THE AUSTRALIAN ORACLE USER GROUP IN ASSOCIATION WITH INTEL PRESENTS

masterclass series

CUT TO THE CHASE USING TIPS AND PRACTICAL EXAMPLES FROM EXPERT USERS

☑ FOR DEVELOPERS ☑ FOR DATABASE ADMINISTRATORS

Performance Tuning in Oracle 10g Part 1

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

Penny Cookson - Managing Director

Agenda

- Identifying the problem
- The Automatic Workload Repository
- Identifying high resource SQL
- Resolving SQL problems
- SQL Tuning Advisor
- SQL Access Advisor
- System Statistics
- Using wait events – Tuning I/O
- Common tuning problems – examples
- Using ADDM

Identifying the problem

Approach

- Identify tuning goals
- Investigate problem
- Consider alternative solutions
- Implement chosen solution
- Test against goals

Identifying the Problem

- Possible problems
  - Application issues - Contention
  - High resource SQL – This is always the most likely
  - Database configuration
  - OS configuration
- Tools
  - Wait events
  - the V$ tables
  - Tracing
  - Enterprise Manager

Identifying the Problem

- When does it happen
  - Current session
  - At specific times
  - All the time
- What is the scope of the problem
  - Single user
  - Particular time/job
  - Overall performance
- Has anything changed

Problems with a Current Session

- Find waiting sessions

```
SELECT    sid, serial# , username, event,
          blocking_session, seconds_in_wait, sql_id
FROM      v$session
WHERE     state = 'WAITING'
AND       wait_class != 'Idle'
```

```
 SID SERIAL# USERNAME   EVENT                         BLOCKING_SESSION SECONDS_IN_WAIT SQL_ID
---- ------- ------- ------------------------------ ---------------- --------------- -------------
 161     573 TRAIN   enq: TX - row lock contention              130            1207 g3xry817zpwk3
```

Problems with a Current Session

- Find the SQL the session is running

```
SELECT    sql_text
 FROM     v$sql
 WHERE    sql_id = 'g3xry817zpwk3'
```

```
SQL_TEXT
----------------------------------------------------------------
UPDATE events set start_date = start_date+1 WHERE event_no = :b1
```

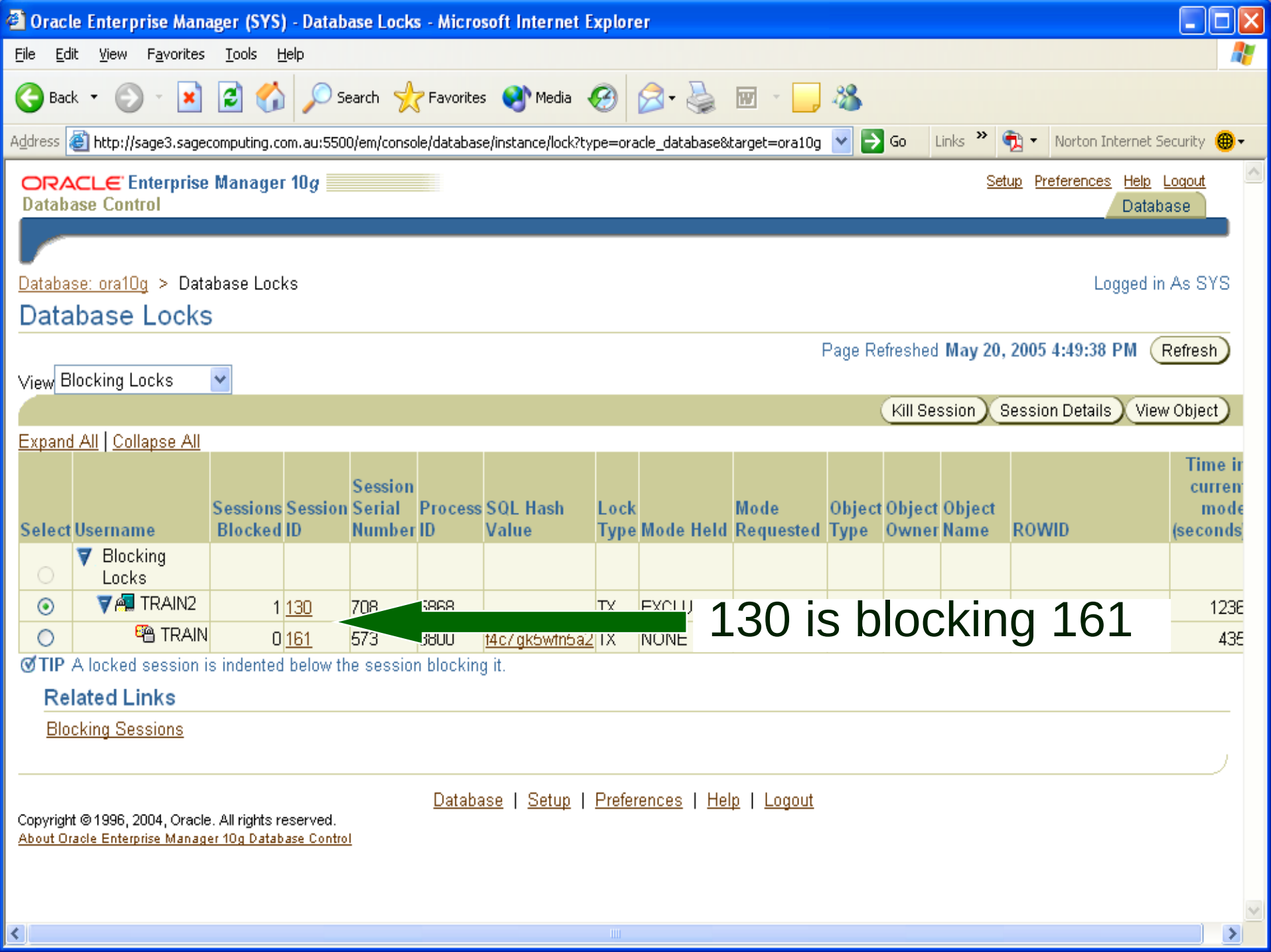
- We can find the SQL the blocker is running but it may not be the blocking statement

Find Bind Variables

```
SELECT   value_string
FROM     v$sql_bind_capture
WHERE    sql_id='g3xry817zpwk3'
```

```
 VALUE_STRING
----------------------------
100
```

- Bind capture is disabled when STATISTICS_LEVEL =BASIC


Oracle Enterprise Manager (SYS) - Database Locks - Microsoft Internet Explorer
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Database Control
Setup Preferences Help Logout
Database
Database: ora10g > Database Locks
Logged in As SYS
Database Locks
Page Refreshed May 20, 2005 4:49:38 PM
Refresh
View Blocking Locks
Kill Session Session Details View Object
Expand All | Collapse All
Select Username Sessions Blocked Session ID Session Serial Number Process ID SQL Hash Value Lock Type Mode Held Mode Requested Object Type Object Owner Object Name ROWID Time in current mode (seconds)
Blocking Locks
TRAIN2 1 130 708 3868 TX EXCLU 123E
TRAIN 0 161 573 3800 t4c7gk5wfn5a2 TX NONE 435
130 is blocking 161
TIP A locked session is indented below the session blocking it.
Related Links
Blocking Sessions
Database | Setup | Preferences | Help | Logout
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About Oracle Enterprise Manager 10g Database Control

SQL Details: f4c7gk5wfn5a2

Run SQL Tuning Advisor

SQL Text

```
UPDATE events
   SET start_date = start_date + 1
   WHERE event_no = :b1
```

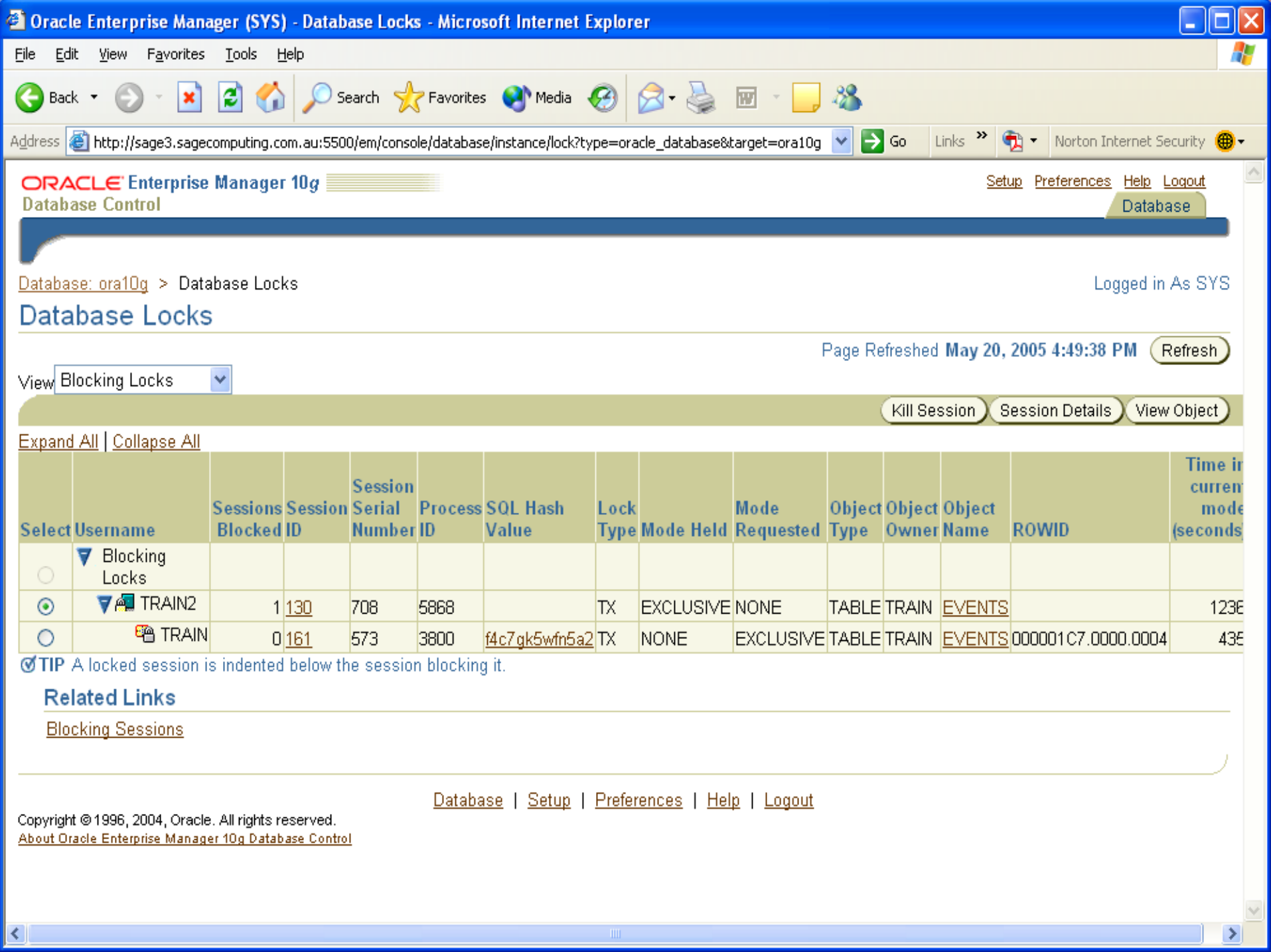
Execution Plan | Current Statistics | Execution History | Tuning History

Collected From Target **May 20, 2005 4:52:36 PM**

Data Source **Cursor Cache** Plan Hash Value **3373917511** Module **SQL*Plus**
Capture Time **May 20, 2005 4:52:37 PM** 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
UPDATE STATEMENT			3			1				
UPDATE			2							
INDEX UNIQUE SCAN	TRAIN.EVT_PK	INDEX (UNIQUE)	1	1	0.012	0		7321	0	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Database Control
Setup Preferences Help Logout
Database
Database: ora10g > Database Locks
Logged in As SYS
Database Locks
Page Refreshed May 20, 2005 4:49:38 PM
Refresh
View Blocking Locks
Kill Session Session Details View Object
Expand All | Collapse All
Select Username Sessions Blocked Session ID Session Serial Number Process ID SQL Hash Value Lock Type Mode Held Mode Requested Object Type Object Owner Object Name ROWID Time in current mode (seconds)
Blocking Locks
TRAIN2 1 130 708 5868 TX EXCLUSIVE NONE TABLE TRAIN EVENTS 123
TRAIN 0 161 573 3800 f4c7gk5wfn5a2 TX NONE EXCLUSIVE TABLE TRAIN EVENTS 000001C7.0000.0004 435
TIP A locked session is indented below the session blocking it.
Related Links
Blocking Sessions
Database | Setup | Preferences | Help | Logout
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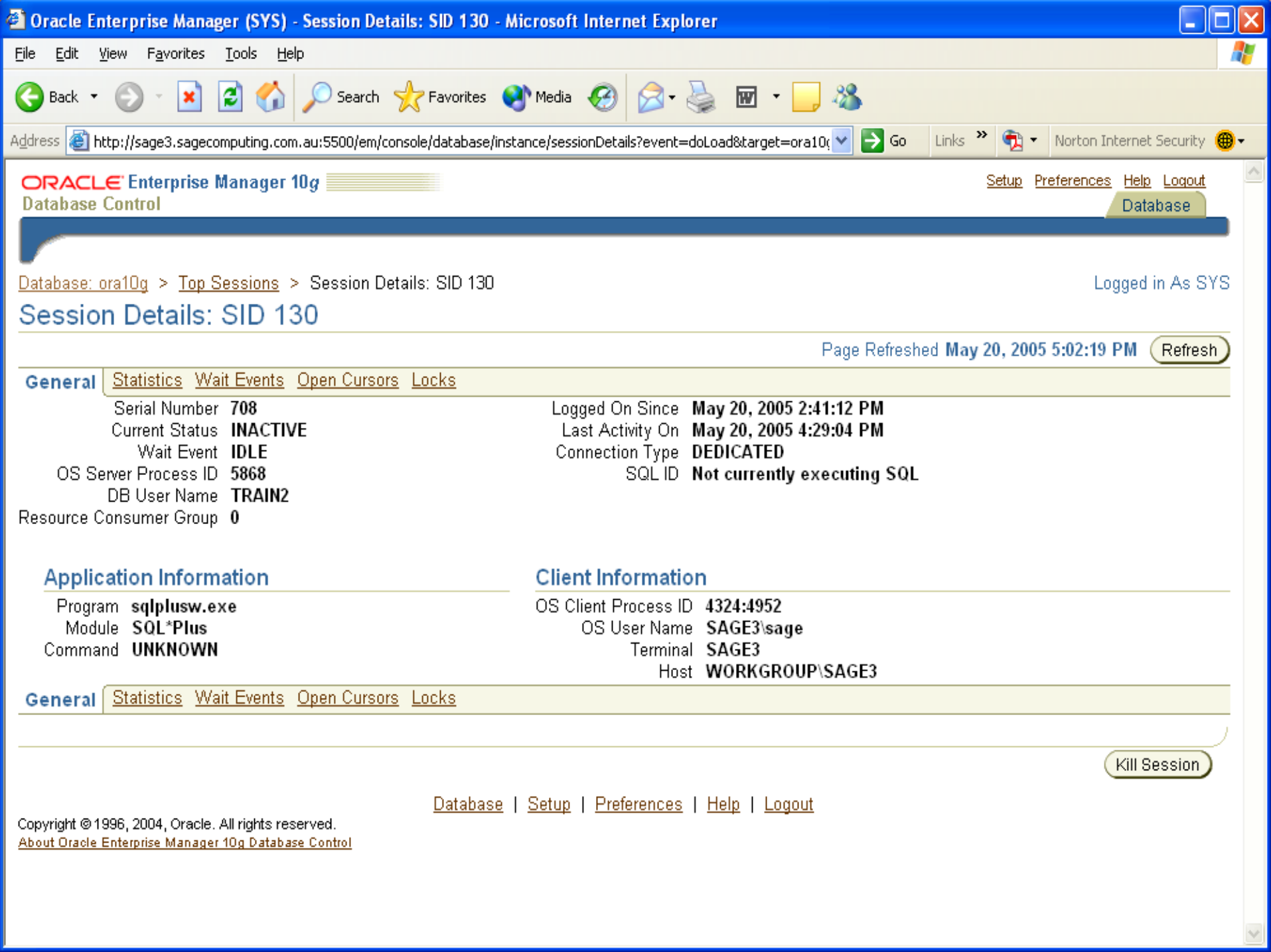
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ORACLE Enterprise Manager 10g
Database Control
Setup Preferences Help Logout
Database
Database: ora10g > Top Sessions > Session Details: SID 130
Logged in As SYS
Session Details: SID 130
Page Refreshed May 20, 2005 5:02:19 PM
Refresh
General Statistics Wait Events Open Cursors Locks
Serial Number 708
Current Status INACTIVE
Wait Event IDLE
OS Server Process ID 5868
DB User Name TRAIN2
Resource Consumer Group 0
Logged On Since May 20, 2005 2:41:12 PM
Last Activity On May 20, 2005 4:29:04 PM
Connection Type DEDICATED
SQL ID Not currently executing SQL
Application Information
Program sqlplusw.exe
Module SQL*Plus
Command UNKNOWN
Client Information
OS Client Process ID 4324:4952
OS User Name SAGE3\sage
Terminal SAGE3
Host WORKGROUP\SAGE3
General Statistics Wait Events Open Cursors Locks
Kill Session
Database | Setup | Preferences | Help | Logout
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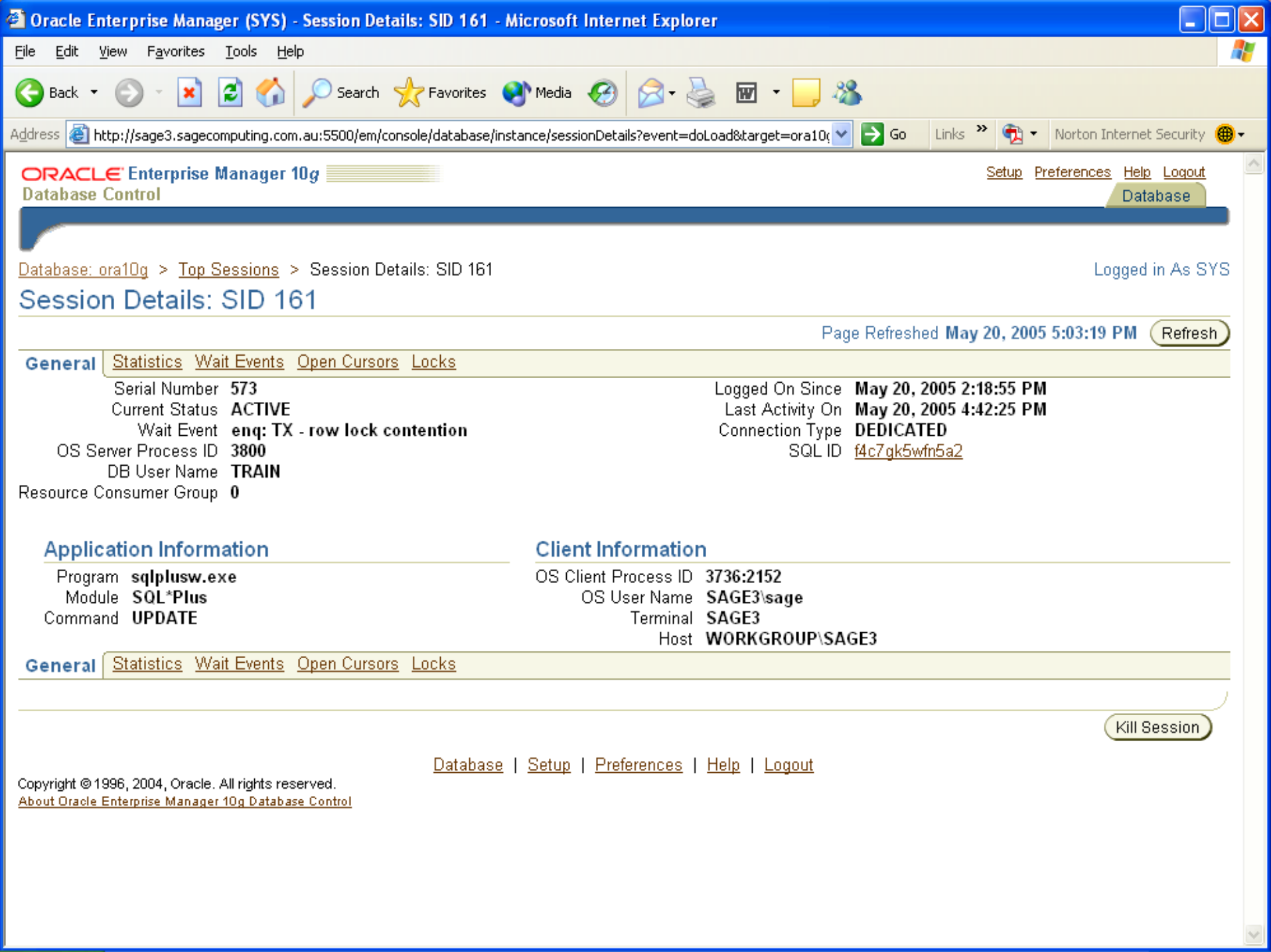
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Go Links Norton Internet Security
ORACLE Enterprise Manager 10g
Database Control
Setup Preferences Help Logout
Database
Database: ora10g > Top Sessions > Session Details: SID 161
Logged in As SYS
Session Details: SID 161
Page Refreshed May 20, 2005 5:03:19 PM
Refresh
General Statistics Wait Events Open Cursors Locks
Serial Number 573
Current Status ACTIVE
Wait Event enq: TX - row lock contention
OS Server Process ID 3800
DB User Name TRAIN
Resource Consumer Group 0
Logged On Since May 20, 2005 2:18:55 PM
Last Activity On May 20, 2005 4:42:25 PM
Connection Type DEDICATED
SQL ID f4c7gk5wfn5a2
Application Information
Program sqlplusw.exe
Module SQL*Plus
Command UPDATE
Client Information
OS Client Process ID 3736:2152
OS User Name SAGE3\sage
Terminal SAGE3
Host WORKGROUP\SAGE3
General Statistics Wait Events Open Cursors Locks
Kill Session
Database | Setup | Preferences | Help | Logout
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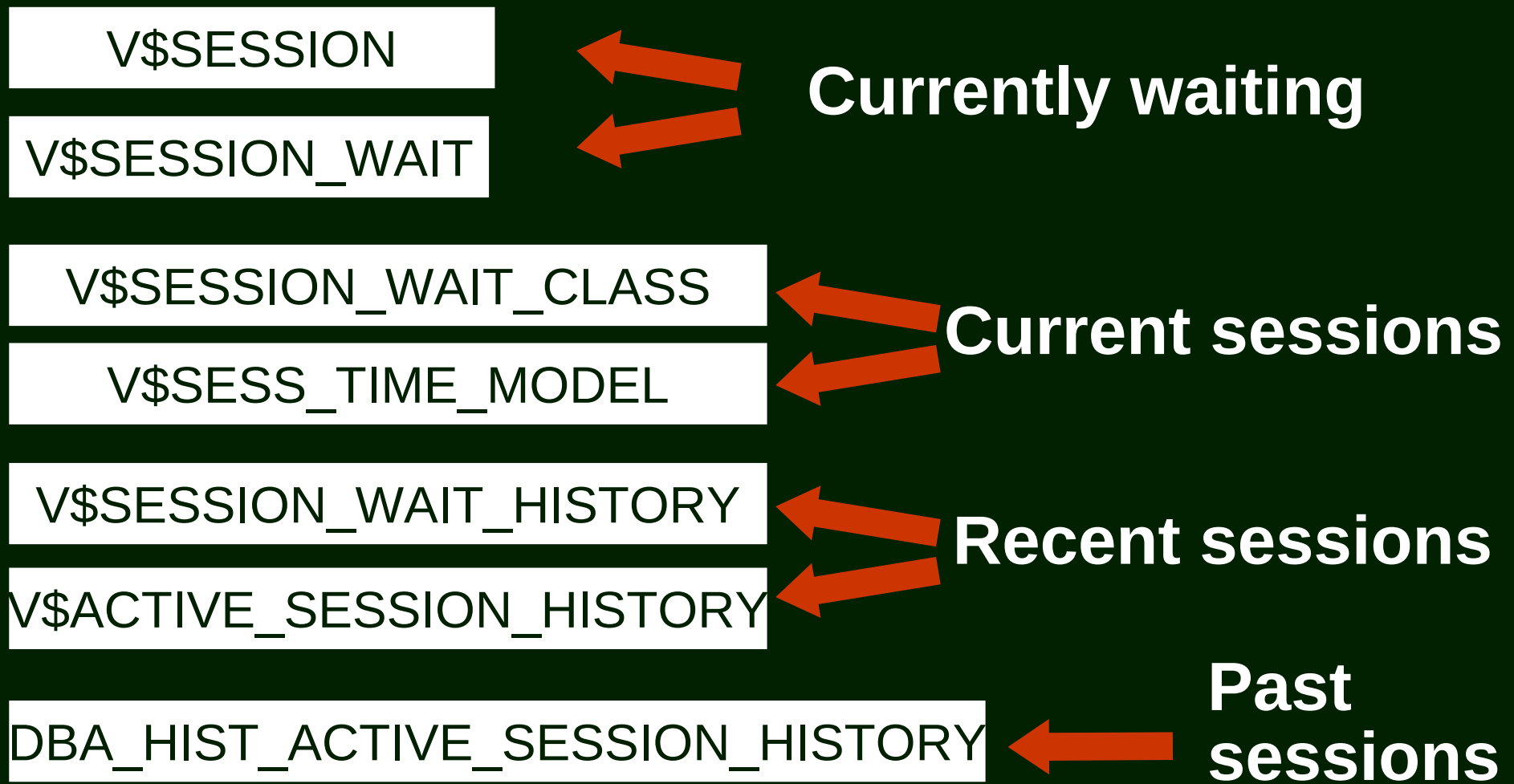
Session Problems



Current Session Problems

- If there is no current wait check the session's wait classes

```
SELECT    wait_class_id, wait_class#, wait_class,
          total_waits, time_waited
 FROM     v$session_wait_class
 WHERE     sid=161
```

WAIT_CLASS_ID	WAIT_CLASS#	WAIT_CLASS	TOTAL_WAITS	TIME_WAITED
4217450380	1	Application	210	62654
3386400367	5	Commit	3	0
2723168908	6	Idle	25	545088
2000153315	7	Network	31	0
1740759767	8	User I/O	11	10

Locking problem

Problems with a Current Session – Example 2

- Find waiting sessions

```
SELECT    sid, serial# , username, event,
          blocking_session, seconds_in_wait, sql_id
FROM      v$session
WHERE     state = 'WAITING'
AND       wait_class != 'Idle'
```

```
 SID SERIAL# USERNAME   EVENT                     BLOCKING_SESSION SECONDS_IN_WAIT SQL_ID
--- ------- ---------- ------------------------- ---------------- -------------- ------------
130     708 TRAIN2     db file scattered read                                  0 3s0z04m9qdusq
```

Current Session Problems

- Is this a one off event or a pattern

```
SELECT    wait_class_id, wait_class#, wait_class,
          total_waits, time_waited
 FROM     v$session_wait_class
 WHERE     sid=130
```

```
WAIT_CLASS# WAIT_CLASS           TOTAL_WAITS TIME_WAITED
----------- -------------------- ----------- -----------
          0 Other                        309         670
          1 Application                  318       74379
          2 Configuration               1233        9735
          4 Concurrency                   31           0
          5 Commit                       495         325
          6 Idle                         605      771174
          7 Network                      694           4
          8 User I/O                   21278       15526
          9 System I/O                  3099        4013
```

Current Session Problems

- Last 10 waits

```
SELECT  event#, event, wait_time, wait_count
FROM    v$session_wait_history
WHERE   sid = 130
```

EVENT#	EVENT	WAIT_TIME	WAIT_COUNT
294	db file sequential read	1	1
586	SQL*Net message to client	0	1
590	SQL*Net message from client	6	1
586	SQL*Net message to client	0	1
590	SQL*Net message from client	2	1
586	SQL*Net message to client	0	1
590	SQL*Net message from client	0	1
586	SQL*Net message to client	0	1
294	db file sequential read	0	1
294	db file sequential read	0	1

Recent Session Problems

- Active session history

```
SELECT    sample_time, event, wait_time, time_waited
FROM      v$active_session_history
WHERE     session_id = 130
AND       session_serial# = 708
ORDER BY sample_time
```

SAMPLE_TIME	EVENT	WAIT_TIME	TIME_WAITED
21-MAY-05 08.35.46.570 AM	control file sequential read	0	24076
21-MAY-05 08.35.47.601 AM	db file scattered read	117906	0
21-MAY-05 08.35.48.632 AM	db file scattered read	117734	0
21-MAY-05 08.35.49.663 AM	log file switch completion	0	278636
21-MAY-05 08.35.50.694 AM	db file sequential read	169	0
21-MAY-05 08.35.51.725 AM	db file scattered read	0	21938
21-MAY-05 08.35.52.757 AM	db file scattered read	0	71240
21-MAY-05 08.35.53.788 AM	db file sequential read	0	14740
21-MAY-05 08.35.54.819 AM	db file sequential read	186	0
21-MAY-05 08.35.55.850 AM	db file sequential read	0	140
21-MAY-05 08.36.26.785 AM	db file scattered read	0	8894
21-MAY-05 08.36.27.816 AM	db file scattered read	0	5867
21-MAY-05 08.36.28.848 AM	db file scattered read	0	45020

Current Session Problems

- Find where the session has spent its time

```
SELECT  stat_name, value
FROM    v$sess_time_model
WHERE   sid=130
```

STAT_NAME	VALUE
DB time	1258404159
DB CPU	167882212
background elapsed time	0
background cpu time	0
sequence load elapsed time	80535063
parse time elapsed	15047886
hard parse elapsed time	8505043
sql execute elapsed time	1228185696
connection management call elapsed time	2375
failed parse elapsed time	174792
failed parse (out of shared memory) elapsed time	0
hard parse (sharing criteria) elapsed time	27209
hard parse (bind mismatch) elapsed time	411
PL/SQL execution elapsed time	996461
inbound PL/SQL rpc elapsed time	0
PL/SQL compilation elapsed time	359583
Java execution elapsed time	0

Oracle Enterprise Manager (SYS) - Database: ora10g - Microsoft Internet Explorer

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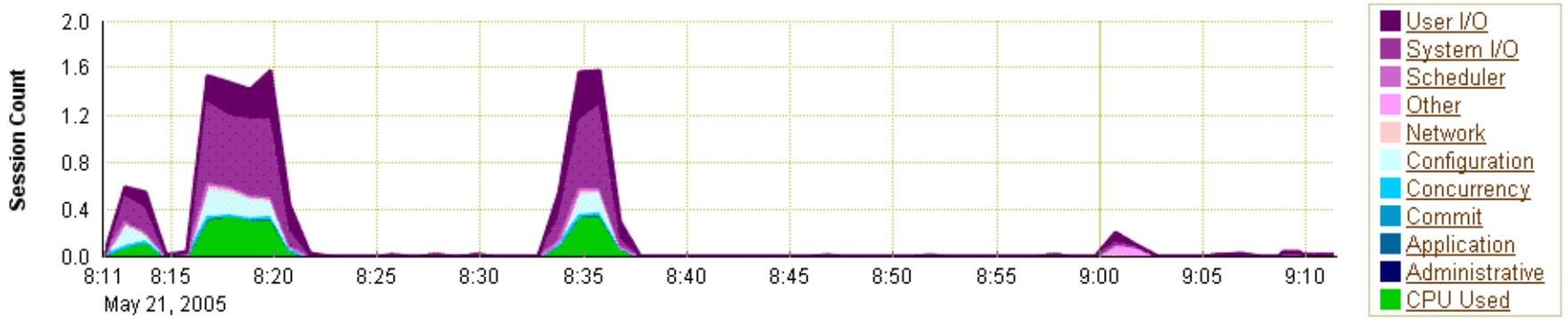
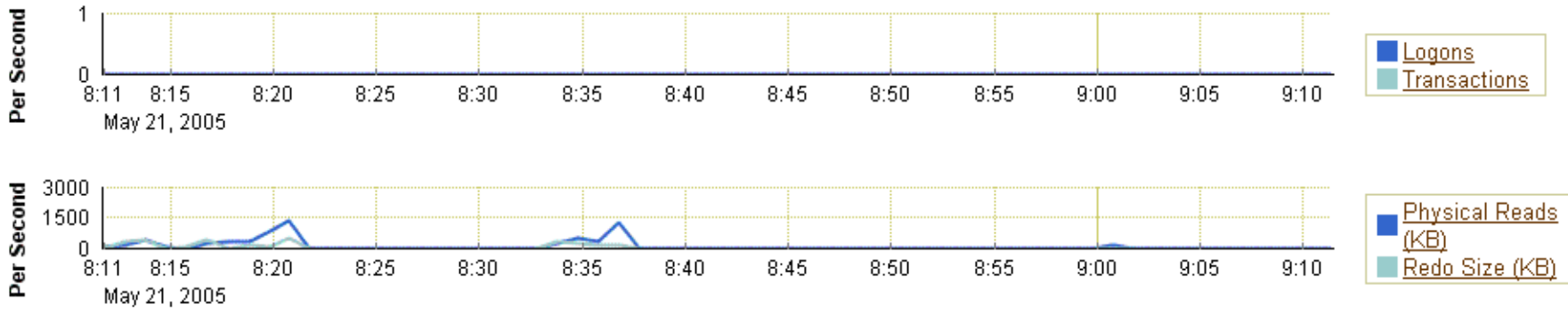
Sessions: Waiting and Working



Instance Throughput



View (•) Per Second ( ) Per Transaction

Additional Monitoring Links

- Top Sessions
- Top SQL
- Blocking Sessions
- Database Locks
- Instance Activity
- Top Consumers
- Snapshots

Home Performance Administration Maintenance

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

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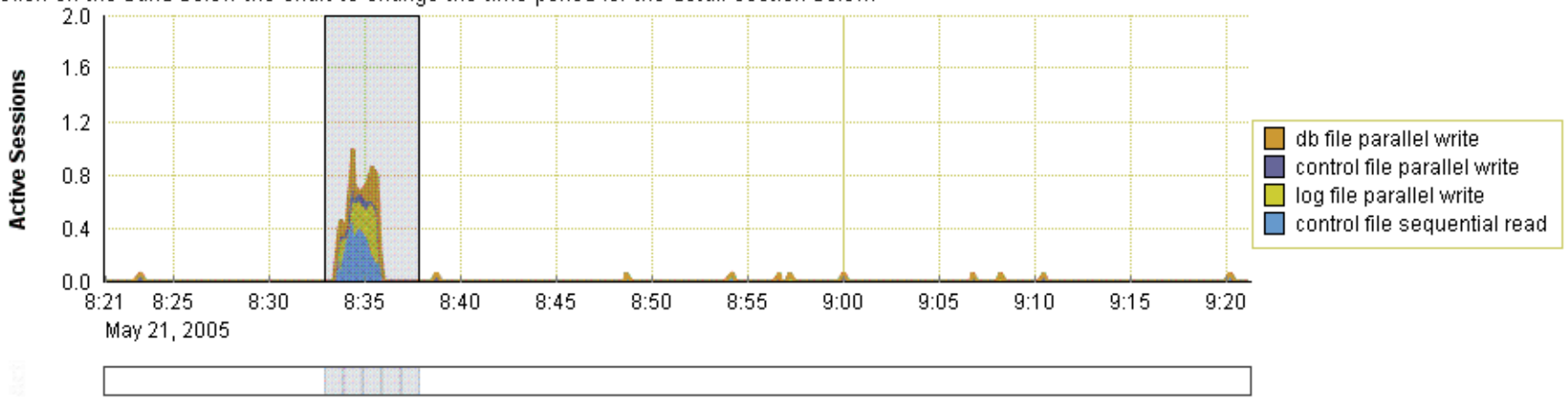
Active Sessions Waiting: System I/O

Click on the band below the chart to change the time period for the detail section below.



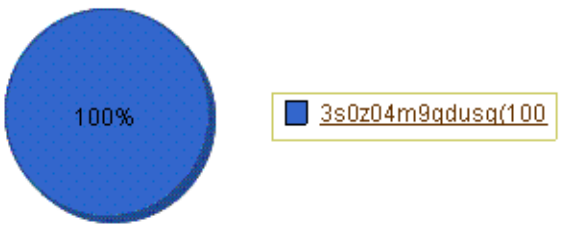
Detail for Selected 5 minute Interval

Start Time **May 21, 2005 8:32:54 AM**

Overview | Top SQL | Top Sessions

Top Waiting SQL

Total Sample Count: 10



Top Waiting Sessions

Total Sample Count: 94

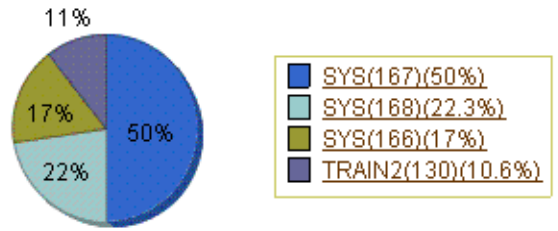


Chart Titled: Top Waiting Sessio

Overview | Top SQL | Top Sessions

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

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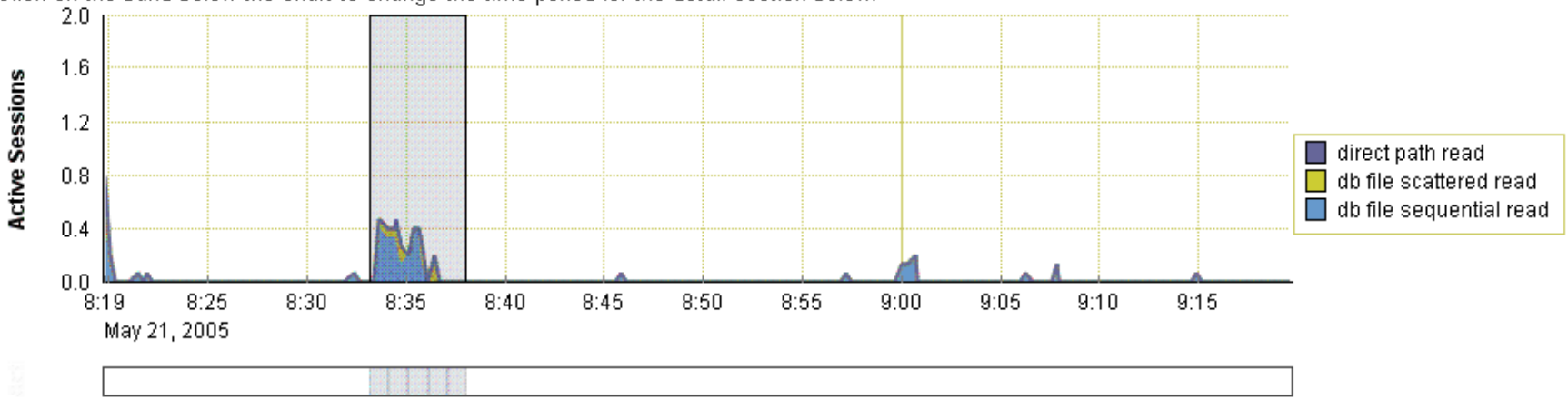
Active Sessions Waiting: User I/O

Click on the band below the chart to change the time period for the detail section below.



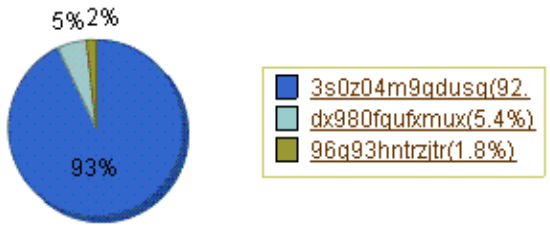
Detail for Selected 5 minute Interval

Start Time **May 21, 2005 8:33:09 AM**

Overview | Top SQL | Top Sessions | Top Files | Top Objects

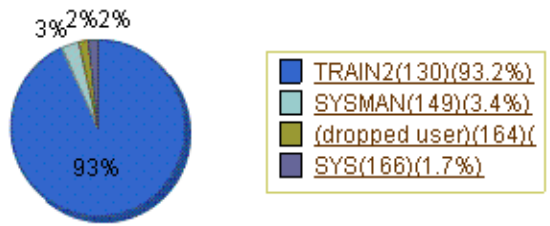
Top Waiting SQL

Total Sample Count: 56



Top Waiting Sessions

Total Sample Count: 59



Overview | Top SQL | Top Sessions | Top Files | Top Objects

SQL Details: 3s0z04m9qdusq

Run SQL Tuning Advisor

SQL Text

```
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)
```

Execution Plan | Current Statistics | Execution History | Tuning History

Collected From Target **May 21, 2005 9:21:56 AM**

Data Source **Cursor Cache** Plan Hash Value **2156733693** Module **SQL*Plus**
Capture Time **May 21, 2005 9:21:56 AM** Optimizer Mode **ALL_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
INSERT STATEMENT			3			1322				
SEQUENCE			2							
TABLE ACCESS FULL	TRAIN2.BOOKINGS_LARGE	TABLE	1	810770	114,806.297	1321	16	147929472	1308	

Oracle Enterprise Manager (SYS) - Session Details: SID 167 - Microsoft Internet Explorer

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Session Details: SID 167

Collected From Target **May 21, 2005 9:22:48 AM**

General Statistics **Wait Events** Open Cursors Locks

Wait Class	Wait Event	P1	P1 Text	P2	P2 Text	P3	P3 Text	Wait Time (Centiseconds)
System I/O	log file parallel write	1	files	2	blocks	1	requests	0
Idle	rdbms ipc message	300	timeout	0		0		278
Idle	rdbms ipc message	300	timeout	0		0		308
Idle	rdbms ipc message	22	timeout	0		0		23
System I/O	log file parallel write	1	files	3	blocks	1	requests	0
Idle	rdbms ipc message	22	timeout	0		0		0
System I/O	log file parallel write	1	files	2	blocks	1	requests	0
Idle	rdbms ipc message	22	timeout	0		0		0
System I/O	log file parallel write	1	files	2	blocks	1	requests	0
Idle	rdbms ipc message	22	timeout	0		0		0

General Statistics **Wait Events** Open Cursors Locks

Kill Session

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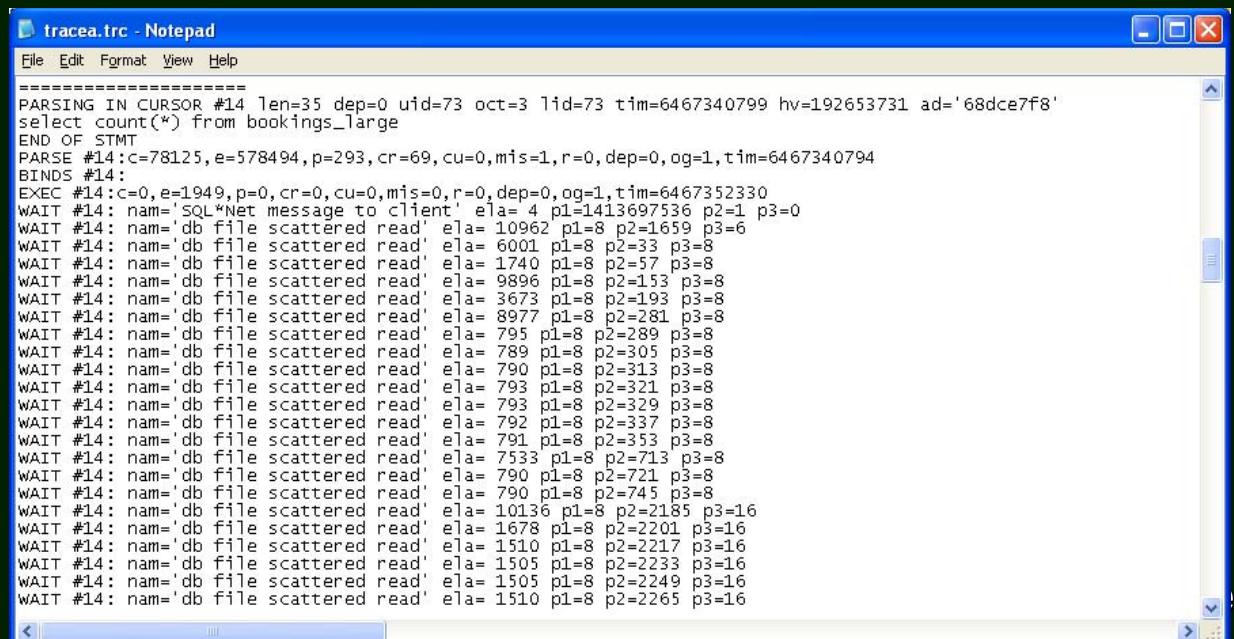
About Oracle Enterprise Manager 10g Database Control

Problems with a Current Session

- Turn tracing on for the session

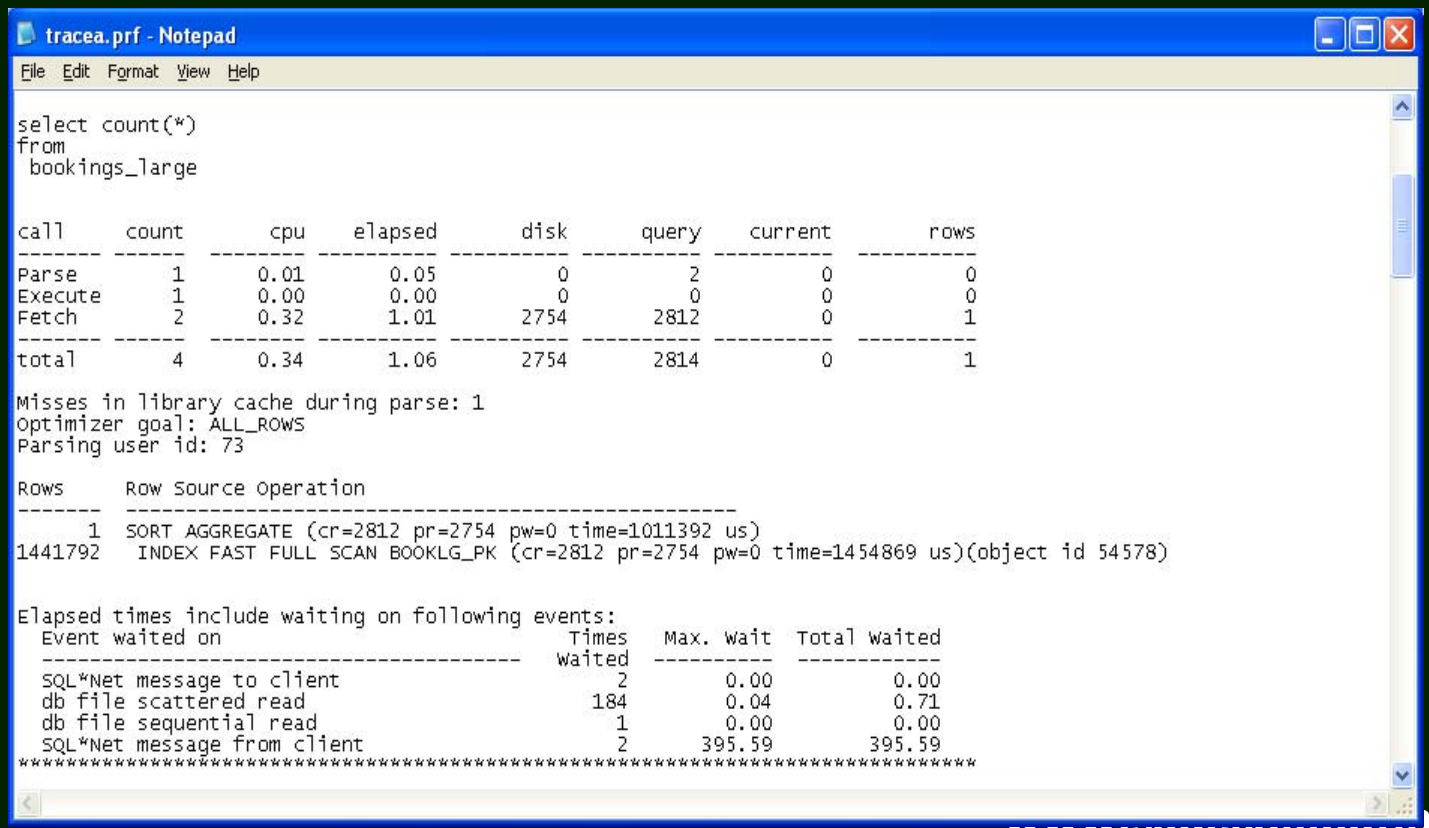
```
BEGIN
dbms_monitor.session_trace_enable(session_id=>130,
serial_num=>708, waits=>TRUE, binds=>TRUE);
END;
```



Problems with a Current Session

- Format the trace file

Tkprof ora10g_ora_5868.trc tracea.prf sort=fchcpu,prscpu,execpu



tracea.prf - Notepad

File Edit Format View Help

```
select count(*)
from
 bookings_large


call     count       cpu    elapsed       disk      query    current        rows
------- ------  -------- ---------- ---------- ---------- ----------  ----------
Parse        1      0.01       0.05          0          2          0           0
Execute      1      0.00       0.00          0          0          0           0
Fetch        2      0.32       1.01       2754       2812          0           1
------- ------  -------- ---------- ---------- ---------- ----------  ----------
total        4      0.34       1.06       2754       2814          0           1

Misses in library cache during parse: 1
Optimizer goal: ALL_ROWS
Parsing user id: 73

Rows     Row Source Operation
-------  ---------------------------------------------------
      1  SORT AGGREGATE (cr=2812 pr=2754 pw=0 time=1011392 us)
1441792   INDEX FAST FULL SCAN BOOKLG_PK (cr=2812 pr=2754 pw=0 time=1454869 us)(object id 54578)


Elapsed times include waiting on following events:
  Event waited on                             Times   Max. Wait  Total Waited
  ----------------------------------------   Waited  ----------  ------------
  SQL*Net message to client                       2        0.00          0.00
  db file scattered read                        184        0.04          0.71
  db file sequential read                         1        0.00          0.00
  SQL*Net message from client                     2      395.59        395.59
********************************************************************************
```

Fix the Problem

- Kill one of the sessions
- Fix the application problem
- Identify and fix the high resource SQL

Overall Performance Problems - Sources

- Alert log
- Wait events
- Oracle 10g gathers comprehensive statistics
  - Active session history
  - Time model
  - Metrics
  - OS statistics

Wait Events

- Look for system wait classes

```
SELECT    wait_class_id, wait_class#, wait_class,
          total_waits, time_waited
FROM      v$system_wait_class
```

WAIT_CLASS_ID	WAIT_CLASS#	WAIT_CLASS	TOTAL_WAITS	TIME_WAITED
1893977003	0	Other	6238	444427
4217450380	1	Application	26661	826816
3290255840	2	Configuration	2096	12605
3875070507	4	Concurrency	136	186
3386400367	5	Commit	8151	1930
2723168908	6	Idle	683331	197711587
2000153315	7	Network	205150	70
1740759767	8	User I/O	69290	57267
4108307767	9	System I/O	134573	57583

Wait Events

- Look for system wait events - Application

```
SELECT  e.event, e.total_waits, e.total_timeouts,
        e.time_waited, average_wait
FROM    v$system_event e, v$event_name n
WHERE   n.event_id = e.event_id
AND     n.wait_class# = 1 -- Application
```

EVENT	TOTAL_WAITS	TOTAL_TIMEOUTS	TIME_WAITED	AVERAGE_WAIT
enq: RO - fast object reuse	33	0	11	0
enq: TX - row lock contention	2690	2686	826242	307
SQL*Net break/reset to client	24110	0	566	0

Wait Events

- Look for system wait events – User I/O

```
SELECT  e.event, e.total_waits, e.total_timeouts,
        e.time_waited, average_wait
FROM    v$system_event e, v$event_name n
WHERE   n.event_id = e.event_id
AND     n.wait_class# = 8 -- User I/O
```

EVENT	TOTAL_WAITS	TOTAL_TIMEOUTS	TIME_WAITED	AVERAGE_WAIT
local write wait	7	0	0	0
read by other session	1	0	1	1
db file sequential read	58691	0	47970	1
db file scattered read	7424	0	8271	1
db file single write	151	0	14	0
db file parallel read	1	0	3	3
direct path read	1474	0	925	1
direct path read temp	102	0	25	0
direct path write	1473	0	160	0
direct path write temp	168	0	2	0

Wait Events

- Look for system wait events – System I/O

```
SELECT  e.event, e.total_waits, e.total_timeouts,
        e.time_waited, average_wait
FROM    v$system_event e, v$event_name n
WHERE   n.event_id = e.event_id
AND     n.wait_class# = 9 -- System I/O
```

EVENT	TOTAL_WAITS	TOTAL_TIMEOUTS	TIME_WAITED	AVERAGE_WAIT
ksfd: async disk IO	288	0	15	0
control file sequential read	13938	0	21111	2
control file single write	714	0	128	0
control file parallel write	26960	0	10292	0
recovery read	6	0	0	0
log file sequential read	378	0	350	1
log file single write	375	0	40	0
log file parallel write	51020	0	17352	0
db file parallel write	42478	0	8626	0

Wait Events

- Look for distribution of wait times
- One event with a long wait time could skew the results

```
SELECT  wait_time_milli, wait_count
FROM    v$event_histogram
WHERE   event = 'enq: TX - row lock contention'
```

WAIT_TIME_MILLI	WAIT_COUNT
1	0
2	0
4	0
8	0
16	0
32	0
64	0
128	2
256	2
512	0
1024	0
2048	1
4096	2685

Wait Events

- Look for distribution of wait times

```
SELECT  wait_time_milli, wait_count
FROM    v$event_histogram
WHERE  event = 'db file sequential read'
```

WAIT_TIME_MILLI	WAIT_COUNT
1	28683
2	1120
4	3017
8	6987
16	10667
32	5671
64	1933
128	391
256	197
512	28
1024	1

Time Model

- Records where the database is spending time
- DB Time is overall database activity time
- ADDM's goal is to minimise this
- Look for high parse time as proportion of SQL execution time

Time Model

- Find where the system has spent its time

```
SELECT  stat_name, value
FROM    v$sys_time_model
```

STAT_NAME	VALUE
DB time	1.0306E+10
DB CPU	526468001
background elapsed time	5488738125
background cpu time	496628001
sequence load elapsed time	80675372
parse time elapsed	71915940
hard parse elapsed time	60198409
sql execute elapsed time	1.0231E+10
connection management call elapsed time	1390986
failed parse elapsed time	302227
failed parse (out of shared memory) elapsed time	0
hard parse (sharing criteria) elapsed time	591387
hard parse (bind mismatch) elapsed time	294519
PL/SQL execution elapsed time	1031366155
inbound PL/SQL rpc elapsed time	0
PL/SQL compilation elapsed time	8411615
Java execution elapsed time	1037473

Metrics

- Calculated at intervals
  - V$SYSMETRIC
  - V$EVENTMETRIC
  - V$WAITCLASSMETRIC
  - V$FILEMETRIC
  - V$METRICNAME

Metrics

- Shows traditional hit ratios

```
SELECT  metric_name, AVG(value), metric_unit
FROM v$sysmetric
WHERE metric_unit LIKE '\%%' ESCAPE '\'
GROUP BY metric_name, metric_unit
```

METRIC_NAME	AVG(VALUE)	METRIC_UNIT
User Limit %	0	% Sessions/License_Limit
PGA Cache Hit %	99	% Bytes/TotalBytes
Process Limit %	22	% Processes/Limit
Session Limit %	21	% Sessions/Limit
Soft Parse Ratio	75	% SoftParses/TotalParses
User Calls Ratio	25	% UserCalls/AllCalls
Memory Sorts Ratio	100	% MemSort/(MemSort + DiskSort)
Shared Pool Free %	12	% Free/Total
Row Cache Hit Ratio	100	% Hits/Gets
Row Cache Miss Ratio	0	% Misses/Gets
Buffer Cache Hit Ratio	100	% (LogRead - PhyRead)/LogRead
Cursor Cache Hit Ratio	0	% CursorCacheHit/SoftParse
Database CPU Time Ratio	84.5	% Cpu/DB_Time
Library Cache Hit Ratio	99	% Hits/Pins
User Commits Percentage	100	% (UserCommit/TotalUserTxn)
Database Wait Time Ratio	31	% Wait/DB_Time
Host CPU Utilization (%)	1	% Busy/(Idle+Busy)
Library Cache Miss Ratio	0	% Misses/Gets
Redo Allocation Hit Ratio	100	% (#Redo - RedoSpaceReq)/#Redo
User Rollbacks Percentage	0	% (UserRollback/TotalUserTxn)
Execute Without Parse Ratio	90	% (ExecWOParse/TotalExec)

OS Stats

```
SELECT stat_name, value
FROM   v$osstat
```

STAT_NAME	VALUE
NUM_CPUS	2
IDLE_TICKS	13545990
BUSY_TICKS	2211629
USER_TICKS	1420457
SYS_TICKS	791172
AVG_IDLE_TICKS	6771706
AVG_BUSY_TICKS	9.2234E+18
AVG_USER_TICKS	708943
AVG_SYS_TICKS	394246
RSRC_MGR_CPU_WAIT_TIME	0
IN_BYTES	2.8167E+10
OUT_BYTES	1550938112
AVG_IN_BYTES	1.4083E+10
AVG_OUT_BYTES	775469056

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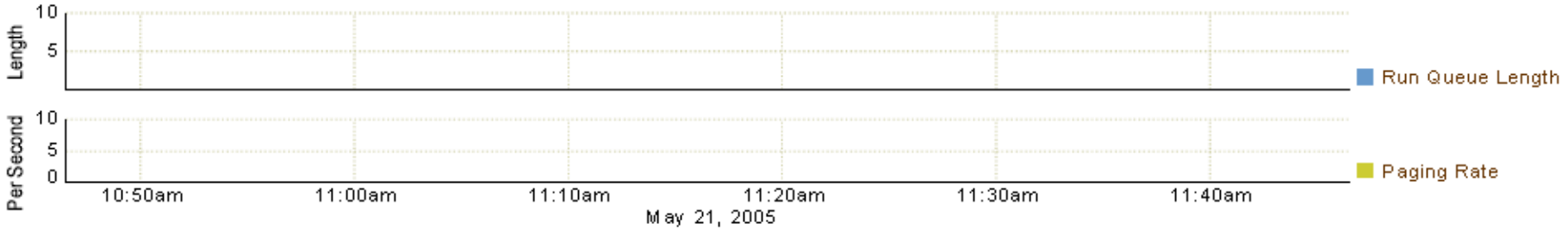
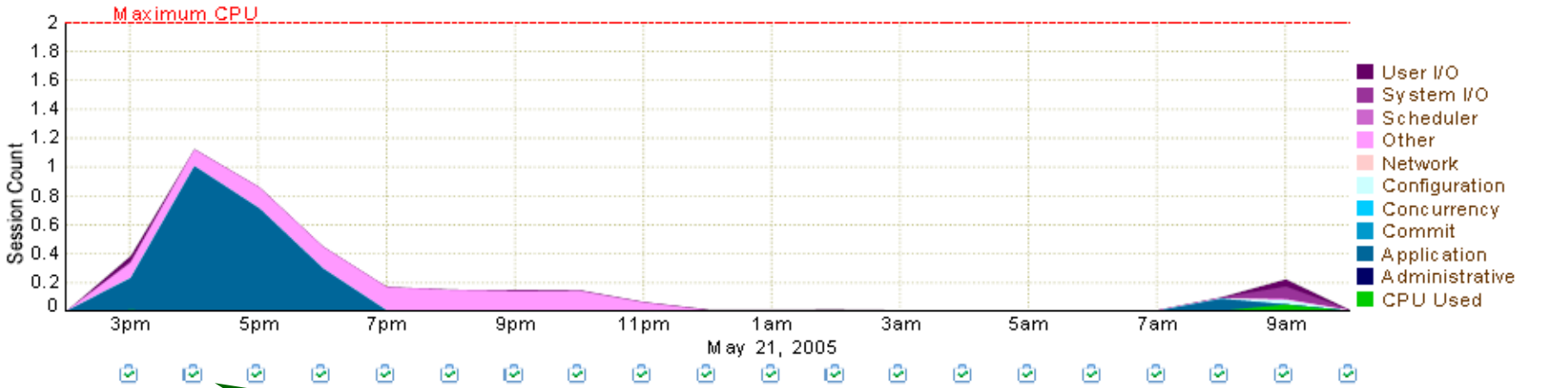
Host



Sessions: Waiting and Working



Instance Throug

Click here to analyse the problem

View Per Second Per Transaction

Automatic Database Diagnostic Monitor (ADDM)

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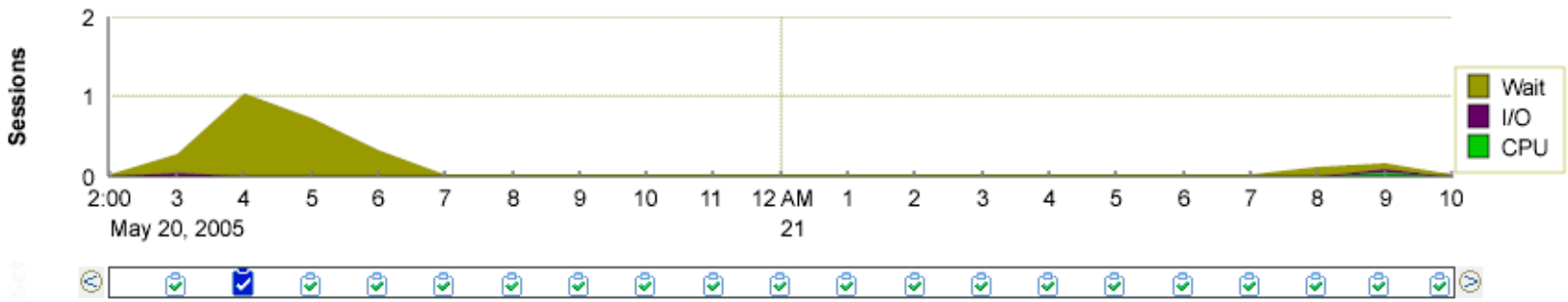
Database Activity

Create ADDM Task

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



Performance Analysis

Task Name **ADDM:3843294908_1_807**

View Snapshots View Report

Database Time (minutes) **60.37** Period Start Time **May 20, 2005 3:01:00 PM** Period Duration (minutes) **59.5**

Task Owner **SYS** Average Active Sessions **1.01**

Impact (%) ▽	Finding	Recommendations
98.42	SQL statements were found waiting for row lock waits.	**1** Application Analysis
11.3	Wait class "Other" was consuming significant database time.	
10.74	Wait event "class slave wait" in wait class "Other" was consuming significant database time.	**2** Application Analysis

▶ **Informational Findings**

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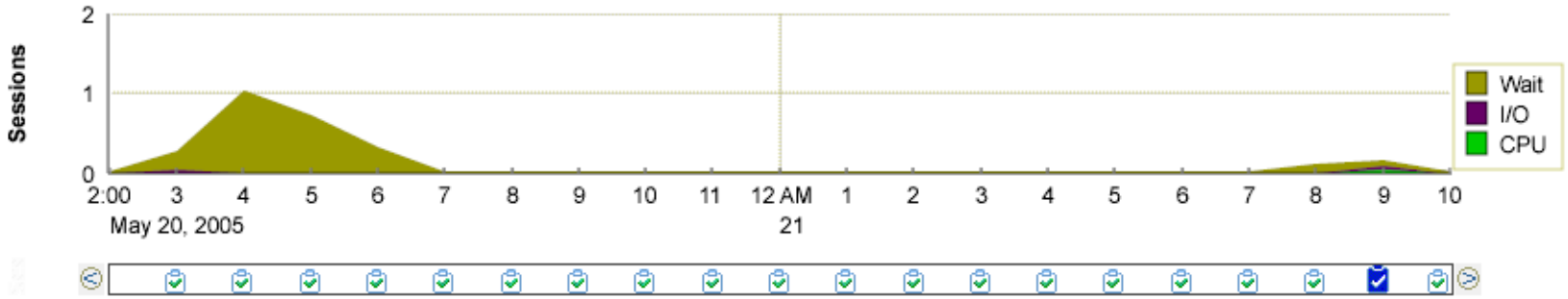
Database Activity

Create ADDM Task

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



Performance Analysis

Task Name **ADDM:3843294908_1_824**

View Snapshots View Report

Database Time (minutes) **9.6** Period Start Time **May 21, 2005 8:00:09 AM** Period Duration (minutes) **60.57**
Task Owner **SYS** Average Active Sessions **0.16**

Impact (%)	Finding	Recommendations
34.93	SQL statements consuming significant database time were found.	2 SQL Tuning
25.99	Undo I/O was a significant portion (80%) of the total database I/O.	
25.43	Buffer cache writes due to small log files were consuming significant database time.	1 DB Configuration
17.02	Individual database segments responsible for significant user I/O wait were found.	2 Segment Tuning
13.7	Time spent on the CPU by the instance was responsible for a substantial part of database time.	2 SQL Tuning
13.59	Sequence cache misses were consuming significant database time.	1 Application Analysis
11.14	Individual database segments responsible for significant physical I/O were found.	5 Segment Tuning
9.97	The throughput of the I/O subsystem was significantly lower than expected.	4 Host Configuration
9.29	Wait event "log file switch completion" in wait class "Configuration" was consuming significant database time.	3 Application Analysis
7.12	Waits for redo log buffer space were consuming significant database time.	1 DB Configuration 1 Host Configuration

More OEM Diagnostics

- Top sessions
- Top SQL
- Top consumers
- Instance activity

The Automatic Workload Repository (AWR)

AWR

- Persistent storage of system statistics
  - Active session history
  - V$tables
  - Plans
  - Automatic Database Diagnostic Monitor results
- Gathered in memory and flushed to disk by MMON
- Purged every 7 days
- Snapshots can be preserved
- Check that AWR collection is not causing library cache waits

DBMS_WORKLOAD_REPOSITORY

- Create an AWR snapshot

  dbms_workload_repository.create_snapshot

- Produce a report using two snapshots

  dbms_workload_repository.awr_report_html

  dbms_workload_repository.awr_report_text

  $ORACLE_HOME/rdbms/admin/awrrpt.sql

- Create a baseline

  dbms_workload_repository.create_baseline

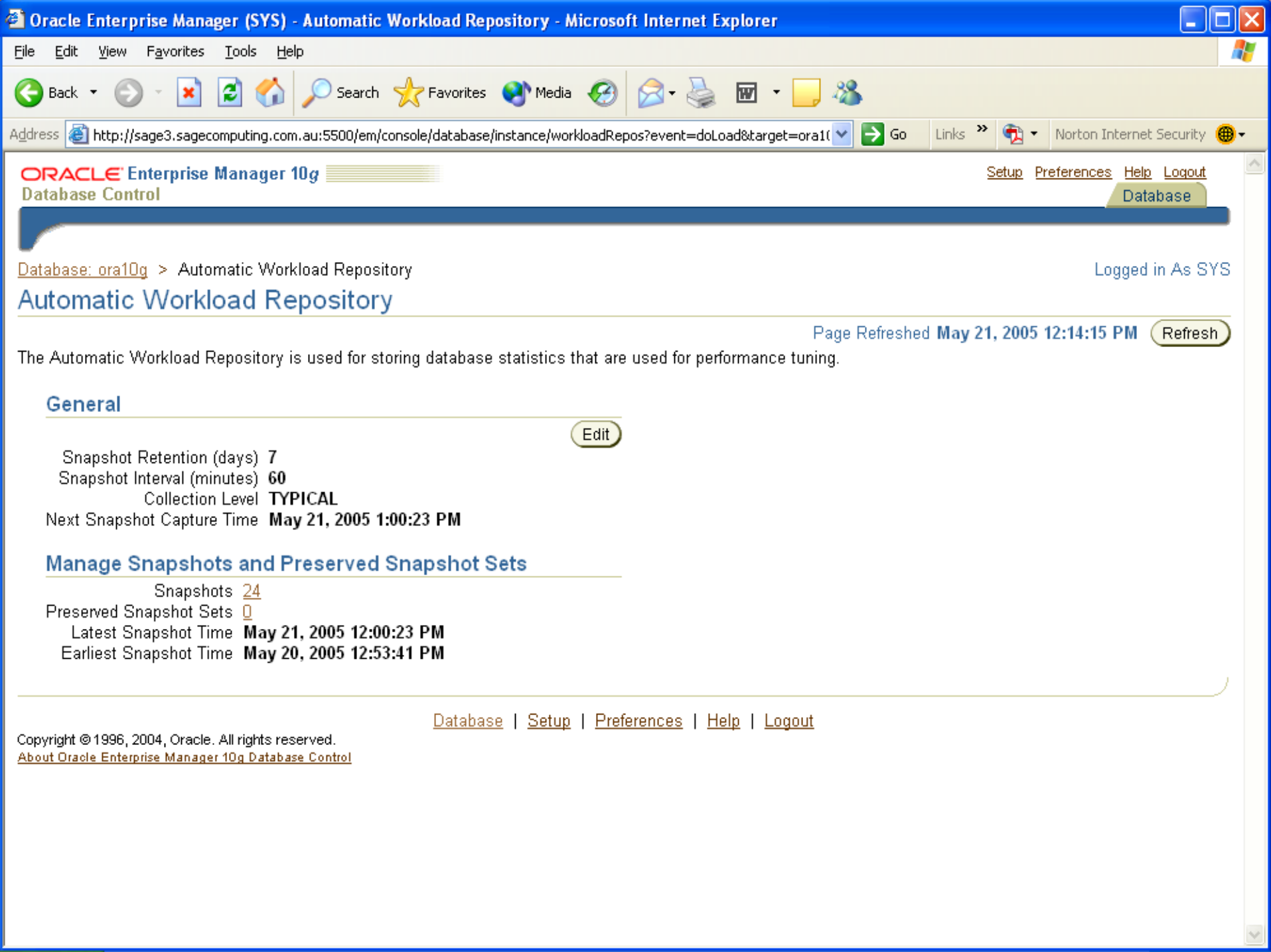
DBA_HIST.....

DBA_HIST_DATABASE_INSTANCE
DBA_HIST_SNAPSHOT
DBA_HIST_SNAP_ERROR
DBA_HIST_BASELINE
DBA_HIST_WR_CONTROL
DBA_HIST_DATAFILE
DBA_HIST_FILESTATXS
DBA_HIST_TEMPFILE
DBA_HIST_TEMPSTATXS
DBA_HIST_SQLSTAT
DBA_HIST_SQLTEXT
DBA_HIST_SQL_SUMMARY
DBA_HIST_SQL_PLAN
DBA_HIST_SQLBIND
DBA_HIST_OPTIMIZER_ENV
DBA_HIST_EVENT_NAME
DBA_HIST_SYSTEM_EVENT
DBA_HIST_BG_EVENT_SUMMARY
DBA_HIST_WAITSTAT
DBA_HIST_ENQUEUE_STAT
DBA_HIST_LATCH_NAME
DBA_HIST_LATCH
DBA_HIST_LATCH_CHILDREN
DBA_HIST_LATCH_PARENT
DBA_HIST_LATCH_MISSES_SUMMARY
DBA_HIST_LIBRARYCACHE
DBA_HIST_DB_CACHE_ADVICE

DBA_HIST_BUFFER_POOL_STAT
DBA_HIST_ROWCACHE_SUMMARY
DBA_HIST_SGA
DBA_HIST_SGASTAT
DBA_HIST_PGASTAT
DBA_HIST_RESOURCE_LIMIT
DBA_HIST_SHARED_POOL_ADVICE
DBA_HIST_SQL_WORKAREA_HSTGRM
DBA_HIST_PGA_TARGET_ADVICE
DBA_HIST_INSTANCE_RECOVERY
DBA_HIST_JAVA_POOL_ADVICE
DBA_HIST_THREAD
DBA_HIST_STAT_NAME
DBA_HIST_SYSSTAT
DBA_HIST_SYS_TIME_MODEL
DBA_HIST_OSSTAT_NAME
DBA_HIST_OSSTAT
DBA_HIST_PARAMETER_NAME
DBA_HIST_PARAMETER
DBA_HIST_UNDOSTAT
DBA_HIST_SEG_STAT
DBA_HIST_SEG_STAT_OBJ
DBA_HIST_METRIC_NAME
DBA_HIST_SYSMETRIC_HISTORY
DBA_HIST_SYSMETRIC_SUMMARY
DBA_HIST_SESSMETRIC_HISTORY
DBA_HIST_FILEMETRIC_HISTORY

AWR Tables

- WRH$.... Tables
  - History of statistics
  - e.g. WRH$_SQLSTAT_BL
- WRI$..... Tables
  - Advice/recommendation tables
  - e.g WRI$_ADV_RECOMMENDATIONS
- WRM$..... Tables
  - Snapshot / baseline tables
  - e.g WRM$_SNAPSHOT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Database
Database: ora10g > Automatic Workload Repository
Logged in As SYS
Automatic Workload Repository
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The Automatic Workload Repository is used for storing database statistics that are used for performance tuning.
General
Edit
Snapshot Retention (days) 7
Snapshot Interval (minutes) 60
Collection Level TYPICAL
Next Snapshot Capture Time May 21, 2005 1:00:23 PM
Manage Snapshots and Preserved Snapshot Sets
Snapshots 24
Preserved Snapshot Sets 0
Latest Snapshot Time May 21, 2005 12:00:23 PM
Earliest Snapshot Time May 20, 2005 12:53:41 PM
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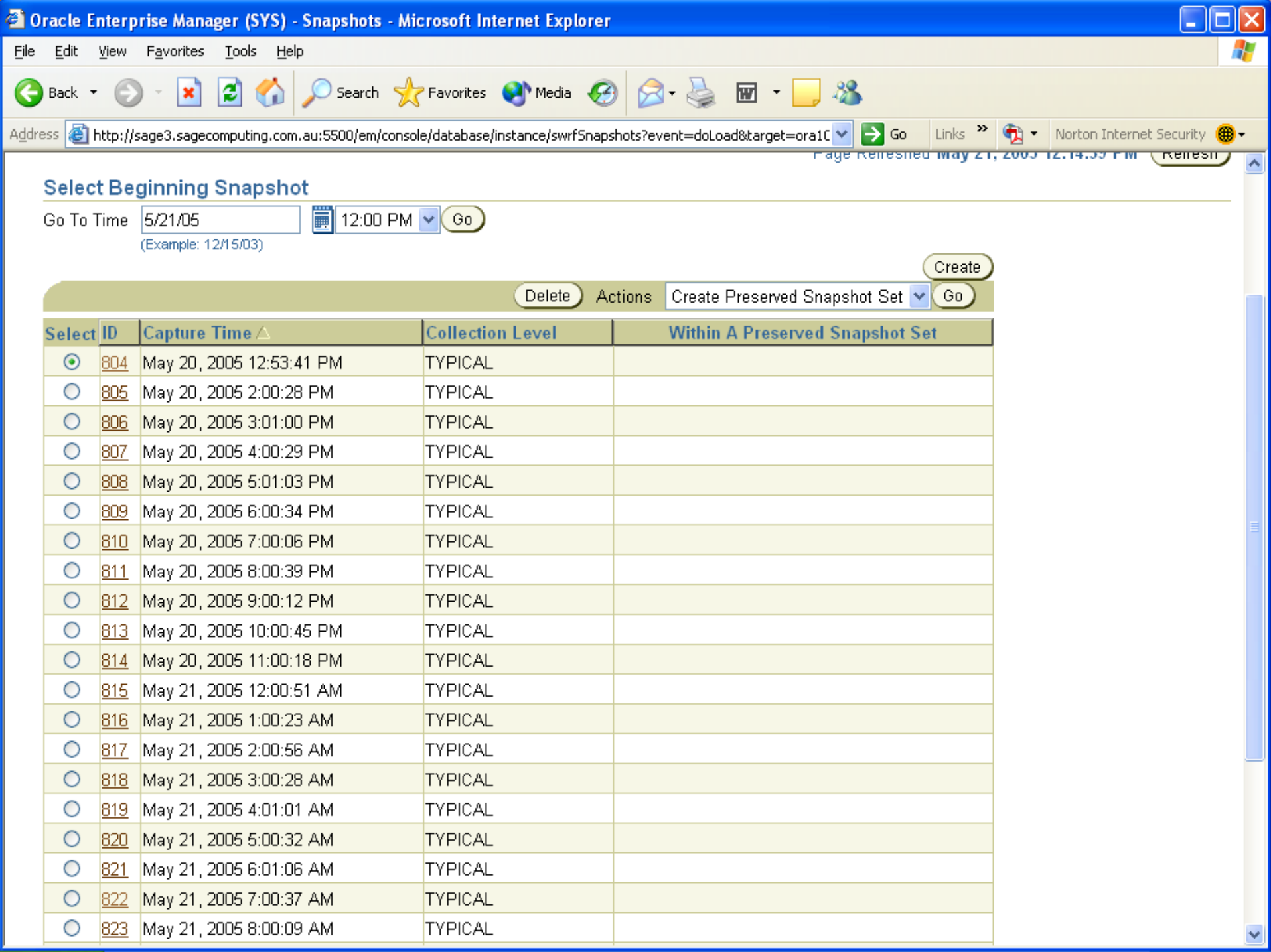
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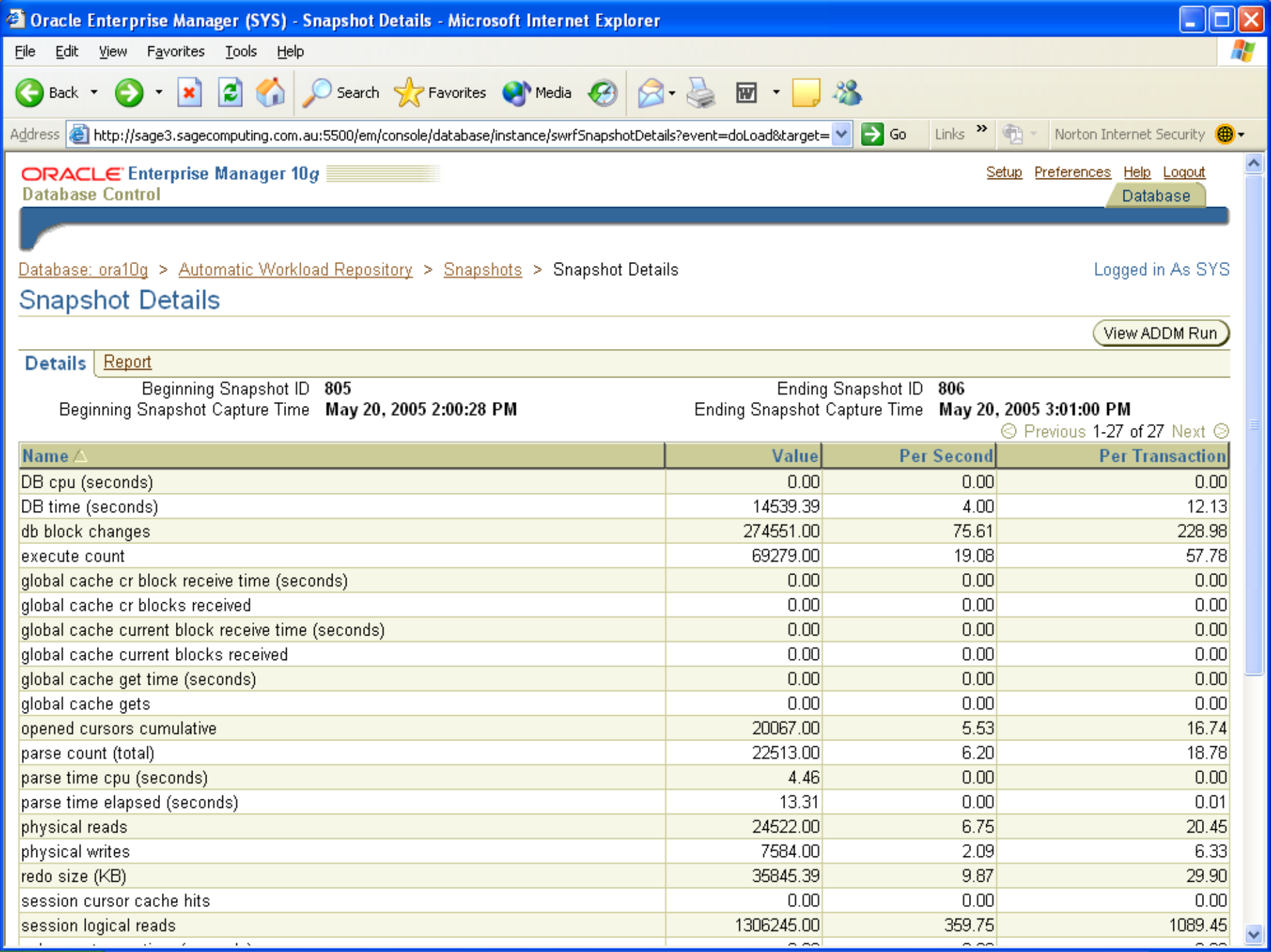
Select Beginning Snapshot
Go To Time 5/21/05 12:00 PM Go
(Example: 12/15/03)
Create
Delete Actions Create Preserved Snapshot Set Go
Select ID Capture Time Collection Level Within A Preserved Snapshot Set
804 May 20, 2005 12:53:41 PM TYPICAL
805 May 20, 2005 2:00:28 PM TYPICAL
806 May 20, 2005 3:01:00 PM TYPICAL
807 May 20, 2005 4:00:29 PM TYPICAL
808 May 20, 2005 5:01:03 PM TYPICAL
809 May 20, 2005 6:00:34 PM TYPICAL
810 May 20, 2005 7:00:06 PM TYPICAL
811 May 20, 2005 8:00:39 PM TYPICAL
812 May 20, 2005 9:00:12 PM TYPICAL
813 May 20, 2005 10:00:45 PM TYPICAL
814 May 20, 2005 11:00:18 PM TYPICAL
815 May 21, 2005 12:00:51 AM TYPICAL
816 May 21, 2005 1:00:23 AM TYPICAL
817 May 21, 2005 2:00:56 AM TYPICAL
818 May 21, 2005 3:00:28 AM TYPICAL
819 May 21, 2005 4:01:01 AM TYPICAL
820 May 21, 2005 5:00:32 AM TYPICAL
821 May 21, 2005 6:01:06 AM TYPICAL
822 May 21, 2005 7:00:37 AM TYPICAL
823 May 21, 2005 8:00:09 AM TYPICAL



Name	Value	Per Second	Per Transaction
DB cpu (seconds)	0.00	0.00	0.00
DB time (seconds)	14539.39	4.00	12.13
db block changes	274551.00	75.61	228.98
execute count	69279.00	19.08	57.78
global cache cr block receive time (seconds)	0.00	0.00	0.00
global cache cr blocks received	0.00	0.00	0.00
global cache current block receive time (seconds)	0.00	0.00	0.00
global cache current blocks received	0.00	0.00	0.00
global cache get time (seconds)	0.00	0.00	0.00
global cache gets	0.00	0.00	0.00
opened cursors cumulative	20067.00	5.53	16.74
parse count (total)	22513.00	6.20	18.78
parse time cpu (seconds)	4.46	0.00	0.00
parse time elapsed (seconds)	13.31	0.00	0.01
physical reads	24522.00	6.75	20.45
physical writes	7584.00	2.09	6.33
redo size (KB)	35845.39	9.87	29.90
session cursor cache hits	0.00	0.00	0.00
session logical reads	1306245.00	359.75	1089.45

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Details | Report

Save to File

WORKLOAD REPOSITORY report for

DB Name	DB Id	Instance	Inst num	Release	Cluster	Host
ORA10G	3843294908	ora10g	1	10.1.0.2.0	NO	SAGE3

	Snap Id	Snap Time	Sessions	Cursors/Session
Begin Snap:	805	20-May-05 14:00:28	28	14.8
End Snap:	806	20-May-05 15:01:00	31	10.1
Elapsed:		60.53 (mins)		
DB Time:		16.11 (mins)		

Report Summary

Cache Sizes (end)

Buffer Cache:	24M	Std Block Size:	8K
Shared Pool Size:	80M	Log Buffer:	512K

Load Profile

	Per Second	Per Transaction
Redo size:	10,106.84	30,613.58
Logical reads:	359.67	1,089.45
Block changes:	75.60	228.98
Physical reads:	6.75	20.45
Physical writes:	2.09	6.33
User calls:	2.83	8.57

Automatic Database Diagnostic Monitor (ADDM)

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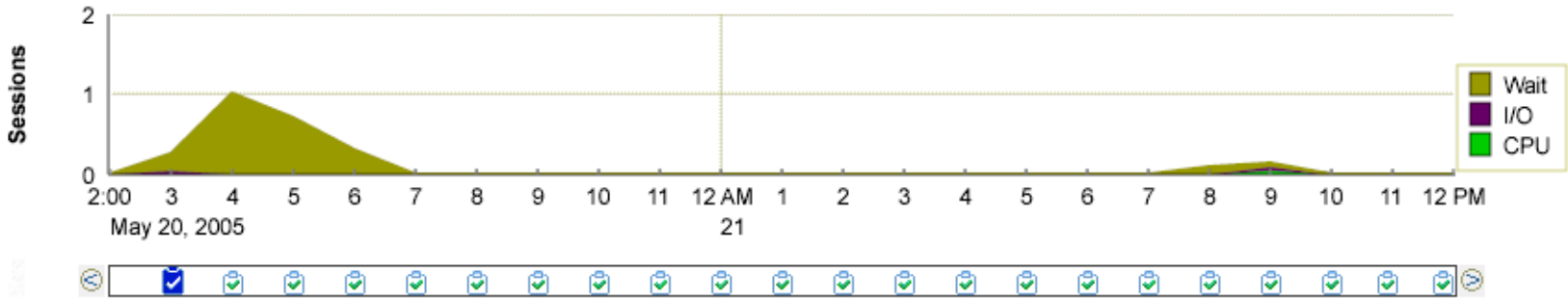
Database Activity

Create ADDM Task

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



Performance Analysis

Task Name **ADDM:3843294908_1_806**

View Snapshots View Report

Database Time (minutes) **16.11** Period Start Time **May 20, 2005 2:00:28 PM** Period Duration (minutes) **60.53**

Task Owner **SYS** Average Active Sessions **0.27**

Impact (%) ▽	Finding	Recommendations
82.32	SQL statements were found waiting for row lock waits.	1 Application Analysis
38.75	Wait class "Other" was consuming significant database time.	
36	Wait event "class slave wait" in wait class "Other" was consuming significant database time.	2 Application Analysis
5.08	SQL statements consuming significant database time were found.	1 SQL Tuning
4.43	Individual database segments responsible for significant physical I/O were found.	5 Segment Tuning
3.96	The buffer cache was undersized causing significant additional read I/O.	1 DB Configuration
3.86	PL/SQL execution consumed significant database time.	1 SQL Tuning
3.2	The throughput of the I/O subsystem was significantly lower than expected.	2 Host Configuration

AWR

- Save snapshots for standard work profiles
- Use as a source for ADDM
- Use as a baseline
- Compare timelines
- Create a SQL Tuning set from a range of snapshots

Identifying High Resource SQL

Turn Trace 10046 On

- Turn tracing on for the system (performance overhead) or session
- Identify location of user_dump_dest
- Check max_dump_file_size

```
BEGIN
dbms_monitor.session_trace_enable(session_id=>130,
serial_num=>708, waits=>TRUE, binds=>TRUE);
END;
```

```
ALTER system set events
'10046 trace name context forever, level 12'
```

Consolidate and Format Trace Files

- trcsess output=all_traces.trc service=ora10g *.trc

- tkprof all_traces.trc all_traces.prf sort=execpu, prscpu, fchcpu

all_trace.prf - Notepad

File Edit Format View Help

```
TKPROF: Release 9.0.1.5.1 - Production on Mon May 23 18:11:37 2005

(c) Copyright 2001 Oracle Corporation.  All rights reserved.

Trace file: c:\udump\all_trace.trc
Sort options: prscpu  fchcpu  execpu
********************************************************************************
count    = number of times OCI procedure was executed
cpu      = cpu time in seconds executing
elapsed  = elapsed time in seconds executing
disk     = number of physical reads of buffers from disk
query    = number of buffers gotten for consistent read
current  = number of buffers gotten in current mode (usually for update)
rows     = number of rows processed by the fetch or execute call
********************************************************************************

SELECT COUNT(B.COMMENTS)
FROM
 BOOKINGS_LARGE B WHERE B.RESOURCE_CODE = :B1


call     count       cpu    elapsed       disk      query    current        rows
------- ------  -------- ---------- ---------- ---------- ----------  ----------
Parse        2      0.00       0.00          0          0          0           0
Execute     21      0.28       0.29          0          0          0           0
Fetch       21    133.35     229.92     248622    1577058          0          21
------- ------  -------- ---------- ---------- ---------- ----------  ----------
total       44    133.64     230.21     248622    1577058          0          21

Misses in library cache during parse: 1
Misses in library cache during execute: 1
Optimizer goal: FIRST_ROWS
Parsing user id: 73     (recursive depth: 1)

Rows     Row Source Operation
-------  ---------------------------------------------------
      1  SORT AGGREGATE (cr=75098 pr=11724 pw=0 time=11570799 us)
 533654   TABLE ACCESS FULL BOOKINGS_LARGE (cr=75098 pr=11724 pw=0 time=12296770 us)


Elapsed times include waiting on following events:
  Event waited on                             Times   Max. Wait  Total Waited
  ----------------------------------------   Waited  ----------  ------------
  db file sequential read                      1839        0.13          2.97
  db file scattered read                        626        0.20          2.72
********************************************************************************
```

High Resource SQL

- V$SQL has buffer gets and physical reads for statements in the SGA
- V$SQL_PLAN has plans for statements in the SGA
- dba_hist_sqlstat and dba_hist_sqltext have buffer gets and physical reads for past statement
- dba_hist_sql_plan has plans for past statement

AWR Data for High Resource SQL

- 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
---------- ------------- ----------------- ---------------- ----------
SQL_TEXT
--------------------------------------------------------------------------------
       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
```

AWR Data for High Resource SQL

- Find execution path

```
SELECT          lpad(to_char(id),level) ID, parent_id PT,
                decode(id,0,'Cost: '||cost,object_name) OB,
                operation OP, rpad(options,30)|| rpad(access_predicates,30)||
                rpad(filter_predicates,30) OT,
                to_number(decode(id,0,null,position)) PS, cardinality CD
FROM            dba_hist_sql_plan
CONNECT BY prior id = parent_id
AND             sql_id = '&&sql_id'
START WITH      parent_id is null
AND             sql_id = '&&sql_id';
```

```
Id     Par Object          Operation          Options                        Pos       Rows
------ --- --------------- ------------------ ------------------------------ ---- ----------
0          Cost: 1322      INSERT STATEMENT
 1       0                 SEQUENCE                                           1
  2      1 BOOKINGS_LARGE  TABLE ACCESS       FULL                           1     810770
```

Resolving SQL Problems

Tune the SQL – First steps

- Are statistics up to date?
- Are histograms gathered on skewed data?
- Are system statistics collected?
- Are the initialisation parameters appropriate
- Use trace 10053

Tune the SQL – Second steps

- Use SQL Tuning Advisor
- Use SQL Access Advisor
- Consider rewriting the statement
- Consider hints
- Consider new indexes

If the optimiser is already using the best path

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

Automatic SQL Tuning

- SQL Tuning Advisor
- Optimiser runs in tuning mode
- Takes more time to decide
- Uses dynamic sampling
- Uses partial execution
- Uses past execution

Automatic SQL Tuning

- Source can be:
  - Top SQL
  - Statement
  - SQL Tuning Set
  - Snapshot
  - Preserved snapshot set

Automatic Tuning Optimiser

- Statistics
  - Recommendations to gather
  - Implement these and rerun
  - Create auxiliary statistics
- SQL Profiles
  - Store auxiliary statistics
  - Verify and correct estimates
    - Complex predicates
    - Skewed join data
    - Sparse join data
  - Custom optimiser mode
  - Not run in limited mode
  - Rerun when significant data changes

Automatic Tuning Optimiser

- Access path
  - Indexes
  - Only for this statement
- SQL Structure
  - Changes to code
  - Datatype mismatches
  - UNION/UNION ALL
  - Modified columns

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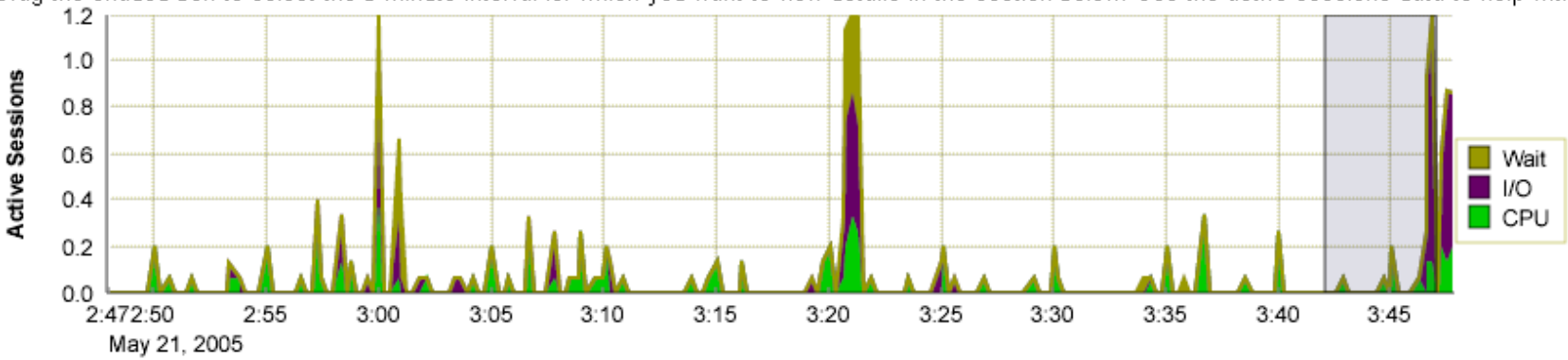
Spot SQL shows all the sql statements that have been active in a recent 5 minute interval.

View Data: Real Time: 15 Second Refresh

Spot Interval Selection

Drag the shaded box to select the 5 minute interval for which you want to view details in the section below. Use the active sessions data to help with your selection.



Detail for Selected 5 minute Interval

Start Time **May 21, 2005 3:42:07 PM**

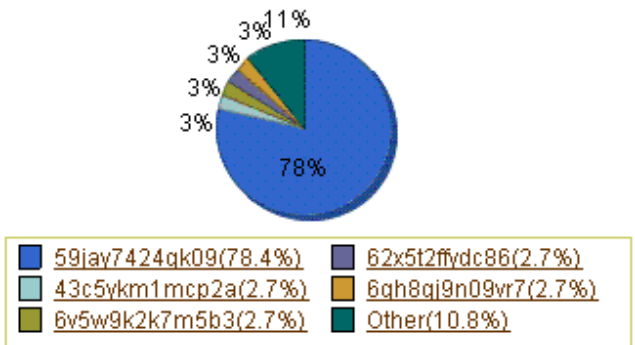
All SQL

Run SQL Tuning Advisor | Create SQL Tuning Set

Select All | Select None

Select	SQL ID	SQL Type	Activity (%)	CPU (%)	Wait (%)
☐	59jay7424gk09	SELECT	78.38	33.33	87.10
☐	43c5ykm1mcp2a	PL/SQL EXECUTE	2.70	16.67	0.00
☐	6v5w9k2k7m5b3	SELECT	2.70	0.00	3.23
☐	62x5t2ffydc86	SELECT	2.70	0.00	3.23
☐	6gh8gj9n09vr7	SELECT	2.70	16.67	0.00
☐	1583aypkbc97m	PL/SQL EXECUTE	2.70	16.67	0.00
☐	2b064ybzkwf1y	PL/SQL EXECUTE	2.70	16.67	0.00
☐	cn1xbk0gjy3c4	SELECT	2.70	0.00	3.23
☐	gdfhhpmtw33mv	SELECT	2.70	0.00	3.23

Top SQL (ordered by Activity)



SQL Details: 59jay7424gk09

Run SQL Tuning Advisor

SQL Text

```
SELECT event_no, cost
   FROM train2.bookings_large
   WHERE event_no < 90001
```

Execution Plan | Current Statistics | Execution History | Tuning History

Collected From Target **May 21, 2005 3:48:27 PM**

Data Source **Cursor Cache** Plan Hash Value **421824506** Module **SQL*Plus**
Capture Time **May 21, 2005 3:48:27 PM** 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			1299620				
TABLE ACCESS BY INDEX ROWID	TRAIN2.BOOKINGS_LARGE	TABLE	2	1304247	10,189.43	1299620	7469	9851171840	1297846	
INDEX RANGE SCAN	TRAIN2.BK_LG_EVTNO	INDEX	1	1304247		2918	17	279419904	2868	

SQL Details: 59jay7424gk09

Run SQL Tuning Advisor

SQL Text

```
SELECT event_no, cost
   FROM train2.bookings_large
   WHERE event_no < 90001
```

Execution Plan | **Current Statistics** | Execution History | Tuning History

Collected From Target **May 21, 2005 3:49:43 PM**

General

Number of Execution Plans	**1**
Program Name (Line Number)	**Not Applicable**
SQL Profile	**Unavailable**
SQL Profile Status	**Unavailable**
SQL Profile Category	**Unavailable**

Execution Statistics

Executions	**1**
Parse Calls	**1**
Rows Per Fetch	**15.0**
Rows Per Execution	**1298992.0**
Executions Per Parse Call	**1.0**

Time Model Statistics

Elapsed Time Per Execution (seconds)	**147.25**
CPU Time per Execution (seconds)	**21.67**
Wait Ratio	**0.85**

Shared Pool Statistics

Shareable Memory (bytes)	**9356**
Loads	**1**
Last Load Time	
Invalidations	**0**

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Partition Name	Tablespace
No partitions have been defined.	

Storage

Space Usage

Free Space (PCTFREE)(%) **10**
Used Space (PCTUSED)(%) **40**

Free Lists

Free Lists **1**
Free List Groups **1**

Number of Transactions

Initial **1**
Maximum **255**

Buffer Pool

Buffer Pool **DEFAULT**

Options

Parallel Degree	**Disabled**
Enable Row Movement	**No**
Logging	**Enabled**
Cache	**Disabled**

TIP There will be no special placement of data in the buffer cache.

Statistics

Last Analyzed	**May 21, 2005 2:00:23 PM**
Empty Blocks	**0**
Average Space	**0**
Number of Rows	**1452112**
Sample Size	**56674**
Average Row Length	**39**
Continued Row Count	**0**
Average Space Freelist Blocks	**0**
Number of Freelist Blocks	**0**

Edit OK

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Check Statistics

- Is data skewed?

```
SELECT min (num), max(num)
FROM
(SELECT event_no, count(*) num
FROM bookings_large
GROUP BY event_no)
```

```
 MIN(NUM)   MAX(NUM)
---------- ----------
         1         16
```

- Do we have system statistics

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

```
SNAME          PNAME                PVAL1 PVAL2
-------------- -------------- ---------- --------------
SYSSTATS_INFO  STATUS                     COMPLETED
SYSSTATS_INFO  DSTART                     05-21-2005 08:17
SYSSTATS_INFO  DSTOP                      05-21-2005 11:36
SYSSTATS_INFO  FLAGS                   1
SYSSTATS_MAIN  CPUSPEEDNW      904.86697
SYSSTATS_MAIN  IOSEEKTIM              10
SYSSTATS_MAIN  IOTFRSPEED           4096
SYSSTATS_MAIN  SREADTIM            5.747
SYSSTATS_MAIN  MREADTIM            14.17
```

Trace 10053

olc1.trc - Notepad

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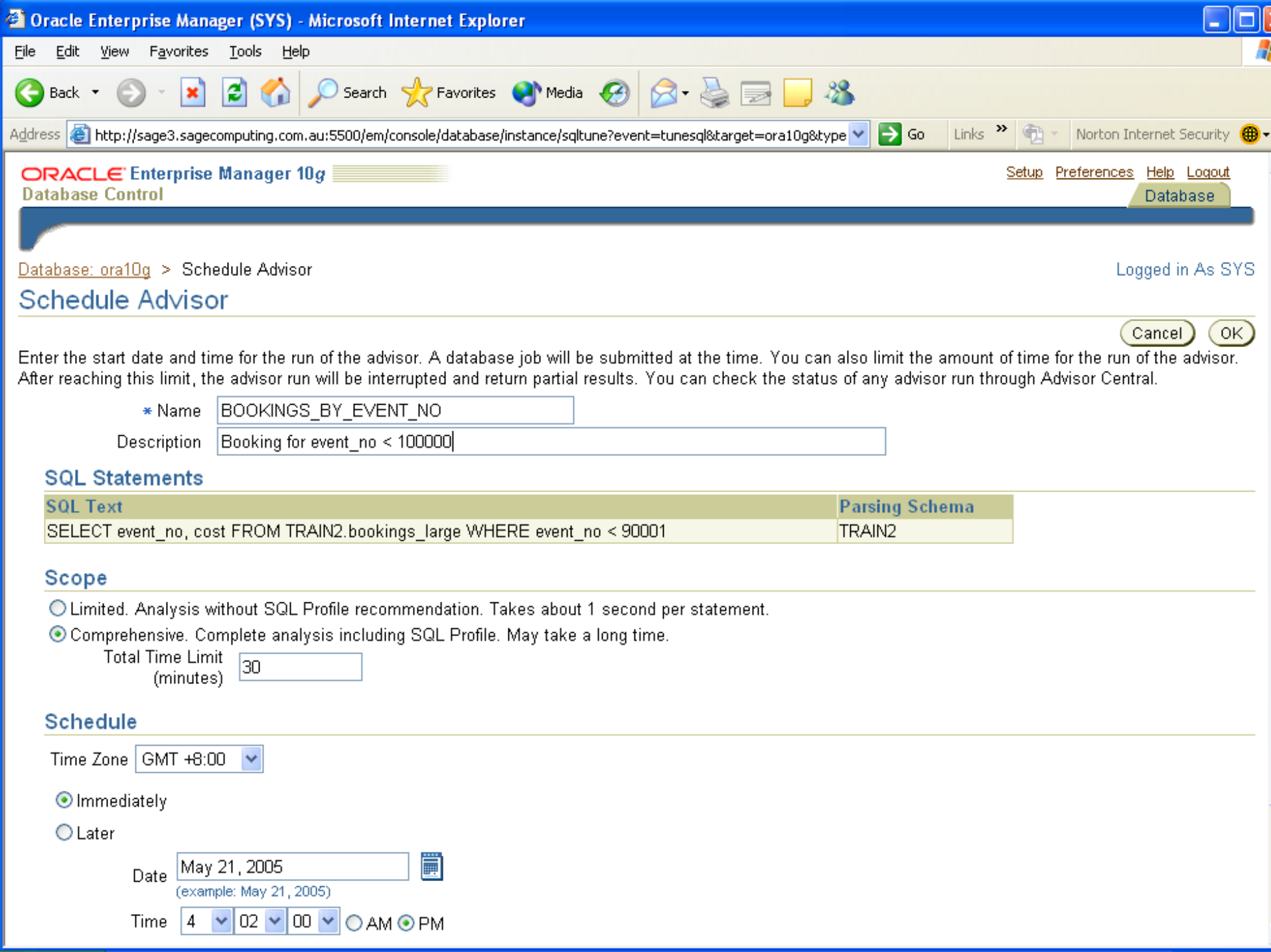
```
*******************************************
BASE STATISTICAL INFORMATION
***********************
Table stats    Table: BOOKINGS_LARGE   Alias: BOOKINGS_LARGE
  TOTAL ::  CDN: 1452112  NBLKS:  8706  AVG_ROW_LEN:  39
Index stats
  Index: BK_LG_EVTNO  COL#: 2
    TOTAL ::  LVLS: 2   #LB: 3190  #DK: 100001  LB/K: 1  DB/K: 14  CLUF: 1441791
  Index: BOOKLG_PK  COL#: 1
    TOTAL ::  LVLS: 2   #LB: 2794  #DK: 1441792  LB/K: 1  DB/K: 1  CLUF: 8703
_OPTIMIZER_PERCENT_PARALLEL = 0
*******************************************
SINGLE TABLE ACCESS PATH
  COLUMN:   EVENT_NO(NUMBER)  Col#: 2      Table: BOOKINGS_LARGE   Alias: BOOKINGS_LARGE
    Size: 5  NDV: 98737  Nulls: 0  Density: 1.0128e-005 Min: 208  Max: 100181
    No Histogram: #BKT: 1
        (1 uncompressed buckets and 2 endpoint values)
  TABLE: BOOKINGS_LARGE  Alias: BOOKINGS_LARGE
    Original Card: 1452112  Rounded Card: 1304247  Computed Card: 1304247.07
  Access Path: table-scan  Resc:  1745  Resp:  1745
  Access Path: index (scan)
    Index: BK_LG_EVTNO
    rsc_cpu: 9851172078   rsc_io: 1297846
    ix_sel:  8.9817e-001    ix_sel_with_filters:  8.9817e-001
  BEST_CST: 1299620.47  PATH: 4  Degree:  1
*******************************************
OPTIMIZER STATISTICS AND COMPUTATIONS
*******************************************
GENERAL PLANS
***********************
Join order[1]:  BOOKINGS_LARGE[BOOKINGS_LARGE]#0
Best so far: TABLE#: 0  CST:    1299620  CDN:    1304247  BYTES:   10433976
(newjo-stop-1) k:0, spcnt:0, perm:1, maxperm:80000
prefetching is on for BK_LG_EVTNO
Final - First Rows Plan:
  JOIN ORDER: 1
  CST: 1299620  CDN: 1304247  RSC: 1299620  RSP: 1299620  BYTES: 10433976
  IO-RSC: 1297846  IO-RSP: 1297846  CPU-RSC: 9851172078  CPU-RSP: 9851172078
QUERY
```

au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Database Control
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Database
Database: ora10g > Schedule Advisor
Logged in As SYS
Schedule Advisor
Cancel OK
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 BOOKINGS_BY_EVENT_NO
Description Booking for event_no < 100000
SQL Statements
SQL Text
Parsing Schema
SELECT event_no, cost FROM TRAIN2.bookings_large WHERE event_no < 90001
TRAIN2
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 May 21, 2005
(example: May 21, 2005)
Time 4 02 00 AM PM

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Recommendations for SQL ID:59jay7424gk09

Return

Only one recommendation should be implemented.

SQL Text

SELECT event_no, cost FROM TRAIN2.bookings_large WHERE event_no < 90001

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.		99.86	

Return

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Compare Plans

Original Explain Plan

The following is the original explain plan for the SQL statement being tuned. The cost might be adjusted by the SQL Tuning Advisor to reflect the real cost.

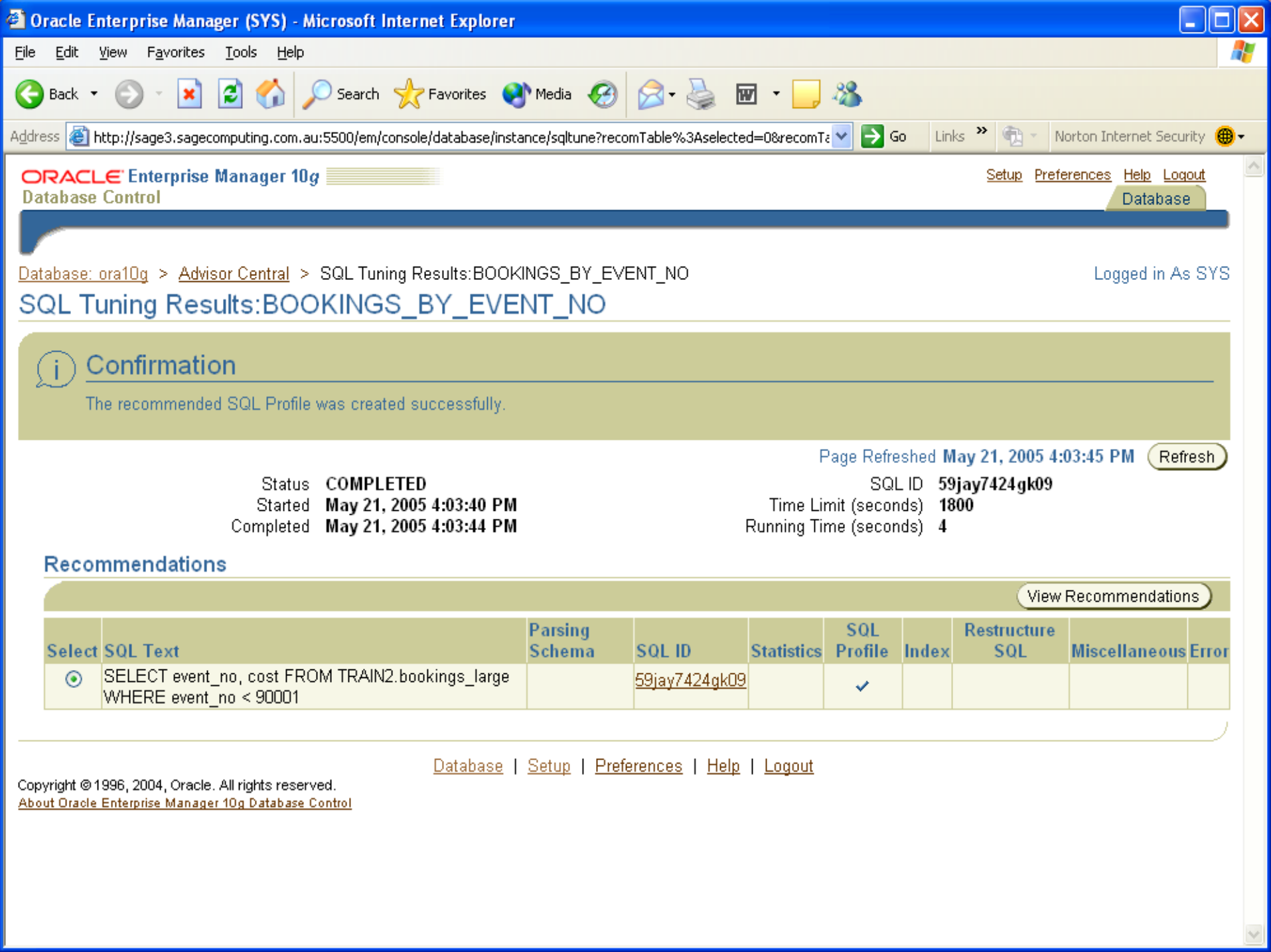
Expand All | Collapse All

Operation	Line ID	Order	Rows	KB	Cost	Time (seconds)	CPU Cost	IO Cost	Object	Object Type	O N
SELECT STATEMENT	0	3	1304247	10,189.43	1299587	7469	9669874688	1297846			
TABLE ACCESS BY INDEX ROWID	1	2	1304247	10,189.43	1299587	7469	9669874688	1297846	TRAIN2.BOOKINGS_LARGE	TABLE	
INDEX RANGE SCAN	2	1	1304247		2918	17	279419904	2868	TRAIN2.BK_LG_EVTNO	INDEX	

New Explain Plan

Expand All | Collapse All

Operation	Line ID	Order	Rows	KB	Cost	Time (seconds)	CPU Cost	IO Cost	Object	Object Type	Ob No
SELECT STATEMENT	0	2	1304247	10,189.43	1745	11	511888608	1653			
TABLE ACCESS FULL	1	1	1304247	10,189.43	1745	11	511888608	1653	TRAIN2.BOOKINGS_LARGE	TABLE	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Database Control
Setup Preferences Help Logout
Database
Database: ora10g > Advisor Central > SQL Tuning Results:BOOKINGS_BY_EVENT_NO
Logged in As SYS
SQL Tuning Results:BOOKINGS_BY_EVENT_NO
Confirmation
The recommended SQL Profile was created successfully.
Page Refreshed May 21, 2005 4:03:45 PM
Refresh
Status COMPLETED
Started May 21, 2005 4:03:40 PM
Completed May 21, 2005 4:03:44 PM
SQL ID 59jay7424gk09
Time Limit (seconds) 1800
Running Time (seconds) 4
Recommendations
View Recommendations
Select
SQL Text
Parsing Schema
SQL ID
Statistics
SQL Profile
Index
Restructure SQL
Miscellaneous
Error
SELECT event_no, cost FROM TRAIN2.bookings_large WHERE event_no < 90001
59jay7424gk09
Database | Setup | Preferences | Help | Logout
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Find the Profile

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

```
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
--- --------------------------------
  1 FIRST_ROWS(1)
  2 OPTIMIZER_FEATURES_ENABLE(default)
```

Test the Profile

```
EXPLAIN PLAN FOR
SELECT event_no, cost
FROM TRAIN2.bookings_large
WHERE event_no < 90001
```

```
PLAN_TABLE_OUTPUT
------------------------------------------------------------------------------------
Plan hash value: 1469695226
-------------------------------------------------------------------------------------
| Id  | Operation         | Name           | Rows  | Bytes | Cost (%CPU)| Time     |
-------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT  |                |  1304K|     9M|  1745   (6)| 00:00:11 |
|*  1 |  TABLE ACCESS FULL| BOOKINGS_LARGE |  1304K|     9M|  1745   (6)| 00:00:11 |
-------------------------------------------------------------------------------------

Predicate Information (identified by operation id):
---------------------------------------------------
   1 - filter("EVENT_NO"<90001)

Note
-----
   - SQL profile "SYS_SQLPROF_050521160626750" used for this statement
```

Manage Profiles

Disable a profile

```
BEGIN
  DBMS_SQLTUNE.ALTER_SQL_PROFILE(
     name                          => 'BOOKINGS_BY_EVENT_NO',
     attribute_name                => 'STATUS',
     value                         => 'DISABLED');
END;
```

Drop a profile

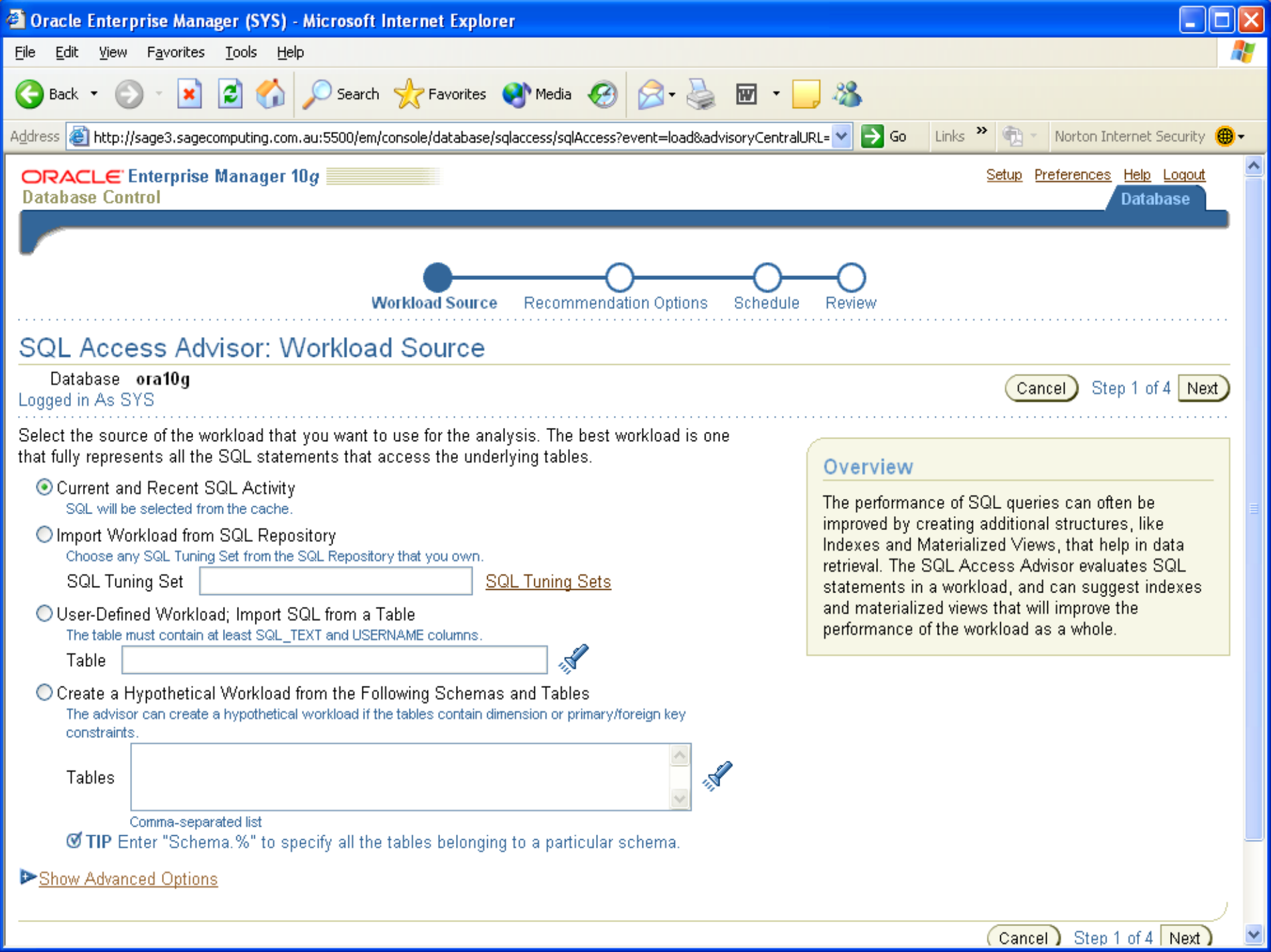
```
BEGIN
  DBMS_SQLTUNE.DROP_SQL_PROFILE(name => 'BOOKINGS_BY_EVENT_NO');
END;
```

SQL Access Advisor

- Source can be:
  - Top SQL
  - SQL Tuning Set
  - Defined SQL
  - Schemas and/or tables
  - Filter by
    - Users
    - Tables
    - Top resource users
    - Module IDs
    - Actions

SQL Access Advisor

- Options
  - Define workload type
  - Include dropping indexes
- Indexes
- Materialised views
- Both
- Limited
- Comprehensive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Database Control
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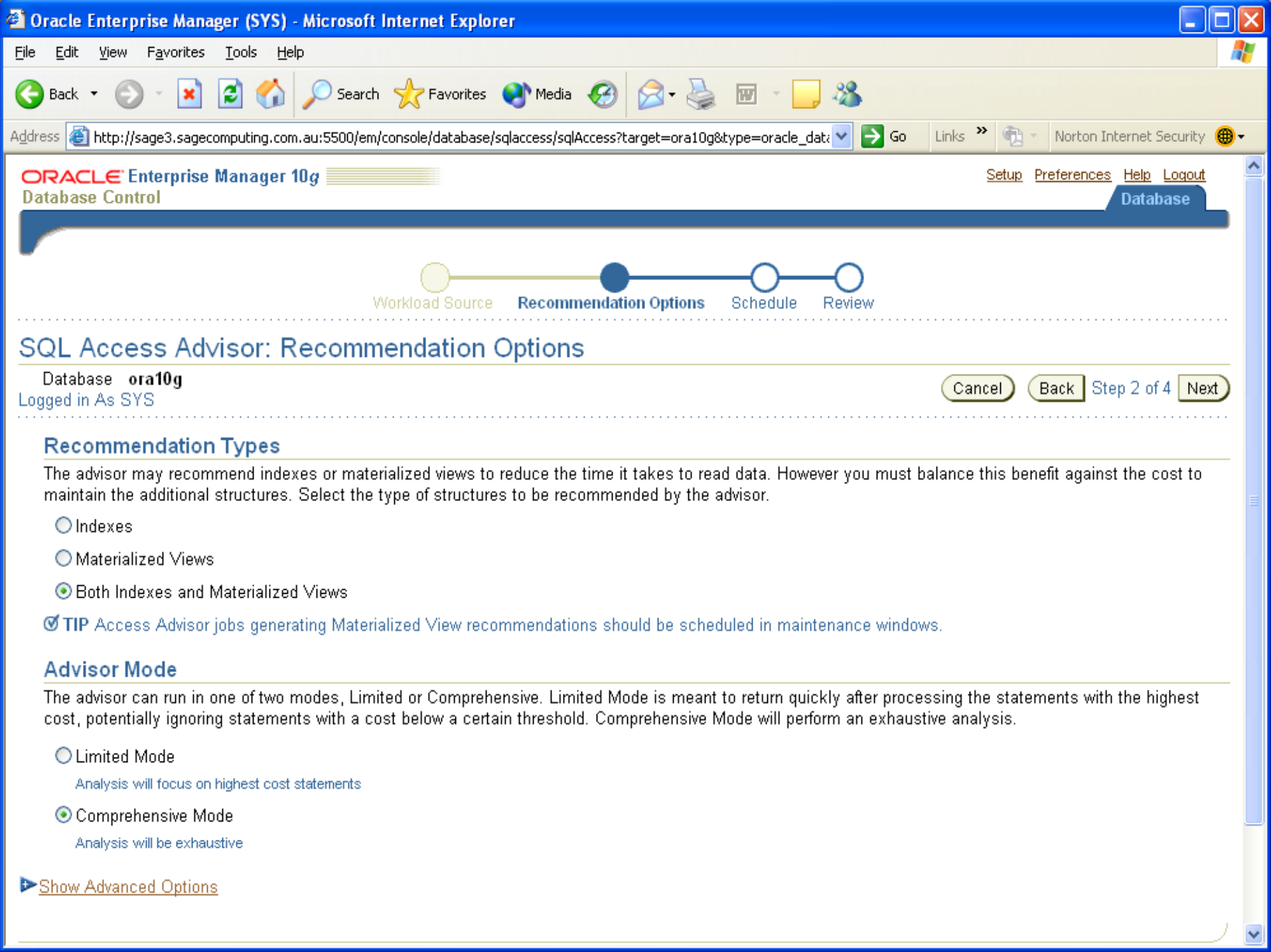
Database
Workload Source
Recommendation Options
Schedule
Review
SQL Access Advisor: Workload Source
Database ora10g
Logged in As SYS
Cancel Step 1 of 4 Next
Select the source of the workload that you want to use for the analysis. The best workload is one that fully represents all the SQL statements that access the underlying tables.
Current and Recent SQL Activity
SQL will be selected from the cache.
Import Workload from SQL Repository
Choose any SQL Tuning Set from the SQL Repository that you own.
SQL Tuning Set
SQL Tuning Sets
User-Defined Workload; Import SQL from a Table
The table must contain at least SQL_TEXT and USERNAME columns.
Table
Create a Hypothetical Workload from the Following Schemas and Tables
The advisor can create a hypothetical workload if the tables contain dimension or primary/foreign key constraints.
Tables
Comma-separated list
TIP Enter "Schema.%" to specify all the tables belonging to a particular schema.
Show Advanced Options
Overview
The performance of SQL queries can often be improved by creating additional structures, like Indexes and Materialized Views, that help in data retrieval. The SQL Access Advisor evaluates SQL statements in a workload, and can suggest indexes and materialized views that will improve the performance of the workload as a whole.
Cancel Step 1 of 4 Next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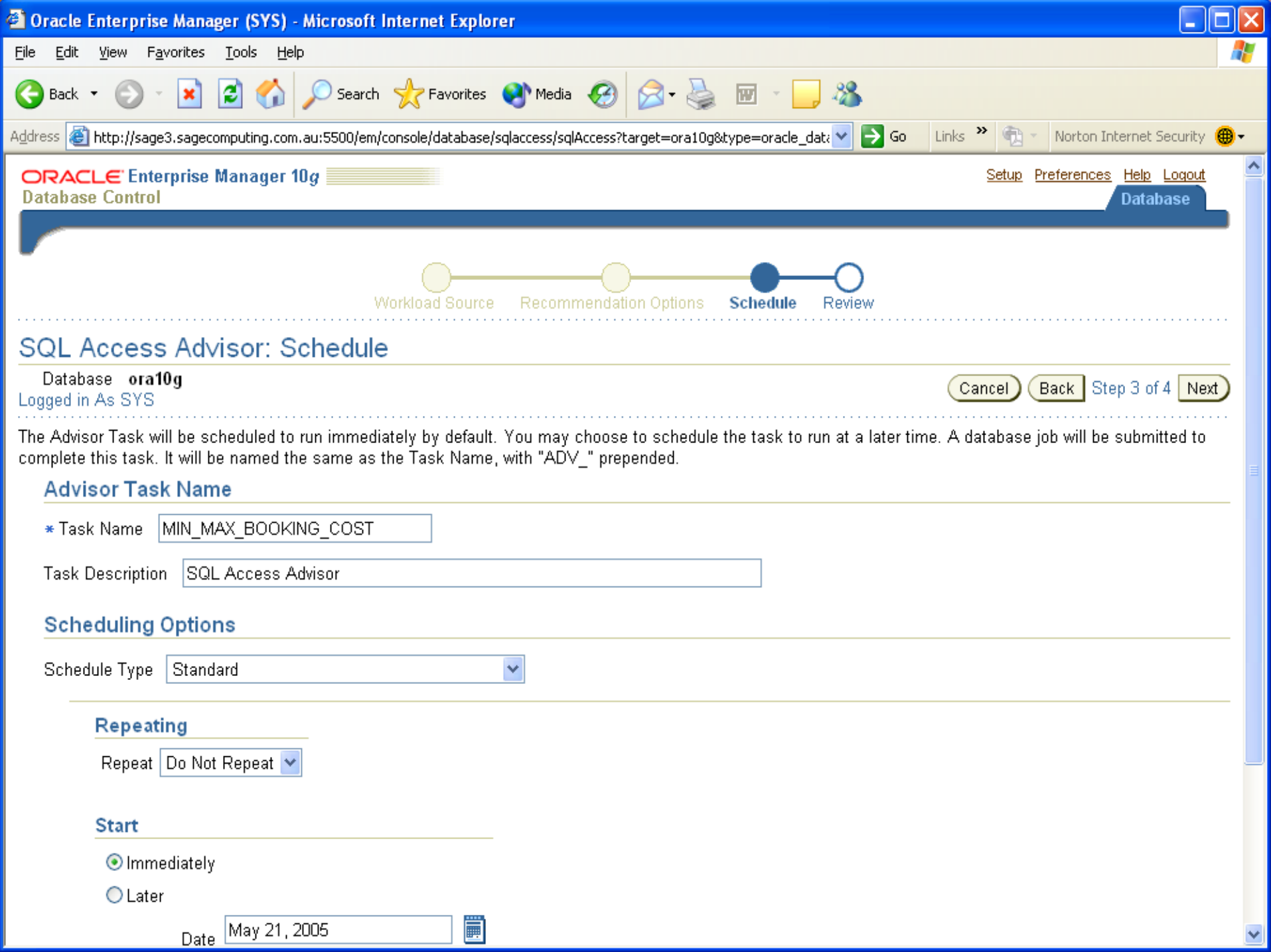
Database Control
Setup Preferences Help Logout
Database
Workload Source
Recommendation Options
Schedule
Review
SQL Access Advisor: Recommendation Options
Database ora10g
Logged in As SYS
Cancel
Back
Step 2 of 4
Next
Recommendation Types
The advisor may recommend indexes or materialized views to reduce the time it takes to read data. However you must balance this benefit against the cost to maintain the additional structures. Select the type of structures to be recommended by the advisor.
Indexes
Materialized Views
Both Indexes and Materialized Views
TIP Access Advisor jobs generating Materialized View recommendations should be scheduled in maintenance windows.
Advisor Mode
The advisor can run in one of two modes, Limited or Comprehensive. Limited Mode is meant to return quickly after processing the statements with the highest cost, potentially ignoring statements with a cost below a certain threshold. Comprehensive Mode will perform an exhaustive analysis.
Limited Mode
Analysis will focus on highest cost statements
Comprehensive Mode
Analysis will be exhaustive
Show Advanced Options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Database Control
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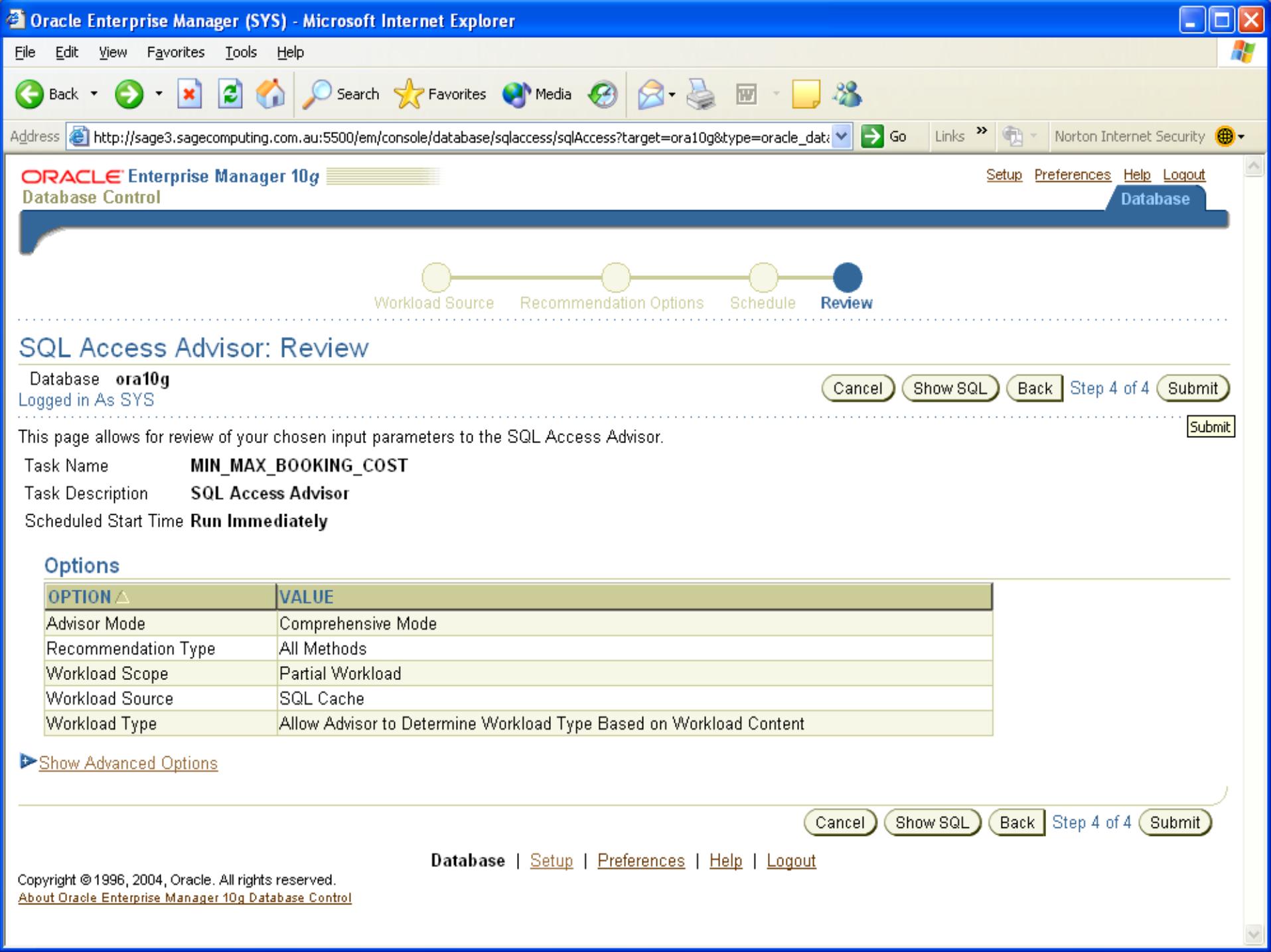
Database
Workload Source
Recommendation Options
Schedule
Review
SQL Access Advisor: Schedule
Database ora10g
Logged in As SYS
Cancel Back Step 3 of 4 Next
The Advisor Task will be scheduled to run immediately by default. You may choose to schedule the task to run at a later time. A database job will be submitted to complete this task. It will be named the same as the Task Name, with "ADV_" prepended.
Advisor Task Name
* Task Name MIN_MAX_BOOKING_COST
Task Description SQL Access Advisor
Scheduling Options
Schedule Type Standard
Repeating
Repeat Do Not Repeat
Start
Immediately
Later
Date May 21, 2005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Database Control
Setup Preferences Help Logout
Database
Workload Source
Recommendation Options
Schedule
Review
SQL Access Advisor: Review
Database ora10g
Logged in As SYS
Cancel Show SQL Back Step 4 of 4 Submit
Submit
This page allows for review of your chosen input parameters to the SQL Access Advisor.
Task Name MIN_MAX_BOOKING_COST
Task Description SQL Access Advisor
Scheduled Start Time Run Immediately
Options
OPTION
VALUE
Advisor Mode
Comprehensive Mode
Recommendation Type
All Methods
Workload Scope
Partial Workload
Workload Source
SQL Cache
Workload Type
Allow Advisor to Determine Workload Type Based on Workload Content
Show Advanced Options
Cancel Show SQL Back Step 4 of 4 Submit
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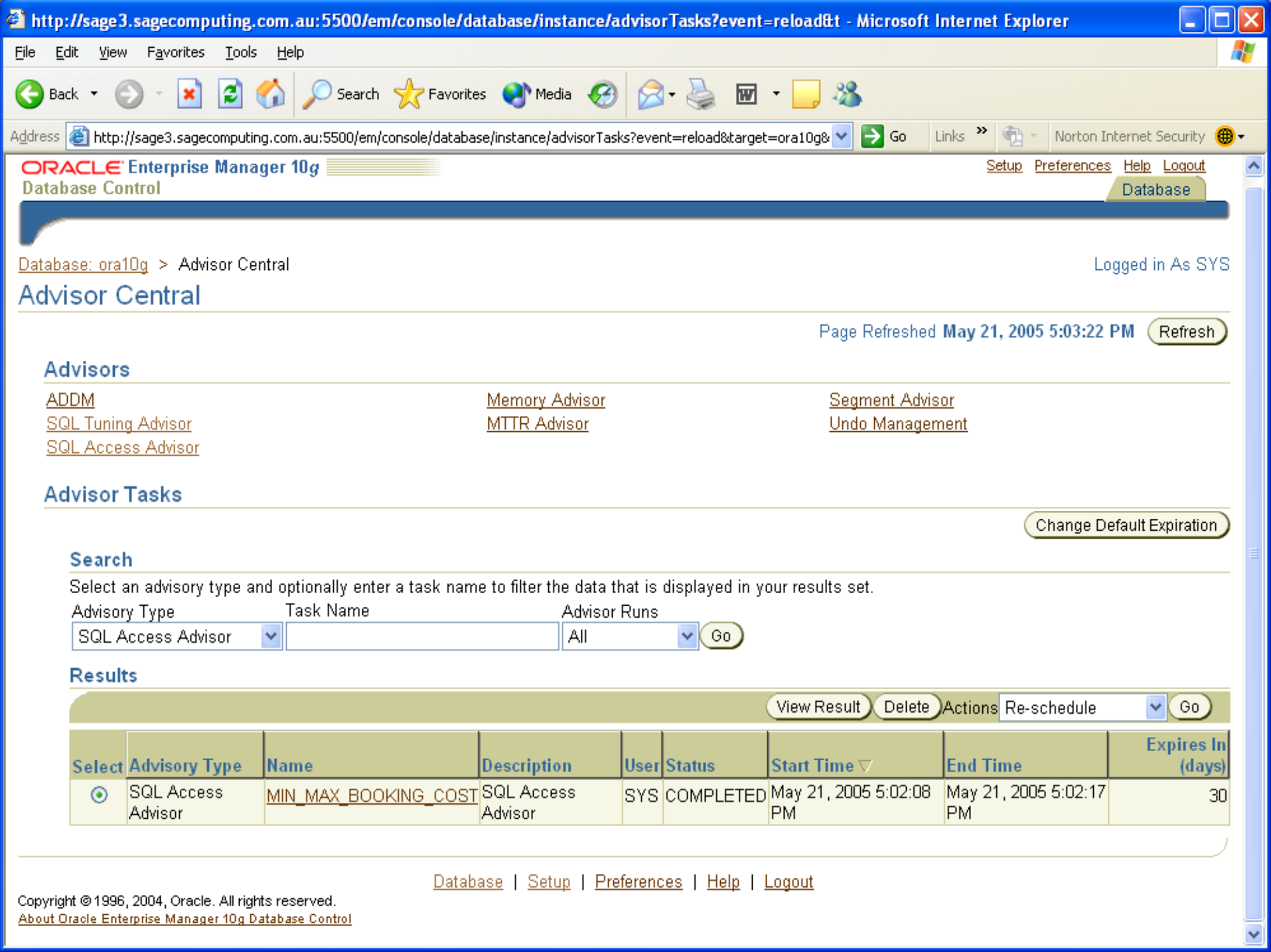
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Database Control
Setup Preferences Help Logout
Database
Database: ora10g > Advisor Central
Logged in As SYS
Advisor Central
Page Refreshed May 21, 2005 5:03:22 PM
Refresh
Advisors
ADDM
SQL Tuning Advisor
SQL Access Advisor
Memory Advisor
MTTR Advisor
Segment Advisor
Undo Management
Advisor Tasks
Change Default Expiration
Search
Select an advisory type and optionally enter a task name to filter the data that is displayed in your results set.
Advisory Type
SQL Access Advisor
Task Name
Advisor Runs
All
Go
Results
View Result
Delete
Actions
Re-schedule
Go
Select
Advisory Type
Name
Description
User
Status
Start Time
End Time
Expires In (days)
SQL Access Advisor
MIN_MAX_BOOKING_COST
SQL Access Advisor
SYS
COMPLETED
May 21, 2005 5:02:08 PM
May 21, 2005 5:02:17 PM
30
Database | Setup | Preferences | Help | Logout
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About Oracle Enterprise Manager 10g Database Control

Recommendations for Task: MIN_MAX_BOOKING_COST

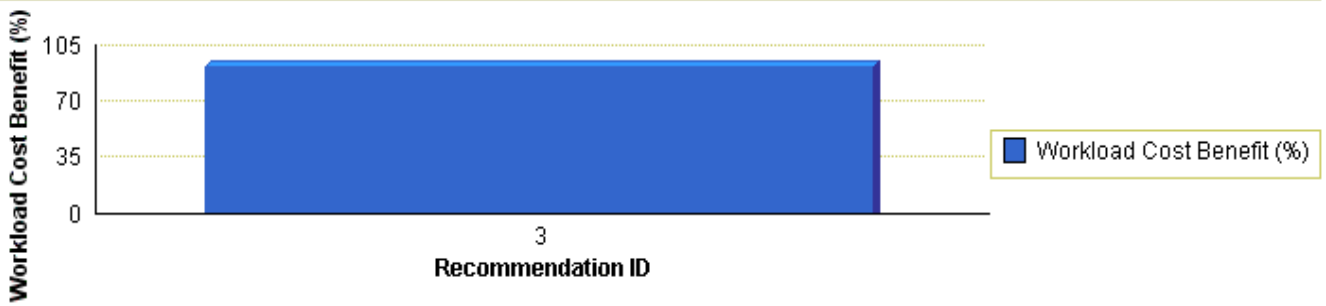
Task Name	**MIN_MAX_BOOKING_COST**	Started	**May 21, 2005 5:02:08 PM**
Status	**COMPLETED**	Ended	**May 21, 2005 5:02:17 PM**
Advisor Mode	**COMPREHENSIVE**	Running Time (seconds)	**9**
		Time Limit (seconds)	**UNLIMITED**

View: Recommendations

Recommendations

The following chart and table initially show the top recommendations ordered by their percentage improvement to the total cost of the whole workload. The top recommendation will have the biggest total performance improvement.

Recommendations Ordered by Workload Cost Benefit (%)



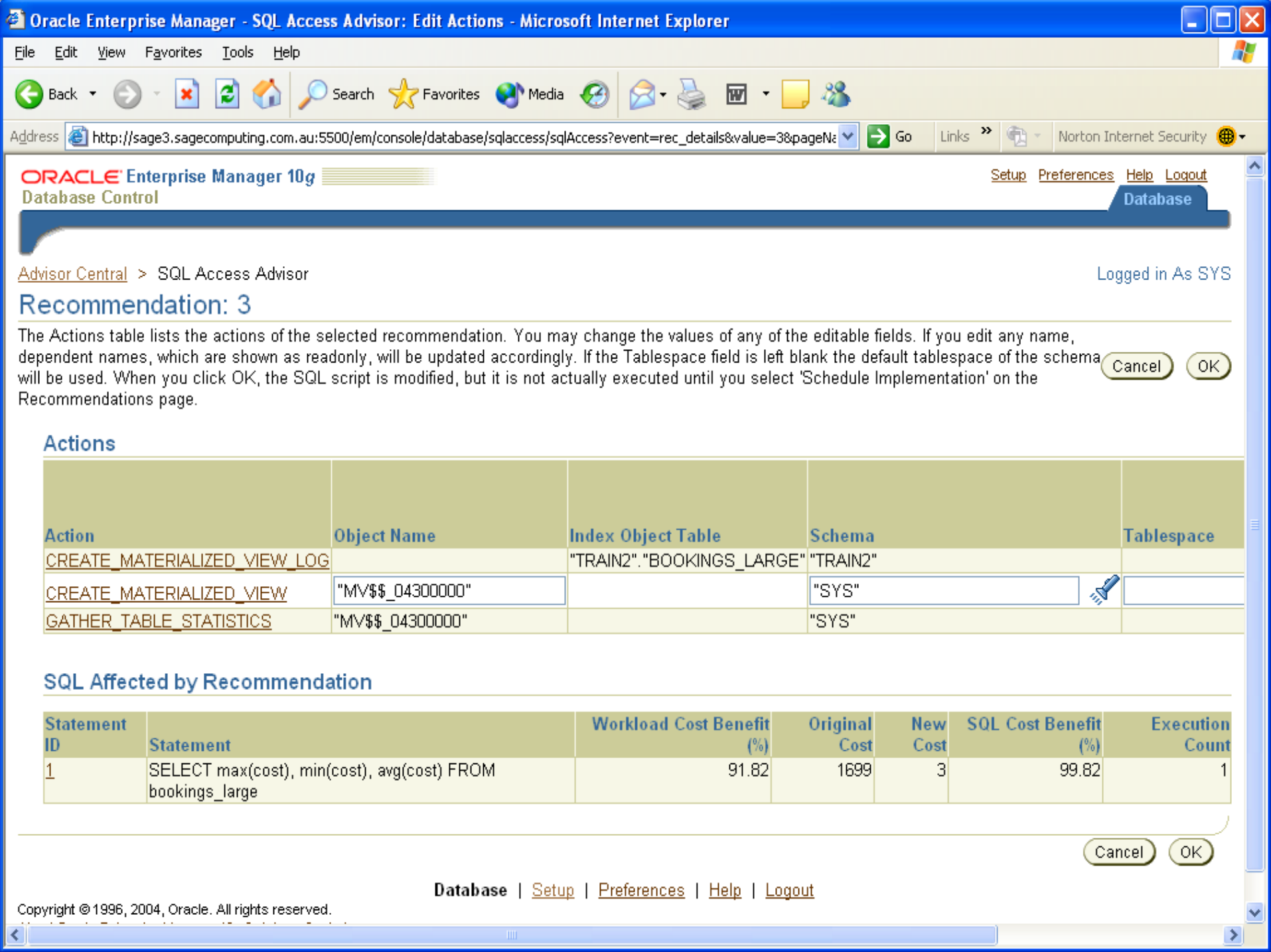
Select Recommendations for Implementation

Schedule Implementation | Show SQL

Select All | Select None

Select	Recommendation ID	Actions	Workload Cost Benefit (%)	Estimated Space Used (MB)	Affected SQL Statements
☑	3	3	91.82	0.008	1

Show Advanced Options


Oracle Enterprise Manager - SQL Access Advisor: Edit Actions - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://sage3.sagecomputing.com.au:5500/em/console/database/sqlaccess/sqlAccess?event=rec_details&value=3&pageNa
Go Links Norton Internet Security
ORACLE Enterprise Manager 10g
Database Control
Setup Preferences Help Logout
Database
Advisor Central > SQL Access Advisor
Logged in As SYS
Recommendation: 3
The Actions table lists the actions of the selected recommendation. You may change the values of any of the editable fields. If you edit any name, dependent names, which are shown as readonly, will be updated accordingly. If the Tablespace field is left blank the default tablespace of the schema will be used. When you click OK, the SQL script is modified, but it is not actually executed until you select 'Schedule Implementation' on the Recommendations page.
Cancel
OK
Actions
Action
Object Name
Index Object Table
Schema
Tablespace
CREATE_MATERIALIZED_VIEW_LOG
"TRAIN2"."BOOKINGS_LARGE"
"TRAIN2"
CREATE_MATERIALIZED_VIEW
"MV$$_04300000"
"SYS"
GATHER_TABLE_STATISTICS
"MV$$_04300000"
"SYS"
SQL Affected by Recommendation
Statement ID
Statement
Workload Cost Benefit (%)
Original Cost
New Cost
SQL Cost Benefit (%)
Execution Count
1
SELECT max(cost), min(cost), avg(cost) FROM bookings_large
91.82
1699
3
99.82
1
Cancel
OK
Database | Setup | Preferences | Help | Logout
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Partitions

Partitioning

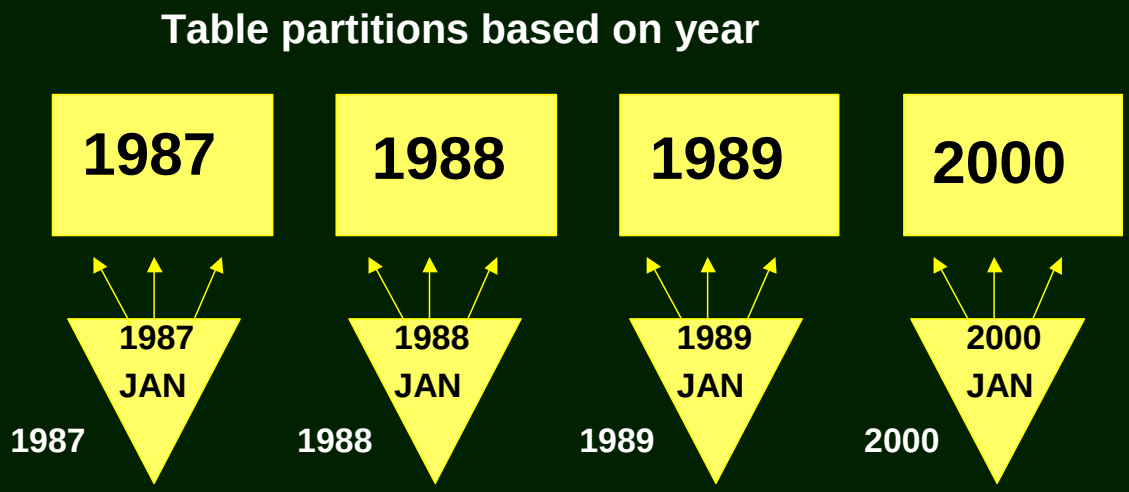
- Single logical table
- Physically stored as a series of separate segments
- Availability – partition maintenance
- Performance
  - Partition elimination
  - Partition wise joins
  - Parallelisation

Partitioning

- Range
- Hash
- List
- Composite

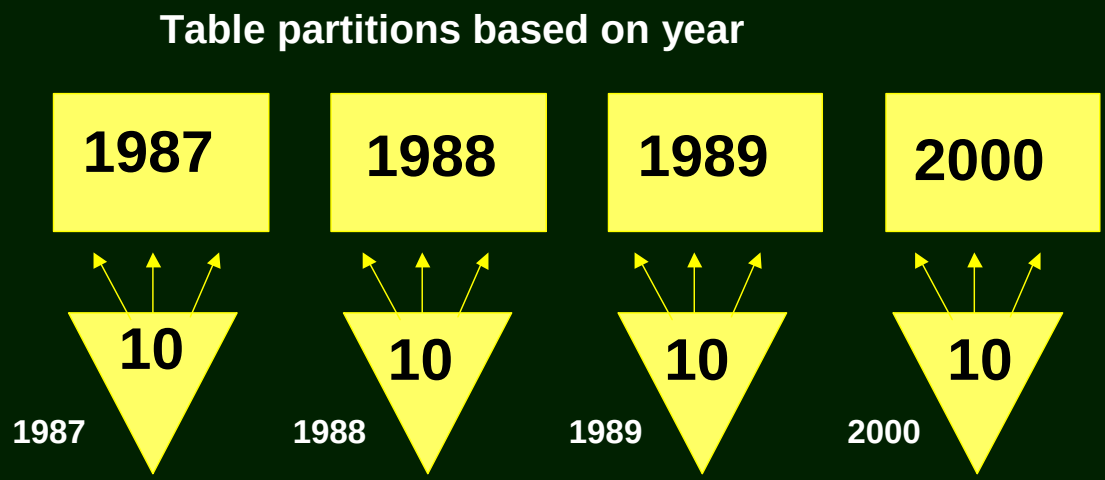
Prefixed Indexes

- Allow the pruning of index partitions
- More useful in OLTP type applications



Non Prefixed Indexes

- Useful in decision support databases
- Allow probes of the multiple index partitions to be performed in parallel

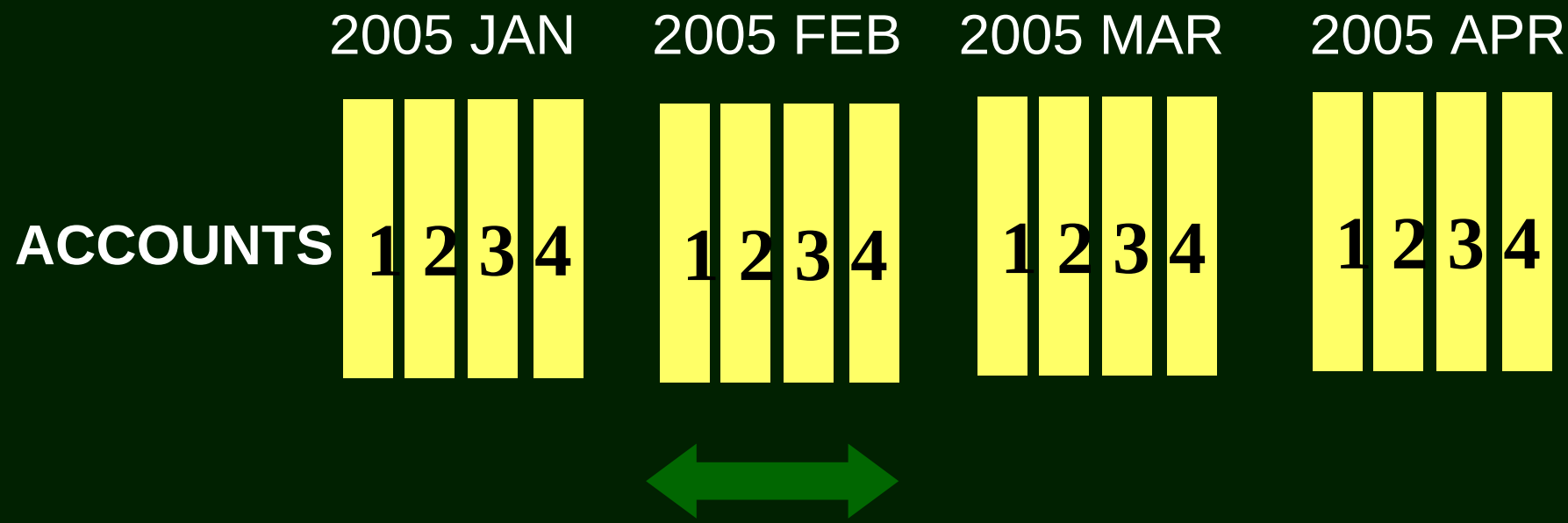


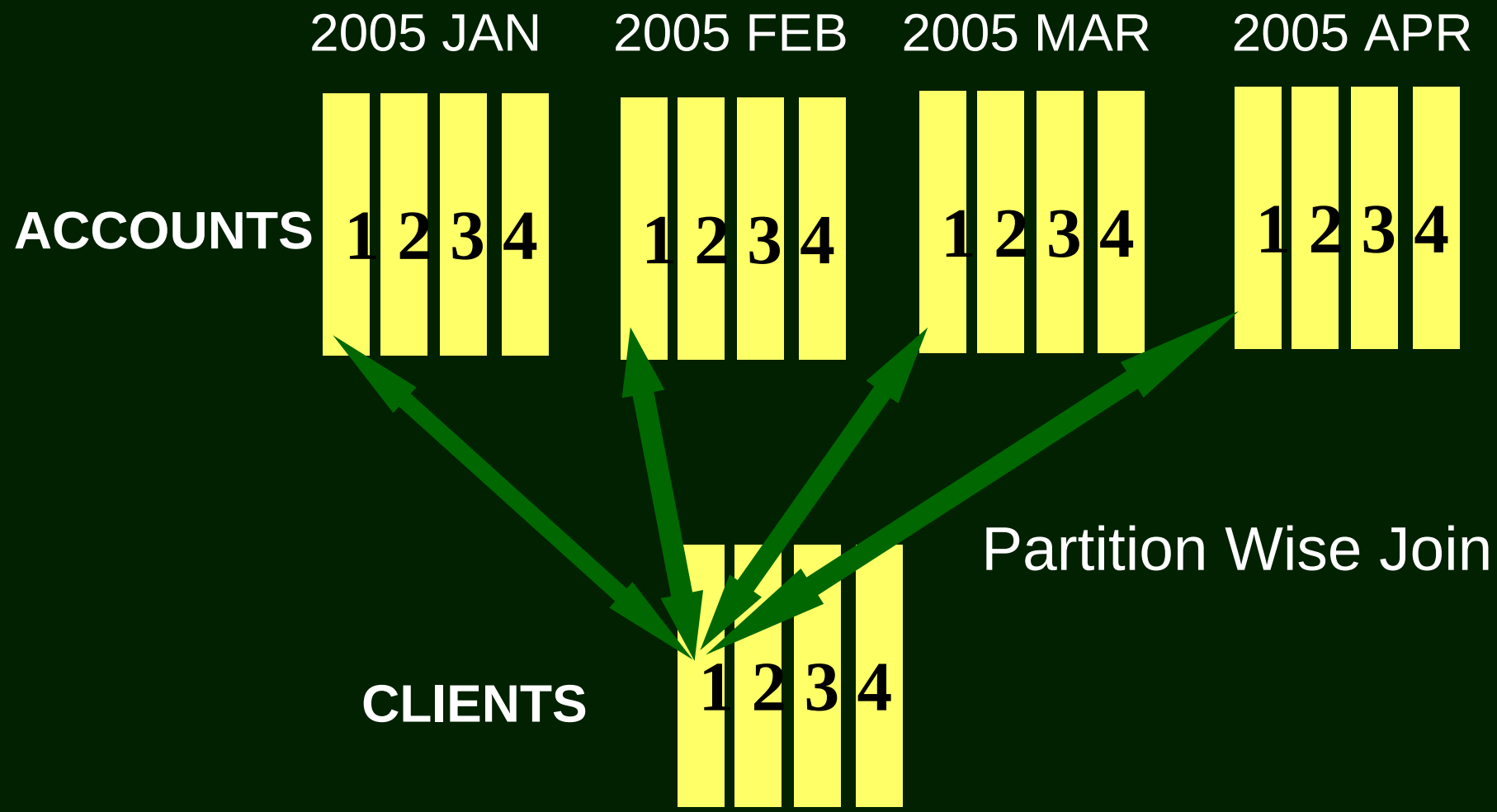
Partition Design - Example

- Main table ACCOUNTS
  partitioned on Year and Month
  Sub partitioned on hash of Client_no

- Joining table CLIENTS
  partitioned on hash of Client_no

Partition Design - Example



Partition scan for one month's reporting

Partition Design - Example