	ADD PARTITION MODIFY PARTITION ... ADD SUBPARTITION	ADD PARTITION MODIFY PARTITION ... ADD SUBPARTITION
Coalescing Partitions	n/a	COALESCE PARTITION	n/a	MODIFY PARTITION ... COALESCE SUBPARTITION	n/a
Dropping Partitions	DROP PARTITION	n/a	DROP PARTITION	DROP PARTITION	DROP PARTITION DROP SUBPARTITION
Exchanging Partitions	EXCHANGE PARTITION	EXCHANGE PARTITION	EXCHANGE PARTITION	EXCHANGE PARTITION EXCHANGE SUBPARTITION	EXCHANGE PARTITION EXCHANGE SUBPARTITION
Merging Partitions	MERGE PARTITIONS	n/a	MERGE PARTITIONS	MERGE PARTITIONS	MERGE PARTITIONS MERGE SUBPARTITIONS
Modifying Default Attributes	MODIFY DEFAULT ATTRIBUTES	MODIFY DEFAULT ATTRIBUTES	MODIFY DEFAULT ATTRIBUTES	MODIFY DEFAULT ATTRIBUTES MODIFY DEFAULT ATTRIBUTES FOR PARTITION	MODIFY DEFAULT ATTRIBUTES MODIFY DEFAULT ATTRIBUTES FOR PARTITION
Modifying Real Attributes of Partitions	MODIFY PARTITION	MODIFY PARTITION	MODIFY PARTITION	MODIFY PARTITION MODIFY SUBPARTITION	MODIFY PARTITION MODIFY SUBPARTITION
Modifying List Partitions: Adding Values	n/a	n/a	MODIFY PARTITION...ADD VALUES	n/a	MODIFY SUBPARTITION ... ADD VALUES
Modifying List Partitions: Dropping Values	n/a	n/a	MODIFY PARTITION...DROP VALUES	n/a	MODIFY SUBPARTITION ... DROP VALUES
Modifying a Subpartition Template	n/a	n/a	n/a	SET SUBPARTITION TEMPLATE	SET SUBPARTITION TEMPLATE
Moving Partitions	MOVE PARTITION	MOVE PARTITION	MOVE PARTITION	MOVE SUBPARTITION	MOVE SUBPARTITION

Internet 100%



Range Partitioning



```
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 (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 (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



```
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.

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(35,null);
insert into dept_new2 values(45,null);
insert into dept_new2 values(55,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_P61
DEPT_NEW2	SYS_P62
DEPT_NEW2	SYS_P63



Interval Partitioning – 11g



```
select table_name, partition_count
from dba_part_tables
where table_name in ('DEPT_NEW','DEPT_NEW2');
```

TABLE_NAME	PARTITION_COUNT
DEPT_NEW2	1048575
DEPT_NEW	3

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
- ALTER TABLE... NOCOMPRESS
- Table compression now supported for OLTP

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.



Partition Compression

```
insert into dept_new3 values(10,null);
```

1 row created.

```
insert into dept_new3 values(20,null);
```

1 row created.

```
insert into dept_new3 values(30,null);
```

1 row created.

```
insert into dept_new3 values(60,null);
```

1 row created.

```
insert into dept_new3 values(90,null);
```

1 row created.

Partition Compression



```
select table_name, partition_name, compression
from dba_tab_partitions
where table_name = 'DEPT_NEW3';
```

TABLE_NAME	PARTITION_NAME	COMPRESS
DEPT_NEW3	D1	ENABLED
DEPT_NEW3	D2	DISABLED
DEPT_NEW3	D3	ENABLED
DEPT_NEW3	SYS_P64	ENABLED
DEPT_NEW3	SYS_P65	ENABLED
DEPT_NEW3	SYS_P66	ENABLED

6 rows selected.

Object Maintenance

Oracle Enterprise Manager - Table View - Windows Internet Explorer

https://[redacted]/em/console/database/schema/table?name=SYSTEM&oname=DEPT_NEW3&event=view&cancelURL=/em/console/database/datab... Certificate Error

Oracle Enterprise Manager 11g
Database Control

Database Instance: O11gb > Tables > View Table: SYSTEM.DEPT_NEW3

Logged in As SYS

Actions: Run Segment Advisor (Go) Edit OK

General

Name: DEPT_NEW3
Schema: SYSTEM
Tablespace: SYSTEM
Organization: Standard (Heap Organized)

Columns

Name	Data Type	Size	Scale	Not NULL	Default Value	Encrypted
DEPTNO	NUMBER	2		<input type="checkbox"/>		<input type="checkbox"/>
DEPT_NAME	VARCHAR2	30		<input type="checkbox"/>		<input type="checkbox"/>

Indicates a Primary Key column
Indicates a Unique Key column

Constraints

Name	Table Type	Columns	Disabled	Deferrable	Initially Deferred	Validate	RELY	Check Condition	Referenced Schema	Referenced Table	Referenced Table Columns	Cascade on Delete
No constraints have been defined.												

Partitions

Partitioning Description

Partitioning Method: Range
Partitioning Columns: DEPTNO
Number of Partitions: 6

Partition Definitions

Partition Name	High Value - DEPTNO (NUMBER)	Tablespace
D1	10	SYSTEM
D2	20	SYSTEM
D3	30	SYSTEM
SYS_P65	40	SYSTEM
SYS_P64	70	SYSTEM
SYS_P66	100	SYSTEM

Options

Parallel Degree: Disabled



Object Maintenance – Reorganize

Oracle Enterprise Manager 11g
Database Control

Reorganize Objects: Review

Database Instance **O11gb** Schema Objects **6** Step 6 of 6

Logged In As **SYS**

Job Name **REORGANIZE_O11GB_1**
Job Schedule **Run Immediately**

Script

The script summary is a list of the database commands that will be used to reorganize the selected objects. The full script is a PL/SQL script that includes functions, procedures, and other commands needed during the reorganization. The full script will be created when you submit the job and will be executed by the Job to perform the reorganization.

View Script Summary Full Script

```
-- Target database: O11gb
-- Script generated at: 23-MAR-2007 23:00
ALTER TABLE "SYSTEM"."DEPT_NEW3" MOVE PARTITION "D1"
ALTER TABLE "SYSTEM"."DEPT_NEW3" MOVE PARTITION "D2"
ALTER TABLE "SYSTEM"."DEPT_NEW3" MOVE PARTITION "D3"
ALTER TABLE "SYSTEM"."DEPT_NEW3" MOVE PARTITION "SYS_P64"
ALTER TABLE "SYSTEM"."DEPT_NEW3" MOVE PARTITION "SYS_P65"
ALTER TABLE "SYSTEM"."DEPT_NEW3" MOVE PARTITION "SYS_P66"
BEGIN DBMS_STATS.GATHER_TABLE_STATS("SYSTEM", "DEPT_NEW3", partname=>"D1", estimate_percent=>NULL);
END;
BEGIN DBMS_STATS.GATHER_TABLE_STATS("SYSTEM", "DEPT_NEW3", partname=>"D2", estimate_percent=>NULL);
END;
BEGIN DBMS_STATS.GATHER_TABLE_STATS("SYSTEM", "DEPT_NEW3", partname=>"D3", estimate_percent=>NULL);
END;
BEGIN DBMS_STATS.GATHER_TABLE_STATS("SYSTEM", "DEPT_NEW3", partname=>"SYS_P64",
estimate_percent=>NULL); END;
```

Step 6 of 6

Database | Setup | Preferences | Help | Logout

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[About Oracle Enterprise Manager](#)

Nice DBA Tools/Improvements



Read Only Tables
Automated Maintenance
Additional Features



Read Only Tables

- You could already have a **Tablespace** in Read Only Mode in prior versions of Oracle.
- NOW You can have a **TABLE** in Read Only Mode in Oracle 11g (*alter table x read only*).
- **COMPATIBLE** must be set to 11.0 or higher
- Once put in READ ONLY mode:
 - No DML is allowed
 - No DDL other than DROP TABLE and an ALTER TABLE to READ WRITE mode is allowed.
 - SELECT FOR UPDATE is NOT allowed



Read Only Tables

```
alter table dept_new read only;
```

Table altered.

```
insert into dept_new values (10, 'ADMIN');
```

*

ERROR at line 1:

ORA-12081: update operation not allowed on table "SYSTEM"."DEPT_NEW"

```
alter table dept_new read write;
```

Table altered.

```
insert into dept_new values (10, 'ADMIN');
```

1 row created.

Automated Maintenance Tasks



- Automatic Optimizer **Statistics Collection**
- Automatic **Segment Advisor**
- Automatic **SQL Tuning Advisor (DBMS_SQLTUNE)**
- **Disable/Enable Automated Tasks:**

DBMS_AUTO_TASK_ADMIN.DISABLE (ENABLE)

- **Setting up Maintenance Windows**

DBMS_SCHEDULER.CREATE_WINDOW





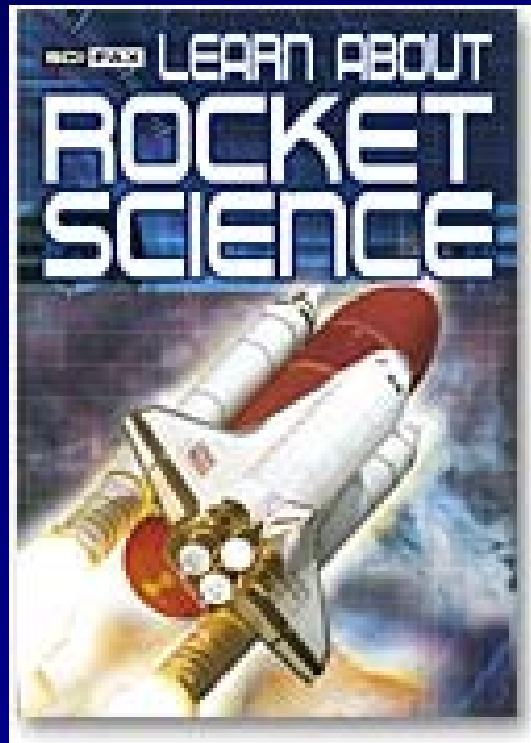
Additional Enhancements



- Ability to online redefine tables that have materialized view logs:
 - Tables with materialized view logs can now be redefined online.
 - Materialized view logs are now one of the dependent objects that can be copied to the interim table with the `DBMS_REDEFINITION.COPY_TABLE_DEPENDENTS` package procedure.
- `DBMS_STATS` performance has been improved.



Automatic Diagnostic Repository (ADR)



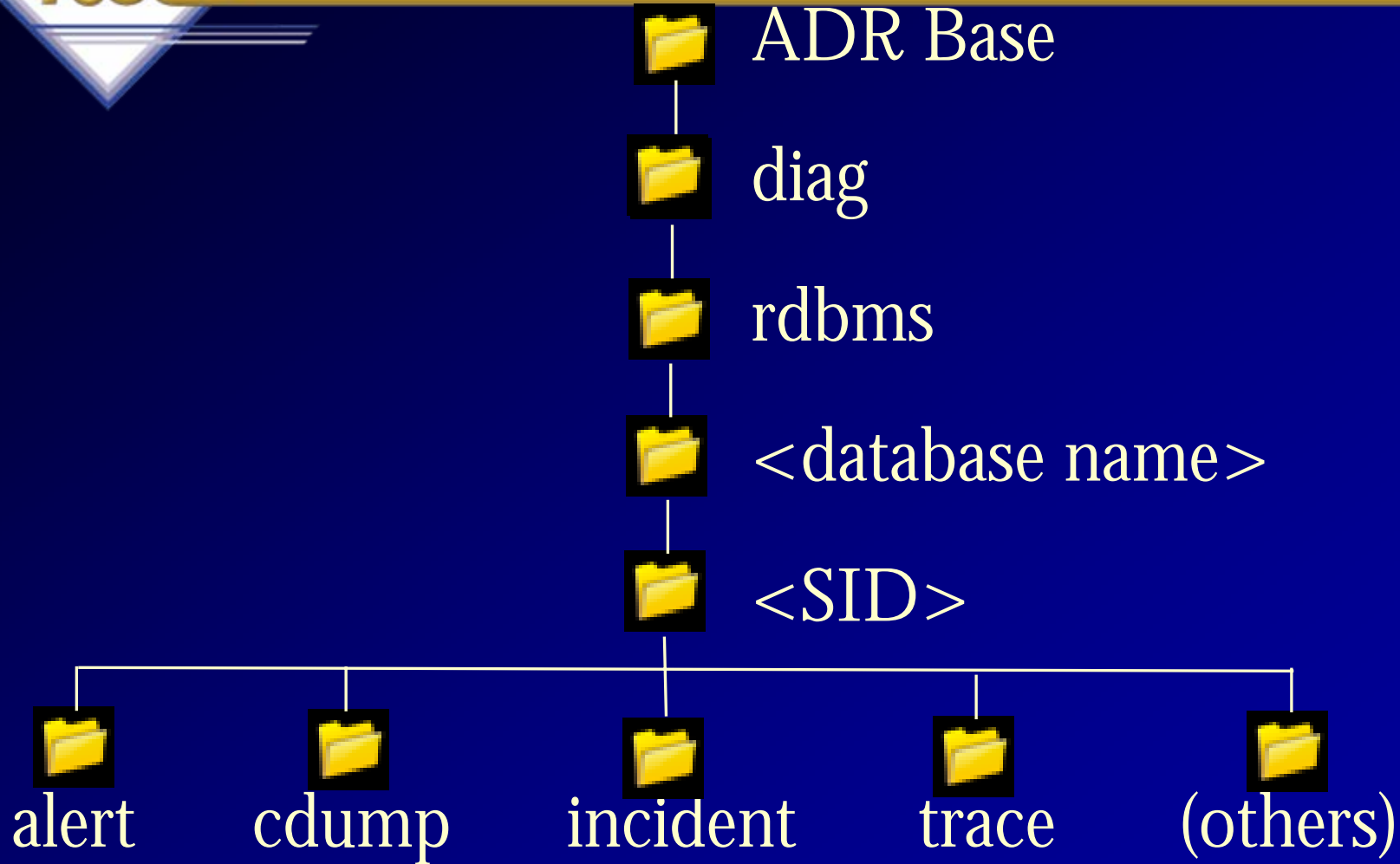
Automatic Diagnostic Repository (ADR)



- Oracle 11g includes a Fault Diagnosability Infrastructure to prevent, detect, diagnose, resolve issues related to bugs, corruption, etc.
- When a critical error occurs it is assigned an incident number and all diagnostic data tagged with this in ADR.
- ADR is a file based repository outside of the database
- ADR helps detect problems proactively
- ADR helps limit the damage of interruptions
- ADR helps reduce problem diagnostic time
- ADR simplifies Oracle Support / Customer interaction
- The ADR also contains Health Reports, Trace Files, Dump Files, SQL Test Cases and Data Repair Records



ADR Directory Structure for a Database Instance



Alert Log: /u01/app/oracle/diag/rdbms/o11gb/O11gb/trace

ORACLE_HOME: /u01/app/oracle/product/11.1.0/db_1



ADR – V\$ Diagnostic Info

```
select name, value
from v$diag_info;
```

NAME	VALUE
-----	-----
Diag Enabled	TRUE
ADR Base	/u01/app/oracle
ADR Home	/u01/app/oracle/diag/rdbms/o11gb/O11gb
Diag Trace	/u01/app/oracle/diag/rdbms/o11gb/O11gb/trace
Diag Alert	/u01/app/oracle/diag/rdbms/o11gb/O11gb/alert
Diag Incident	/u01/app/oracle/diag/rdbms/o11gb/O11gb/incident
Diag Cdump	/u01/app/oracle/diag/rdbms/o11gb/O11gb/cdump
Health Monitor	/u01/app/oracle/diag/rdbms/o11gb/O11gb/hm
Default Trace File	/u01/app/oracle/diag/rdbms/o11gb/O11gb/trace/O11gb_ora_16676.trc
Active Problem Count	0
Active Incident Count	0

11 rows selected.



Optimizer Statistics & Other Optimizer Advances



Special Thanks: Maria Colgan & 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 of sampling.
 - Accuracy is comparable to **COMPUTE**

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!

Manage New Statistics

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
```

```
-----
```

```
FALSE
```



Manage New Statistics

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_private_statistics = true;
```

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

```
exec dbms_stats.publish_private_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-APR-07	55500	1451	180

```
exec dbms_stats.delete_table_stats('SH', 'CUST'); <to delete>156
```

Extended Optimizer Statistics: New Multi-Column Statistics



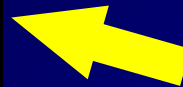
- Corporate data often has **correlations between different columns of a table**. For example:
 - A job title is correlated to the salary.
 - The **season affects the sold amounts** of items such as **swim suits** sell more in the summer and **snow shoes** sell more in the winter.
 - The make of a car and color are often used together but are not really correlated well.
- 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 histograms are not enough!

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

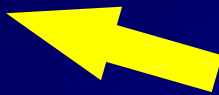
Make	Price	Color
CORVETTE	40,000	RED
CORVETTE	60,000	BLACK
CORVETTE	50,000	SILVER
CADILLAC	90,000	RED
JEEP	35,000	BLACK
JEEP	45,000	SLIVER

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

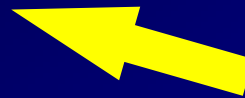
Make	Price	Color
CORVETTE	40,000	RED
CORVETTE	60,000	BLACK
CORVETTE	50,000	SILVER
CADILLAC	90,000	RED
JEEP	35,000	BLACK
JEEP	45,000	SLIVER

Example, cont.



```
SELECT make, price, color
FROM cars_dot_com
WHERE make = 'CORVETTE'
AND PRICE > 35000;
```

CORVETTE	40,000	RED
CORVETTE	60,000	BLACK
CORVETTE	50,000	SLIVER



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

- Three records selected.
 - Correlated columns
 - Additional predicate has no effect
 - **Single column statistics are NOT sufficient**

Manage New Statistics

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

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

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

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
CUST_VALID	2	NONE
COUNTRY_ID	19	FREQUENCY
CUST_STATE_PROVINCE	146	NONE
CUST_CITY_ID	620	HEIGHT BALANCED
CUST_CITY	621	NONE
CUST_LAST_NAME	755	NONE
CUST_FIRST_NAME	987	NONE
CUST_ID	55605	NONE
...		
SYS_STUJGVLRVH5USVDU\$XNV4_IR#4	146	NONE

24 rows selected.



Manage New Statistics

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.

Adaptive Cursor Sharing



- The optimizer **peeks at user-defined bind values** during plan selection on the hard parse.
- Initial **value of the binds determines the plan for all future binds** (hopefully the first peek covers most queries)
- Same execution plan shared regardless of future bind values
- One plan is not always appropriate for all bind values for a given SQL statement
 - Where **job= 'PRESIDENT'** (use an **index** – only one row)
 - Where **job = 'OPERATOR'** (don't use an **index** – 90% of the table)
- If Oracle “peeks” and sees the President, it will use the index. Future queries also use the index without peeking after that (bad for the OPERATOR query).

Consider a Telephone Company...



```
SELECT Ename, Empno, Job  
FROM Emp  
WHERE Job = :B1  
Value of B1 = 'OPERATOR';
```

Ename	Empno	Job
SMITH	6973	OPERATOR
ALLEN	7499	OPERATOR
WARD	7521	OPERATOR
KING	8739	PRESIDENT
SCOTT	7788	OPERATOR
CLARK	7782	OPERATOR

Ename	Empno	Job
SMITH	6973	OPERATOR
ALLEN	7499	OPERATOR
WARD	7521	OPERATOR
SCOTT	7788	OPERATOR
CLARK	7782	OPERATOR

- If **'OPERATOR'** is the bind value at hard parse, most records will be selected. Execution plan will be a **full table scan**
- If **'PRESIDENT'** is the bind value at hard parse, few records will be selected. Execution plan will be an **index search**



Adaptive Cursor Sharing

Solution:

- In 11g, Oracle uses **bind-aware cursor matching**.
- **Share the plan when binds values are “equivalent”**
 - Plans are marked with selectivity range
 - If current bind values fall within range they use the same plan
- **Create a new plan if binds are not equivalent**
 - Generating a new plan with a different selectivity range



Bind Peeking Cursor Sharing (cs) Statistics

select sql_id, peeked, executions, rows_processed, cpu_time
from v\$sql_cs_statistics; (using the peeked value on the 2nd+ execution)

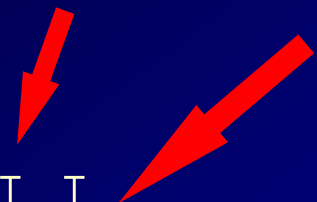
SQL_ID	P	EXECUTIONS	ROWS_PROCESSED	CPU_TIME
5wfj3qs71nd7m	Y	3	1	0
2rad83pp613m1	Y	3	3	0
dr78c03uv97bp	N	1	3	0
dr78c03uv97bp	N	1	3	0
dr78c03uv97bp	Y	1	3	0
9qv6tq9ag5b80	Y	3	3	0
a2k4qkh681fzx	Y	3	2	0
413zr99jf9h72	N	1	1	0
413zr99jf9h72	N	1	1	0
413zr99jf9h72	Y	1	1	0
fd69nfwzww1mhm	Y	6	0	0



Bind Peeking – V\$SQL

```
select sql_id, executions, is_bind_sensitive, is_bind_aware  
from v$sql;
```

SQL_ID	EXECUTIONS	I	I
9ugwm6xmvw06u	11	Y	N
bdfrydpbzw07g	11	Y	N
57pfs5p8xc07w	20	N	N
...			



- `is_bind_sensitive` – If 'Y', then Oracle is using multiple plans depending on bind variable.
- `is_bind_aware` – Oracle knows that the different data patterns may result depending on bind value. Oracle switches to a bind-aware cursor and may hard parse the statement.

Enterprise Manager for the Grid



Host and Hardware



Database

State

Active Sessions: 19

SQL Response Time (%): ✔ 83.87
(compared to baseline)

Bad SQL: ✘ 11

Top SQL Report: 238

Duplicate SQL: ! 738

Latest Alert Log Entry: ✔ No ORA- errors

Oracle9iAS

Application Server: ias902.dlsun1641.us.oracle.com

View: Top Applications by Average Servlet/JSP Processing Time

Name	OC4J Instance	Total Processing Time (seconds)	Average Servlet/JSP Processing Time (seconds)	Servlet/JSP Requests Processed	Servlet Process Time (secs)
hrapp	home	167.20	12.69	11	1
default	home	562.77	0.17	3 235	5

Network and Load Balancer



Administration Monitoring Provisioning Security

Alerts

Metric	Transaction	Severity
Packets Dropped (%)	mail.us.oracle.com	✘
Status	mail.us.oracle.com	✘

Enterprise Manager

Applications

Storage

Qtree's (ordered by Used (%))

Status	Name	Volume	Total(GB)	Used(GB)	Used (%)
✘	stst3	stb04	60.0	58.82	98.03
✘	stst4	stb04	250.0	231.48	92.59
!	local_backup	backup04	250.0	219.68	87.87
!	oam_top	app1top04	350.0	298.05	85.16
✔	stst1	stb04	60.0	48.51	80.85
✔	stst2	stb04	60.0	47.92	79.87
✔	stst4	stb04	60.0	47.65	79.41
✔	anubackup	backup04	100.0	82.67	82.67
✔	app901sun	app1top04	50.0	25.3	50.6

Enterprise Manager: Back in Time!



The screenshot displays the Oracle Storage Manager interface for a database instance named 'rich1'. The left pane shows a tree view of the database structure, with the file 'C:\ORAWIN95\DATABASE\USR1ORCL.ORA' selected under the 'Datafiles' folder. The right pane shows the 'General' tab for this file, with the following details:

- General: Auto Extend
- Name: :\ORAWIN95\DATABASE\USR1ORCL.ORA
- Tablespace: USER_DATA
- Status: Online Offline
- New File Size: [] K M Bytes
- Use Existing File

Buttons at the bottom of the right pane include Apply, Revert, Show SQL, and Help.

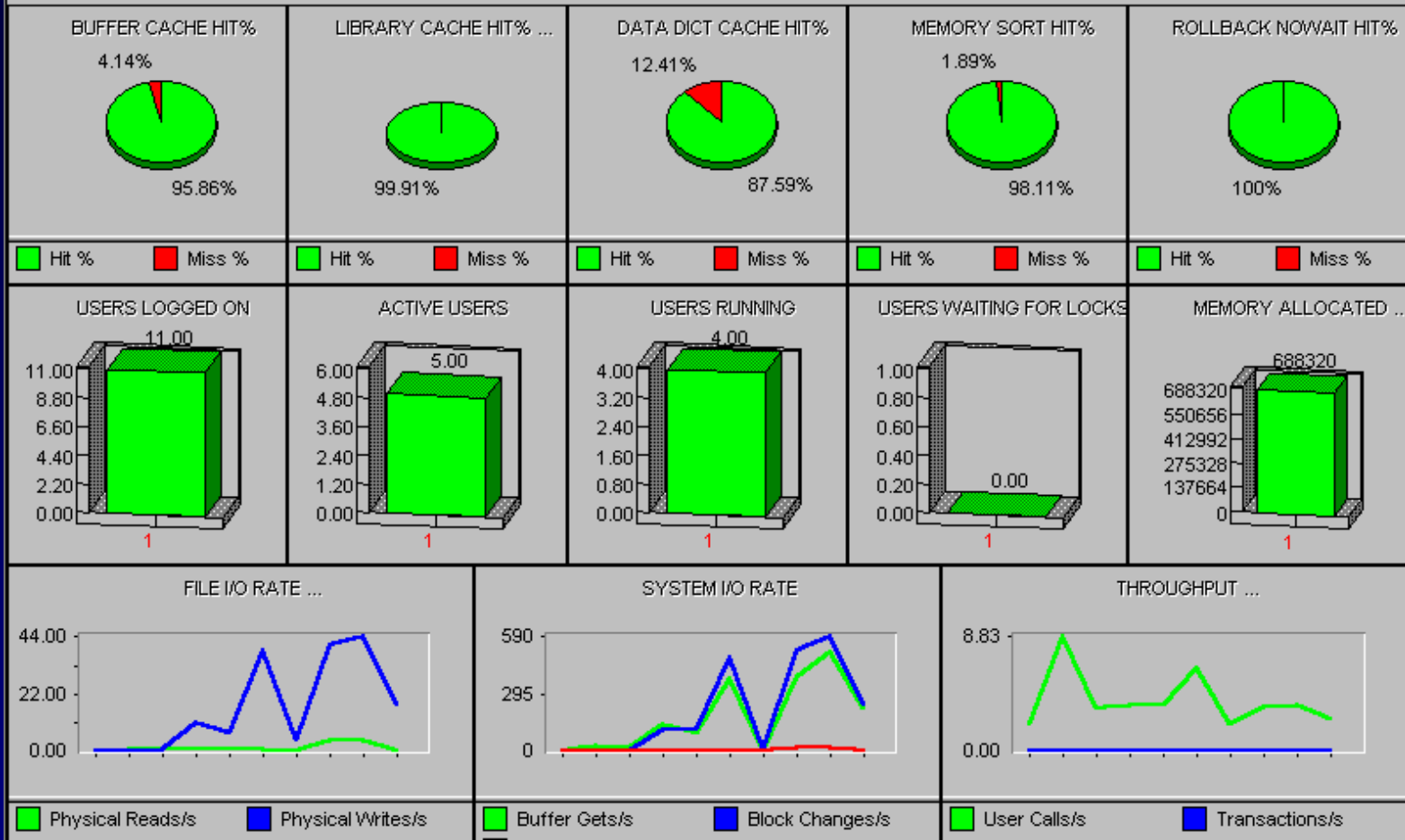
Performance Manager : Back in Time!

OVERVIEW - rich1

Window Refresh Help



Automatic Refresh Interval: 0 min 30 sec



For Help, press F1





igR2;
ing!

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) - 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

Address: http://at1md8.us.oracle.com:7777/em/console/racl/racl5kemap?type=rac_database&target=ioug&pageNum=5

Cluster IOUG > Logged in As SYSTEM

Cluster Database: ioug

Home Performance Administration Maintenance **Topology**

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

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 (↑↓)
Cluster	IOUG
Alerts	5 8

Name: ioug_ioug1
Type: Database Instance
Host: at1md1.us.oracle.com
Critical Alerts: 1
Warning Alerts: 1
Status: Up
ASM: +ASM1_at1md1.us.oracle.com

Internet

Database Performance



Oracle Enterprise Manager (SYS) - Database Instance: O11gb - Windows Internet Explorer

Oracle Enterprise Manager 11g Database Control

Database Instance: O11gb

Home Performance Availability Server Schema Data Movement Software and Support

Latest Data Collected From Target Mar 27, 2007 3:18:55 PM CDT

General

Status Up
Up Since Mar 27, 2007 8:09:26 AM CDT
Instance Name O11gb
Version 11.1.0.3.0
Host [REDACTED]
Listener LISTENER [REDACTED]

Health Meter

2 Issues
0 Incidents
2 Alerts

Host CPU

100%
75%
50%
25%
0%

Other O11gb

Load 2.74 Paging 0.00

Active Sessions

3.0
2.3
1.5
0.8
0.0

Wait User I/O CPU

Maximum CPU 1

Diagnostic Summary

ADDM Findings 1
Period Start Time Mar 27, 2007 2:00:02 PM
Alert Log Mar 21, 2007 9:15:38 PM
SQL Response Time 53.84%

Space Summary

Database Size (GB) 1,572
Problem Tablespace 0
Segment Advisor Recommendations 0
Space Violations 0
Dump Area Used (%) 79

High Availability

Instance Recovery Time (sec) 23
Last Backup n/a
Usable Flash Recovery Area (%) 100
Flashback Logging Disabled

Alerts

Category All Critical 0 Warning 2

Severity	Category	Name	Impact	Message	Alert Triggered
Warning	Response	User Logon Time (msec)		User logon time is 1991.02 msec	Mar 27, 2007 2:43:55 PM
Warning	User Audit	Audited User		User SYS logged on from [REDACTED]	Mar 27, 2007 8:03:33 AM

ADDM Performance Analysis

Period Start Time Mar 27, 2007 2:00:02 PM Period Duration (minutes) 60.58 Instance O11gb

Impact (%)	Finding	Occurrences (last 24 hrs)
96.4	Top SQL by DB Time	2 of 22

Monitor Database

We have a CPU issue!

Database Performance



Top SQL
the Issue

Oracle Enterprise Manager (SYS) - Database Instance: O11gb - Windows Internet Explorer

https://[redacted]/insole/database/instance/istemap?event=doLoad&target=O11gb&type=oracle_database

Category: All Critical 0 Warning 2

Severity	Category	Name	Impact	Message	Alert Triggered
Warning	Response	User Logon Time (msec)		User logon time is 1991.02 msec.	Mar 27, 2007 2:43:55 PM
Warning	User Audit	Audited User		User SYS logged on from ora11gtest.tuscil.com.	Mar 27, 2007 8:03:33 AM

► Related Alerts

ADDM Performance Analysis

Period Start Time **Mar 27, 2007 2:00:02 PM** Period Duration (minutes) **60.58** Instance **O11gb**

Impact (%)	Finding	Occurrences (last 24 hrs)
96.4	Top SQL by DB Time	2 of 22
19.4	CPU Usage	3 of 22
15	Buffer Cache Latches	1 of 22
12.8	Shared Pool Latches	1 of 22

Policy Violations

Current 2 Distinct Rules Violated 8 Compliance Score (%) 92 [Policy Trend Overview](#)

Security

Last Security Evaluation **Mar 26, 2007 8:30:29 PM CDT** Compliance Score (%) 90 [Enterprise Security At a Glance](#)

Job Activity

Jobs scheduled to start no more than 7 days ago

Scheduled Executions 0 Running Executions 0 Suspended Executions 0 Problem Executions 0

Home Performance Availability Server Schema Data Movement Software and Support

Related Links

Access	Advisor Central	Alert History
Alert Log Content	All Metrics	Archive/Purge Alert Log
AWR Baseline Metric Thresholds	Blackouts	EM SQL History
Jobs	Metric and Policy Settings	Metric Collection Errors
Monitoring Configuration	Monitor in Memory Access Mode	Policy Groups
Reports	Scheduler Central	SQL Worksheet
Target Properties	Trace Files	User-Defined Metrics

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

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[About Oracle Enterprise Manager](#)

Database Performance



Oracle Enterprise Manager (SYS) - Availability (Status History): O11gb - Windows Internet Explorer

Database Control

Database Instance: O11gb >

Availability (Status History): O11gb

Page Refreshed Mar 21, 2007 9:03:20 PM CDT

View Data Last 24 hours

Last 24 hours
 Last 7 days
 Last 31 days

General

Overall Availability

Current Status **Up**
 Up Since **Mar 21, 2007 8:58:55 PM**
 Availability (%) **90.28**
 Down Time (minutes) **50**
 Blackout Time (minutes) **0**
 Agent Down Time (minutes) **90**
 System Error Time (minutes) **0**
 Status Pending Time (minutes) **0**

Category	Percentage
Up Time	90.3%
Down Time	3.5%
Agent Down Time	6.2%

Availability (%) = Uptime / (Uptime + Target Downtime + Agent Downtime)

90.28%

Downtime History for Last 24 Hours

View

Start Time	End Time	Duration (minutes)	Outage Type
Mar 21, 2007 8:48:55 PM	Mar 21, 2007 8:58:55 PM	10	Down
Mar 21, 2007 8:33:55 PM	Mar 21, 2007 8:43:55 PM	10	Down
Mar 21, 2007 7:58:39 PM	Mar 21, 2007 8:28:39 PM	29	Down
Feb 19, 2007 2:59:03 PM	Mar 20, 2007 10:33:11 PM	42214	Agent Down

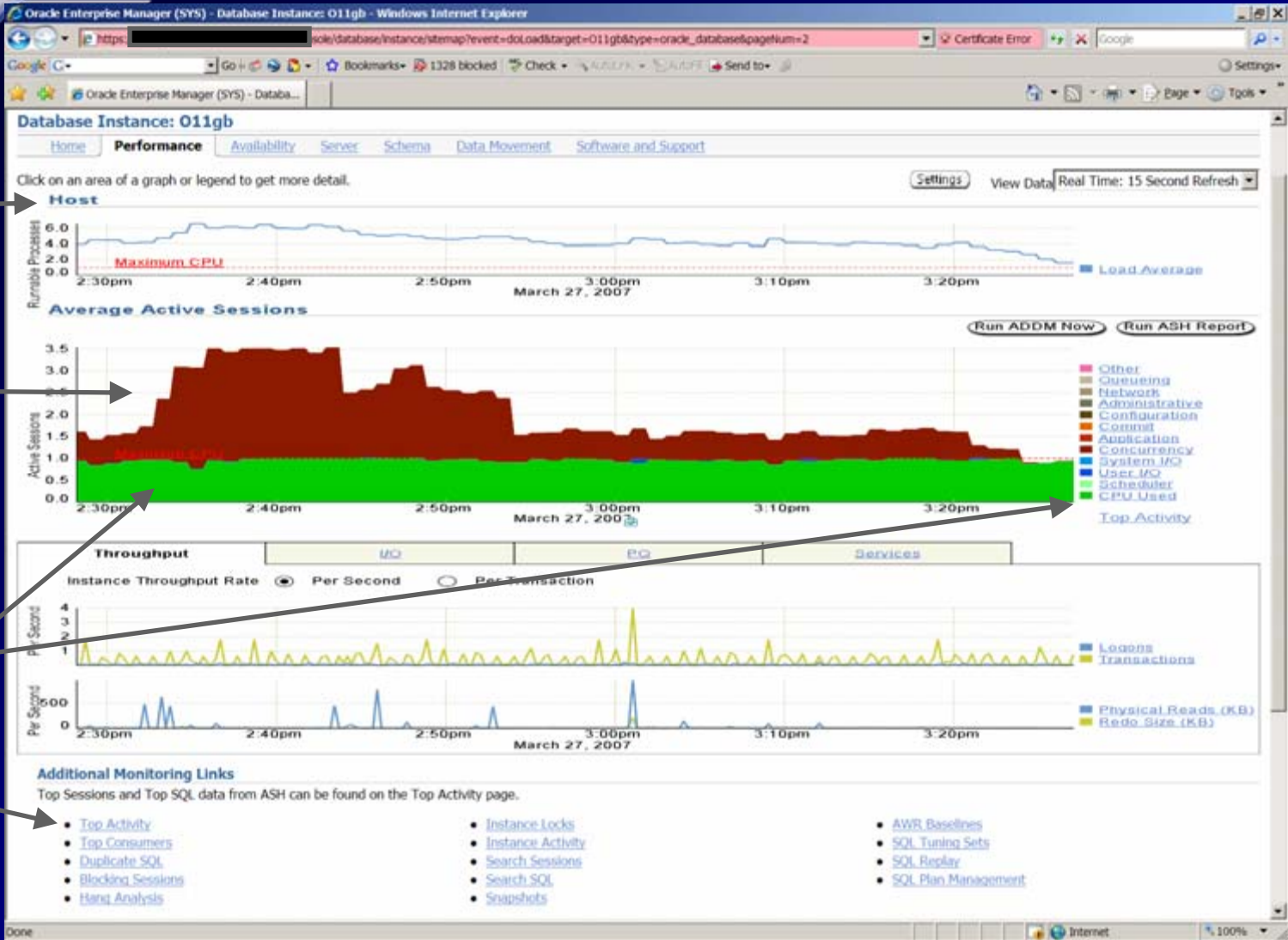
[Database](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

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Current Status

History of Availability

Database Performance



Check Host

Check Database Active Sessions (CPU)

Top Activity



Database Performance

Top Activity

Lock Table Issues

The screenshot displays the Oracle Enterprise Manager 11g Database Control interface. The 'Top Activity' section features a stacked area chart showing active sessions over time, with a legend including categories like Other, Generating, Network, Administration, Configuration, Commit, Application, Consistency, System I/O, User I/O, Scheduler, and CPU. A detail view for a 5-minute interval is shown below, containing two tables: 'Top SQL' and 'Top Sessions'.

Top SQL

Select Activity (%)	SQL ID	SQL Type
49.42	4shj10umse8kk	LOCK
49.26	1chvks9lfr	lock table system.dept_rch in exclusive mode
.33	404zndbth5g	SELECT
.17	2f6byza722jdb	SELECT
.17	5a181u68n9dy	SELECT
.17	dkp7stsv3b75	SELECT
.17	257mooqv4kz	SELECT
.17	3wmodkypf92s	SELECT
.17	2b97ab0yn7u6	SELECT

Top Sessions

Activity (%)	Session ID	QC Session ID	User Name	Program
48.86	121		SYS	sqlplus@ (TNS V1-V3)
48.69	120		SYSTEM	sqlplus@ (TNS V1-V3)
	120		DBSNMP	OMS
.16	148		SYS	sqlplus@ (TNS V1-V3)
.16	148		SYS	sqlplus@ (TNS V1-V3)
.16	148		SYS	sqlplus@ (TNS V1-V3)
.16	148		SYS	sqlplus@ (TNS V1-V3)
.16	148		SYS	sqlplus@ (TNS V1-V3)
.16	148		SYS	sqlplus@ (TNS V1-V3)

Database Performance



CPU
Worst SQL
by CPU

Oracle Enterprise Manager (SYS) - Active Sessions Working: CPU Used - Windows Internet Explorer

https://[redacted].../oracle/database/instance/watDetail?event=doLoad&target=O11gb&type=oracle_database/watClass=CPU%20Used

ORACLE Enterprise Manager 11g
Database Control

Database Instance: O11gb >

Active Sessions Working: CPU Used

Drag the shaded box to change the time period for the detail section below.

View Data: Real Time | 15 Second Refresh

Detail for Selected 5 Minute Interval
Start Time: Mar 21, 2007 9:01:11 PM CDT

Top Working SQL

[Schedule SQL Tuning Advisor](#) [Create SQL Tuning Set](#)

Select All | Select None

Select Activity (%)	SQL ID	SQL Type
33.33	05ac43d9psvtn	SELECT
16.67	odqbfm0d3ygg	SELECT
16.67	0kcpnl85613hys	SELECT
16.67	cyzumft19p208	SELECT
16.67	odqbfm0d3ygg	SELECT

Total Sample Count: 6

Top Working Sessions

View: Top Sessions

Activity (%)	Session ID	QC Session ID	User Name	Program
28.57	128		DBSNMP	emagr... (TNS V1-V3)
28.57	123		SYS	oracle@... (m000)
14.29	139		SYSMAN	OMS
14.29	142		SYSMAN	oracle@... (J000)
7.14	163		SYS	oracle@... (DBW0)
7.14	166		SYS	oracle@... (PSPO)

Total Sample Count: 14

Additional Monitoring Links
Top Sessions and Top SQL data from ASH can be found on the Top Activity page.

- [Top Activity](#)
- [Top Consumers](#)
- [Duplicate SQL](#)
- [Blocking Sessions](#)
- [Hang Analysis](#)
- [Instance Locks](#)
- [Instance Activity](#)
- [Search Sessions](#)
- [Search SQL](#)
- [Snapshots](#)
- [AWR Baselines](#)
- [SQL Tuning Sets](#)
- [SQL Replay](#)
- [SQL Plan Management](#)



SQL
Statistics
for this
SQL

Oracle Enterprise Manager (SYS) - SQL Details: 5a1j61u6hy9dy - Windows Internet Explorer

Oracle Enterprise Manager 11g
Database Control

Database Instance: O11gb > Top Activity >
SQL Details: 5a1j61u6hy9dy

Switch to SQL ID: [] (Go) View Data: Real Time: Manual Refresh [Refresh] [SQL Worksheet] [Schedule SQL Tuning Advisor] [Repair Advisor]

Text

```
select module, count(*)  
from v$active_session_history  
where sample_time > sysdate - 1/24 and service_hash = :1 group by module order by count(*) desc
```

Details

Select the plan hash value to see the details below. Plan Hash Value: 2561781287

Statistics Activity Plan Tuning Information

Summary

General

Module: **Realtime Connection**
Action: Parsing Schema
DBSNMP
SQL/SQL Source (Line Number): SYS.DBMS_SERVER_ALERT (111)

Activity By Waits

Activity By Time

Elapsed Time (sec) **5.34**
CPU Time (sec) **5.00**
Wait Time (sec) **0.34**

Elapsed Time Breakdown

SQL Time (sec) **5.34**
PL/SQL Time (sec) **0.00**
Java Time (sec) **0.00**

Other Statistics

Executions that Fetched all Rows (%) **100.00**
Average Persistent Mem (KB) **4.59**
Average Runtime Mem (KB) **3.98**
Serializable Aborts **0**
Remote **No**
Obsolete **No**
Child I sql Number

Shared Cursors Statistics

Total Parses **8**
Hard Parses **1**
Child Cursors **1**
Child Cursors With Loaded Plans **1**
Invalidations **0**
Largest Cursor Size (KB) **16.51**
All Cursor Size (KB) **16.51**

Execution Statistics

	Total	Per Execution	Per Row
Executions	158	1	NA
CPU Time (sec)	5.00	0.03	NA
Buffer Gets	18	0.11	NA

Hang Analysis!



A screenshot of the Oracle Enterprise Manager 11g interface. The browser window title is "Oracle Enterprise Manager (SYS) - Kill Session Confirmation - Windows Internet Explorer". The URL is "https://[redacted]:1521/database/instance/sessionDetails?event=doLoad&target=O11gb&type=oracle_database&SID=125&sessNum=5091&pageItem=5&refreshChoice=RT_1". The page content shows a "Confirmation" dialog box with the following text: "Are you sure you want to kill this session?", "SID 125", "DB User SYSTEM", "Program sqlplus [redacted] (TNS V1-V3)", and "Options Kill Immediate" (selected) and "Post Transactional" (unselected). At the bottom right of the dialog are buttons for "Show SQL", "No", and "Yes". The Oracle logo and "ORACLE Enterprise Manager 11g Database Control" are visible at the top of the page content. Copyright information for Oracle is at the bottom.



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.



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) ¹⁸⁶



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 2006 (5E)**

or

- **All Email generated in the world in 2006 (6E)**

or

- **1 Mount Everest filled with Documents (approx.)**

Impact Tuning with Oracle



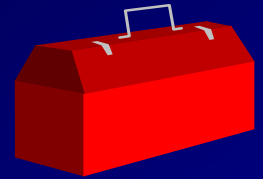
99.8% Less Data Accessed / 96.8% Time Reduction

<u>Option</u>	<u>Before</u>	<u>After</u>
Partitions	120 sec - 310M	0.43 sec - 200k
Partitions / Tuned	120 sec - 310M	0.01 sec - 8k
Parallel Query (20 Proc.)	230 sec	18 sec
Function-Based Index	1206 sec - 3G	7 sec - 8k
Materialized View	28 sec	3 sec
Cursor_Sharing	240 sec	0.01 sec
Truncate	510 sec / 8G	0.40 sec / 32k
Driving Table	900 sec	1 second
SGA Sizing	30 sec	0.01 sec
750,000 Query Mix	5.1 T / 540 hours	9 G / 23 hours

NOW Oracle will do all of this for you!!!



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
11.1.0.3 (beta)	482 (+22%)	782 (+22%)



Oracle 11g Keeps the Database Up & Secure!



DBA
Problem

Stolen Computer Database

Database is a free service provided by the American Computer Exchange. It is our hope that this database will help you find stolen computers. For this system to work efficiently, we will need your help. Please let your local newspaper know about this service. In addition, tell your local law enforcement agencies about the database. They may be able to help you return recovered stolen property.

Celebrity
Problem

The screenshot shows a news website interface with a navigation bar containing 'Featured', 'Entertainment', 'Sports', and 'Life'. Below the navigation bar, the date 'ar 26, 2007' is visible. The main content area features a photograph of Britney Spears wearing a hat and holding a microphone. To the right of the photo is the article title 'Painful tooth for Britney' and a brief summary: 'Britney Spears hits the town and fixes a toothache. Also, see how a gamer could earn cash. » Watch 'THE 9''. Below the summary are two bullet points: '▪ Bill Clinton likes '24,' 'I Love Lucy'' and '▪ TV fans pick new 'Grease' stars'.

Wouldn't you rather be a DBA...



Overview



- Start Me Up – Using Memory Target
- The Result Cache
- Invisible Indexes & Online Index Rebuilds
- Virtual Columns and Nice Developer Tools
- ADDM Enhancements
- SQL Plan Management & SQL Plan Baselines
- SQL Access Advisor & Partition Advisor
- SQL Query Repair Advisor
- SQL Replay and DB Capture & Replay
- Interval Partitioning & Partition Compression
- DBA Tools, ADR and DBMS_STATS
- Grid Control & EM
- Security Enhancements & the Future Sizes
- Summary



Kramer doesn't have a Backup



My Junior DBA is getting the backup right now!

Statspack - Still nice; Some new 10g features



No more Data for you!
Now you go. Never come back. Next!

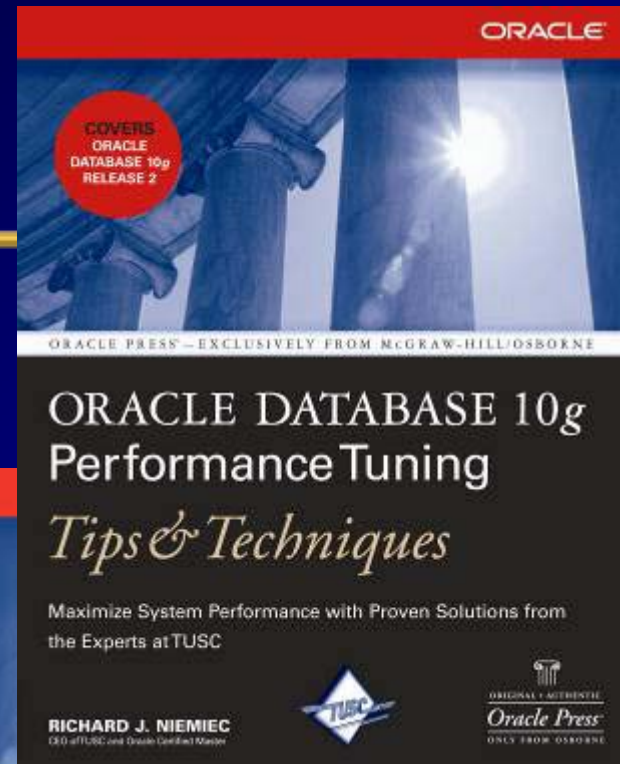
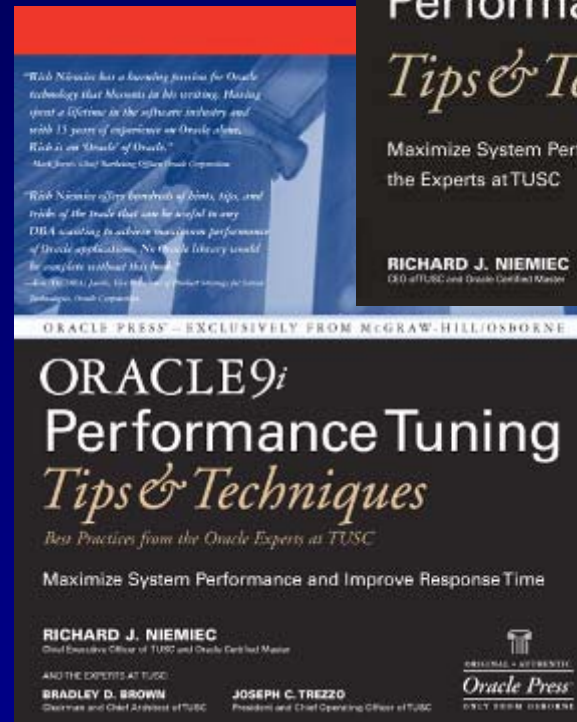


Do Developers think of this when they think of their DBA? ¹⁹³

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



References

- www.tusc.com
- *Oracle10g Performance Tuning Tips & Techniques; Richard J. Niemiec; Oracle Press*
- www.ioug.org, www.oracle.com & technet.oracle.com
- Thanks Dan M., Bob T., Brad, Joe, Heidi, Mike K., Debbie
- All companies and product names are trademarks or registered trademarks of the respective owners.
- Database Secure Configuration Initiative: Enhancements with Oracle Database 11g, www.oracle.com
- All Oracle11g Documentation from Oracle Beta Site
- Dedicated to the memory of Stan Yellott, Mark Beaton, Ray Mansfield, Lex De Haan, Elaine DeMeo and Jim Gray.



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Contact Information

Rich Niemiec: rich@tusc.com

www.tusc.com





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

- Henry David Thoreau