



Whose Fault is it? – A Review of Application Tuning Problems

SAGE Computing Services
Customised Oracle Training Workshops
and Consulting
www.sagecomputing.com.au

Penny Cookson
Managing Director
www.sagecomputing.com.au



Introduction



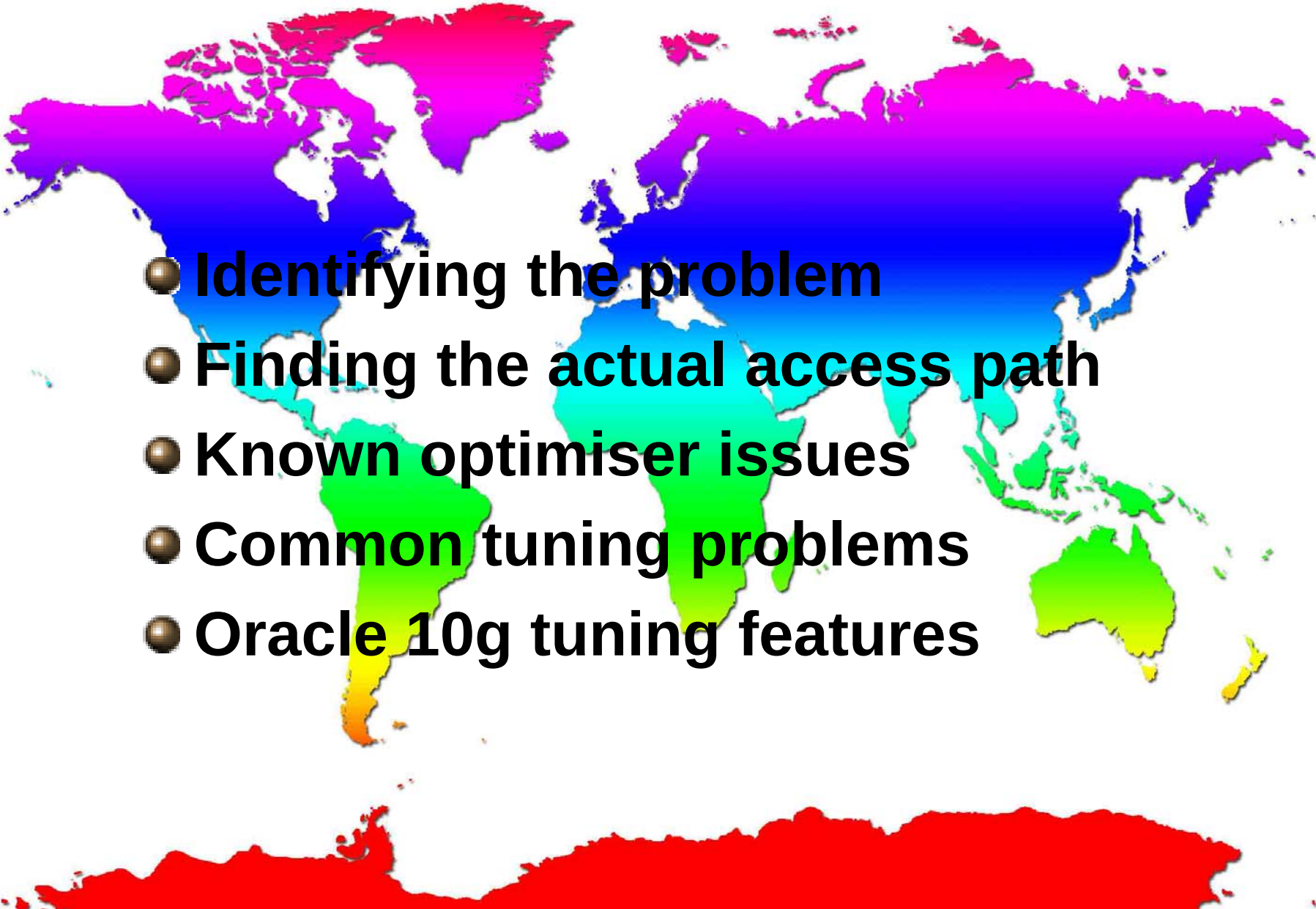
Australian Oracle User Group



International Oracle User Group

- **18 years working with Oracle products**
- **Database administration / development / training / tuning**
- **Oracle Magazine's Educator of the Year 2004**
- **Sage Computing Services is a consulting / training company based in Perth, Western Australia**

Agenda

- 
- Identifying the problem
  - Finding the actual access path
  - Known optimiser issues
  - Common tuning problems
  - Oracle 10g tuning features



Identifying the Problem

● Stage 1 – Denial

- Lets try it again, it might work next time
- Maybe something else was running
- It ran OK last week and I haven't changed anything

● Stage 2 – Blame someone else

- Give it to the DBA
- Leave it and hope someone else notices
- Call the hardware engineers

● Stage 3 – I'd better do something



Case 1 – The Problem

- **Select statement is generated by a third party product**
- **Statement runs for 4 minutes**
- **Developer's action**
  - **Cut and paste the statement from V\$SQLAREA**
  - **Run Explain in the same database**
  - **Statement runs in <1 sec**
  - **Statement is using the expected index**



Find Out What it Really Did

● Use trace event 10046

● Check user_dump_dest

- Location for trace files
- Set at system level only

● Check max_dump_file_size

- Maximum size of trace file in OS blocks
- Can be set at session level

● Check timed_statistics

- Automatically on if statistics_level = TYPICAL or ALL
- Needed for cpu/elapsed times



Find Out What it Really Did

● Trace the user's session

```
BEGIN
  DBMS_MONITOR.SESSION_TRACE_ENABLE(
    session_id => 999, serial_num => 99,
    waits => TRUE, binds => FALSE);
END;
```

● Format the trace file

● tkprof ora10g_ora_4216.trc trace1.lst
sys=no

● Statement does not use the index



Determine Why

● Use trace event 10053

- Trace optimiser decision
- Not formatted with tkprof

```
ALTER SYSTEM SET EVENTS
```

```
'10053 trace name context forever';
```

```
ALTER SYSTEM SET EVENTS
```

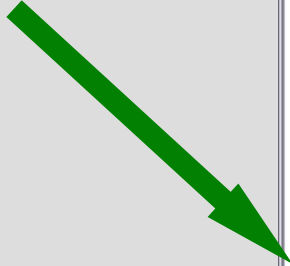
```
'10053 trace name context off';
```

- File in user_dump_dest
- Only on hard parse



Trace 10053 File – Initialisation Parameters

● Check for
Optimizer
Mode and
other session
variables



```
ora10g_ora_3556.trc - Notepad
File Edit Format View Help
*****
PARAMETERS USED BY THE OPTIMIZER
*****
*****
PARAMETERS WITH ALTERED VALUES
*****
db_file_multiblock_read_count      = 16
*****
PARAMETERS WITH DEFAULT VALUES
*****
optimizer_mode_hinted              = false
optimizer_features_hinted          = 0.0.0
parallel_execution_enabled         = true
parallel_query_forced_dop          = 0
parallel_dml_forced_dop            = 0
parallel_ddl_forced_degree         = 0
parallel_ddl_forced_instances      = 0
_query_rewrite_fudge               = 90
optimizer_features_enable          = 10.1.0
_optimizer_search_limit            = 5
cpu_count                          = 2
active_instance_count              = 1
parallel_threads_per_cpu           = 2
hash_area_size                    = 131072
bitmap_merge_area_size            = 1048576
sort_area_size                     = 65536
sort_area_retained_size            = 0
_sort_elimination_cost_ratio       = 0
_optimizer_block_size              = 8192
_sort_multiblock_read_count        = 2
_hash_multiblock_io_count          = 0
_optimizer_max_permutations        = 2000
pga_aggregate_target               = 24576 KB
_pga_max_size                      = 204800 KB
_sort_space_for_write_buffers      = 1
_query_rewrite_maxdisjunct         = 257
_smm_auto_min_io_size              = 56 KB
_smm_auto_max_io_size              = 248 KB
_smm_min_size                      = 128 KB
_smm_max_size                      = 1228 KB
_smm_px_max_size                   = 7371 KB
_cpu_to_io                         = 0
_optimizer_undo_cost_change        = 10.1.0
parallel_query_mode                = enabled
parallel_dml_mode                  = disabled
parallel_ddl_mode                  = enabled
optimizer_mode                     = all_rows
sqlstat_enabled                    = false
_optimizer_percent_parallel        = 101
_always_anti_join                  = choose
_always_semi_join                  = choose
_optimizer_mode_force              = true
_partition_view_enabled            = true
```



The Reason

- The third party product issued an **ALTER SESSION SET OPTIMIZER_MODE = ALL_ROWS** before submitting the **SELECT** statement
- The SQL session used to Explain was running with **FIRST_ROWS**

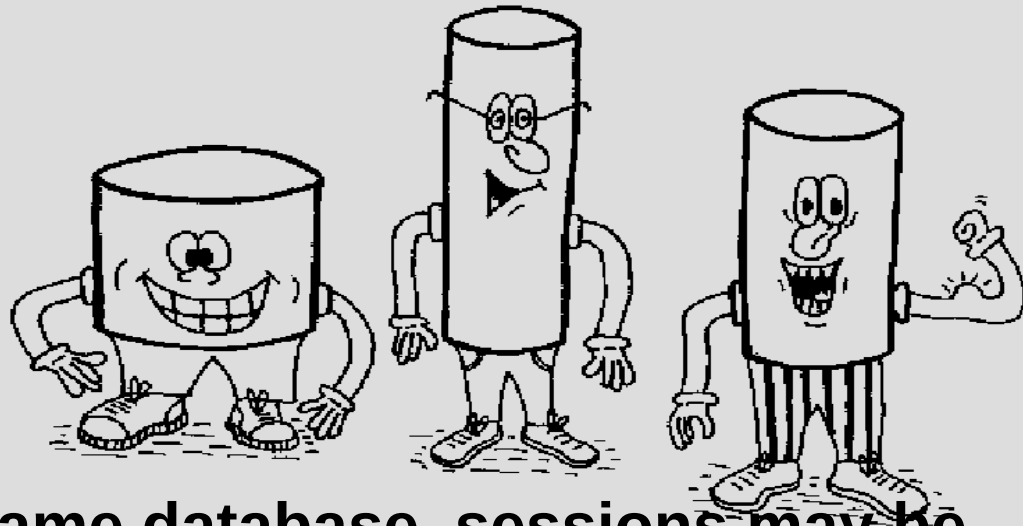


Resolution

- **Package -> cannot change the code**
- **Cannot use a SQL*Profile since statement generated slightly differently each time**
- **Cannot use a stored outline since statement generated slightly differently each time**
- **Use OPTIMIZER_INDEX_COST_ADJ to make an index more attractive**

Problems with Explain

- Most databases are different



- Even within the same database, sessions may be different
  - The CBO is aware of a variety of parameters which can be changed at system and session level including:
    - OPTIMIZER_MODE
    - SORT_AREA_SIZE
    - DB_FILE_MULTIBLOCK_READ_COUNT
    - OPTIMIZER_INDEX_COST_ADJ
    - OPTIMIZER_INDEX_CACHING
    - HASH_JOIN_ENABLE
- Don't rely on Explain



Finding The Actual Access Path

- **Trace 10046**
- **V\$tables**
- **Enterprise Manager**



Trace 10046 Levels

- **ALTER SESSION SET
TRACEFILE_IDENTIFIER = 'PENNY3'**
- **Trace levels**
  - 1**   Trace resources
  - 4**   Trace resources and bind variable values
  - 8**   Trace resources and wait events
  - 12**   Trace resources, bind variables and wait events
- **ALTER SYSTEM SET EVENTS '10046 trace
name context forever, level 12'**
- **ALTER SESSION SET EVENTS '10046 trace
name context forever, level 12'**



Trace 10046 Example

```
ALTER session SET EVENTS '10046 trace  
name context forever, level 12'
```

```
DECLARE  
v_event_no NUMBER :=2264;  
v_count    NUMBER;  
BEGIN  
SELECT      COUNT(e.comments)  
INTO        v_count  
FROM        events e, bookings b  
WHERE       e.event_no = b.event_no  
AND         e.org_id = v_event_no;  
END;
```



Trace 10046 Example

```
=====
PARSING IN CURSOR #16 len=100 dep=1 uid=67 oct=3 lid=67 tim=1820067602 hv=3289882752 ad='671e4a68'
SELECT COUNT(E.COMMENTS) FROM EVENTS E, BOOKINGS B WHERE E.EVENT_NO = B.EVENT_NO AND E.ORG_ID = :B1
END OF STMT
PARSE #16:c=0,e=327,p=0,cr=0,cu=0,mis=1,r=0,dep=1,og=1,tim=1820067596
=====
PARSING IN CURSOR #8 len=210 dep=2 uid=0 oct=3 lid=0 tim=1820074126 hv=864012087 ad='6a3b2014'
select /*+ rule */ bucket_cnt, row_cnt, cache_cnt, null_cnt, timestamp#, sample_size, minimum, maximum, distcnt, lowval, h
END OF STMT
PARSE #8:c=0,e=89,p=0,cr=0,cu=0,mis=0,r=0,dep=2,og=3,tim=1820074121
BINDS #8:
  bind 0: dty=2 mxl=22(22) mal=00 scl=00 pre=00 oacflg=08 oacfl2=0001 size=24 offset=0
    bfp=05bfcd48 bln=22 avl=04 flg=05
    value=53686
  bind 1: dty=2 mxl=22(22) mal=00 scl=00 pre=00 oacflg=08 oacfl2=0001 size=24 offset=0
    bfp=062c029c bln=24 avl=02 flg=05
    value=7
EXEC #8:c=0,e=8682,p=0,cr=0,cu=0,mis=0,r=0,dep=2,og=3,tim=1820089289
FETCH #8:c=0,e=78,p=0,cr=3,cu=0,mis=0,r=1,dep=2,og=3,tim=1820090928
BINDS #16:
  bind 0: dty=2 mxl=22(21) mal=00 scl=00 pre=00 oacflg=13 oacfl2=206001 size=24 offset=0
    bfp=05e4bc8c bln=22 avl=03 flg=09
    value=2264
EXEC #16:c=31250,e=25972,p=0,cr=3,cu=0,mis=1,r=0,dep=1,og=1,tim=1820099318
WAIT #16: nam='db file sequential read' ela= 105980 p1=6 p2=130 p3=1
FETCH #16:c=0,e=107747,p=1,cr=5,cu=0,mis=0,r=1,dep=1,og=1,tim=1820208431
EXEC #14:c=31250,e=143977,p=1,cr=8,cu=0,mis=0,r=1,dep=0,og=1,tim=1820209995
WAIT #14: nam='SQL*Net message to client' ela= 5 p1=1413697536 p2=1 p3=0
```



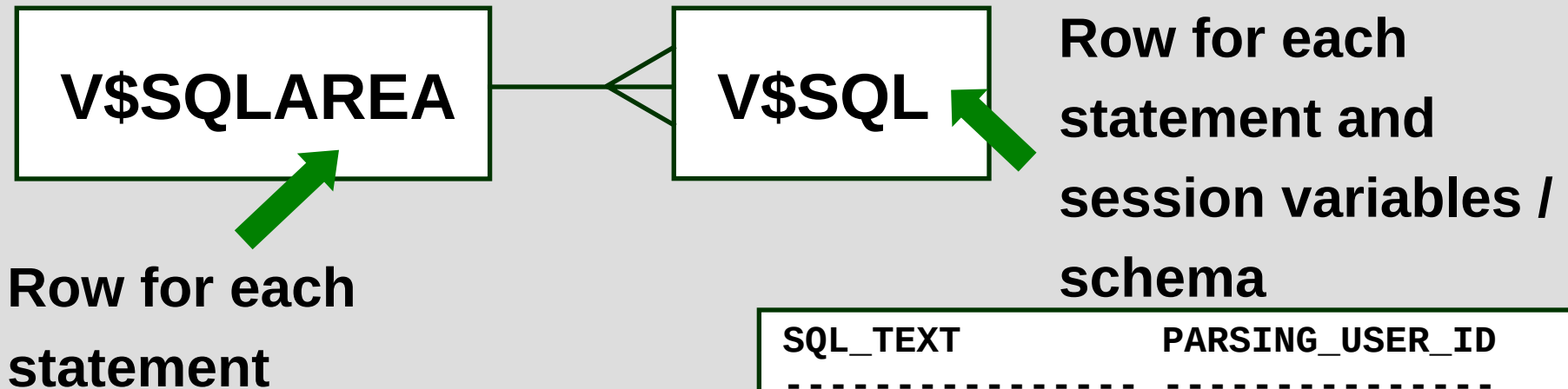

tkprof

tkprof ora10g_oracle_456.trc trace1.prf

SQL*Net message to client							
				1	0.00	0.00	
*****							
SELECT COUNT(E.COMMENTS)							
FROM							
EVENTS E, BOOKINGS B WHERE E.EVENT_NO = B.EVENT_NO AND E.ORG_ID = :B1							
call	count	cpu	elapsed	disk	query	current	rows
-----	-----	-----	-----	-----	-----	-----	-----
Parse	1	0.00	0.00	0	0	0	0
Execute	1	0.03	0.01	0	0	0	0
Fetch	1	0.00	0.10	1	5	0	1
-----	-----	-----	-----	-----	-----	-----	-----
total	3	0.03	0.12	1	5	0	1
Misses in library cache during parse: 1							
Misses in library cache during execute: 1							
Optimizer goal: ALL_ROWS							
Parsing user id: 67 (recursive depth: 1)							
Elapsed times include waiting on following events:							
Event waited on				Times	Max. Wait	Total Wait	
-----				Waited	-----	-----	
db file sequential read				1	0.10	0.10	
*****							



Shared Pool - Views



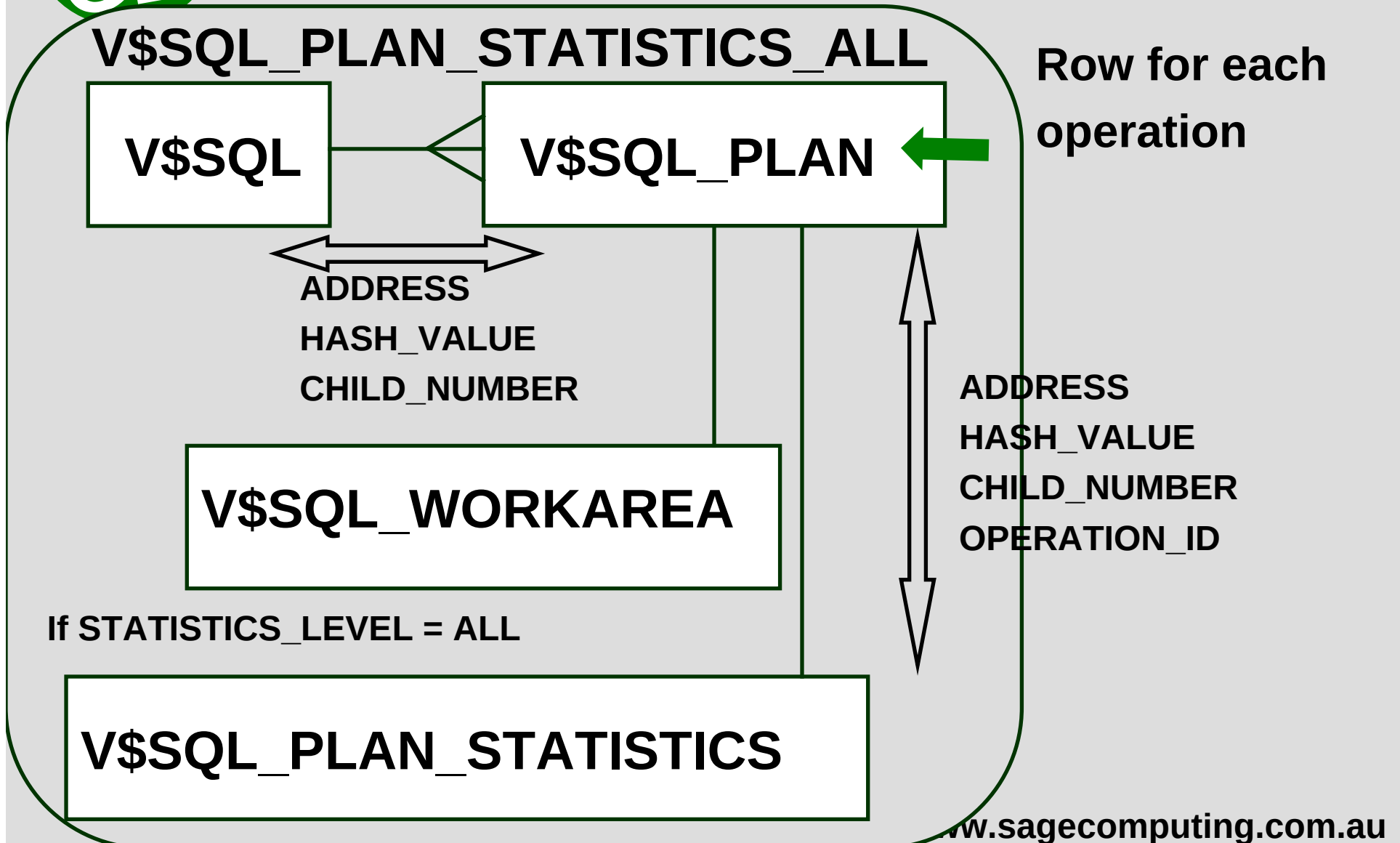
SQL_TEXT	

HASH_VALUE ADDRESS VERSION_COUNT	

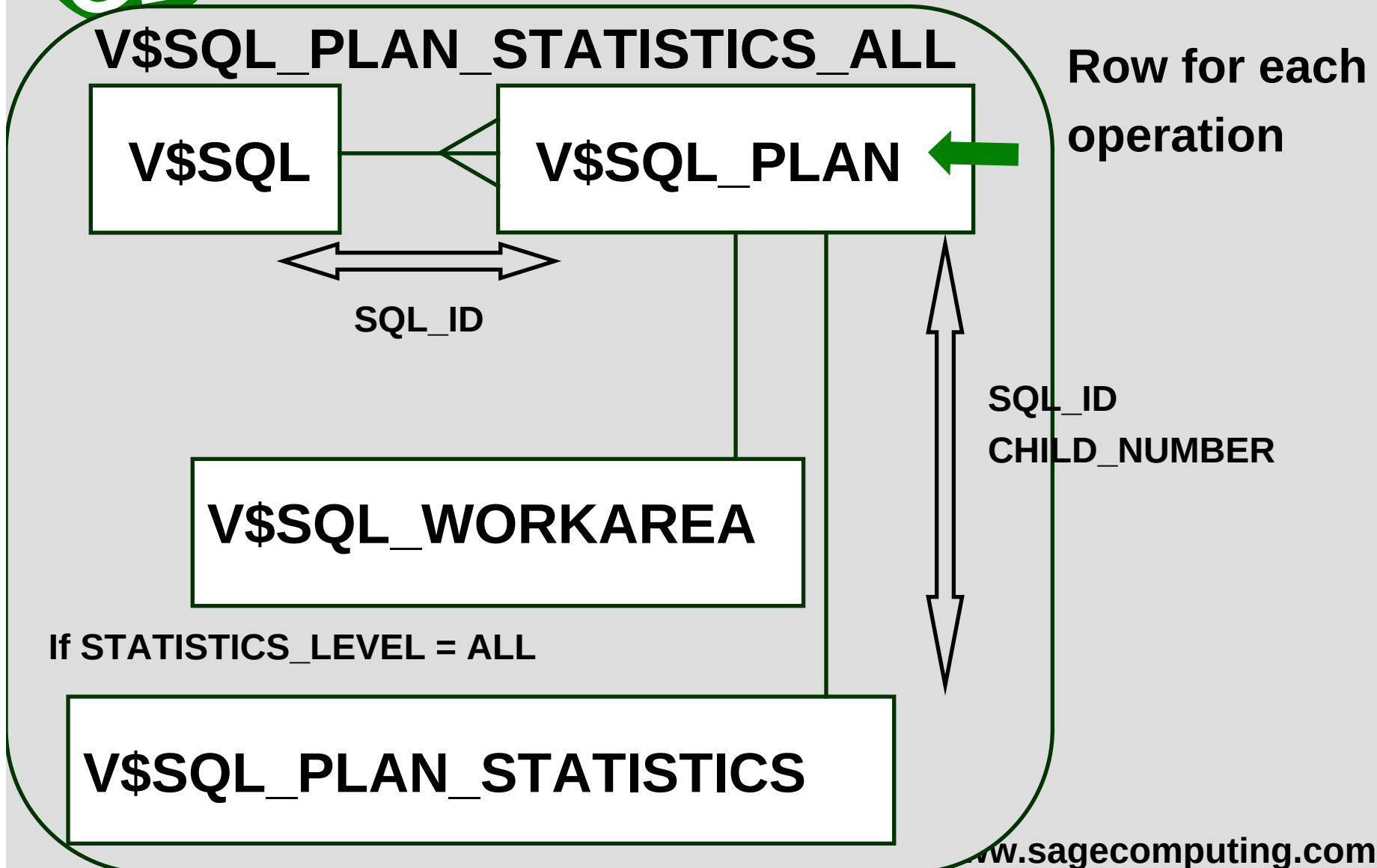
SELECT * FROM events	
WHERE org_id = 1000	
3111581409 7AF81434	2

SQL_TEXT	PARSING_USER_ID
-----	-----
HASH_VALUE ADDRESS CHILD_NUMBER	
-----	-----
SELECT * FROM events	61
WHERE org_id = 1000	
3111581409 7AF81434	0
SELECT * FROM events	5
WHERE org_id = 1000	
3111581409 7AF81434	1

Oracle 9i - Views



Oracle 10g - Views



Example- Identify High Resource Statements

- Select from V\$SQL for high buffer_gets

t12.sql - Notepad

```
File Edit Format View Help
SELECT u.username,
       s.buffer_gets,
       s.executions,
       s.buffer_gets / NULLIF(s.executions,0) reads,
       s.sql_id,
       s.sql_text
FROM   dba_users u, v$sqlarea s
WHERE  s.parsing_user_id
      = u.user_id
AND    s.buffer_gets / NULLIF(s.executions,0) > &reads
AND    UPPER(s.sql_text) LIKE '%BOOKINGS_LARGE%';
```

Oracle SQL*Plus

```
File Edit Search Options Help
1
-----
USERNAME                BUFFER_GETS  EXECUTIONS    READS  SQL_ID
-----
SQL_TEXT
-----
TRAIN2                  62776        1    62,776 ct6fc31yva3dn
SELECT * FROM bookings_large WHERE resource_code = 'UCR1'
```

Example – Get the Plan from V\$SQL_PLAN

```

plan_real.sql - Notepad
File Edit Format View Help
Rem      Filename:      plan_real.sql
Rem      Purpose:       Display results from the V$SQL_PLAN.
Rem                        Steps are displayed in an indented format according to
Rem                        their level in the execution tree.

set verify off
set linesize 180
set pagesize 60

col ID format a6 heading "Id"
col PT format 99 heading "Parent"
col OB format
col OP format
col OT format
col PS format
col CD format

spool plan_real.sql
SELECT

FROM
WHERE
/

set verify on
spool off
set linesize 80
  
```

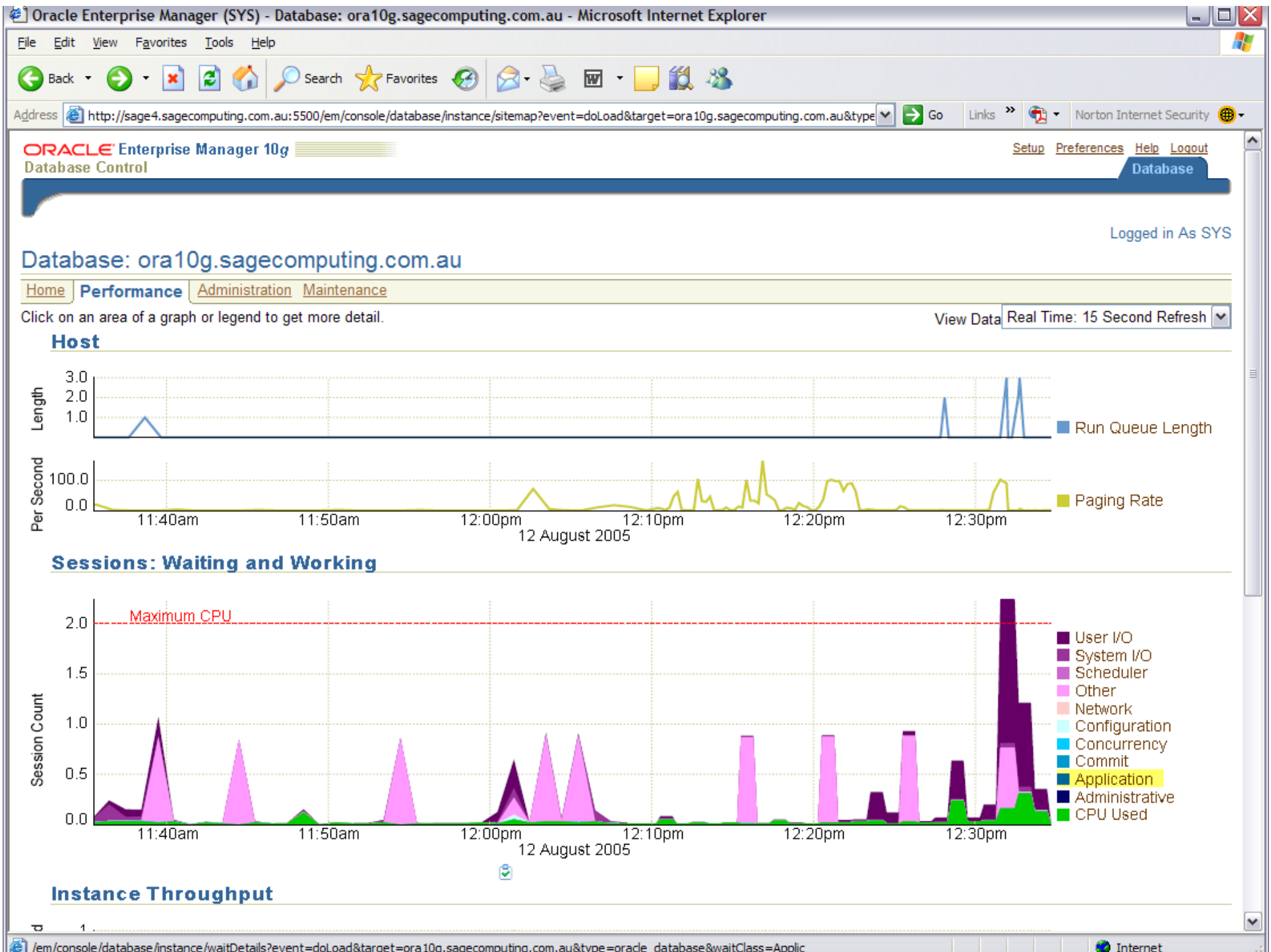
Oracle SQL*Plus

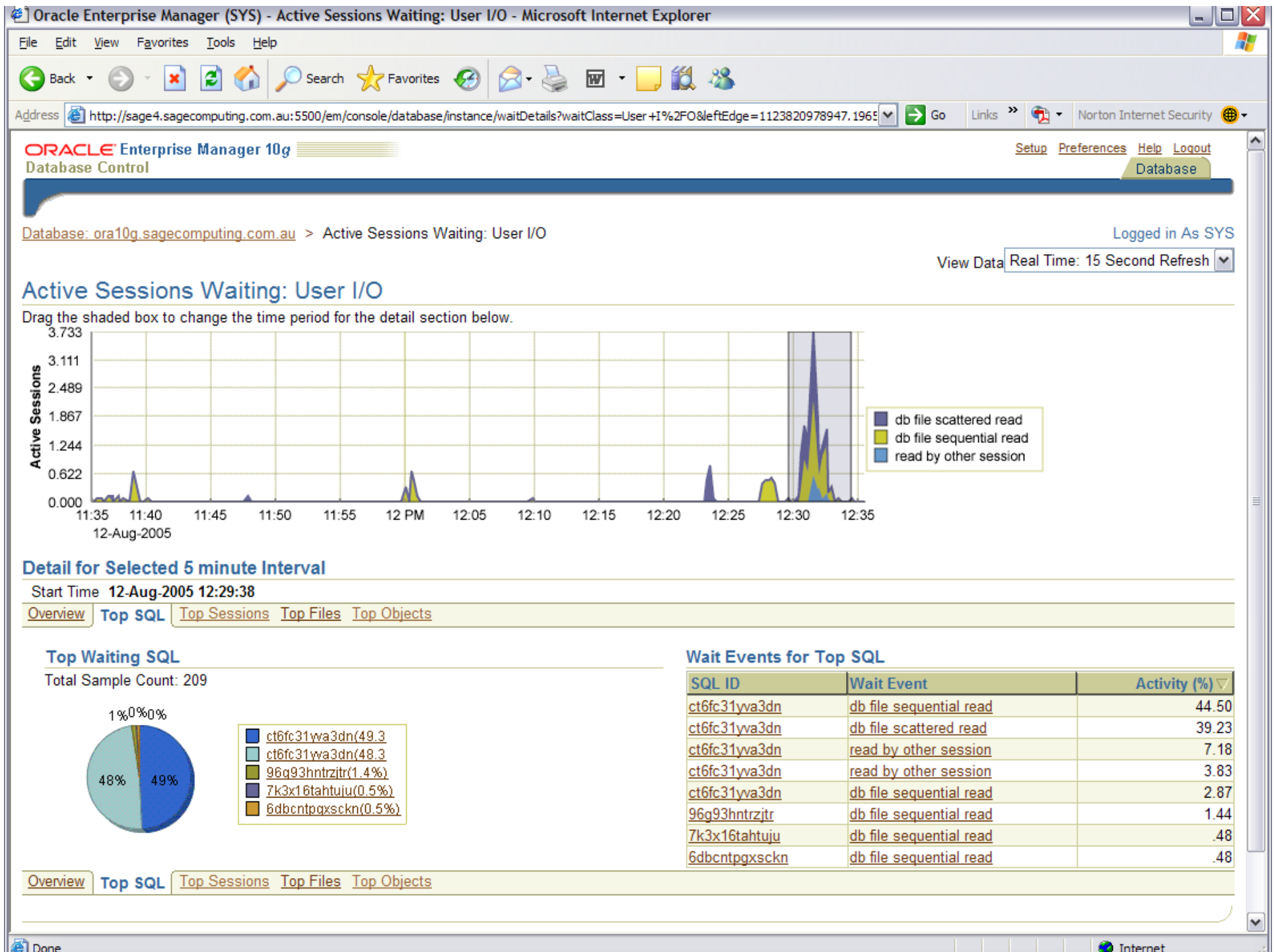
```

File Edit Search Options Help
TRAIN2>@plan_real
Enter value for sql_id: ct6fc31yva3dn

Id      Parent Object                Operation                Options                Pos      Rows
-----
1              Cost: 7440      SELECT STATEMENT
0 BOOKINGS_LARGE TABLE ACCESS            BY INDEX ROWID          1    160,032
2              1 BK_RES2      INDEX                    RANGE SCAN              1    160,032

TRAIN2>
  
```





Oracle Enterprise Manager (SYS) - SQL Details: ct6fc31yva3dn - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Reload Print Mail Web Stop New Tab

Address <http://sage4.sagecomputing.com.au:5500/em/console/database/instance/realTimeSqlObject?event=doLoad&target=ora10g.sagecomputing.com> Go Links Norton Internet Security

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database: ora10g.sagecomputing.com.au > Top SQL > SQL Details: ct6fc31yva3dn

Logged in As SYS

Run SQL Tuning Advisor

SQL Text

```
SELECT *  
FROM bookings_large  
WHERE resource_code = 'VCR1'
```

Execution Plan [Current Statistics](#) [Execution History](#) [Tuning History](#)

Collected From Target 12-Aug-2005 12:36:52

Data Source Cursor Cache Plan Hash Value 1776924575 Module SQL*Plus
Capture Time 12-Aug-2005 12:36:52 Optimizer Mode FIRST_ROWS Action Unavailable
Parsing Schema TRAIN2

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

Operation	Object	Object Type	Order	Rows	KB	Cost	Time (seconds)	CPU Cost	IO Cost	Object Node
SELECT STATEMENT			3			7440				
TABLE ACCESS BY INDEX ROWID	TRAIN2 BOOKINGS_LARGE	TABLE	2	160032	6,094.969	7439	138	134642784	7434	
INDEX RANGE SCAN	TRAIN2_BK_RES2	INDEX	1	160032		360	7	34596596	359	

Execution Plan [Current Statistics](#) [Execution History](#) [Tuning History](#)

Run SQL Tuning Advisor

Database | Setup | Preferences | Help | Logout

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[About Oracle Enterprise Manager 10g Database Control](#)

Internet



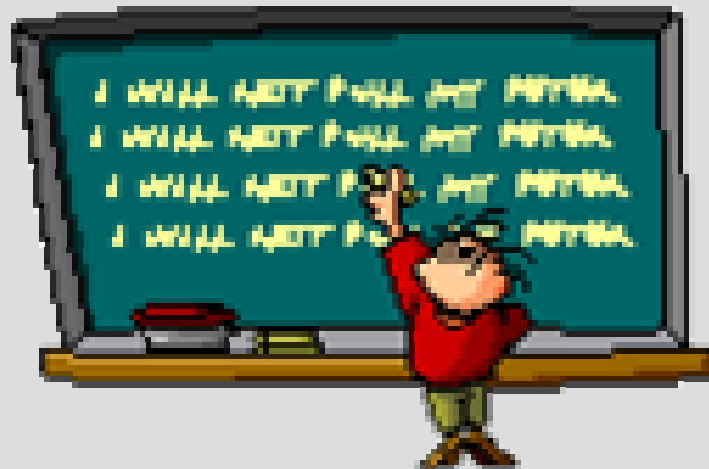
IT in Australia

**What do
Australian DBAs
have for
breakfast?**

**DBAs do not eat
breakfast. They
go to work early
to avoid developers**



Known Optimiser Problems





Problems Calculating Cardinality

- The CBO can work out cardinality for single table access when it has:
  - Data not skewed + col = literal or col = bind variable
  - Data not skewed + range check using literal
  - Data skewed + histogram + col = literal
- The CBO cannot work out cardinality for single table access when it has:
  - Data skewed + col = bind variable
  - Data not skewed + range check using bind variable
- The CBO's solution to this is to use bind peeking

Example Data

```
SELECT resource_code, COUNT(*)
FROM bookings_large
GROUP BY resource_code
```



RES0	COUNT (*)
----	-----
BRLG	297763
BRSM	148879
CONF	99255
FLPC	99252
LNCH	148881
PC1	9629
TAP1	49626
VCR1	489252
VCR2	99255

```
SELECT num_distinct, histogram
FROM user_tab_col_statistics
WHERE table_name = 'BOOKINGS_LARGE'
AND column_name = 'RESOURCE_CODE'
```



NUM_DISTINCT	HISTOGRAM

9	NONE



Cardinality

- **Column = bind variable (No histogram)**
Number of rows expected (cardinality) =
(Cardinality of table – Number of null rows) *
Density of column

Example:

SELECT * FROM bookings_large
WHERE resource_code = :b1

$$174727.67 = 1572549 / 9$$

```
*****
SINGLE TABLE ACCESS PATH
  COLUMN: RESOURCE_C(VARCHAR2) Col#: 3      Table: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
    Size: 5 NDV: 9 Nulls: 0 Density: 1.1111e-001
    No Histogram: #BKT: 1
      (1 uncompressed buckets and 2 endpoint values)
  TABLE: BOOKINGS_LARGE Alias: BOOKINGS_LARGE
    Original Card: 1572549 Rounded Card: 174728 Computed Card: 174727.67
  Access Path: table-scan Resc: 1961 Resp: 1961
  Access Path: index (equal)
    Index: BK_RES2
    rsc_cpu: 142551196 rsc_io: 7525
    ix_sel: 0.0000e+000 ix_sel_with_filters: 1.1111e-001
  BEST_CST: 1961.44 PATH: 2 Degree: 1
*****
```



Bind Peeking

- Version 9i/10g use “Bind Variable Peeking”
- Plan is based on the value of the first bind value used when statement is hard parsed
- To disable set `_optim_peek_user_binds` to FALSE



Bind Peeking

```
ORA92>SELECT resource_code, count(*)  
        FROM bookings_large  
        GROUP BY resource_code;
```

RES0	COUNT (*)
-----	-----
BRLG	311399
BRSM	155698
CONF	103800
FLPC	103798
LNCH	155699
PC1	51900
TAP1	51899
VCR1	403802
VCR2	103800



Minority value



Majority value



Bind Peeking – Non Selective Criteria First

```
ALTER SESSION set events '10046 trace name context forever'  
variable v1 VARCHAR2(4)
```

```
begin :v3 := 'VCR1'; end;
```

```
SELECT SUM(quantity)  
FROM   bookings_large  
WHERE  resource_code = :v3;
```

```
begin :v3 := 'PC1'; end;
```

```
SELECT SUM(quantity)  
FROM   bookings_large  
WHERE  resource_code = :v3;
```

```
tkprof ora10g_ora_1856.trc trace21.lst SYS=no aggregate=no
```



Bind Peeking – Non Selective Criteria First

```
ora10g_ora_1856.trc - WordPad
File Edit View Insert Format Help
[Icons]

*****
SINGLE TABLE ACCESS PATH
  COLUMN: RESOURCE_C(VARCHAR2) Col#: 3      Table: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
    Size: 5 NDV: 9 Nulls: 0 Density: 3.3841e-007
    Frequency Histogram: #BKT: 9
      (5343 uncompressed buckets and 9 endpoint values)
  TABLE: BOOKINGS_LARGE Alias: BOOKINGS_LARGE
    Original Card: 1444856 Rounded Card: 439974 Computed Card: 439973.93
  Access Path: table-scan Resc: 2497 Resp: 2497
  Access Path: index (equal)
    Index: BK_RES2
    rsc_cpu: 331387879 rsc_io: 18791
    ix_sel: 0.0000e+000 ix_sel_with_filters: 3.0451e-001
  BEST_CST: 2496.62 PATH: 2 Degree: 1
*****
[Scroll Bar]
For Help, press F1
```

Bind Peeking – Non Selective Criteria First

```

*****
begin
:v3 := 'VCRI';
end;

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      1          0.01        0.01          0          0          0          0
Execute    1          0.00        0.00          0          0          0          1
Fetch      0          0.00        0.00          0          0          0          0
-----
total      2          0.01        0.01          0          0          0          1

Misses in library cache during parse: 1
Misses in library cache during execute: 1
Optimizer mode: ALL_ROWS
Parsing user id: 86
*****

SELECT SUM(quantity)
FROM   bookings_large
WHERE  resource_code = :v3

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      1          0.01        0.01          0          0          0          0
Execute    1          0.64        0.77          0          0          0          0
Fetch      2          0.57        5.81       6087       8676          0          1
-----
total      4          1.23        6.61       6087       8676          0          1

Misses in library cache during parse: 1
Misses in library cache during execute: 1
Optimizer mode: ALL_ROWS
Parsing user id: 86

Rows      Row Source Operation
-----
1         SORT AGGREGATE (cr=8676 pr=6087 pw=0 time=5819988 us)
443801    TABLE ACCESS FULL BOOKINGS_LARGE (cr=8676 pr=6087 pw=0 time=16894216 us)
*****

```

Bind Peeking –Selective Criteria Second

```

*****
begin
:v3 := 'PC1';
end;

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      1      0.01      0.00      0      0      0      0
Execute    1      0.00      0.00      0      0      0      1
Fetch      0      0.00      0.00      0      0      0      0
-----
total      2      0.01      0.01      0      0      0      1

Misses in library cache during parse: 1
Misses in library cache during execute: 1
Optimizer mode: ALL_ROWS
Parsing user id: 86
*****

SELECT SUM(quantity)
FROM   bookings_large
WHERE  resource_code = :v3

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      1      0.01      0.00      0      0      0      0
Execute    1      0.00      0.00      0      0      0      0
Fetch      2      0.26      5.86      6088      8676      0      1
-----
total      4      0.28      5.87      6088      8676      0      1

Misses in library cache during parse: 0
Optimizer mode: ALL_ROWS
Parsing user id: 86

Rows      Row Source Operation
-----
1          SORT AGGREGATE (cr=8676 pr=6088 pw=0 time=5860612 us)
11901      TABLE ACCESS FULL BOOKINGS_LARGE (cr=8676 pr=6088 pw=0 time=5844375 us)
*****

```



Bind Peeking – Selective Criteria First

```
ALTER SESSION set events '10046 trace name context forever'  
variable v1 VARCHAR2(4)
```

```
begin :v1 := 'PC1'; end;
```

```
SELECT SUM(quantity)  
FROM   bookings_large  
WHERE  resource_code = :v1;
```

```
begin :v1 := 'VCR1'; end;
```

```
SELECT SUM(quantity)  
FROM   bookings_large  
WHERE  resource_code = :v1;
```

```
tkprof ora10g_ora_1856.trc trace21.lst SYS=no aggregate=no
```




Bind Peeking –Selective Criteria First

```
ora10g_ora_1856.trc - WordPad
File Edit View Insert Format Help
[Icons]
*****
SINGLE TABLE ACCESS PATH
COLUMN: RESOURCE_C(VARCHAR2) Col#: 3      Table: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
Size: 5 NDV: 9 Nulls: 0 Density: 3.3841e-007
Frequency Histogram: #BKT: 9
(5343 uncompressed buckets and 9 endpoint values)
TABLE: BOOKINGS_LARGE Alias: BOOKINGS_LARGE
Original Card: 1444856 Rounded Card: 9735 Computed Card: 9735.13
Access Path: table-scan Resc: 2496 Resp: 2496
Access Path: index (equal)
Index: BK_RES2
rsc_cpu: 7355633 rsc_io: 419
ix_sel: 0.0000e+000 ix_sel_with_filters: 6.7378e-003
BEST_CST: 419.32 PATH: 4 Degree: 1
*****
[Scroll Bar]
For Help, press F1
```

Bind Peeking –Selective Criteria First

```

*****
begin
:v1 := 'PC1';
end;

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      1          0.00         0.00          0          0           0           0
Execute    1          0.00         0.00          0          0           0           1
Fetch      0          0.00         0.00          0          0           0           0
-----
total      2          0.00         0.00          0          0           0           1

Misses in library cache during parse: 1
Misses in library cache during execute: 1
Optimizer mode: ALL_ROWS
Parsing user id: 86
*****

SELECT SUM(quantity)
FROM bookings_large
WHERE resource_code = :v1

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      1          0.00         0.00          0          0           0           0
Execute    1          0.00         0.00          0          0           0           0
Fetch      2          0.07         1.08        1711        1711          0           1
-----
total      4          0.07         1.08        1711        1711          0           1

Misses in library cache during parse: 1
Misses in library cache during execute: 1
Optimizer mode: ALL_ROWS
Parsing user id: 86

Rows      Row Source Operation
-----
1          SORT AGGREGATE (cr=1711 pr=1711 pw=0 time=1081364 us)
11901      TABLE ACCESS BY INDEX ROWID BOOKINGS_LARGE (cr=1711 pr=1711 pw=0 time=1079826 us)
11901      INDEX RANGE SCAN BK_RES2 (cr=112 pr=112 pw=0 time=136170 us)(object id 57054)
*****

```

Bind Peeking –Non Selective Criteria Second

trace18.lst - Notepad

File Edit Format View Help

```

begin
:v1 := 'VCR1';
end;

```

call	count	cpu	elapsed	disk	query	current	rows
Parse	1	0.00	0.00	0	0	0	0
Execute	1	0.00	0.00	0	0	0	1
Fetch	0	0.00	0.00	0	0	0	0
total	2	0.00	0.00	0	0	0	1

Misses in library cache during parse: 1
 Misses in library cache during execute: 1
 Optimizer mode: ALL_ROWS
 Parsing user id: 86

```

SELECT SUM(quantity)
FROM bookings_large
WHERE resource_code = :v1

```

call	count	cpu	elapsed	disk	query	current	rows
Parse	1	0.00	0.00	0	0	0	0
Execute	1	0.00	0.00	0	0	0	0
Fetch	2	1.48	87.81	9744	9746	0	1
total	4	1.48	87.81	9744	9746	0	1

Misses in library cache during parse: 0
 Optimizer mode: ALL_ROWS
 Parsing user id: 86

Rows	Row Source Operation
1	SORT AGGREGATE (cr=9746 pr=9744 pw=0 time=87817191 us)
443801	TABLE ACCESS BY INDEX ROWID BOOKINGS_LARGE (cr=9746 pr=9744 pw=0 time=76852391 us)
443801	INDEX RANGE SCAN BK_RES2 (cr=1081 pr=1079 pw=0 time=25357582 us)(object id 57054)

*****



Handling Bind Peeking

- **Bind peeking is OK if:**
  - Query always uses selective criteria
  - Query always uses non selective criteria
- **Bind peeking is a problem if:**
  - Selectivity of criteria varies
- **Write separate queries**
- **Turn bind peeking off**
- **Its better to do a full scan than use a bad index**



Unusual Data Patterns

- **CBO makes assumptions about data distribution**
- **Uses number of distinct values**
- **Assumes even distribution**
- **Uses low and high values for ranges**



Estimate of Cardinality

● Column > Value (No histogram)

Number of rows expected (cardinality) =
(Cardinality of table – Number of null rows)
* (Max – Value) / Max – Min)

Example:

SELECT * FROM bookings_large WHERE booking_no > 11000

$$263.88 = (11264 - 6) * \\ (11264 - 11000) / (11264 - 1)$$

```
COLUMN: BOOKING_NO(NUMBER)  Col#: 1      Table: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
Size: 5  NDV: 11258  Nulls: 6  Density: 8.8826e-005  Min: 1  Max: 11264
No Histogram: #BKT: 1
(1 uncompressed buckets and 2 endpoint values)
TABLE: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
Original Card: 11264  Rounded Card: 264  Computed Card: 263.88|
```



Case 2 – Poor Index Use

- Table has 1.4 million rows

```
SELECT COUNT(booking_no)
FROM   bookings_large;
```

```
COUNT(BOOKING_NO)
-----
1441793
```

- There are no majority values

```
SELECT MAX(COUNT(EVENT_NO))
FROM BOOKINGS_LARGE
GROUP BY EVENT_NO;
```

```
MAX(COUNT(EVENT_NO))
-----
11795
```



Case 2 – Poor Index Use

OPTIMIZER_MODE=FIRST_ROWS_10

```
trace16.lst - Notepad
File Edit Format View Help
*****
SELECT *
FROM bookings_large
WHERE event_no < 200000

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      2          0.45       0.54         0          0          0            0
Execute    2          0.00       0.00         0          0          0            0
Fetch    190670      18.32      75.68      16796     3056650      0     2860000
-----
total    190674      18.78      76.23      16796     3056650      0     2860000

Misses in library cache during parse: 1
Optimizer mode: FIRST_ROWS
Parsing user id: 86 (TRAIN2)

Rows      Row Source Operation
-----
1430000    TABLE ACCESS BY INDEX ROWID BOOKINGS_LARGE (cr=1528325 pr=8529 pw=0 time=55770689 us)
1430000    INDEX RANGE SCAN BK_EVT2 (cr=98325 pr=838 pw=0 time=10019949 us)(object id 57055)

Elapsed times include waiting on following events:
Event waited on                      Times    Max. Wait    Total waited
-----
SQL*Net message to client             190670      0.00          0.20
SQL*Net message from client           190670      0.01         49.62
db file sequential read                16796      0.16         58.36
*****
```



Case 2 – Poor Index Use

Full scan is more efficient

```
trace19a.lst - Notepad
File Edit Format View Help
*****
SELECT --+ FULL(b)
*
FROM bookings_large b
WHERE event_no < 200000

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      2          0.45       0.44         0          0           0           0
Execute    2          0.00       0.00         0          0           0           0
Fetch    190670      8.89      19.93      12374      206878       0      2860000
-----
total    190674      9.34      20.38      12374      206878       0      2860000

Misses in library cache during parse: 1
Optimizer mode: FIRST_ROWS
Parsing user id: 86 (TRAIN2)

Rows      Row Source Operation
-----
1430000  TABLE ACCESS FULL BOOKINGS_LARGE (cr=103439 pr=6398 pw=0 time=7240621 us)

Elapsed times include waiting on following events:
Event waited on                      Times    Max. Wait    Total waited
-----
SQL*Net message to client             190670      0.00         0.20
db file sequential read                 619        0.10         1.80
SQL*Net message from client           190670      0.02        48.43
db file scattered read                 2316        0.12         9.75
*****
```



Find Out Why it Did It

- CBO thinks it will return 14 rows

```
trace19b.lst - Notepad
File Edit Format View Help
_OPTIMIZER_PERCENT_PARALLEL = 0
*****
SINGLE TABLE ACCESS PATH
COLUMN:  EVENT_NO(NUMBER)  Col#: 2      Table: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
Size: 5  NDV: 99684  Nulls: 0  Density: 1.0032e-005  Min: 211  Max: 10000000000000000
No Histogram: #BKT: 1
(1 uncompressed buckets and 2 endpoint values)
TABLE: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
Original Card: 1439350  Rounded Card: 14  Computed Card: 14.44
Access Path: table-scan  Resc: 2494  Resp: 2494
Access Path: index (scan)
Index: BK_EVT2
rsc_cpu: 135836  rsc_io: 18
ix_sel: 1.0032e-005  ix_sel_with_filters: 1.0032e-005
```

Check the Data Patterns

```
SELECT MIN(event_no), max(event_no), COUNT(distinct
event_no)
FROM bookings_large;
```



MIN(EVENT_NO)	MAX(EVENT_NO)	COUNT(DISTINCTEVENT_NO)
-----	-----	-----
200	1.0000E+15	100002

```
SELECT WIDTH_BUCKET(event_no,1,10000000000000002,99) bucket,
count(*)
FROM bookings_large
GROUP BY WIDTH_BUCKET(event_no,1,10000000000000002,99)
```



BUCKET	COUNT (*)
-----	-----
1	1430000
100	11795

Oracle Enterprise Manager (SYS) - SQL Details: 625sfggxt7z1r - Microsoft Internet Explorer

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Database Control Database

Database: ora10g.sagecomputing.com.au > Top SQL > SQL Details: 625sfggxt7z1r Logged in As SYS

SQL Details: 625sfggxt7z1r Run SQL Tuning Advisor

SQL Text

```
SELECT *  
FROM bookings_large b  
WHERE event_no < 200000
```

Execution Plan Current Statistics Execution History Tuning History

Collected From Target 12-Aug-2005 16:42:04

Data Source Cursor Cache Plan Hash Value 2050645063 Module SQL*Plus
Capture Time 12-Aug-2005 16:42:04 Optimizer Mode FIRST_ROWS Action Unavailable
Parsing Schema TRAIN2

Expand All Collapse All

Operation	Object	Object Type	Order	Rows	KB	Cost	Time (seconds)	CPU Cost	IO Cost	Object Node
SELECT STATEMENT			3			14				
TABLE ACCESS BY INDEX ROWID	TRAIN2.BOOKINGS_LARGE	TABLE	2	10	0.381	14	1	105310	14	
INDEX RANGE SCAN	TRAIN2.BK_EVT2	INDEX	1	14		3	1	23564	3	

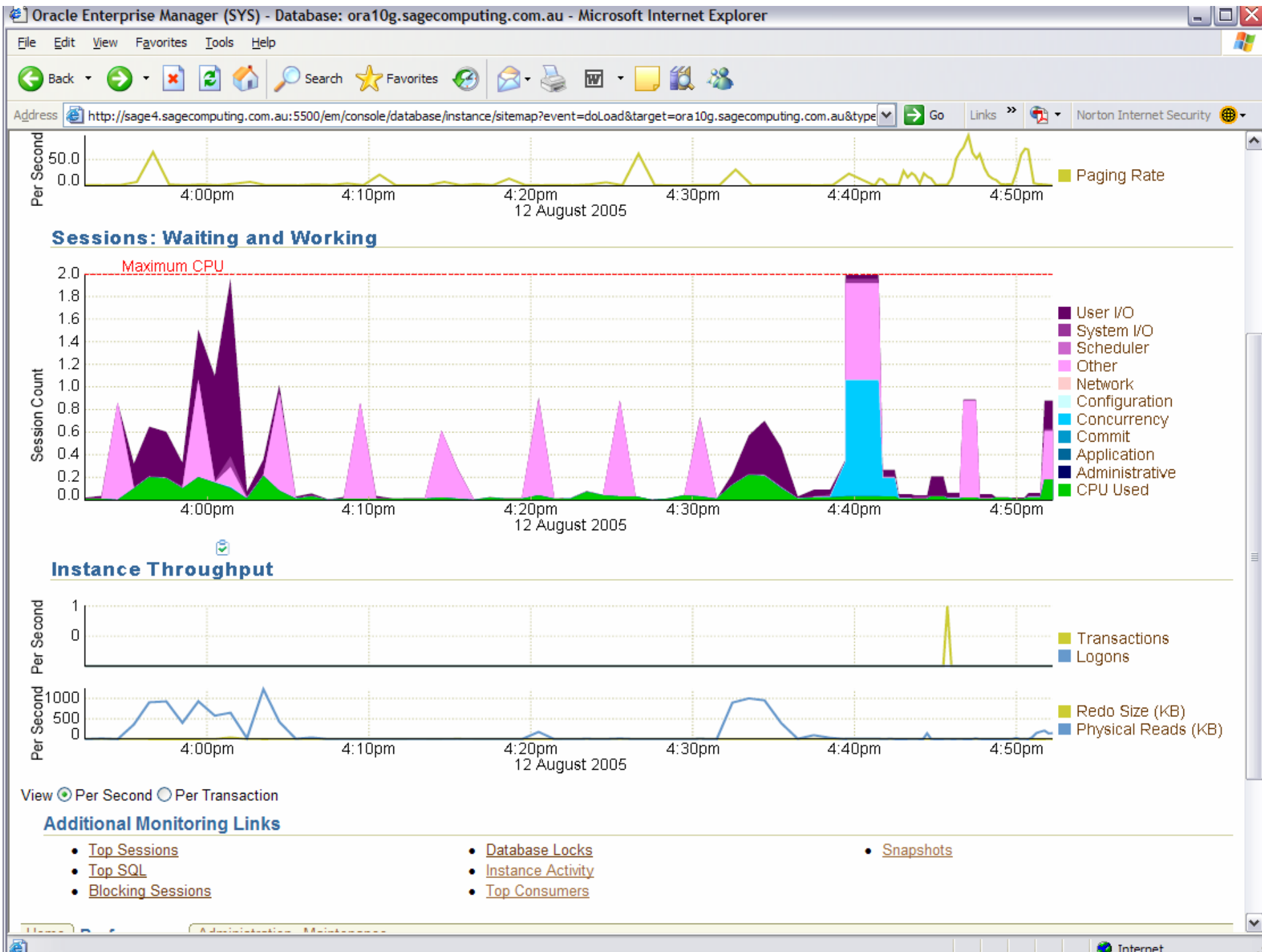
Execution Plan Current Statistics Execution History Tuning History

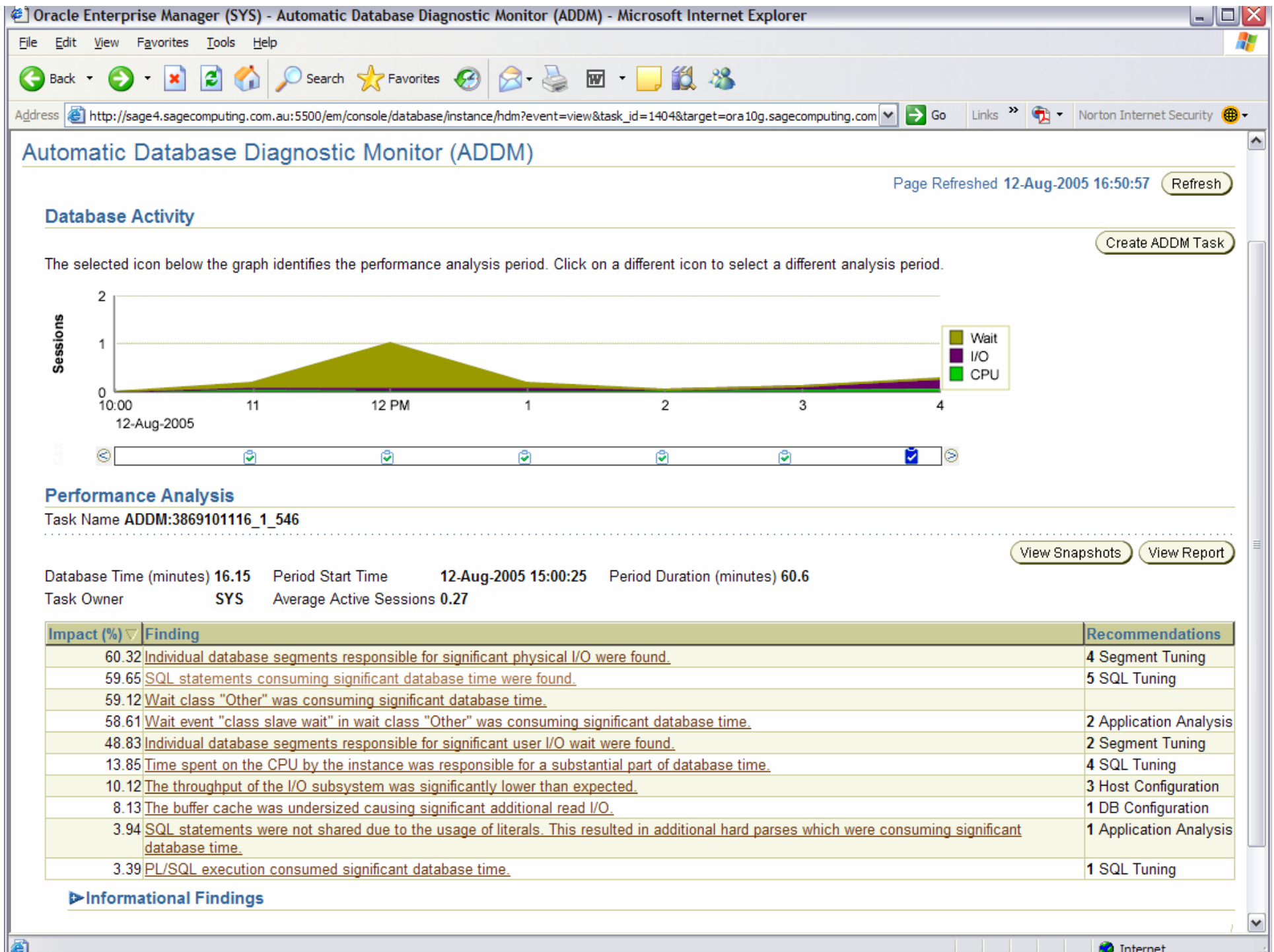
Run SQL Tuning Advisor

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Database: [ora10g.sagecomputing.com.au](#) > [Advisor Central](#) > [Automatic Database Diagnostic Monitor \(ADDM\)](#) > Performance Finding Details Logged in As SYS

Performance Finding Details

Database Time (minutes) 16.15 Period Start Time 12-Aug-2005 15:00:25 Period Duration (minutes) 60.6
Task Owner SYS Task Name ADDM:3869101116_1_546 Average Active Sessions 0.27

Finding SQL statements consuming significant database time were found.
Impact (minutes) 9.63
Impact (%) 59.65

Recommendations

Select Item(s) and... Run SQL Tuning Advisor

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

Select	Details	Category	Benefit (%)
☒	Hide	SQL Tuning	20.46

SQL Text [SELECT * FROM bookings_large WHERE event_no < 200000](#)
Action Run SQL Tuning Advisor on the SQL statement with SQL_ID "0qwbn7av1zwqk". Run Advisor Now

☒	Show	SQL Tuning	13.29
☒	Show	SQL Tuning	12.06
☒	Show	SQL Tuning	8.19
☒	Show	SQL Tuning	5.65

Findings Path

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

Findings	Impact (%)	Additional Information
SQL statements consuming significant database time were found.	59.65	

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Back

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http://sage4.sagecomputing.com.au:5500/em/console/database/instance/sqltune?event=viewstmt&task_id=1407&objectId=1&target=ora10g.

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Database

Database: ora10g.sagecomputing.com.au > Advisor Central > SQL Tuning Results:TASK_1407 > Recommendations for SQL ID:0qwbn7av1zwqk

Logged in As SYS

Recommendations for SQL ID:0qwbn7av1zwqk

Return

i

Update Message

There is no recommendation.

SQL Text

SELECT * FROM bookings_large WHERE event_no < 200000

Select Recommendation

Original Explain Plan

Select	Type	Findings	Recommendations	Rationale	Benefit (%)	New Explain Plan

Return

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Create a Histogram

```
BEGIN
dbms_stats.gather_table_stats (ownname=>'TRAIN2',
                               tabname=>'BOOKINGS_LARGE',
                               cascade=>TRUE,
                               method_opt=>'FOR COLUMNS event_no SIZE 100');
END;
```

A screenshot of a Notepad window titled 'ora10g_ora_1780.trc - Notepad'. The window displays the output of an Oracle SQL trace, showing statistics for the 'BOOKINGS_LARGE' table. The output includes details about the column 'EVENT_NO', the table's size, density, and the execution of a histogram. It also shows the access path used (table-scan) and various performance metrics like rsc_cpu, rsc_io, ix_sel, and ix_sel_with_filters.

```
*****
SINGLE TABLE ACCESS PATH
  COLUMN:  EVENT_NO(NUMBER)  Col#: 2      Table: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
    Size: 5  NDV: 98300  Nulls: 0  Density: 9.7962e-005
    Height Balanced Histogram: #BKT: 100
    (100 uncompressed buckets and 101 endpoint values)
  TABLE: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
    Original Card: 1446297  Rounded Card: 1431834  Computed Card: 1431834.03
  Access Path: table-scan  Resc: 2503  Resp: 2503
  Access Path: index (scan)
    Index: BK_EVT2
    rsc_cpu: 10833108104  rsc_io: 1418975
    ix_sel: 9.9000e-001  ix_sel_with_filters: 9.9000e-001
  BEST_CST: 2502.85  PATH: 2  Degree: 1
*****
```




What if we are using Bind Variables?

● SET statistics manually

```
setstats.sql - Notepad
File Edit Format View Help
CREATE OR REPLACE PROCEDURE set_booking_stats IS
CURSOR c_book IS
SELECT max(event_no), min(event_no)
FROM bookings_large
WHERE event_no < 1000000000;

v_max NUMBER;
v_min NUMBER;

r_statsrec      dbms_stats.statrec;
a_stats         dbms_stats.numarray;

BEGIN
OPEN c_book;
FETCH c_book INTO v_max,v_min;
CLOSE c_book;

r_statsrec.epc := 2;
r_statsrec.bkvals := null;

a_stats := dbms_stats.numarray(v_min,v_max);

dbms_stats.prepare_column_values(r_statsrec,a_stats);

dbms_stats.set_column_stats (ownname=>'TRAIN2',tablename=>'BOOKINGS_LARGE',
                             colname=>'EVENT_NO', srec=>r_statsrec);

END;
/
```



Trace Using Manually Set Statistics

```
penny22.lst - Notepad
File Edit Format View Help
*****
SELECT *
FROM bookings_large
WHERE event_no < 200000

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      2          0.00       0.00         0          0          0            0
Execute    2          0.00       0.00         0          0          0            0
Fetch    190670      9.98       74.51       16189      206878      0          2860000
-----
total    190674      9.98       74.51       16189      206878      0          2860000

Misses in library cache during parse: 0
Optimizer mode: FIRST_ROWS
Parsing user id: 86

ROWS      Row Source Operation
-----
1430000   TABLE ACCESS FULL BOOKINGS_LARGE (cr=103439 pr=8095 pw=0 time=35787909 us)

Elapsed times include waiting on following events:
Event waited on                      Times    Max. wait    Total waited
-----
SQL*Net message to client             190670      0.00          0.20
db file scattered read                 1609        0.50         64.36
SQL*Net message from client           190670      0.46        153.60
db file sequential read                18          0.21          0.45
*****
```


IT in Australia

How advanced is Australian society?

We even have air travel now





Using Oracle 10g Tuning Features

● Case 3 – The Problem

- Query is only returning a few rows
- CBO uses hash joins



Case 3 – The Query

```
SELECT count(b.comments)
FROM organisations o, events_large e,
      TRAIN2.bookings_large b, resources r
WHERE o.org_id = e.org_id
AND   e.event_no = b.event_no
AND   b.resource_code = r.code
AND   o.name = 'Australian Medical Systems'
AND   r.description = 'Buffet Lunch'
AND   e.comments = 'TEST';
```

BOOKINGS_LARGE Indexes

INDEX_NAME	COLUMN_NAME
BL_EVT2	EVENT_NO
BK_RES2	RESOURCE_CODE
BOOKLG_PK	BOOKING_NO



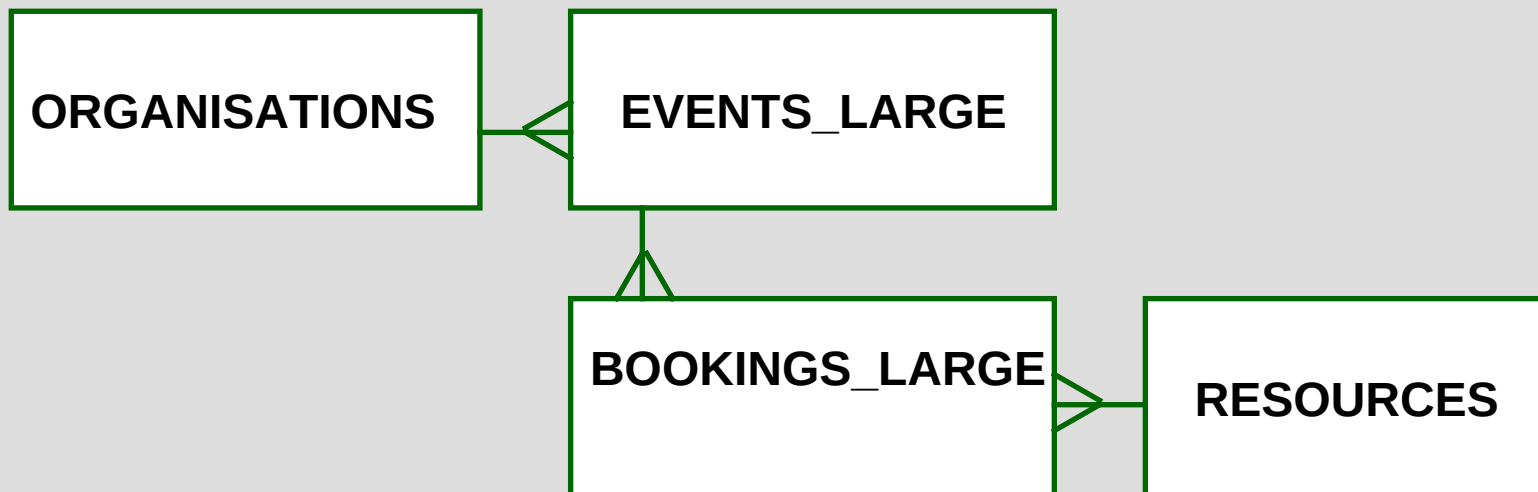
Case 3 – Trace

call	count	cpu	elapsed	disk	query	current	rows
Parse	1	0.00	0.00	0	0	0	0
Execute	1	0.00	0.00	0	0	0	0
Fetch	2	5.14	15.91	35907	36176	0	1
total	4	5.14	15.91	35907	36176	0	1

Misses in library cache during parse: 0
 Optimizer mode: ALL_ROWS
 Parsing user id: 67

Rows	Row Source Operation
1	SORT AGGREGATE (cr=36176 pr=35907 pw=0 time=15914592 us)
33	HASH JOIN (cr=36176 pr=35907 pw=0 time=10143161 us)
1	TABLE ACCESS FULL RESOURCES (cr=7 pr=0 pw=0 time=108 us)
232	HASH JOIN (cr=36169 pr=35907 pw=0 time=26171912 us)
4	HASH JOIN (cr=948 pr=700 pw=0 time=25782 us)
1	TABLE ACCESS FULL ORGANISATIONS (cr=7 pr=0 pw=0 time=119 us)
73745	TABLE ACCESS FULL EVENTS_LARGE (cr=941 pr=700 pw=0 time=172872 us)
5767168	TABLE ACCESS FULL BOOKINGS_LARGE (cr=35221 pr=35207 pw=0 time=34622905 us)

Case 3 – The Model



Case 3 – Check Join and Access Paths

o.name = 'Australian Medical Systems'



ORGANISATIONS



EVENTS_LARGE

AND e.comments = 'TEST'



BOOKINGS_LARGE



RESOURCES



r.description = 'Buffet Lunch'

Case 3 – Check Join and Access Paths

o.name = 'Australian Medical Systems'



ORGANISATIONS

EVENTS_LARGE



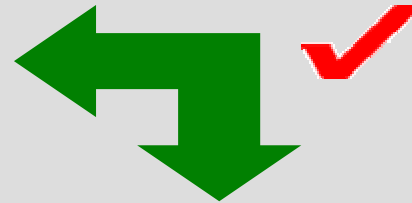
BOOKINGS_LARGE



RESOURCES



AND e.comments = 'TEST'

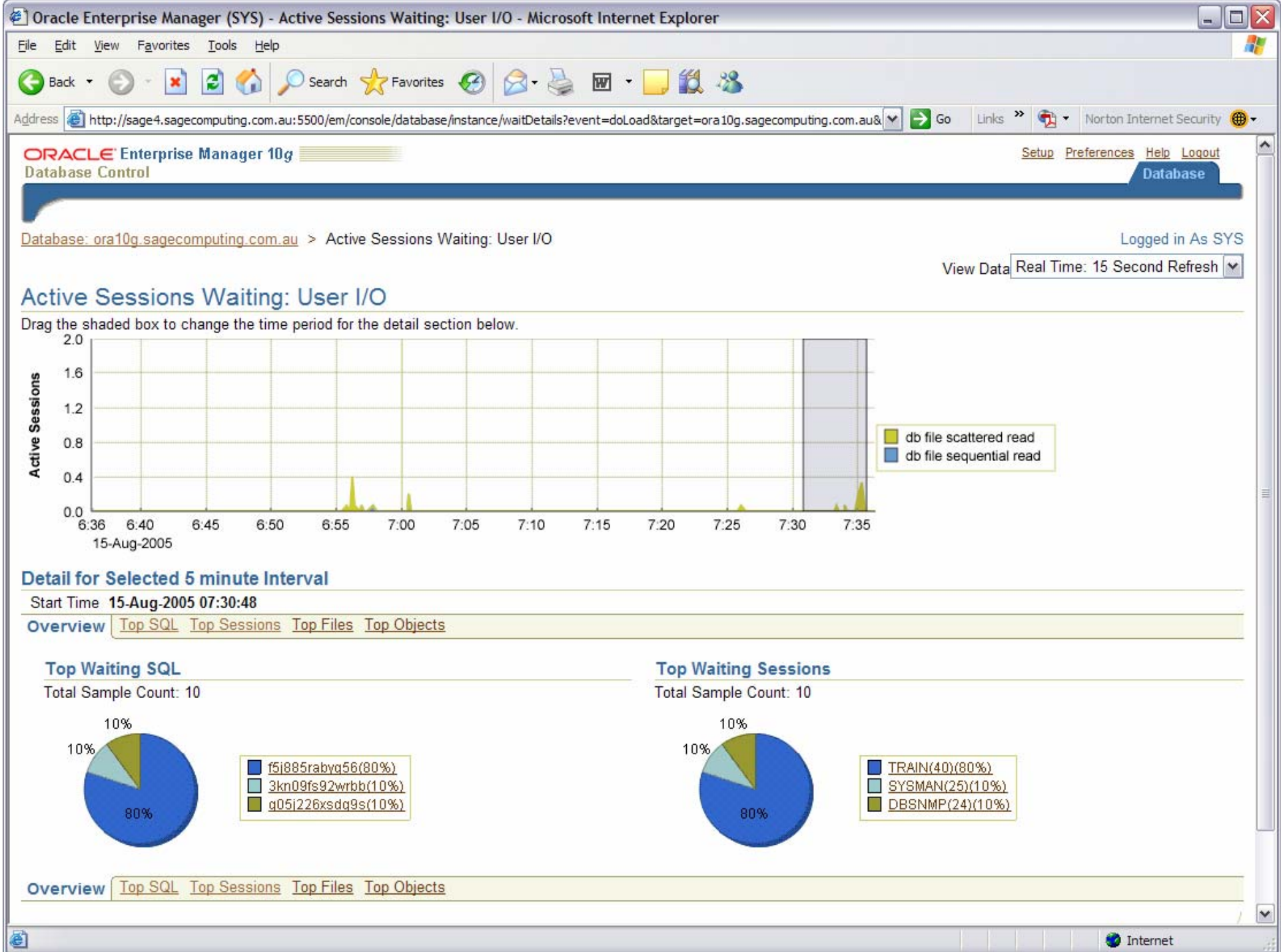


r.description = 'Buffet Lunch'



Unusual Data Patterns

- **The CBO does not know about complex data patterns in normal mode**
- **The CBO does know about complex data patterns in tuning mode**
- **Uses partial execution of statement**



Oracle Enterprise Manager (SYS) - SQL Details: f5j885rabyg56 - Microsoft Internet Explorer

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Database: ora10g.sagecomputing.com.au > Top SQL > SQL Details: f5j885rabyg56 Logged in As SYS

SQL Details: f5j885rabyg56

Run SQL Tuning Advisor

SQL Text

```
SELECT count(b.comments)
FROM organisations o, events_large e, train2.bookings_large b,
resources r
WHERE o.org_id = e.org_id
AND e.event_no = b.event_no
AND b.resource_code = r.code
AND o.name = 'Australian Medical Systems'
AND r.description = 'Buffet Lunch'
AND e.comments = 'TEST'
```

Execution Plan Current Statistics Execution History Tuning History

Collected From Target 15-Aug-2005 07:37:01

Data Source Cursor Cache Plan Hash Value 418552905 Module SQL*Plus
 Capture Time 15-Aug-2005 07:37:01 Optimizer Mode ALL_ROWS Action Unavailable
 Parsing Schema TRAIN

Expand All Collapse All

Operation	Object	Object Type	Order	Rows	KB	Cost	Time (seconds)	CPU Cost	IO Cost	Object Node
SELECT STATEMENT			9			2776				
SORT AGGREGATE			8	1	0.08					
HASH JOIN			7	12355	989.365	2775	52	483077952	2755	
TABLE ACCESS FULL	TRAIN.RESOURCES	TABLE	1	1	0.02	2	1	10481	2	
HASH JOIN			6	98840	5,984.453	2772	52	461507776	2753	
HASH JOIN			4	6971	292.728	277	6	54755268	275	
TABLE ACCESS FULL	TRAIN.ORGANISATIONS	TABLE	2	1	0.025	2	1	10001	2	
TABLE ACCESS FULL	TRAIN.EVENTS_LARGE	TABLE	3	41829	694.427	274	6	38886648	273	
TABLE ACCESS FULL	TRAIN2.BOOKINGS_LARGE	TABLE	5	1444856	26,808.852	2488	46	249545680	2478	

Execution Plan Current Statistics Execution History Tuning History

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Back

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ORACLE Enterprise Manager 10g

Database Control

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Database

Database: ora10g.sagecomputing.com.au > Schedule Advisor

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Schedule Advisor

CancelOK

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

SQL_TUNING_1124062639390

Description

SQL Statements

SQL Text	Parsing Schema
SELECT count(b.comments) FROM organisations o, events_large e, TRAIN2.bookings_large b, resources r WHERE o.org_id = e.org_id AND e.event_no = b.event_no AND b.resource_code = r.code AND o...	TRAIN

Scope

☐ Limited. Analysis without SQL Profile recommendation. Takes about 1 second per statement.

☒ Comprehensive. Complete analysis including SQL Profile. May take a long time.

Total Time Limit (minutes)

30

Schedule

Time Zone

GMT +8:00

☒ Immediately

☐ Later

Date

15-Aug-2005

(example: 15-Aug-2005)

Time

7

37

00

☒ AM☐ PM

CancelOK

DoneInternet

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Back

Search

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Database: [ora10g.sagecomputing.com.au](#) > [Advisor Central](#) > [SQL Tuning Results:SQL_TUNING_1124062639390](#) >

Recommendations for SQL ID:f5j885rabyg56

Logged in As SYS

Recommendations for SQL ID:f5j885rabyg56

Return

Only one recommendation should be implemented.

SQL Text

SELECT count(b.comments) FROM organisations o, events_large e, TRAIN2.bookings_large b, resources r WHERE o.org_id = e.org_id AND e.event_no = b.event_no AND b.resource_code = r.code AND o...

Select Recommendation

Original Explain Plan

Implement

Select	Type	Findings	Recommendations	Rationale	Benefit (%)	New Explain Plan
☒	SQL Profile	A potentially better execution plan was found for this statement.	Consider accepting the recommended SQL profile.		78.95	SQL

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New Explain Plan

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

Operation	Line ID	Order	Rows	KB	Cost	Time (seconds)	CPU Cost	IO Cost	Object	Object Type	Object Node
▼ SELECT STATEMENT	0	10	1	0.08	583	11	68761080	581			
▼ SORT AGGREGATE	1	9	1	0.08							
▼ HASH JOIN	2	8	8	0.641	583	11	68761080	581			
▼ TABLE ACCESS BY INDEX ROWID	3	6	14	0.26	16	1	121574	16	TRAIN2 BOOKINGS_LARGE	TABLE	
▼ NESTED LOOPS	4	5	65	3.936	581	11	57065184	579			
▼ HASH JOIN	5	3	19	0.798	277	6	54755268	275			
TABLE ACCESS FULL	6	1	1	0.025	2	1	10001	2	TRAIN.ORGANISATIONS	TABLE	
TABLE ACCESS FULL	7	2	41829	694.427	274	6	38886648	273	TRAIN.EVENTS_LARGE	TABLE	
INDEX RANGE SCAN	8	4	14		2	1	21564	2	TRAIN2.BK_EVT2	INDEX	
TABLE ACCESS FULL	9	7	1	0.02	2	1	10481	2	TRAIN.RESOURCE	TABLE	

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

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[About Oracle Enterprise Manager 10g Database Control](#)

Done Internet

Oracle Enterprise Manager (SYS) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back

Search

Favorites

Address <http://sage4.sagecomputing.com.au:5500/em/console/database/instance/sqltune?recomTable%3Aselected=0&recomTable%3Alength=1&obje> Go Links Norton Internet Security

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout

Database

Database: [ora10g.sagecomputing.com.au](#) > [Advisor Central](#) > SQL Tuning Results:SQL_TUNING_1124062639390 Logged in As SYS

SQL Tuning Results:SQL_TUNING_1124062639390

i

Confirmation

The recommended SQL Profile was created successfully.

StatusCOMPLETED

Started15-Aug-2005 07:37:46

Completed15-Aug-2005 07:37:59

Page Refreshed 15-Aug-2005 07:38:03

Refresh

SQL IDf5j885rabyg56

Time Limit (seconds)1800

Running Time (seconds)13

Recommendations

View Recommendations

Select	SQL Text	Parsing Schema	SQL ID	Statistics	SQL Profile	Index	Restructure SQL	Miscellaneous	Error
☒	SELECT count(b.comments) FROM organisations o, events_large e, TRAIN2.bookings_large b, resources ...		f5j885rabyg56		✓				

Database | Setup | Preferences | Help | Logout

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Internet



View the SQL Profile

```
SELECT id, name, advisor_name
FROM WRI$_ADV_TASKS
WHERE name = 'SQL_TUNING_1124062639390'
```



ID	NAME	ADVISOR_NAME
-----	-----	-----
1462	SQL_TUNING_1124062639390	SQL Tuning Advisor

```
SELECT id, attr1
FROM WRI$_ADV_RATIONALE
WHERE task_id = 1462
```



ID	ATTR1
-----	-----
1	OPT_ESTIMATE(@"SEL\$1", JOIN, ("B"@"SEL\$1", "E"@"SEL\$1", "O"@"SEL\$1"), SCALE_ROWS =0.2412761095)
2	OPT_ESTIMATE(@"SEL\$1", JOIN, ("E"@"SEL\$1", "O"@"SEL\$1"), SCALE_ROWS=0.00272541449)



Tune Manually

```
SELECT --+ ORDERED USE_NL_WITH_INDEX(b BK_EVT2)
      count(b.comments)
FROM   organisations o, events_large e,
      TRAIN2.bookings_large b, resources r
WHERE  o.org_id = e.org_id
AND    e.event_no = b.event_no
AND    b.resource_code = r.code
AND    o.name = 'Australian Medical Systems'
AND    r.description = 'Buffet Lunch'
AND    e.comments = 'TEST'
/
```


Result

```

trace22.lst - Notepad
File Edit Format View Help

-----
SELECT --+ ORDERED USE_NL_WITH_INDEX(b BK_EVT2)
count(b.comments)
FROM organisations o, events_large e, TRAIN2.bookings_large b, resources r
WHERE o.org_id = e.org_id
AND   e.event_no = b.event_no
AND   b.resource_code = r.code
AND   o.name = 'Australian Medical systems'
AND   r.description = 'Buffet Lunch'
AND   e.comments = 'TEST'

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      1        0.00        0.00         0         0         0         0
Execute    1        0.00        0.00         0         0         0         0
Fetch      2        0.14        0.96        963       1052         0         1
-----
total      4        0.14        0.97        963       1052         0         1

Misses in library cache during parse: 1
Optimizer mode: ALL_ROWS
Parsing user id: 67

Rows      Row Source Operation
-----
1          SORT AGGREGATE (cr=1052 pr=963 pw=0 time=969152 us)
5          HASH JOIN (cr=1052 pr=963 pw=0 time=470916 us)
1          TABLE ACCESS FULL RESOURCES (cr=3 pr=0 pw=0 time=64 us)
46         TABLE ACCESS BY INDEX ROWID BOOKINGS_LARGE (cr=1049 pr=963 pw=0 time=164724 us)
63         NESTED LOOPS (cr=1004 pr=950 pw=0 time=9146309 us)
16         HASH JOIN (cr=958 pr=944 pw=0 time=31534 us)
1          TABLE ACCESS FULL ORGANISATIONS (cr=3 pr=0 pw=0 time=26 us)
75294      TABLE ACCESS FULL EVENTS_LARGE (cr=955 pr=944 pw=0 time=31117 us)
46         INDEX RANGE SCAN BK_EVT2 (cr=46 pr=6 pw=0 time=158514 us)(object id 57055)

*****

```



Check for Unusual Data Patterns

- Majority values
- Unusually high or low values
- Complex data dependencies





A Myth

The Optimiser will always choose the cheapest plan

- **Query returning majority of table**
- **Really bad index use**
- **No unusual data patterns**



Case 4 – Bad Index Use

```
SELECT  MIN(event_no), MAX(event_no),  
        COUNT(booking_no)  
FROM    bookings_large
```

MIN(EVENT_NO)	MAX(EVENT_NO)	COUNT(BOOKING_NO)
200	1555	11258



Case 4 – Bad Index use

EXPLAIN PLAN FOR
SELECT * FROM bookings_large
WHERE event_no < 1500

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		10807	443K	10839 (1)	00:02:11
1	TABLE ACCESS BY INDEX ROWID	BOOKINGS_LARGE	10807	443K	10839 (1)	00:02:11
* 2	INDEX RANGE SCAN	BK_EVT5	10807		25 (0)	00:00:01

Predicate Information (identified by operation id):

2 - access("EVENT_NO"<1500)



Case 4 – The Trace

- Optimizer knows the index scan is not the cheapest plan

```
*****
SINGLE TABLE ACCESS PATH
  COLUMN:  EVENT_NO(NUMBER)  Col#: 2      Table: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
  Size: 4  NDV: 1356  Nulls: 0  Density: 7.3746e-004  Min: 200  Max: 1555
  No Histogram: #BKT: 1
    (1 uncompressed buckets and 2 endpoint values)
  TABLE: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
  Original Card: 11264  Rounded Card: 10807  Computed Card: 10806.79
  Access Path: table-scan  Rsc: 17  Resp: 17
  Access Path: index (scan)
    Index: BK_EVTS
    rsc_cpu: 82860027  rsc_io: 10831
    ix_sel: 9.5941e-001  ix_sel_with_filters: 9.5941e-001
  BEST_CST: 10838.63  PATH: 4  Degree: 1
*****
OPTIMIZER STATISTICS AND COMPUTATIONS
*****
GENERAL PLANS
*****
Join order[1]:  BOOKINGS_LARGE[BOOKINGS_LARGE]#0
Best so far: TABLE#: 0  CST: 10839  CDN: 10807  BYTES: 453894
(newjo-stop-1) k:0, spcnt:0, perm:1, maxperm:80000
prefetching is on for BK_EVTS
Final - First Rows Plan:
  JOIN ORDER: 1
  CST: 10839  CDN: 10807  RSC: 10839  RSP: 10839  BYTES: 453894
  IO-RSC: 10831  IO-RSP: 10831  CPU-RSC: 82860027  CPU-RSP: 82860027
*****
```

FIRST_ROWS



FIRST_ROWS_N

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		2	84	2 (0)	00:00:01
* 1	TABLE ACCESS FULL	BOOKINGS_LARGE	2	84	2 (0)	00:00:01

Predicate Information (identified by operation id):

1 - filter("EVENT_NO"<1500)

```
*****
Join order[1]: BOOKINGS_LARGE[BOOKINGS_LARGE]#0
Best so far: TABLE#: 0 CST: 17 CDN: 10815 BYTES: 454230
*****
SINGLE TABLE ACCESS PATH (First K Rows)
TABLE: BOOKINGS_LARGE Alias: BOOKINGS_LARGE
Original Card: 2 Rounded Card: 2 Computed Card: 2.00
Access Path: table-scan Resc: 2 Resp: 2
Access Path: index (scan)
Index: BK_EVT5
rsc_cpu: 29546 rsc_io: 4
ix_sel: 1.0000e+000 ix_sel_with_filters: 1.0000e+000
BEST_CST: 2.00 PATH: 2 Degree: 1
First K Rows: unchanged join prefix len = 1
*****
Join order[1]: BOOKINGS_LARGE[BOOKINGS_LARGE]#0
Best so far: TABLE#: 0 CST: 2 CDN: 2 BYTES: 84
(newjo-stop-1) k:0, spcnt:0, perm:1, maxperm:80000
Final - First K Rows Plan:
JOIN ORDER: 1
CST: 2 CDN: 2 RSC: 2 RSP: 2 BYTES: 84
IO-RSC: 2 IO-RSP: 2 CPU-RSC: 7881 CPU-RSP: 7881
```

FIRST_ROWS_1



FIRST_ROWS_n

● FIRST_ROWS

- For backwards compatibility
- Uses mix of Cost and Rule
- Unlikely to do full scans

● FIRST_ROWS_n

- Uses Cost
- May do full scans
- --+FIRST_ROWS(n)



SQL*Profile

```
SELECT id, name  
FROM WRI$_ADV_TASKS
```



Id NAME

Id	NAME
1065	BOOKINGS_BY_EVENT_NO
1062	TUNE_BK_LG1
1035	ADDM:3843294908_1_810
1036	ADDM:3843294908_1_811
1037	ADDM:3843294908_1_812
1049	ADDM:3843294908_1_824
1034	ADDM:3843294908_1_809
1050	ADDM:3843294908_1_825
1051	ADDM:3843294908_1_826
1053	ADDM:3843294908_1_828

```
SELECT id, attr1  
FROM WRI$_ADV_RATIONALE  
WHERE task_id = 1065
```



Id ATTR1

Id	ATTR1
1	FIRST_ROWS(1)
2	OPTIMIZER_FEATURES_ENABLE(default)



OPTIMIZER_MODE

- Use **FIRST_ROWS_N** for OLTP
- Use **ALL_ROWS** for Reporting/Batch
- Only use **FIRST_ROWS** to force index use when Oracle doesn't want to



Gathering Statistics

- **Why Use DBMS_STATS**
  - **Correct partition statistics**
  - **Parallel execution**
  - **Block sampling**
  - **The ability to go back**



Case 5 – The Problem

● Monday

- Database performance is acceptable

● Monday night

- Minor database upgrade

● Tuesday night

- Gather statistics

● Wednesday

- Users start complaining
- Performance of some jobs goes from 4hrs to 17hrs and 30 secs to 4mins



Case 5 – The Investigation

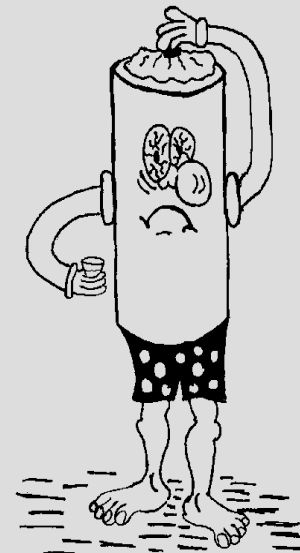
- Create a team of:
  - Developers
  - DBAs
  - Oracle Consultants
  - Hardware Engineers





Case 5 – The Result

- Optimiser picking really bad access paths
- Insufficient evidence to work out why
- Resolved by tuning individual statements
- ALWAYS provide yourself with a way to recover





Case 5 - Prevention

- **Use DBMS_STATS to backup statistics each time they are changed**
- **If performance deteriorates after gathering statistics put the old ones back**
- **Store the plans of critical statements so you can tell if they have changed**
- **ALWAYS provide yourself with a way to back out**



Approach - Initial Checks

- Are statistics up to date and gathered on all objects?
- Are histograms gathered on skewed data?
- Are system statistics collected?
- Are the initialisation parameters appropriate



- Fix any of these and then rerun the statement



- If it still doesn't run well
- Trace the statement
- Decide what you want it to do



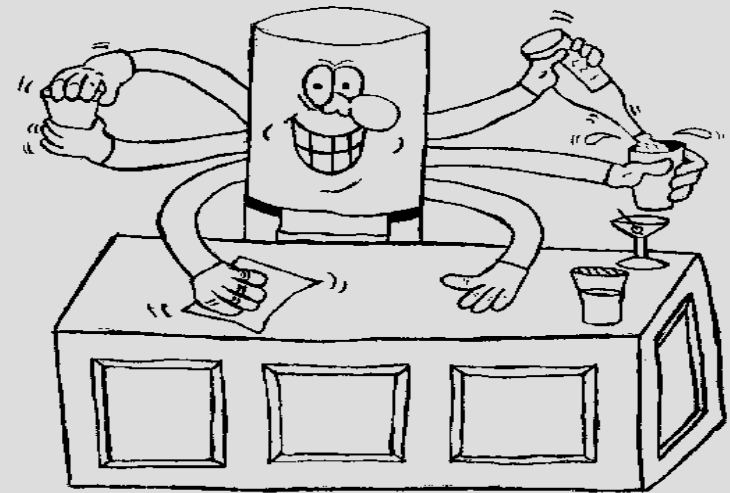
Fixing It

- **Change session settings**
- **Consider rewriting the statement**
- **Consider hints**
- **Consider new indexes**
- **Use SQL Tuning Advisor**
- **Use SQL Access Advisor**



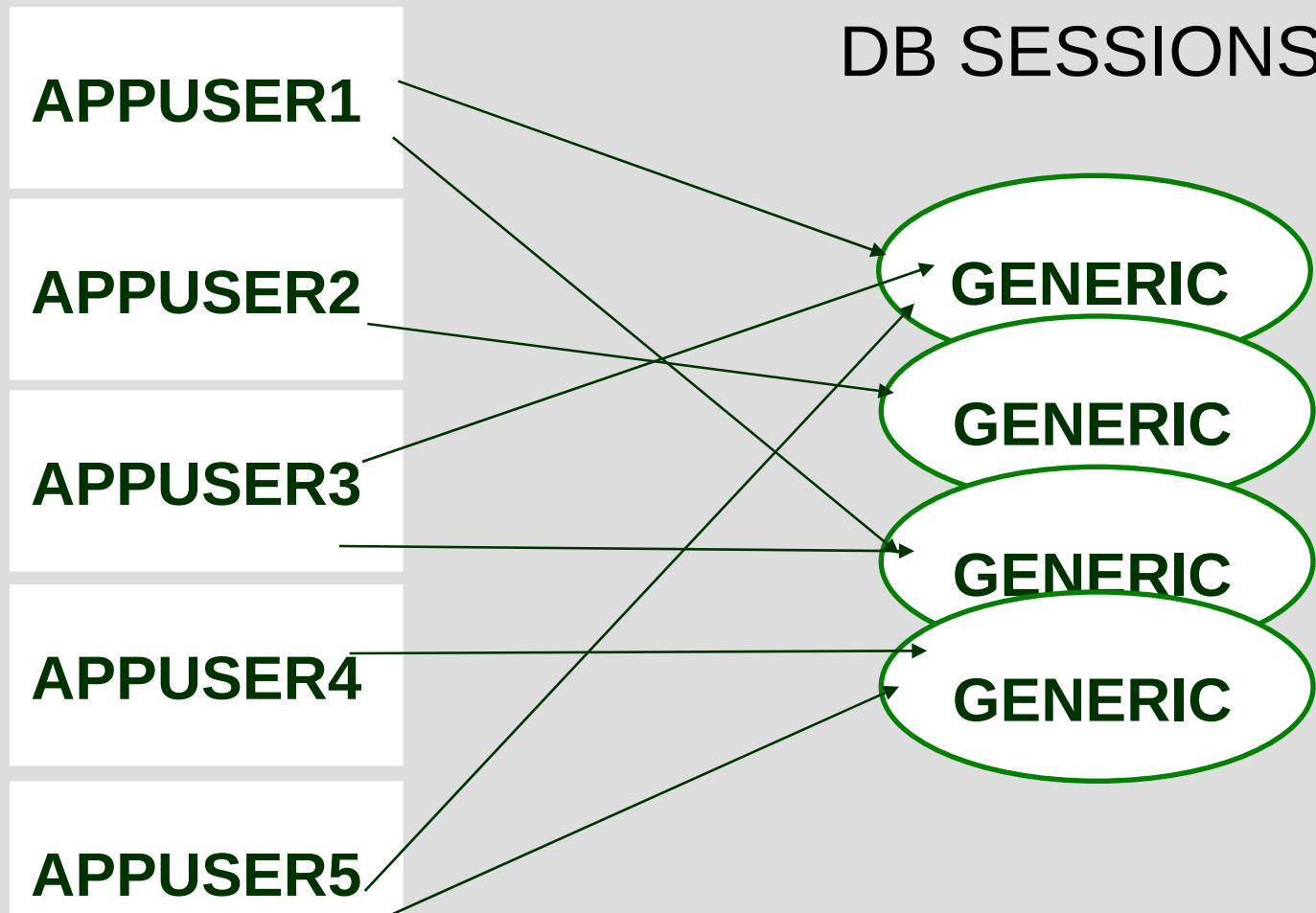
If it Needs to Do That Much Work

- Run the statement overnight
- Consider materialised views
- Consider partitioning
- Consider parallelisation





End to End Monitoring





Oracle 10g Tuning - trcsess

- **trcsess used to consolidate a number of trace files**
- **Based on**
  - **Service**
  - **Clientid**
  - **Module**
  - **Action**
- **DBMS_APPLICATION_INFO package can be used to set the module and action from within an application**



Setting Module and Action

```
dbms_application_info.set_module  
  (module_name=>'RESBOOK',  
   action_name=>'UPDATEBOOK');
```

```
SELECT module, action  
FROM   v$session  
WHERE  module IS NOT NULL
```

MODULE	ACTION
-----	-----
SQL*Plus	
RESBOOK	UPDATEBOOK
SQL*Plus	

temp.trc - WordPad

File Edit View Insert Format Help

Dump file c:\ora\admin\ora10g\udump\ora10g_ora_7888.trc
Sun Jul 31 09:49:37 2005
ORACLE V10.1.0.2.0 - Production vsnsta=0
vsnsql=13 vsnxtr=3
Oracle Database 10g Enterprise Edition Release 10.1.0.2.0 - Production
With the Partitioning, OLAP and Data Mining options
Windows XP Version V5.1 Service Pack 2
CPU : 2 - type 586
Process Affinity: 0x00000000
Memory (A/P) : PH:357M/2046M, PG:2284M/3942M, VA:1752M/2047M
Instance name: ora10g

Redo thread mounted by this instance: 1

Oracle process number: 21

Windows thread id: 7888, image: ORACLE.EXE (SHAD)

*** SERVICE NAME:(ora10g.sagecomputing.com.au) 2005-07-31 09:49:37.468
*** SESSION ID:(33.907) 2005-07-31 09:49:37.468
WAIT #0: nam='SQL*Net message to client' ela= 5 p1=1413697536 p2=1 p3=0
WAIT #0: nam='SQL*Net message from client' ela= 2624 p1=1413697536 p2=1 p3=0
=====|
PARSING IN CURSOR #3 len=34 dep=0 uid=5 oct=47 lid=5 tim=4659568503 hv=1514172353 ad='6a7ab2a0'
BEGIN
train.update_bookings2;
end;
END OF STMT
PARSE #3:c=140625,e=181055,p=1,cr=6,cu=0,mis=1,r=0,dep=0,og=1,tim=4659568497
BINDS #3:
*** ACTION NAME:(UPDATEBOOK) 2005-07-31 09:50:01.609
*** MODULE NAME:(RESBOOK) 2005-07-31 09:50:01.609
=====

For Help, press F1



Consolidate Trace Files

```
trcssess output=trace4.trc module=RESBOOK
```

```
tkprof trace4.trc trace4.lst sys=no
```

trace4.lst - Notepad

File Edit Format View Help

*****

UPDATE BOOKINGS_LARGE SET COST = COST *1.01

call	count	cpu	elapsed	disk	query	current	rows
Parse	3	0.00	0.00	0	0	0	0
Execute	5	2.43	33.58	0	35923	149715	56320
Fetch	0	0.00	0.00	0	0	0	0
total	8	2.43	33.58	0	35923	149715	56320

Misses in library cache during parse: 0
Optimizer goal: ALL_ROWS
Parsing user id: 67 (recursive depth: 1)

Elapsed times include waiting on following events:

Event waited on	Times waited	Max. wait	Total waited
log file sync	8	0.00	0.00



DBMS Monitor

● Trace

- Session
- Service/Module/Action
- Client ID

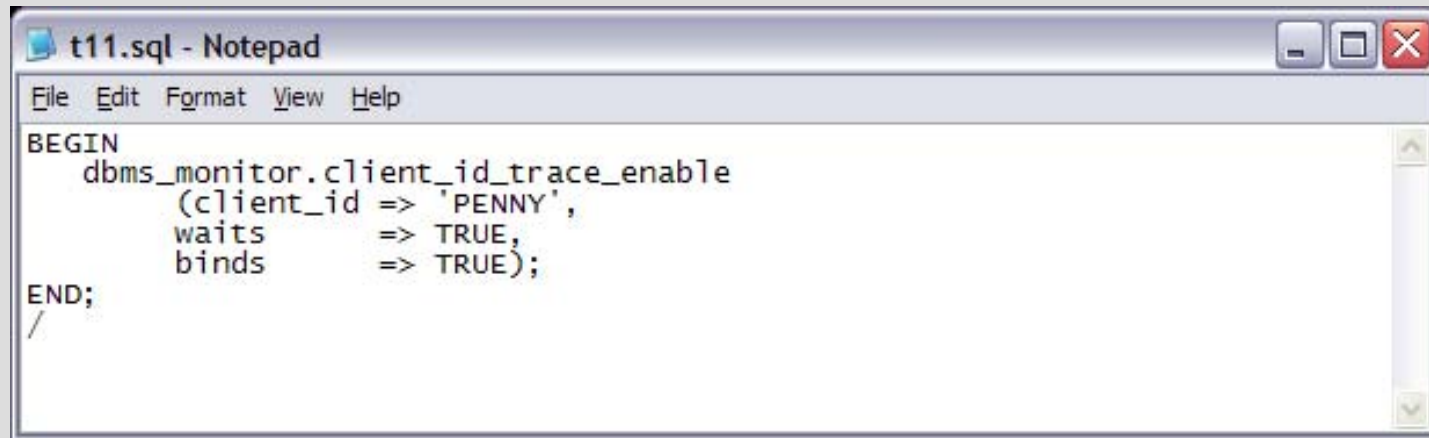
● Gather statistics for

- Session
- Service/Module/Action
- Client ID

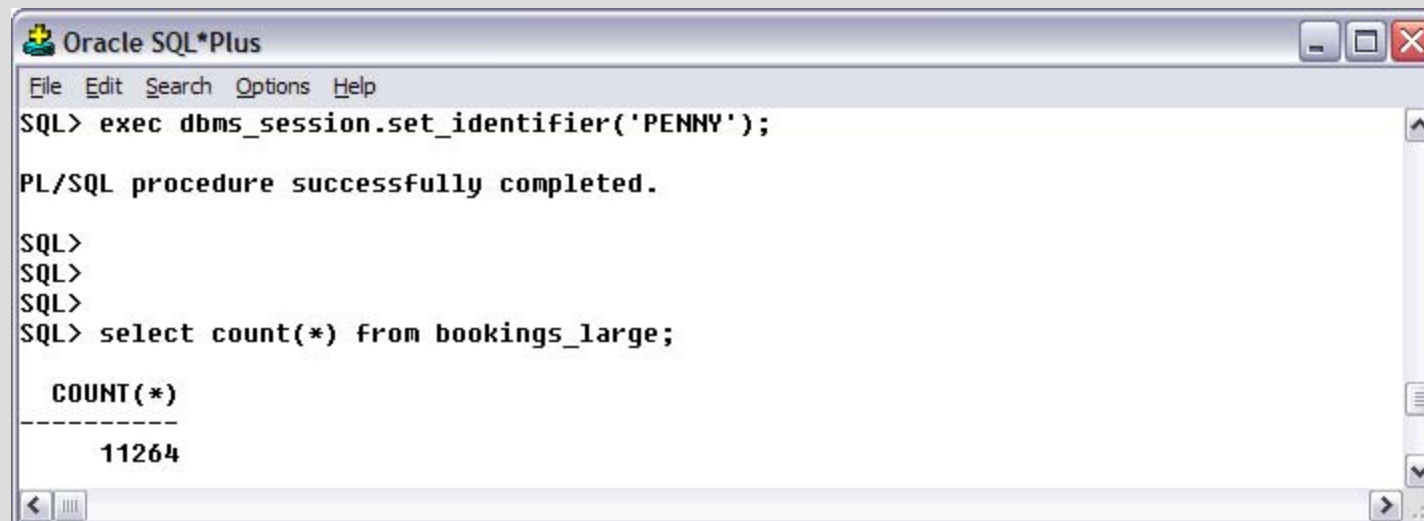
● Set Module/Action with `dbms_application_info`

● Set Client Id with `dbms_session`

Trace a Client



```
t11.sql - Notepad
File Edit Format View Help
BEGIN
  dbms_monitor.client_id_trace_enable
    (client_id => 'PENNY',
     waits      => TRUE,
     binds      => TRUE);
END;
/
```



```
Oracle SQL*Plus
File Edit Search Options Help
SQL> exec dbms_session.set_identifier('PENNY');

PL/SQL procedure successfully completed.

SQL>
SQL>
SQL>
SQL> select count(*) from bookings_large;

  COUNT(*)
-----
    11264
```



Find Active Traces

```
SELECT *  
FROM  
DBA_ENABLED_TRACES
```

```
TRACE_TYPE  
-----  
PRIMARY_ID  
-----  
QUALIFIER_ID1  
-----  
QUALIFIER_ID2          WAITS BINDS INSTANCE_NAME  
-----  
CLIENT_ID  
PENNY  
  
TRUE  TRUE
```



Trace a Client

```
ora10g_ora_7436.trc - WordPad
File Edit View Insert Format Help
Dump file c:\ora\admin\ora10g\udump\ora10g_ora_7436.trc
Sun Jul 31 12:05:49 2005
ORACLE V10.1.0.2.0 - Production vsnsta=0
vsnsql=13 vsnxtr=3
Oracle Database 10g Enterprise Edition Release 10.1.0.2.0 - Production
With the Partitioning, OLAP and Data Mining options
Windows XP Version V5.1 Service Pack 2
CPU : 2 - type 586
Process Affinity: 0x00000000
Memory (A/P) : PH:338M/2046M, PG:2266M/3942M, VA:1756M/2047M
Instance name: ora10g

Redo thread mounted by this instance: 1

Oracle process number: 18

Windows thread id: 7436, image: ORACLE.EXE (SHAD)

*** 2005-07-31 12:05:49.156
*** ACTION NAME: (UPDATEBOOK) 2005-07-31 12:05:49.140
*** MODULE NAME: (RESBOOK) 2005-07-31 12:05:49.140
*** SERVICE NAME: (ora10g.sagecomputing.com.au) 2005-07-31 12:05:49.140
*** CLIENT ID: (PENNY) 2005-07-31 12:05:49.140
*** SESSION ID: (36.43) 2005-07-31 12:05:49.140
```




Consolidate Trace Files

```
trcsess output=trace5.trc clientid='PENNY'
```

```
tkprof trace5.trc trace5.lst sys=no
```

```
trace5.lst - Notepad
File Edit Format View Help
SQL*Net message from client          1      15.39      15.39
*****

select count(*)
from
bookings_large

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      4         0.00         0.00         0         0         0         0
Execute    4         0.01         0.00         0         0         0         0
Fetch      8         0.03         0.05        26        116         0         4
total     16         0.04         0.06        26        116         0         4

Misses in library cache during parse: 1
Optimizer goal: ALL_ROWS
Parsing user id: 67

Rows      Row Source Operation
-----
1          SORT AGGREGATE (cr=29 pr=26 pw=0 time=49240 us)
11264      INDEX FAST FULL SCAN BK_EVT5 (cr=29 pr=26 pw=0 time=34861 us)(object id
54996)
```

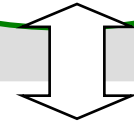


End to End Monitoring

APPUSER1



GENERIC

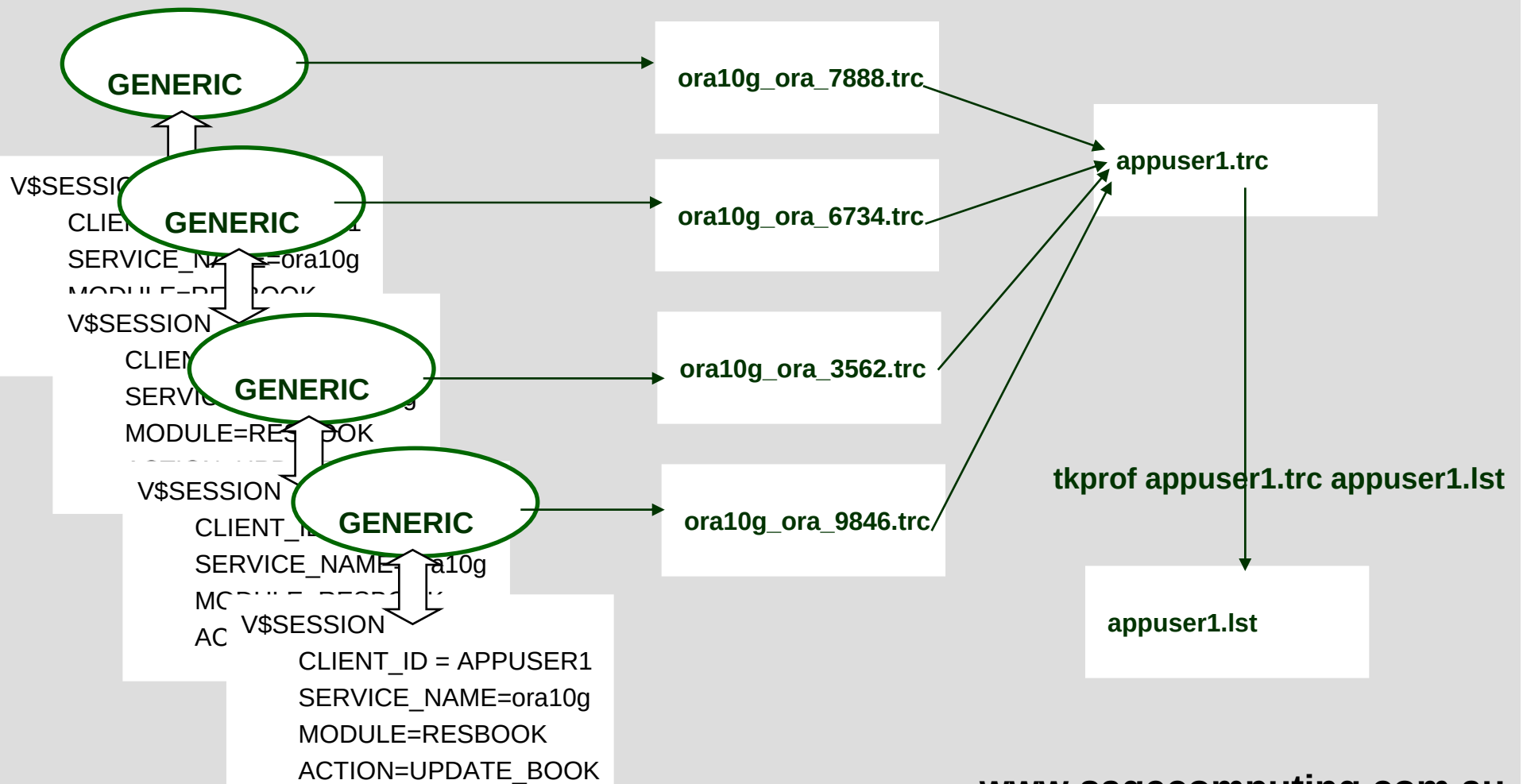


V\$SESSION
CLIENT_ID
SERVICE_NAME
MODULE
ACTION



End to End Monitoring

trcsess output=appuser1.trc clientid=APPUSER1



Example - HTMLDB

Employees - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites

Address <http://sage4.sagecomputing.com.au:7780/pls/htmldb/f?p=118:6:11105254909161965822::NO> Go Links Norton Internet Security

Home **Employees** Calendar Enter Timesheet Approve Timesheets Reporting Upload files Timesheet2 Parties Sec

Employee Parameters

Organisation Name Go

Employees Create

	Name	First Names	Date of Birth	Job Title	Organisation	From	To
	Brunini	Christian	29-DEC-70	System Consultant	SAGE Computing Services	01-MAY-95	
	Cookson	Penny	14-JAN-56	Managing Director	SAGE Computing Services	01-MAY-93	05-FEB-05
	Harris	Eddie	10-NOV-87	System Consultant	SAGE Computing Services	21-JUN-02	
	Marshall	Katie	28-JUN-05	System Consultant	SAGE Training Services	10-JUL-04	
	Njegichddd	Branka		System Consultant	SAGE Training Services	24-AUG-98	
	Smith	Fred	01-JUN-53		Oddbods Professional Services	01-SEP-04	
	Tindallid	Ray		System Consultant	SAGE Computing Services	10-NOV-96	

1 - 7

Internet



Example HTMLDB

```
SELECT service_name, client_identifier,  
module, action, username  
FROM v$session  
WHERE username = 'HTMLDB_PUBLIC_USER'
```

SERVICE_NAME

CLIENT_IDENTIFIER

MODULE

ACTION

USERNAME

-----

ora10g.sagecomputing.com.au

HTML DB

application 118, page 13, sessio HTMLDB_PUBLIC_USER



```
Dump file c:\ora\admin\ora10g\udump\ora10g_ora_6436.trc
Sun Jul 31 13:22:46 2005
ORACLE V10.1.0.2.0 - Production vsnsta=0
vsnsql=13 vsnxtr=3
Oracle Database 10g Enterprise Edition Release 10.1.0.2.0 - Production
With the Partitioning, OLAP and Data Mining options
Windows XP Version V5.1 Service Pack 2
CPU           : 2 - type 586
Process Affinity: 0x00000000
Memory (A/P)   : PH:1067M/2046M, PG:3086M/3942M, VA:1753M/2047M
Instance name: ora10g

Redo thread mounted by this instance: 1

Oracle process number: 17

Windows thread id: 6436, image: ORACLE.EXE (SHAD)

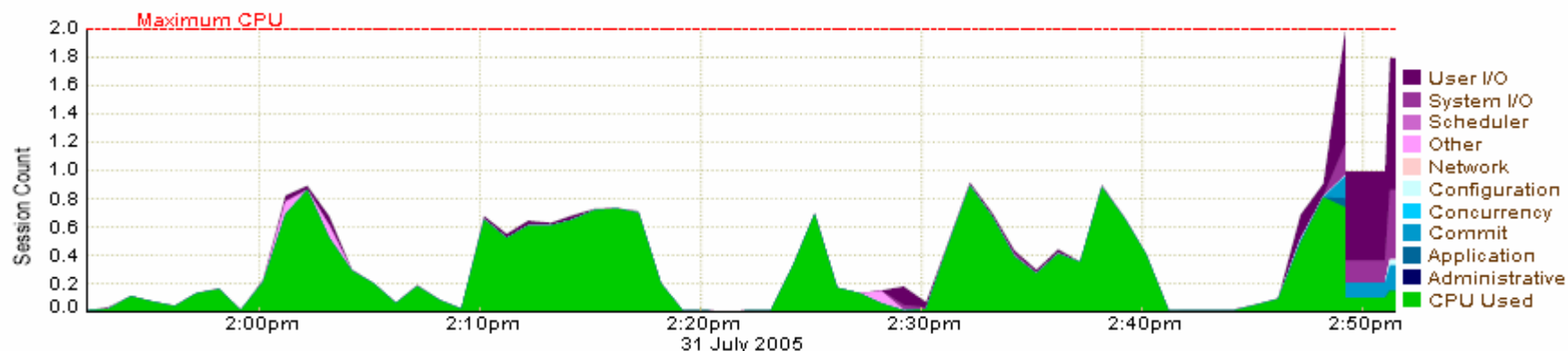
*** 2005-07-31 13:22:46.250
*** ACTION NAME:(application 118, page 6, session) 2005-07-31 13:22:46.234
*** MODULE NAME:(HTML DB) 2005-07-31 13:22:46.234
*** SERVICE NAME:(ora10g.sagecomputing.com.au) 2005-07-31 13:22:46.234
*** SESSION ID:(29.531) 2005-07-31 13:22:46.234
=====
PARSING IN CURSOR #54 len=614 dep=0 uid=65 oct=47 lid=65 tim=2059248367 hv=3947649331 ad='6844bef8'
declare
  rc__ number;
begin
  owa.init_cgi_env(:n__,:nm__,:v__);
  http.HTBUF_LEN := 255;
  null;
  null;
```



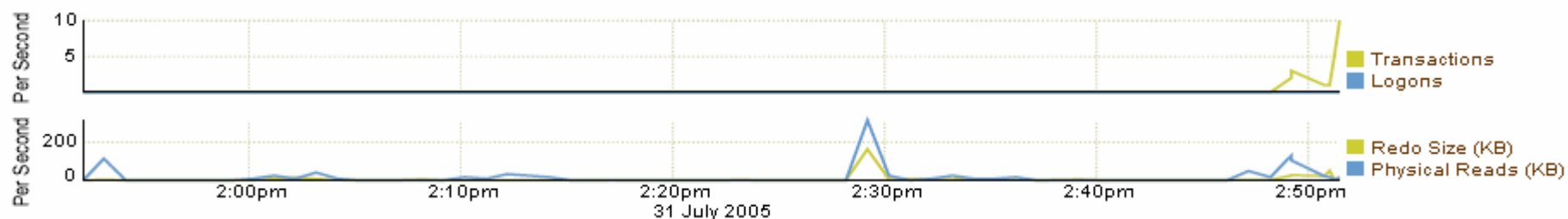
Example HTMLDB

Process	
* Page	7 Employee Details
* Name	set_user
Type: PL/SQL anonymous block	
Process Firing Point	
* Sequence	11
Process Point	On Submit - After Computations and Validations
Run Process	Once Per Page Visit (default)
Source	
* Process	[Download Source]
<pre>begin dbms_session.set_identifier(:APP_USER); end;</pre>	

Sessions: waiting and working



Instance Throughput



View ☒ Per Second ☐ Per Transaction

Additional Monitoring Links

- [Top Sessions](#)
- [Top SQL](#)
- [Blocking Sessions](#)
- [Database Locks](#)
- [Instance Activity](#)
- [Top Consumers](#)
- [Snapshots](#)

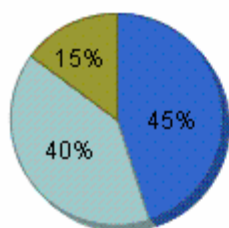
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Related Links



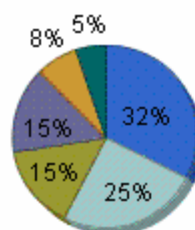
Overview [Top Services](#) [Top Modules](#) [Top Actions](#) [Top Clients](#) [Top Sessions](#)

Top Services



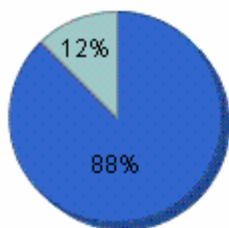
■ [SYS\\$USERS\(45%\)](#)
 ■ [ora10g.sagecomputing.com.au\(40%\)](#)
 ■ [SYS\\$BACKGROUND\(15%\)](#)

Top Modules (by Service)



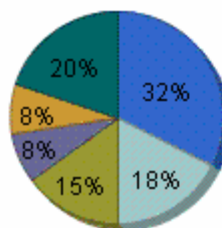
■ [emagent.exe \(SYS\\$USERS\)\(32.5%\)](#)
 ■ [OEM.SystemPool \(ora10g.sagecomputing.com.au\)\(25%\)](#)
 ■ [HTML DB \(ora10g.sagecomputing.com.au\)\(15%\)](#)
 ■ [Unnamed \(SYS\\$BACKGROUND\)\(15%\)](#)
 ■ [EM_PING \(SYS\\$USERS\)\(7.5%\)](#)
 ■ [Other\(5%\)](#)

Top Clients



■ [Unnamed\(87.5%\)](#)
 ■ [ADMIN\(12.5%\)](#)

Top Actions (by Module) (by Service)



■ [Unnamed \(emagent.exe\) \(SYS\\$USERS\)\(32.5%\)](#)
 ■ [XMLLoader0 \(OEM.SystemPool\) \(ora10g.sagecomputing.com.au\)\(17.5%\)](#)
 ■ [Unnamed \(Unnamed\) \(SYS\\$BACKGROUND\)\(15%\)](#)

Oracle Enterprise Manager (SYS) - Client: ADMIN - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Reload Print Mail Stop

Address <http://sage4.sagecomputing.com.au:5500/em/console/database/instance/clientDetails?event=doLoad&target=...> Go Links Norton Internet Security

View Data Real Time: Manual Refresh

Client: ADMIN

Page Refreshed 31-Jul-2005 15:15:39 [Refresh](#)

Statistics

Previous 1-25 of 27 Next 2

Name	Delta Value	Cumulative Value
user calls	0	59
DB time	0	2968891
DB CPU	0	1670160
parse count (total)	0	1955
parse time elapsed	0	1369944
execute count	0	7753
sql execute elapsed time	0	2869692
opened cursors cumulative	0	1917
session logical reads	0	11818
physical reads	0	180
physical writes	0	0
redo size	0	20476
user commits	0	16
workarea executions - optimal	0	365
workarea executions - onepass	0	0
workarea executions - multipass	0	0
session cursor cache hits	0	0
user rollbacks	0	0
db block changes	0	246
gc cr blocks received	0	0
gc cr block receive time	0	0
gc current blocks received	0	0

Done Internet

Oracle Enterprise Manager (SYS) - Module: HTML DB - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back

Search

Favorites

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Go

Links

Norton Internet Security

ORACLE Enterprise Manager 10g

Database Control

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

Database

Database: ora10g.sagecomputing.com.au > Top Consumers > Service: ora10g.sagecomputing.com.au > Module: HTML DB

Logged in As SYS

View Data

Real Time: Manual Refresh

Module: HTML DB

Page Refreshed 31-Jul-2005 15:17:00

Refresh

Actions

Statistics

Top Actions

Action	Percentage
application 4000, page 1, sessi	33.3%
application 4000, page 4150, se	33.3%
application 118, page 7, sessio	16.7%
application 118, page 6, sessio	16.7%

Active Actions

View

Active Actions

Enable Aggregation

Disable Aggregation

Enable SQL Trace

Disable SQL Trace

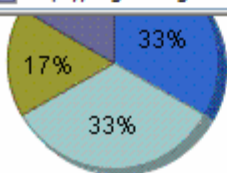
View SQL Trace File

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

				Aggregation	SQL Trace	Delta Elapsed Time	Cumulative Elapsed Time	Delta CPU Time	Cumulative CPU Time	Delta Physical I/O	Cumulative Physical

Done

Internet



[application 4000, page 1, sessi\(33.3%\)](#)
[application 4000, page 4150, se\(33.3%\)](#)
[application 118, page 7, sessio\(16.7%\)](#)
[application 118, page 6, sessio\(16.7%\)](#)

Active Actions

View Active Actions

Enable Aggregation

Disable Aggregation

Enable SQL Trace

Disable SQL Trace

View SQL Trace File

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

Select	Action	Activity (% for the last 5 minutes)	Aggregation Enabled	SQL Trace Enabled	Delta Elapsed Time (seconds)	Cumulative Elapsed Time (seconds)	Delta CPU Time (seconds)	Cumulative CPU Time (seconds)	Delta Physical I/O (blocks)	Cumulative Physical I/O (blocks)
☐	application 4000, page 1, sessi	33.3	FALSE	FALSE						
☐	application 4000, page 4150, se	33.3	FALSE	FALSE						
☒	application 118, page 7, sessio	16.7	FALSE	FALSE						
☐	application 118, page 6, sessio	16.7	FALSE	FALSE						

[Actions](#)
[Statistics](#)

ORACLE Enterprise Manager 10g

Database Control

[Setup](#) [Preferences](#) [Help](#) [Logout](#)[Database](#)Database: ora10g.sagecomputing.com.au > [Top Consumers](#) > [Service: ora10g.sagecomputing.com.au](#) > [Module: HTML DB](#) >

Enable SQL Trace

Logged in As SYS

Enable SQL Trace

Cancel

OK

Action	Waits	Binds
application 118, page 7, sessio	TRUE 	TRUE 

Cancel

OK

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

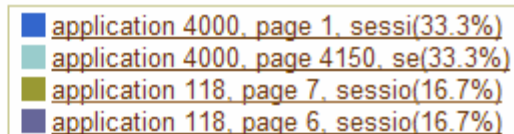
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[About Oracle Enterprise Manager 10g Database Control](#)

View Data Real Time: Manual Refresh

Page Refreshed 31-Jul-2005 15:19:15 Refresh

Statistics



View Active Actions

View Active Actions

[View SQL Trace File](#)

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

				SQL	Delta Elapsed Time	Cumulative Elapsed Time	Delta CPU Time	Cumulative CPU Time	Delta Physical I/O	Cumulative Physical
		Aggregation	Trace							

Oracle Enterprise Manager (SYS) - View SQL Trace File - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Reload Print Mail News RSS Feeds

Address <http://sage4.sagecomputing.com.au:5500/em/console/database/instance/SMDetails?service=ora10g.sagecomp> Go Links Norton Internet Security

ORACLE Enterprise Manager 10g Database Control [Setup](#) [Preferences](#) [Help](#) [Logout](#) [Database](#)

[Database: ora10g.sagecomputing.com.au](#) > [Top Consumers](#) > [Service: ora10g.sagecomputing.com.au](#) > [Module: HTML DB](#) > [View SQL Trace File](#) Logged in As SYS

View SQL Trace File

Oracle provides a tool called Trace Analyzer to collect trace data for a given identifier and produce a single output file. The command to generate the trace output file for service ora10g.sagecomputing.com.au, module HTML DB, action application 118, page 7, sessio is as below:

```
trcsess [output=<output file name>] service=ora10g.sagecomputing.com.au module=HTML DB action=application 118, page 7, sessio <trace file name>
```

The output file produced by Trace Analyzer may be difficult to interpret. You can use TKPROF to format the data. TKPROF provides tabulated statistics for each SQL statement. It can also show the explain plan for each statement.

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

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[About Oracle Enterprise Manager 10g Database Control](#)

Done Internet



Some Basic Tuning Rules

- You will never be provided with enough information – find out yourself
- If you ask the question “What has been changed” the answer will always be “nothing”
- Don’t believe anything your client says – check for yourself
- Know when to stop



IT in Australia

**Why is this koala
like the teenage
DEBA??**

**It is cute and cuddly
Have you ever tried
to ask a koala to
grant you database
access?**





Thank You for Your Attention

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Managing Director
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