



# How Can I Tune it if I Can't Change the Code

**SAGE Computing Services**  
**Customised Oracle Training Workshops**  
**and Consulting**  
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# Agenda

- ◆ Identifying the problem
- ◆ First steps
- ◆ Tune the statements
- ◆ Mess around with the user's session
- ◆ Alter system settings

# Identifying the Problem

# Identifying the Problem

## ◆ User information



Something is  
wrong with the HR  
application

# Identifying the Problem

## ◆ Advanced user information



Something is wrong with the payroll run, its taking much longer than normal

# Identifying the Problem

- ◆ What is “normal”?
- ◆ Is anything else running?
- ◆ Look at LAST\_ANALYZED in dba\_tables / dba\_indexes
- ◆ Check init parameters
- ◆ Do we have baselines?
- ◆ Is there a test environment?
- ◆ Is it the same version/size as production?
- ◆ Can we get at the source code of the program?
- ◆ Is everything else running OK?
- ◆ What has changed?



# Finding the Offending SQL - The Scientific Approach

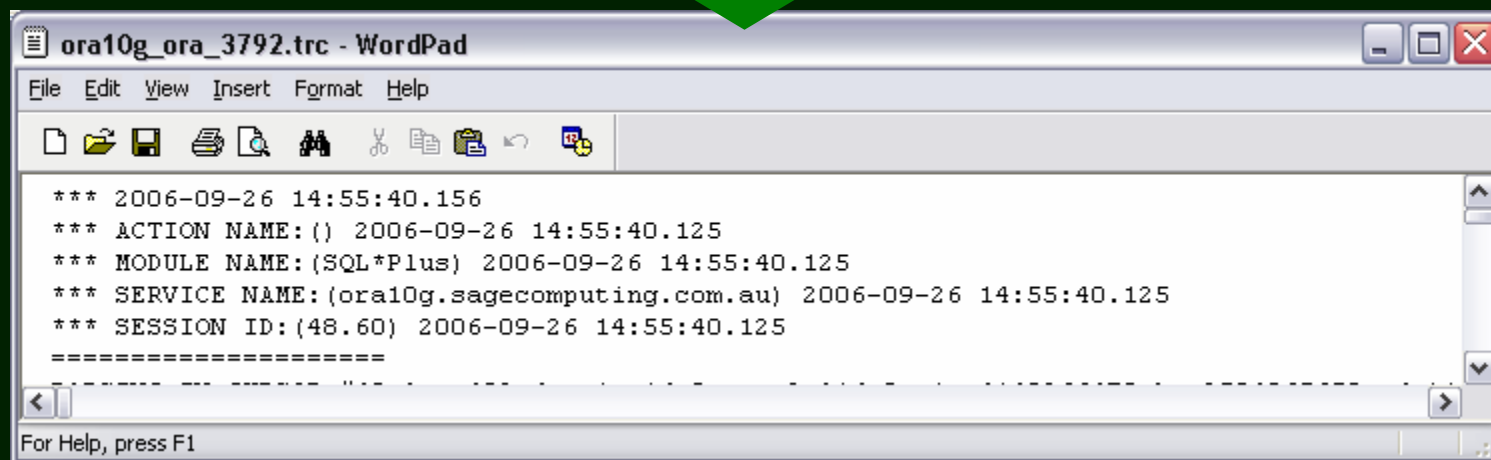
- ✦ Run the program in isolation in a test environment and trace it
- or
- ✦ Identify the session/service/module/action/client id and trace it in production
  - ✦ `dbms_monitor (10g)`
  - ✦ `dbms_system.set_trace_in_session (9)`
- ✦ You might need to trace multiple sessions

# Targeted Tracing – Example

**BEGIN**

```
dbms_monitor.session_trace_enable(session_id=>48,serial_num=>60  
,waits=>TRUE,binds=>TRUE);
```

**END;**

A screenshot of a WordPad window titled "ora10g\_ora\_3792.trc - WordPad". The window contains the following text:

```
*** 2006-09-26 14:55:40.156  
*** ACTION NAME:() 2006-09-26 14:55:40.125  
*** MODULE NAME:(SQL*Plus) 2006-09-26 14:55:40.125  
*** SERVICE NAME:(ora10g.sagecomputing.com.au) 2006-09-26 14:55:40.125  
*** SESSION ID:(48.60) 2006-09-26 14:55:40.125  
=====
```

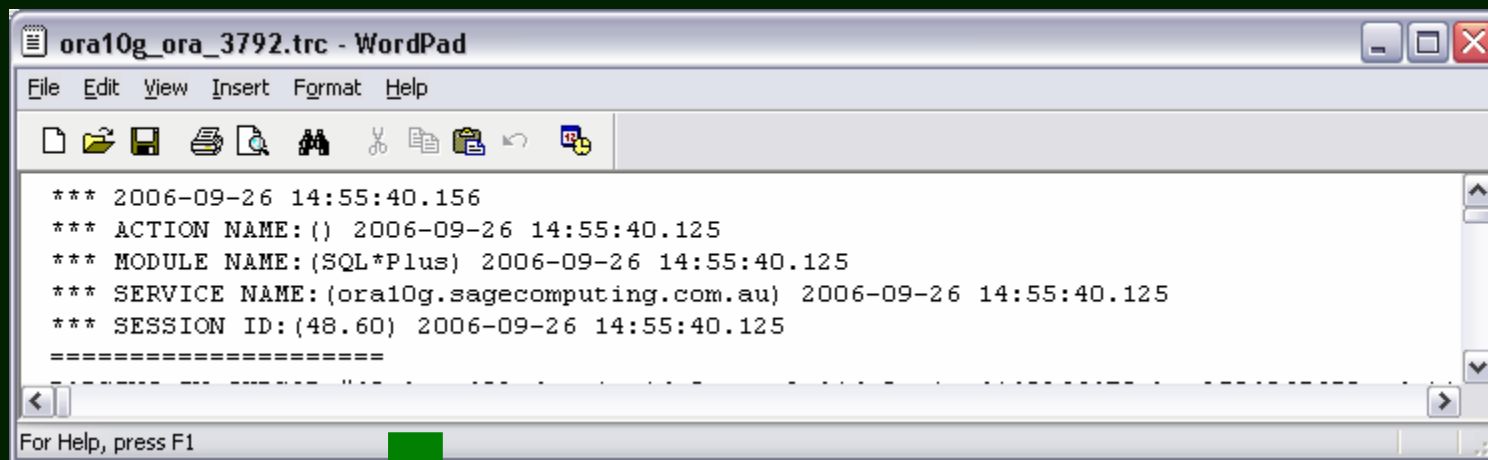
The window has a standard menu bar (File, Edit, View, Insert, Format, Help) and a toolbar with various icons. The status bar at the bottom says "For Help, press F1".



# Targeted Tracing - Example

**BEGIN**

```
dbms_monitor.session_trace_disable(session_id=>48,serial_num=>60);  
END;
```



```
tkprof c:\ora\admin\ora10g\udump\ora10g_ora_3792.trc trace1.lst sort=execpu,prscpu,fchcpu
```

# Targeted Tracing - Example

tracea1.lst - Notepad

File Edit Format View Help

\*\*\*\*\*

```

SELECT count(b.comments)
FROM organisations o, events_large e, 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	0.02	0	0	0	0
Execute	1	0.00	0.00	0	0	0	0
Fetch	2	2.93	20.80	36020	36044	0	1
total	4	2.93	20.82	36020	36044	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=36044 pr=36020 pw=0 time=20806922 us)
25	HASH JOIN (cr=36044 pr=36020 pw=0 time=42925153 us)
4	HASH JOIN (cr=956 pr=945 pw=0 time=30842 us)
1	MERGE JOIN CARTESIAN (cr=6 pr=0 pw=0 time=172 us)
1	TABLE ACCESS FULL ORGANISATIONS (cr=3 pr=0 pw=0 time=93 us)
1	BUFFER SORT (cr=3 pr=0 pw=0 time=65 us)
1	TABLE ACCESS FULL RESOURCES (cr=3 pr=0 pw=0 time=28 us)
75243	TABLE ACCESS FULL EVENTS_LARGE (cr=950 pr=945 pw=0 time=30264 us)
5767168	TABLE ACCESS FULL BOOKINGS_LARGE (cr=35088 pr=35075 pw=0 time=57698789 us)

Elapsed times include waiting on following events:

Event waited on	Times waited	Max. wait	Total waited
SQL*Net message to client	2	0.00	0.00
db file scattered read	2269	0.11	17.74
SQL*Net message from client	2	0.00	0.00

# Finding the Offending SQL - The Best Guess Approach

- ◆ Which one of you was it?
- ◆ Trace everything
- ◆ Consolidate the trace files  
trcssess  
output=all\_traces.trc  
service=ora10g \*.trc
- ◆ Format the trace file  
(tkprof) and sort by  
descending cpu





# Finding the Offending SQL - The Best Guess Approach

- ◆ Use V\$SQLSTATS (10g Rel 2)
  - ◆ Row for unique combinations of SQL statement and optimizer plan (SQL\_ID and PLAN\_HASH\_VALUE)
  - ◆ Retained longer than V\$SQL
  - ◆ Does not include SQL PROFILE or OUTLINE
- ◆ Use DBA\_HIST\_SQLSTAT /  
DBA\_HIST\_SQLTEXT /  
DBA\_HIST\_SQL\_PLAN /  
DBA\_HIST\_OPTIMIZER\_ENV (>=10g)
- ◆ Use V\$SQL or Statspack (<10g)



# Finding the Offending SQL - The Best Guess Approach

## Look for high buffer gets

```
SELECT s.snap_id, s.sql_id, s.buffer_gets_total, s.executions_total,  
       s.buffer_gets_total/NULLIF(executions_total,0) reads, t.sql_text  
FROM   dba_hist_sqlstat s, dba_hist_sqltext t  
WHERE  t.sql_id = s.sql_id  
AND    buffer_gets_total/NULLIF(executions_total,0) > 1000000
```



SNAP_ID	SQL_ID	BUFFER_GETS_TOTAL	EXECUTIONS_TOTAL	READS
824	3s0z04m9qdusq	4979957	1	4979957
insert into bookings_large select booking_seq.nextval, mod(event2_seq.nextval,100000)+201, resource_code, chargeable, made_by, quantity, cost, status, comments from bookings_large				

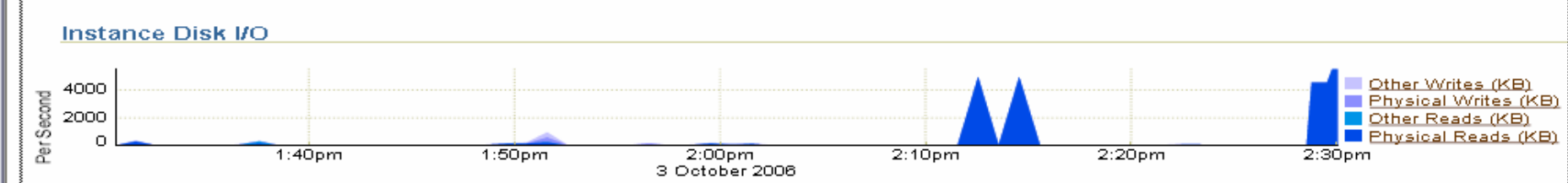
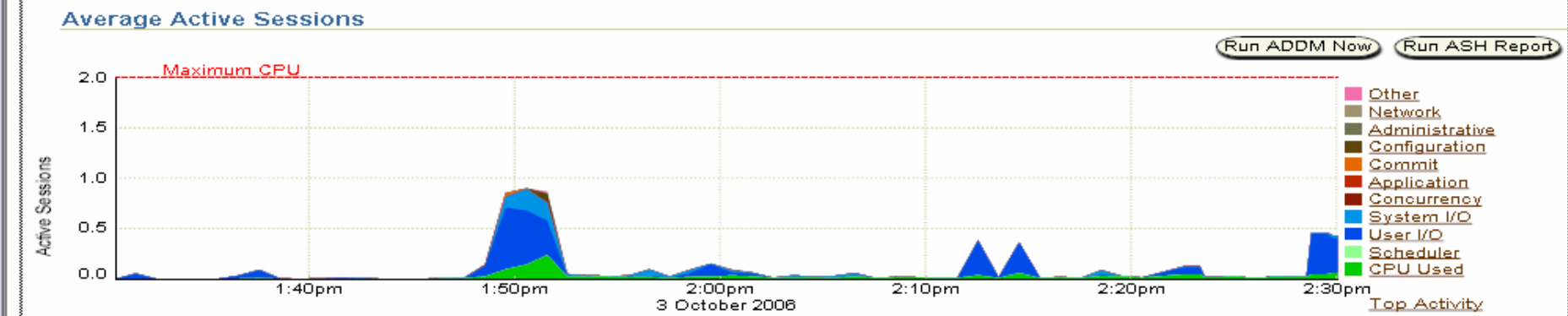
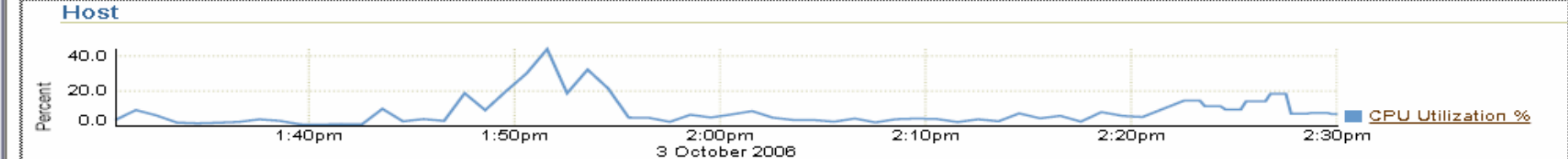
Logged in As SYS

## Database Instance: ora10g.sagecomputing.com.au

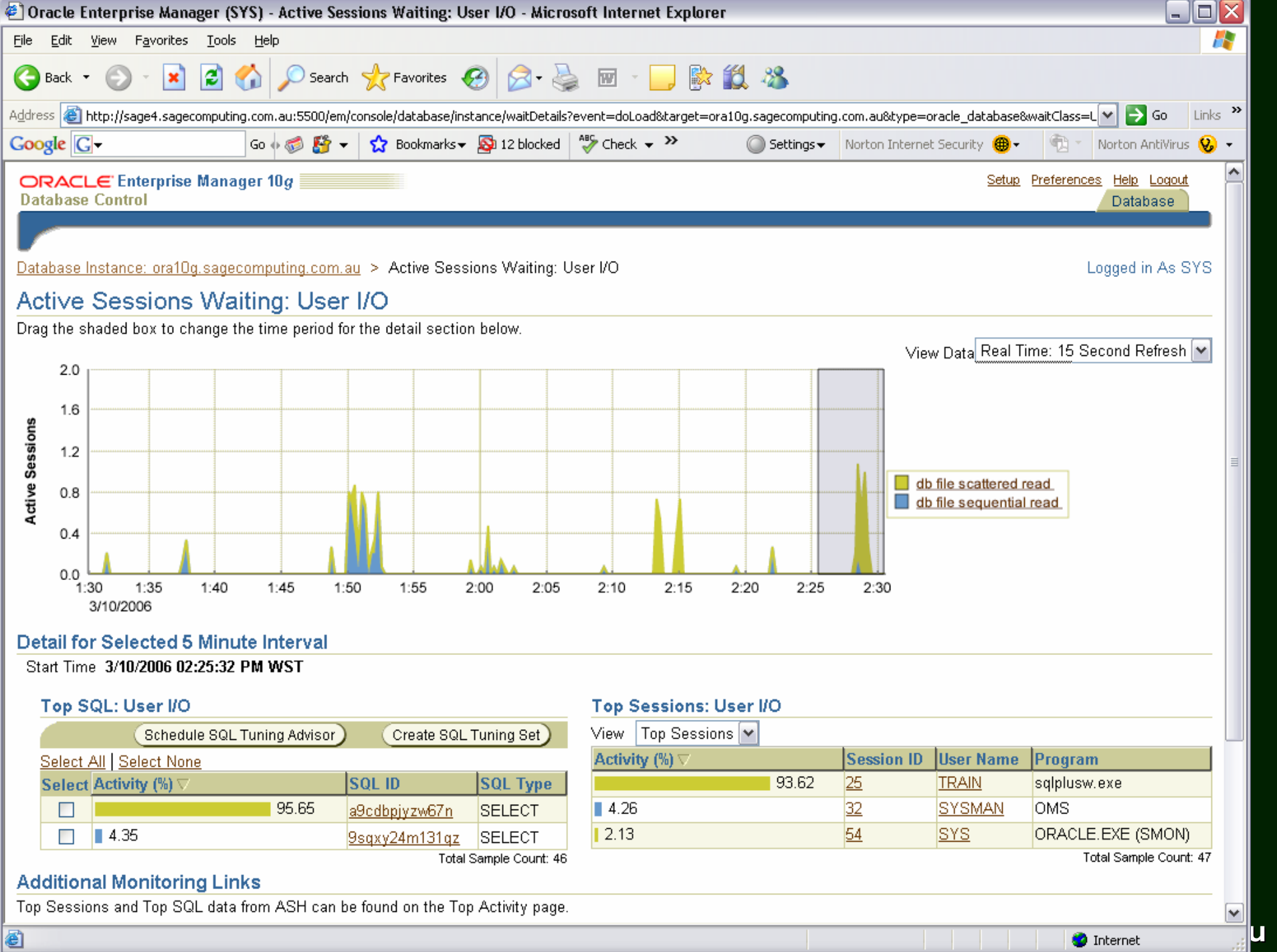
[Home](#) [Performance](#) [Administration](#) [Maintenance](#)

Click on an area of a graph or legend to get more detail.

View Data [Real Time: 15 Second Refresh](#)



### Instance Throughput



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Address [http://sage4.sagecomputing.com.au:5500/em/console/database/instance/sqlDetail?event=doLoad&target=ora10g.sagecomputing.com.au&type=oracle\\_database&sql\\_id=a9cdbp](http://sage4.sagecomputing.com.au:5500/em/console/database/instance/sqlDetail?event=doLoad&target=ora10g.sagecomputing.com.au&type=oracle_database&sql_id=a9cdbp) Go Links >>

Google G Go Bookmarks 12 blocked Check >> Settings Norton Internet Security Norton AntiVirus



Database Instance: ora10g.sagecomputing.com.au > [Top Activity](#) > SQL Details: a9cdbpjzw67n Logged in As SYS

## SQL Details: a9cdbpjzw67n

Switch to SQL ID  Go View Data Real Time: Manual Refresh Refresh Schedule SQL Tuning Advisor

### Text

```
SELECT count(b.comments)
FROM organisations o, events_large e, 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...
```

### Details

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

[Statistics](#) [Activity](#) [Plan](#) [Tuning Information](#)

Data Source **Cursor Cache** Capture Time **3/10/2006 14:31:25** Parsing Schema **TRAIN** Optimizer Mode **ALL\_ROWS**

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

Operation	Object	Object Type	Order	Rows	Size (KB)	Cost	Time (sec)	CPU Cost	I/O Cost
SELECT STATEMENT			10			8068			
SORT AGGREGATE			9	1	0.080				
HASH JOIN			8	45518	3,644.996	8068	97	2667449430	7886
HASH JOIN			6	7081	435.647	215	3	51083998	212
MERGE JOIN CARTESIAN			4	1	0.045	4	1	20483	4
TABLE ACCESS FULL	<a href="#">ORGANISATIONS</a>	TABLE	1	1	0.025	2	1	10001	2
BUFFER SORT			3	1	0.020	2	1	10481	2
TABLE ACCESS FULL	<a href="#">RESOURCES</a>	TABLE	2	1	0.020	2	1	10481	2
TABLE ACCESS FULL	<a href="#">EVENTS_LARGE</a>	TABLE	5	42484	705.301	211	3	39480481	208
TABLE ACCESS FULL	<a href="#">BOOKINGS_LARGE</a>	TABLE	7	5751669	106,720.421	7813	94	2032801898	7674

[Show Explain Rewrite](#)

[Statistics](#) [Activity](#) [Plan](#) [Tuning Information](#)



# First steps

- ◆ Check there is no obvious problem
  - ◆ Are statistics up to date?
  - ◆ Are histograms gathered on skewed data?
  - ◆ Are system statistics collected?
  - ◆ Are the initialisation parameters appropriate

# What Can You Change?

- ◆ Assume we can't change the statement
- ◆ Statement level
  - ◆ Outlines
  - ◆ SQL profiles
- ◆ User level
  - ◆ Init parameters
- ◆ System level for a period of time
  - ◆ Init parameters
  - ◆ Systems statistics
  - ◆ Object Statistics
- ◆ System level
  - ◆ Init parameters
  - ◆ Systems statistics
  - ◆ Object Statistics

# Outlines v SQL Profile

## Outline

- ◆ From Oracle 8i
- ◆ Stored as a set of hints
- ◆ Plan will be static
- ◆ Will not apply to different literals unless  
**CURSOR\_SHARING=SIMILAR or FORCE**  
on creation and use

## SQL Profile

- ◆ From Oracle 10g
- ◆ Stored as supplementary optimiser information
- ◆ Plan may change
- ◆ Applies to different literals if  
**force\_match=>TRUE**

# Outlines v SQL Profile

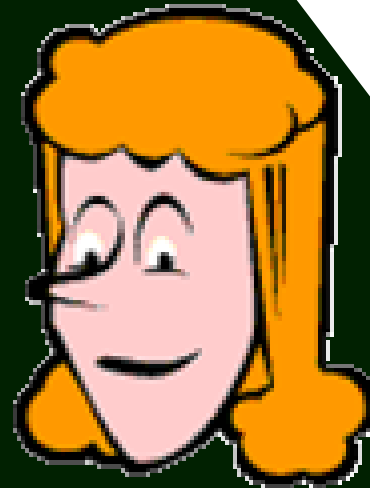
## Outline

This is the  
way you  
must do it



## SQL Profile

If I provide you with  
this information I'm  
sure you'll make the  
right decision



# Outlines

- ✦ Contain the hints required to force the statement to adopt a particular access path
- ✦ Stored in OL\$, OL\$HINTS and OL\$NODES owned by OUTLN user
- ✦ Views USER\_OUTLINES , and USER\_OUTLINE\_HINTS
- ✦ Hints reapplied when the statement is executed again



# Creating Outlines

```
CREATE OUTLINE contact_1
ON
SELECT          vendor_code, vendor_name
FROM            contacts
WHERE           postcode = 6020
FOR CATEGORY hr_app;
```

```
ALTER SYSTEM SET CREATE_STORED_OUTLINES = TRUE;
```

```
ALTER SYSTEM SET CREATE_STORED_OUTLINES = CAT1
NOOVERRIDE;
```

# Editing Outlines

-- Create a public outline

```
CREATE OUTLINE book_1 ON  
SELECT event_no, booking_no, cost  
FROM bookings  
WHERE event_no = 100;
```

-- Create a private outline as copy of the public outline

```
CREATE OR REPLACE PRIVATE OUTLINE  
book_priv_1 FROM book_1;
```

--Edit the private outline

```
dbms_outln_edit.change_join_pos
```

# Editing Outlines

```
-- Refresh the private outline from the user's tables.  
BEGIN  
  dbms_outln_edit.refresh_private_outline('BOOK_PRIV_1')  
  
-- Enable the use of private outlines  
ALTER SESSION SET USE_PRIVATE_OUTLINES=TRUE;  
  
-- Test that the private outline is performing correctly  
  
-- Replace the private outline in the public tables.  
CREATE OR REPLACE OUTLINE book_1  
FROM PRIVATE book_priv_1  
  
-- Disable the use of private outlines  
;
```





# Outlines – Getting the Right Plan

- ◆ **Change optimiser environment settings**

  - V\$SYS\_OPTIMIZER\_ENV**

  - V\$SES\_OPTIMIZER\_ENV**

- ◆ **Change statistics**

- ◆ **Remove indexes**

- ◆ **Probably not supported (but effective)**

  - ◆ **Get the right access path (hints)**

  - ◆ **Update the profile of the real statement  
with the values in the outline tables**



# SQL Profiles

- ◆ Automatic Tuning Optimiser
- ◆ Uses execution history
- ◆ Uses partial execution
- ◆ Store auxiliary statistics
- ◆ Store optimizer settings
- ◆ Verify and correct estimates
  - ◆ Complex predicates
  - ◆ Skewed join data
  - ◆ Sparse join data
- ◆ Rerun when significant data changes
- ◆ Use `SQLTUNE_CATEGORY` to test

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Address [http://sage4.sagecomputing.com.au:5500/em/console/database/instance/sqlDetail?event=doLoad&target=ora10g.sagecomputing.com.au&type=oracle\\_database&sql\\_id=a9cdbp](http://sage4.sagecomputing.com.au:5500/em/console/database/instance/sqlDetail?event=doLoad&target=ora10g.sagecomputing.com.au&type=oracle_database&sql_id=a9cdbp) Go Links >>

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Database Instance: ora10g.sagecomputing.com.au > Top Activity > SQL Details: a9cdbpjzw67n Logged in As SYS

## SQL Details: a9cdbpjzw67n

Switch to SQL ID  Go View Data Real Time: Manual Refresh Refresh Schedule SQL Tuning Advisor

### Text

```
SELECT count(b.comments)
FROM organisations o, events_large e, 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...
```

### Details

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

Statistics Activity **Plan** Tuning Information

Data Source Cursor Cache Capture Time 3/10/2006 14:31:25 Parsing Schema TRAIN Optimizer Mode ALL\_ROWS

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

Operation	Object	Object Type	Order	Rows	Size (KB)	Cost	Time (sec)	CPU Cost	I/O Cost
▼ SELECT STATEMENT			10			8068			
▼ SORT AGGREGATE			9	1	0.080				
▼ HASH JOIN			8	45518	3,644.996	8068	97	2667449430	7886
▼ HASH JOIN			6	7081	435.647	215	3	51083998	212
▼ MERGE JOIN CARTESIAN			4	1	0.045	4	1	20483	4
TABLE ACCESS FULL	ORGANISATIONS	TABLE	1	1	0.025	2	1	10001	2
▼ BUFFER SORT			3	1	0.020	2	1	10481	2
TABLE ACCESS FULL	RESOURCES	TABLE	2	1	0.020	2	1	10481	2
TABLE ACCESS FULL	EVENTS_LARGE	TABLE	5	42484	705.301	211	3	39480481	208
TABLE ACCESS FULL	BOOKINGS_LARGE	TABLE	7	5751669	106,720.421	7813	94	2032801898	7674

Show Explain Rewrite

Statistics Activity **Plan** Tuning Information

Oracle Enterprise Manager (SYS) - Active Sessions Waiting: User I/O - Microsoft Internet Explorer

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Search

Favorites

Address

http://sage4.sagecomputing.com.au:5500/em/console/database/instance/sqltune?event=tunesql&target=ora10g.sagecomputing.com.au&type=oracle\_database&sql\_id=a9cdbpj

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Check

Settings

Norton Internet Security

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ORACLE Enterprise Manager 10g

Database Control

SetupPreferencesHelpLogout

Database

Database Instance: ora10g.sagecomputing.com.au

Schedule Advisor

Logged in As SYS

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

STATEMENT1

Description

SQL Statements

SQL Text

SELECT count(b.comments) FROM organisations o, events\_large e, 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 = 'Aust...

Parsing Schema

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

3/10/2006

(example: 3/10/2006)

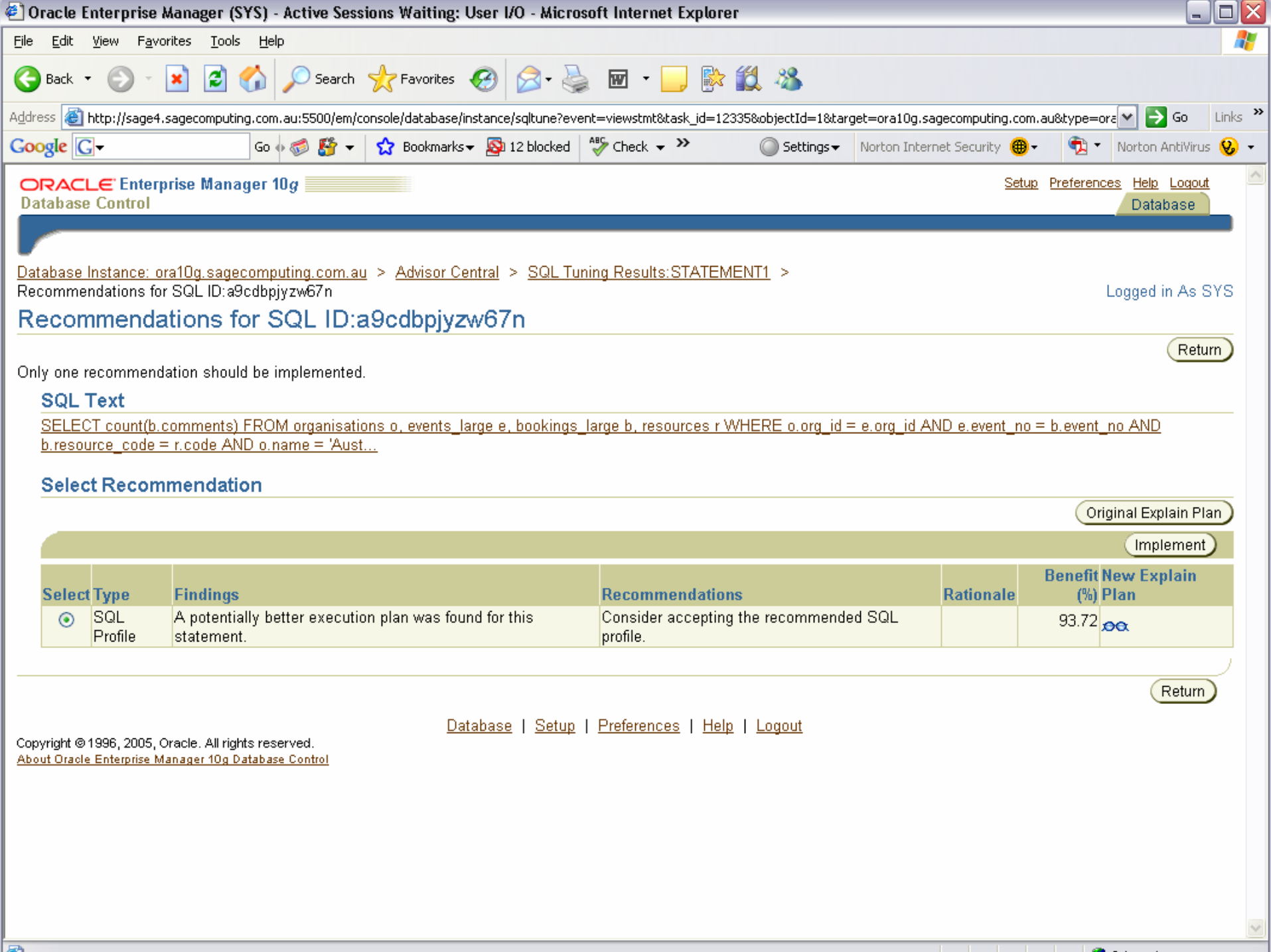
Time

2

33

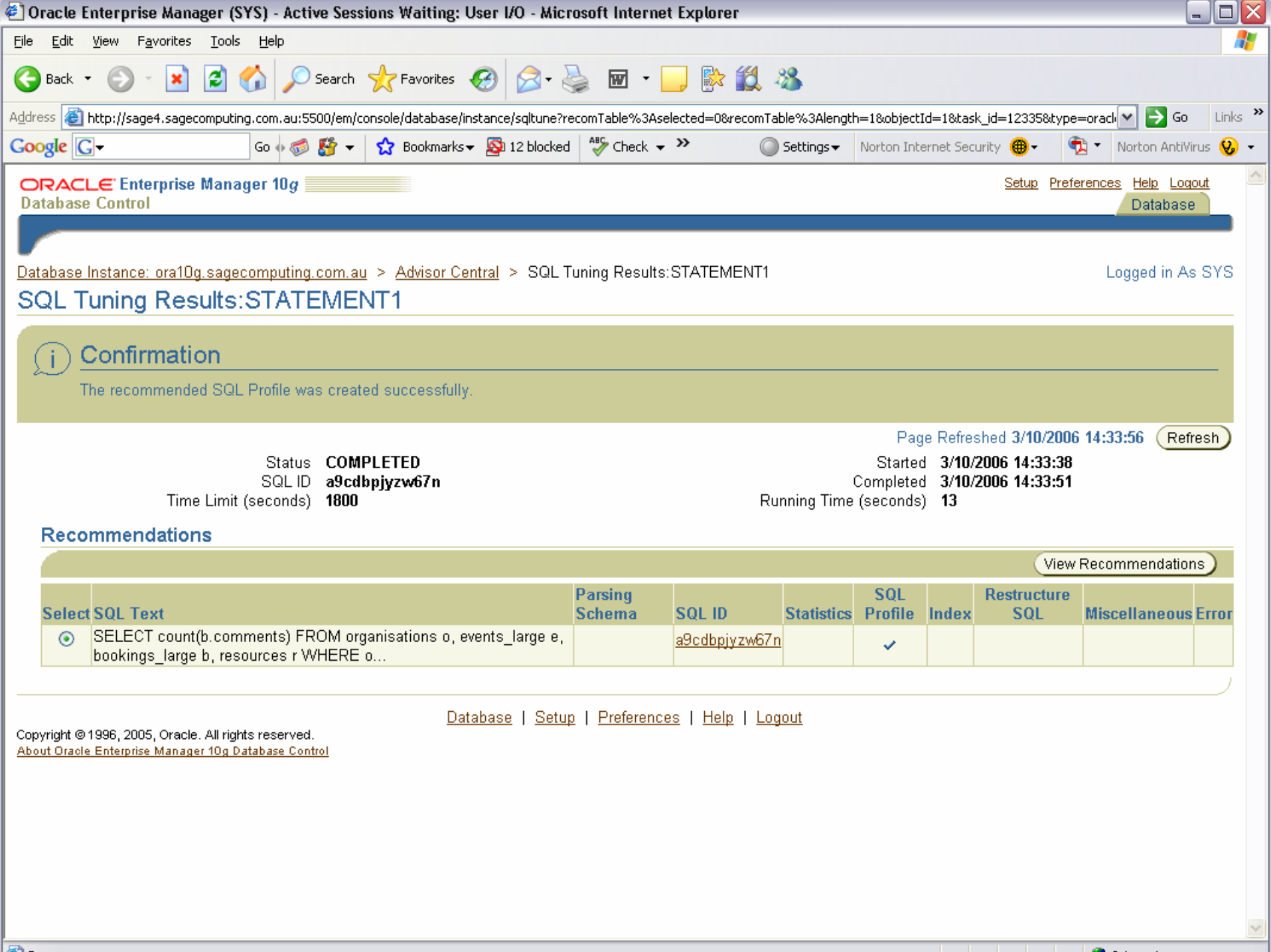
00

AMPM



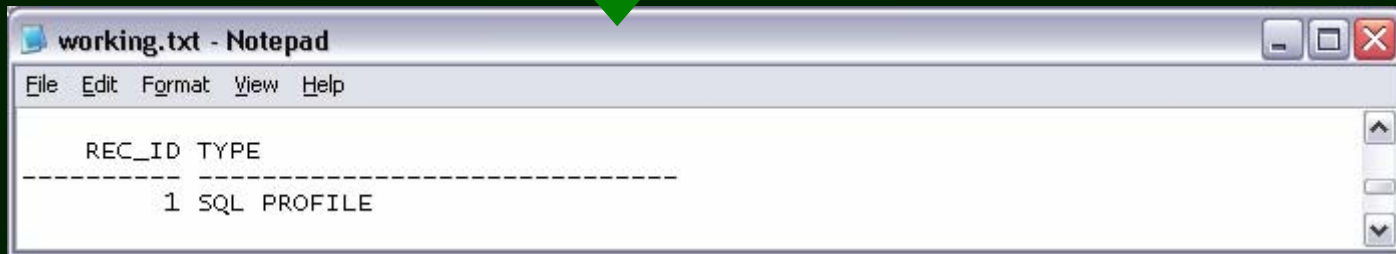
## New Explain Plan

New Explain Plan With SQL Profile							Original Explain Plan						
The following is the new explain plan for the SQL statement being tuned. The cost has been adjusted by the SQL Tuning Advisor to reflect the recommendation.							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.						
<a href="#">Expand All</a>   <a href="#">Collapse All</a>							<a href="#">Expand All</a>   <a href="#">Collapse All</a>						
Operation	Line ID	Object	Object Type	Order	Rows	Size (KB)	Operation	Line ID	Object	Object Type	Order	Rows	Size
SELECT STATEMENT	0			11	1	0.080	SELECT STATEMENT	0			10	1	0
SORT AGGREGATE	1			10	1	0.080	SORT AGGREGATE	1			9	1	0
NESTED LOOPS	2			9	15	1.201	HASH JOIN	2			8	30	2
NESTED LOOPS	3			6	132	7.992	HASH JOIN	3			6	5	0
HASH JOIN	4			3	5	0.210	MERGE JOIN CARTESIAN	4			4	1	0
TABLE ACCESS FULL	5	ORGANISATIONS	TABLE	1	1	0.025	TABLE ACCESS FULL	5	ORGANISATIONS	TABLE	1	1	0
TABLE ACCESS FULL	6	EVENTS_LARGE	TABLE	2	42484	705.301	BUFFER SORT	6			3	1	0
TABLE ACCESS BY INDEX ROWID	7	BOOKINGS_LARGE	TABLE	5	58	1.076	TABLE ACCESS FULL	7	RESOURCES	TABLE	2	1	0
INDEX RANGE SCAN	8	BK_EVT2	INDEX	4	58		TABLE ACCESS FULL	8	EVENTS_LARGE	TABLE	5	42484	705
TABLE	9	RESOURCES	TABLE	8	1	0.020	TABLE ACCESS FULL	9	BOOKINGS_LARGE	TABLE	7	5751669	106,720



# What Does the SQL Profile Do

```
SELECT rec_id, type  
FROM dba_advisor_recommendations  
WHERE task_name = 'STATEMENT1';
```

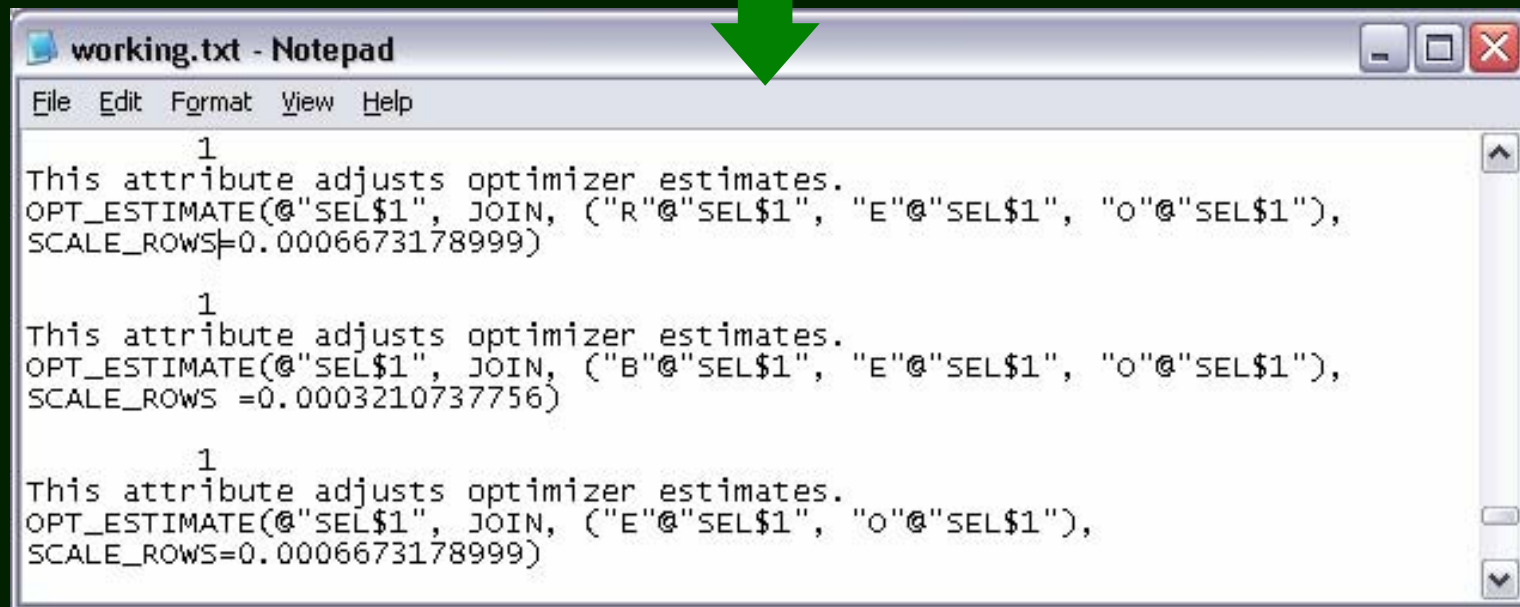
A screenshot of a Notepad window titled "working.txt - Notepad". The window contains the following text:

```
REC_ID TYPE  
-----  
1 SQL PROFILE
```



# What Does the SQL Profile Do

```
SELECT rec_id, message, attr1  
FROM dba_advisor_rationale  
WHERE task_name = 'STATEMENT1';
```



```
working.txt - Notepad  
File Edit Format View Help  
  
1  
This attribute adjusts optimizer estimates.  
OPT_ESTIMATE(@"SEL$1", JOIN, ("R"@"SEL$1", "E"@"SEL$1", "O"@"SEL$1"),  
SCALE_ROWS=0.0006673178999)  
  
1  
This attribute adjusts optimizer estimates.  
OPT_ESTIMATE(@"SEL$1", JOIN, ("B"@"SEL$1", "E"@"SEL$1", "O"@"SEL$1"),  
SCALE_ROWS =0.0003210737756)  
  
1  
This attribute adjusts optimizer estimates.  
OPT_ESTIMATE(@"SEL$1", JOIN, ("E"@"SEL$1", "O"@"SEL$1"),  
SCALE_ROWS=0.0006673178999)
```

Oracle Enterprise Manager (SYS) - Active Sessions Waiting: User I/O - Microsoft Internet Explorer

FileEditViewFavoritesToolsHelp

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Address

http://sage4.sagecomputing.com.au:5500/em/console/database/instance/sqlDetail?event=doLoad&target=ora10g.sagecomputing.com.au&type=oracle\_database&sql\_id=a9cdbp

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ORACLE Enterprise Manager 10g

Database Control

SetupPreferencesHelpLogout

Database

Database Instance: ora10g.sagecomputing.com.au > Top Activity > SQL Details: a9cdbpjyzw67n

Logged in As SYS

SQL Details: a9cdbpjyzw67n

Switch to SQL IDGo

View Data

Real Time: Manual Refresh

Refresh

Schedule SQL Tuning Advisor

Text

```
SELECT count(b.comments)
FROM organisations o, events_large e, 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...
```

Details

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

3475373946

StatisticsActivityPlan

Tuning Information

SQL Profiles and Outlines

A SQL Profile contains additional statistics of this SQL statement for the query optimizer to generate a better execution plan. An outline contains hints for this SQL statement for the query optimizer to generate a better execution plan.

Change Category

Delete

Disable/Enable

Select	Name	Type	Category	Status	Created
	SYS_SQLPROF_014383385c2e0000	SQL Profile	DEFAULT	ENABLED	3/10/2006 14:34:31

SQL Tuning History

The following SQL tuning tasks provide the recommendations to tune this SQL statement.

Advisor Task Name	Advisor Task Owner	Task Completion
STATEMENT1	SYS	3/10/2006 14:33:51

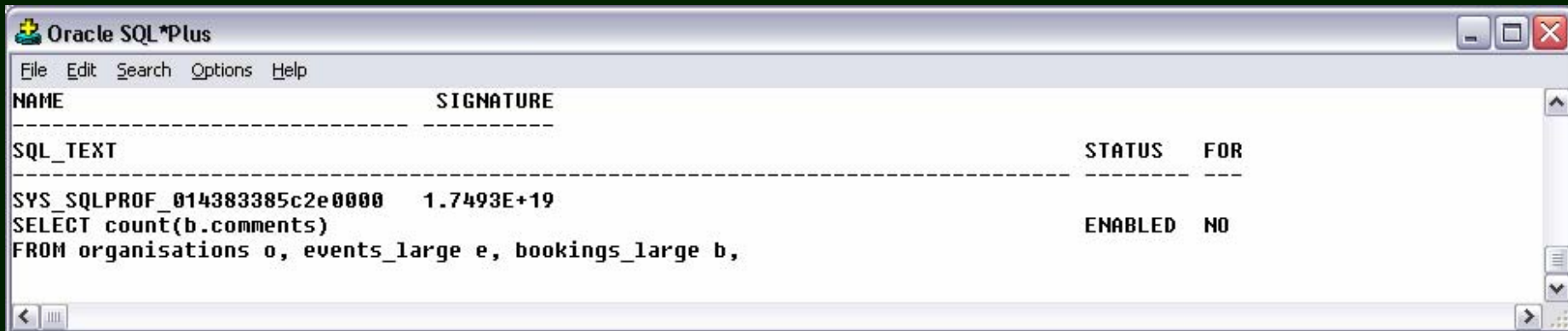
StatisticsActivityPlan

Tuning Information

Schedule SQL Tuning Advisor

# Identify the SQL Profile

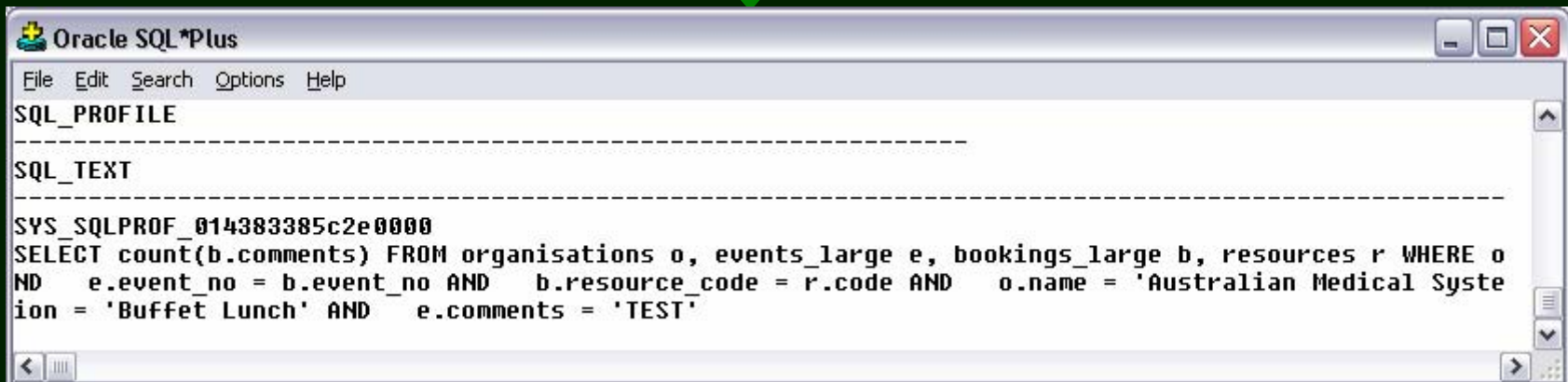
```
SELECT name, signature, sql_text, status, force_matching  
FROM dba_sql_profiles
```

A screenshot of the Oracle SQL\*Plus command-line interface. The window title is "Oracle SQL\*Plus". The menu bar includes "File", "Edit", "Search", "Options", and "Help". The main display area shows the results of the SQL query from the previous block. It is formatted as a table with columns: NAME, SIGNATURE, SQL\_TEXT, STATUS, and FOR. The data row shows a profile named "SYS\_SQLPROF\_014383385c2e0000" with signature "1.7493E+19", the SQL text "SELECT count(b.comments) FROM organisations o, events\_large e, bookings\_large b,", status "ENABLED", and force matching "NO".

NAME	SIGNATURE	SQL_TEXT	STATUS	FOR
SYS_SQLPROF_014383385c2e0000	1.7493E+19	SELECT count(b.comments) FROM organisations o, events_large e, bookings_large b,	ENABLED	NO

# Check the Profile is Used

```
SELECT sql_profile, sql_text  
FROM v$sql  
WHERE sql_profile is not null
```

A screenshot of the Oracle SQL\*Plus command-line interface. The window title is "Oracle SQL\*Plus". The menu bar includes "File", "Edit", "Search", "Options", and "Help". The output shows the results of the SQL query, with columns "SQL\_PROFILE" and "SQL\_TEXT". The first row shows a profile name and a complex SQL query.

```
Oracle SQL*Plus  
File Edit Search Options Help  
SQL_PROFILE  
-----  
SQL_TEXT  
-----  
SYS_SQLPROF_014383385c2e0000  
SELECT count(b.comments) FROM organisations o, events_large e, bookings_large b, resources r WHERE o  
AND e.event_no = b.event_no AND b.resource_code = r.code AND o.name = 'Australian Medical System  
ion = 'Buffet Lunch' AND e.comments = 'TEST'
```

# How a SQL Profile Works

- ❖ Calculates Signature for statement
- ❖ Strips spaces
- ❖ Converts to upper case

```
SELECT *  
FROM sql$
```



working.txt - Notepad

File Edit Format View Help

SIGNATURE	NHASH	SQLAREA_HASH	LAST_USED	INUSE_FEATURES	FLAGS	MODIFIED
-----						
INCARNATION	SPARE1					
-----						
SPARE2						
-----						
-						
1.7493E+19	4207189237	1060898468	03-OCT-06	1	0	
03-OCT-06						
	0					

# How a SQL Profile Works

- Profile attributes contain optimiser information

```
SELECT *
FROM sqlprof$
```



Oracle SQL\*Plus

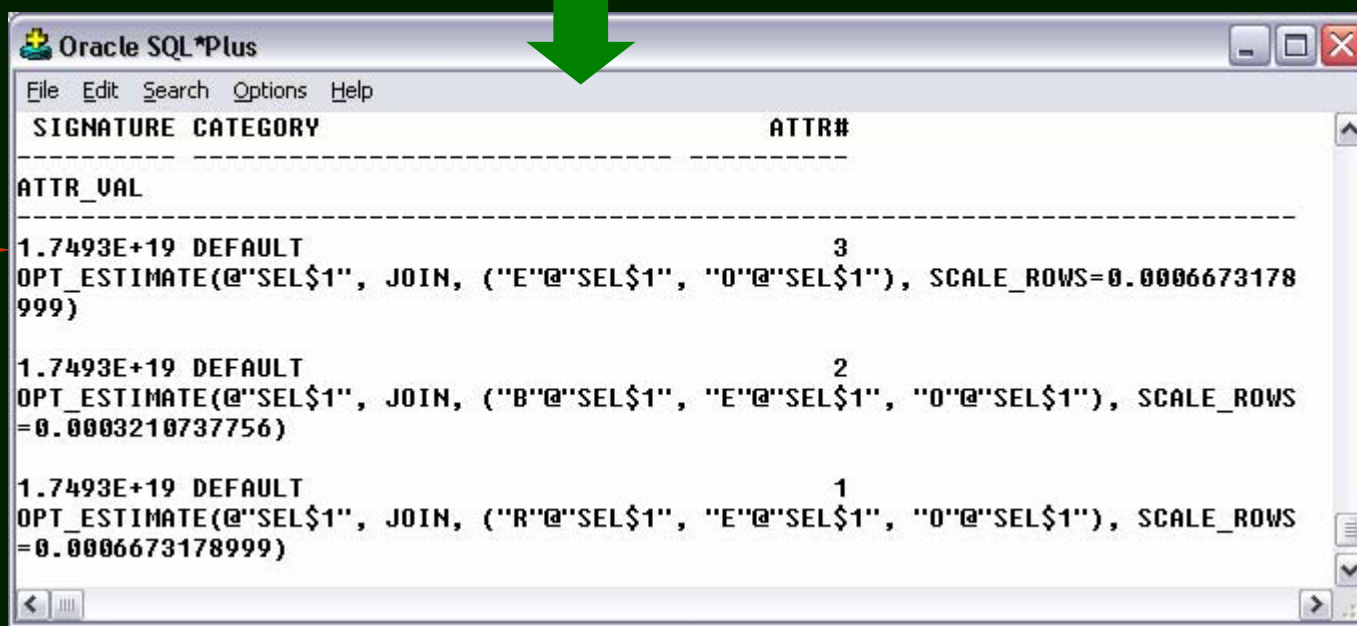
File Edit Search Options Help

SP_NAME	SIGNATURE		CATEGORY			
NHASH	CREATED	LAST_MODI	TYPE	STATUS	FLAGS	SPARE1
SPARE2						
SYS_SQLPROF_014383385c2e0000	1.7493E+19		DEFAULT			
4207189237	03-OCT-06	03-OCT-06	1	1	0	

# How a SQL Profile Works

- Profile attributes contain optimiser information

```
SELECT *
FROM sqlprof$attr
```



SIGNATURE	CATEGORY	ATTR#
1.7493E+19	DEFAULT	3
OPT_ESTIMATE(@"SEL\$1", JOIN, ("E"@"SEL\$1", "O"@"SEL\$1"), SCALE_ROWS=0.0006673178999)		
1.7493E+19	DEFAULT	2
OPT_ESTIMATE(@"SEL\$1", JOIN, ("B"@"SEL\$1", "E"@"SEL\$1", "O"@"SEL\$1"), SCALE_ROWS=0.0003210737756)		
1.7493E+19	DEFAULT	1
OPT_ESTIMATE(@"SEL\$1", JOIN, ("R"@"SEL\$1", "E"@"SEL\$1", "O"@"SEL\$1"), SCALE_ROWS=0.0006673178999)		

# Formatted Trace File

```

trace2.lst - Notepad
File Edit Format View Help

SELECT signature, nhash, sqlarea_hash, last_used, inuse_features, flags,
       modified, incarnation FROM sql$ WHERE signature = :1

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      1          0.00      0.01          1          2          0          1
-----
total      3          0.00      0.02          1          2          0          1

Rows      Row Source Operation
-----
1  TABLE ACCESS BY INDEX ROWID SQL$ (cr=2 pr=1 pw=0 time=11620 us)
1  INDEX UNIQUE SCAN I_SQL$SIGNATURE (cr=1 pr=1 pw=0 time=11598 us)(object id 457)

*****

SELECT category
FROM sqlprof$ WHERE signature = :1

call      count      cpu      elapsed      disk      query      current      rows
-----
Parse      1          0.00      0.00          0          0          0          0
Execute    1          0.01      0.00          0          0          0          0
Fetch      2          0.00      0.01          1          1          0          1
-----
total      4          0.01      0.02          1          1          0          1

Rows      Row Source Operation
-----
1  INDEX RANGE SCAN I_SQLPROF$ (cr=1 pr=1 pw=0 time=19240 us)(object id 463)

*****

SELECT sp_name, nhash, created, last_modified, type, status, flags
FROM sqlprof$ WHERE signature = :1 AND category = :2

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      1          0.00      0.00          1          2          0          1
-----
total      3          0.01      0.00          1          2          0          1

Rows      Row Source Operation
-----
1  TABLE ACCESS BY INDEX ROWID SQLPROF$ (cr=2 pr=1 pw=0 time=550 us)
1  INDEX UNIQUE SCAN I_SQLPROF$ (cr=1 pr=0 pw=0 time=34 us)(object id 463)

*****

SELECT attr#, attr_val
FROM
  sqlprof$attr WHERE signature = :1 and category = :2 ORDER BY attr# DESC

```



# SQL Profile - Example

Both of these statements use the same profile

```
SELECT sql_text, sql_id, sql_profile, exact_matching_signature,
force_matching_signature
FROM v$sql WHERE upper(sql_text) like '%BOOKINGS%'
```



SQL_ID	SQL_PROFILE	EXACT_MATCHING_SIGNATURE	FORCE_MATCHING_SIGNATURE
a9cdbpjyzw67n	SYS_SQLPROF_014383385c2e0000	1.7493E+19	1.1958E+19
dtrvb98yjvc2y	SYS_SQLPROF_014383385c2e0000	1.7493E+19	1.1958E+19

# Handling Literals

◆ Use `force_match` to make literals behave like bind variables

**BEGIN**

```
dbms_sqltune.accept_sql_profile(task_name=>'STATEMENT1',
force_match=>TRUE);
```

**END;**

Oracle SQL\*Plus

File Edit Search Options Help

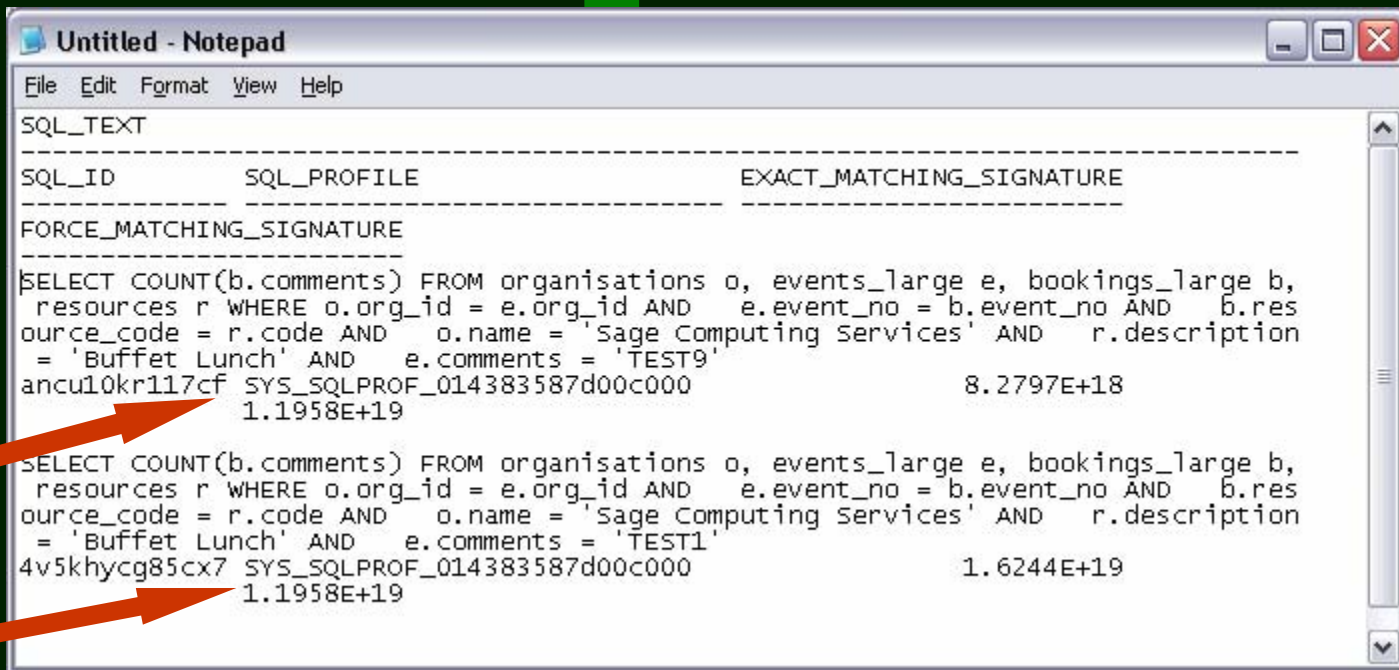
SP_NAME	SIGNATURE		CATEGORY			
NHASH	CREATED	LAST_MODI	TYPE	STATUS	FLAGS	SPARE1
SPARE2						
SYS_SQLPROF_014383385c2e0000	1.7493E+19	DEFAULT				
4207189237 03-OCT-06 03-OCT-06	1	1	0			
SYS_SQLPROF_014383587d00c000	1.1958E+19	DEFAULT				
3678607273 03-OCT-06 03-OCT-06	1	1	0			

m.au

# Handling Literals

◆ Both of these statements use the same profile

```
SELECT sql_text, sql_id, sql_profile, exact_matching_signature,
force_matching_signature
FROM v$sql WHERE upper(sql_text) like '%BOOKINGS%'
```



```
SQL_ID          SQL_PROFILE          EXACT_MATCHING_SIGNATURE
-----
FORCE_MATCHING_SIGNATURE
-----
SELECT COUNT(b.comments) FROM organisations o, events_large e, bookings_large b,
resources r WHERE o.org_id = e.org_id AND e.event_no = b.event_no AND b.res
ource_code = r.code AND o.name = 'Sage Computing Services' AND r.description
= 'Buffet Lunch' AND e.comments = 'TEST9'
ancu10kr117cf SYS_SQLPROF_014383587d00c000      8.2797E+18
1.1958E+19
SELECT COUNT(b.comments) FROM organisations o, events_large e, bookings_large b,
resources r WHERE o.org_id = e.org_id AND e.event_no = b.event_no AND b.res
ource_code = r.code AND o.name = 'Sage Computing Services' AND r.description
= 'Buffet Lunch' AND e.comments = 'TEST1'
4v5khycg85cx7 SYS_SQLPROF_014383587d00c000      1.6244E+19
1.1958E+19
```



# SQL Profiles - Categories

- ◆ Accept profile in a category to test  
DBMS\_SQLTUNE.ACCEPT\_SQL\_PROFILE (  
task\_name => 'Task\_Name',  
category => 'TEST\_CATEGORY')
- ◆ Set the category for your session  
ALTER SESSION SET  
SQLTUNE\_CATEGORY='TEST\_CATEGORY'
- ◆ Test the code
- ◆ Reset the category  
DBMS\_SQLTUNE.ALTER\_SQL\_PROFILE (  
name => 'SQL\_Profile\_Name',  
attribute\_name => 'category', value => 'DEFAULT');

# SQL Profiles – Export/Impart

## ◆ Use staging table

```
dbms_sqltune.create_stgtab_sqlprof(  
table_name=>'PROFILE_TEMP');
```

## ◆ Add profile to staging table

```
dbms_sqltune.pack_stgtab_sqlprof (  
profile_name => 'PROFILE1',  
staging_table_name => 'PROFILE_TEMP');
```

## ◆ Data pump

```
dbms_sqltune.unpack_stgtab_sqlprof(  
staging_table_name => 'PROFILE_TEMP'  
,REPLACE=>TRUE);
```



# User Level

- ◆ You are < 10g and cannot use a SQL Profile
- ◆ Your application uses literals and you don't use cursor sharing so you can't use an Outline
- ◆ Change init parameters for a session



# User Level

# DEMO



# User Level

- ◆ **Set cursor sharing for a session and use an Outline**
  - ◆ **note this does not work for SQL in PL/SQL or for some other statements**
  - ◆ **You cannot use CREATE OUTLINE you must use ALTER SESSION SET  
CREATE\_STORED\_OUTLINE = CAT**





# User Level

# DEMO



# Managing 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**
- ◆ First value = minority value → plan uses index
- ◆ First value = majority value → plan uses full scan



# Managing Bind Peeking

- ◆ Flush shared pool in between executions  
or
- ◆ Don't have histogram – it will probably full scan,  
better than bad index use  
or
- ◆ Create profile/outline that uses index in CAT1
- ◆ Create profile/outline that uses full scan in CAT2
- ◆ Use different users to execute the majority and  
minority case
- ◆ Set the `SQLTUNE_CATEGORY` or enable outline  
category in a logon trigger

# System Level

- ◆ You have overall application problems with multiple statements
- ◆ If you have different types of workloads make change for a period of time and then revert
- ◆ You can change the following
  - ◆ Init parameters
  - ◆ System statistics
  - ◆ Statistics
- ◆ E.g. change the value of  
**OPTIMZER\_INDEX\_COST\_ADJ to 5**  
**OPTIMZER\_INDEX\_CACHING to 100**



# System Statistics

## WORKLOAD

- ◆ SREADTIM Avg time (in milliseconds) to read a single block
- ◆ MREADTIM Avg time (in milliseconds) for a multiblock read
- ◆ CPUSPEED Avg CPU cycles per second
- ◆ MBRC Avg number of blocks read in a multiblock read
- ◆ MAXTHR Maximum IO throughput (for parallel queries)
- ◆ SLAVETHR Maximum slave throughput (for parallel queries)

## NON WORKLOAD

- ◆ CPUSPEEDNW Avg CPU cycles per second
- ◆ IOSEEKTIM Seek time + latency time + OS overhead time
- ◆ IOTFRSPEED Time for a single read request



# System Statistics

```
SELECT *  
FROM sys.aux_stats$
```

SNAME	PNAME	PVAL1	PVAL2
SYSSTATS_INFO	STATUS		COMPLETED
SYSSTATS_INFO	DSTART		05-14-2005 10:25
SYSSTATS_INFO	DSTOP		05-14-2005 16:39
SYSSTATS_INFO	FLAGS	1	
SYSSTATS_MAIN	CPUSPEEDNW	904.86697	
SYSSTATS_MAIN	IOSEEKTIM	10	
SYSSTATS_MAIN	IOTFRSPEED	4096	
SYSSTATS_MAIN	SREADTIM	18.474	
SYSSTATS_MAIN	MREADTIM	11.958	
SYSSTATS_MAIN	CPUSPEED	1264	
SYSSTATS_MAIN	MBRC	7	
SYSSTATS_MAIN	MAXTHR	610304	
SYSSTATS_MAIN	SLAVETHR		

13 rows selected.



# System Statistics

- ◆ **MBRC used rather than `db_file_multiblock_read_count`**
- ◆ **If `db_file_multiblock_read_count` > MBRC used to derive `_db_file_optimizer_read_count`**
- ◆ **If `db_file_multiblock_read_count` <= MBRC `_db_file_optimizer_read_count` is default**
- ◆ **If no workload stats `db_file_multiblock_read_count` used to set `_db_file_optimizer_read_count` and affects optimizer decision**

# System Statistics

## ◆ Gather system statistics for different workloads

```
dbms_stats.gather_system_stats(gathering_mode=>'start');  
dbms_stats.gather_system_stats(gathering_mode=>'stop');
```

## ◆ Gather Import specific stats for a particular job

```
dbms_stats.export_system_stats  
dbms_stats.import_system_stats
```

## ◆ Set specific stats for a particular job

```
dbms_stats.set_system_stats
```



# Object Statistics

- ◆ Find ones that work and lock them
- ◆ Particularly for objects with variable numbers/patterns of rows e.g interfaces
- ◆ `DBMS_STATS.SET_TABLE_STATS`
- ◆ Set table, column or index stats manually
- ◆ Regathering will overwrite
- ◆ Freezing fixes stats – won't respond to changes
- ◆ Use for jobs where data is very volatile and a fixed result gives good results



# User Level

# DEMO



# Thank You For Your Attention

## Any Questions?

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