

# Mining the AWR v1

Alternative Methods for  
Identification of the Top SQLs

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Lead Database Consultant  
Pythian

## Can you read this?

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Connected to:  
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production  
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

**“The best zoom lens is your legs.”**

- Ernst Haas



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Oracle [Apps] DBA since 2005  
Speaker at conferences since 2007



**Maris Elsins**

Lead Database Consultant  
At Pythian since 2011

@MarisDBA

elsins@pythian.com

<http://bit.ly/getMOSPatchV2>

```

PS C:\Users\elsins> java -jar .\getMOSPatch.jar patch=6880880 platform=233P regexp=.*112.* download=all
Enter your MOS username: elsins@pythian.com
Enter your MOS password:
Enter Comma separated platforms to list: 233P

We're going to download patches for the following Platforms/Languages:
233P - Microsoft Windows x64 (64-bit)

Processing patch 6880880 for Microsoft Windows x64 (64-bit) and applying regexp .*112.* to the filenames:
1 - p6880880_112000_MSWIN-x86-64.zip
Enter Comma separated files to download: all
All files will be downloadad because download=all was specified.

Downloading all selected files:
  Downloading p6880880_112000_MSWIN-x86-64.zip: 46MB at average speed of 8203KB/s - DONE!
PS C:\Users\elsins> java -version
java version "1.8.0_66"
Java(TM) SE Runtime Environment (build 1.8.0_66-b18)
Java HotSpot(TM) Client VM (build 25.66-b18, mixed mode, sharing)
PS C:\Users\elsins>

```

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## ABOUT PYTHIAN

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Systems currently  
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GLOBAL

400

Pythian experts  
in 35 countries



EXPERTS

2

Millennia of experience  
gathered and shared  
over 19 years

# AGENDA

## A SERIOUS DEVICE

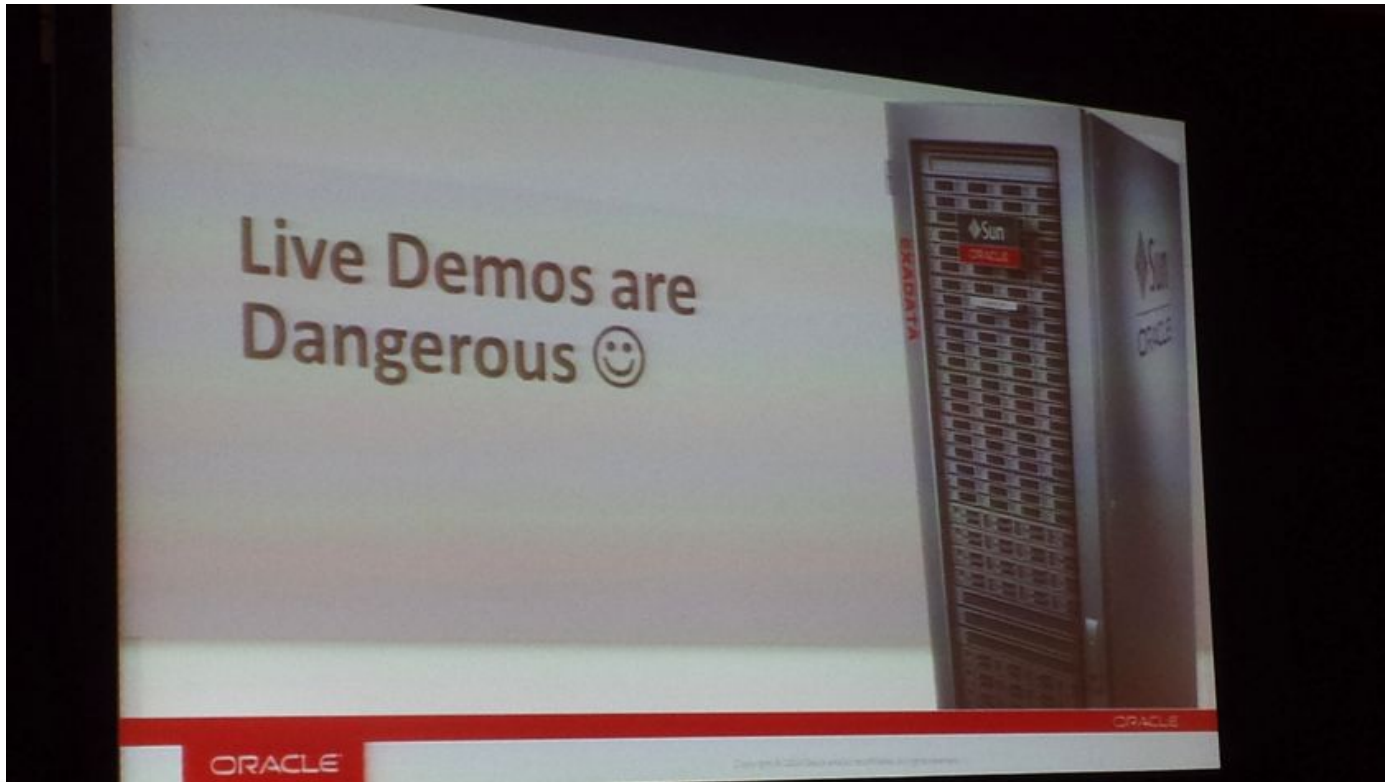


# AGENDA

## PANNING



# DEMO



DEMO





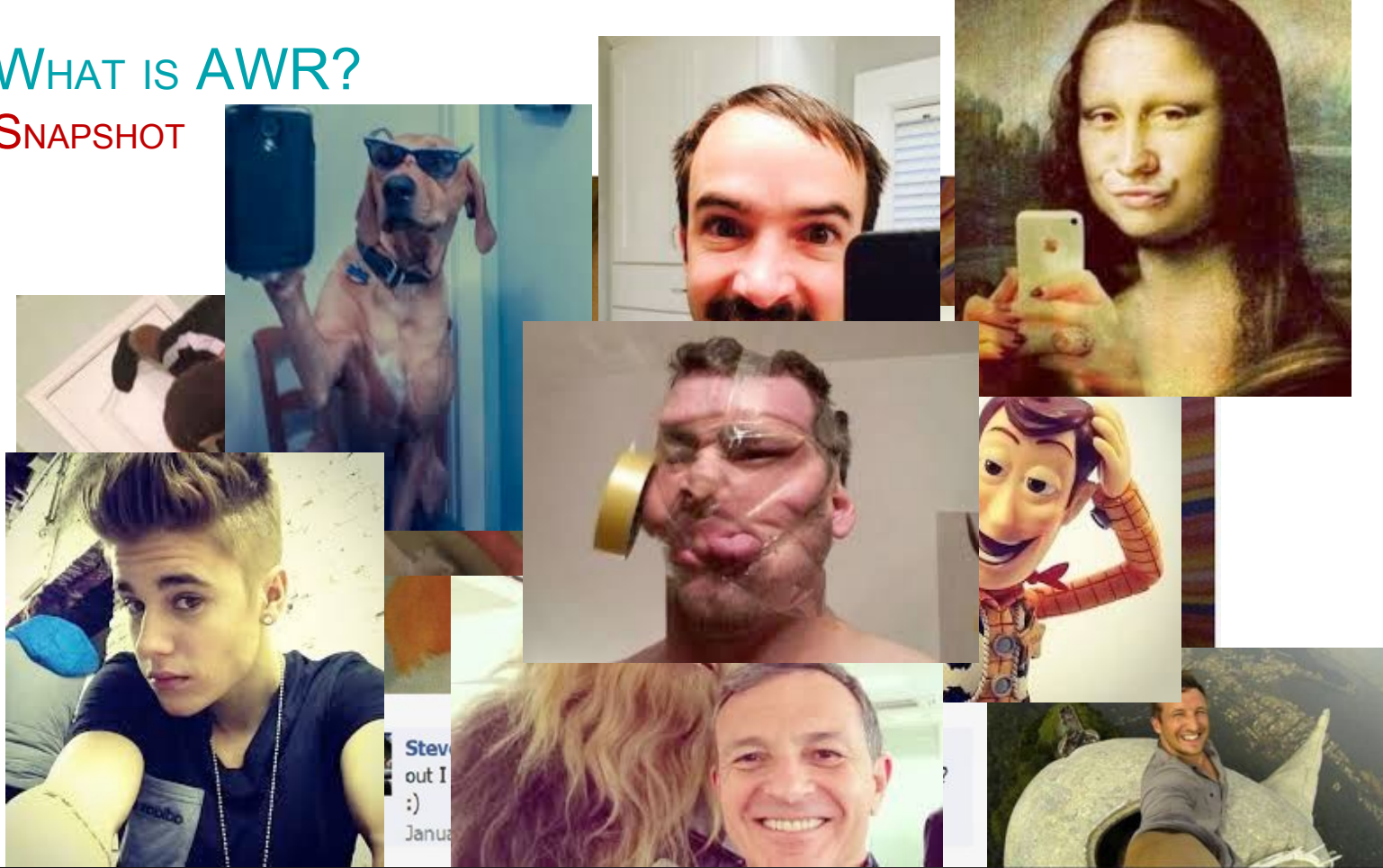
# WHAT IS AWR?

WORKLOAD



# WHAT IS AWR?

## SNAPSHOT



# WHAT IS AWR?

## REPOSITORY





# WHAT IS AWR?

## AWR REPORT



# AWR

Automatic Workload Repository

Let's try again ...





# AWR SNAPSHOT

62+ V\$ & X\$

X\$KCBFWAIT  
V\$PROCESS\_MEMORY X\$KEWRATTRNEW  
X\$KMMSAS V\$TABLESPACE V\$LIBRARYCACHE  
V\$ROWCACHE X\$KEWMFLMV X\$KEWPDBINSNAP  
V\$SYS\_TIME\_MODEL V\$DBFILE V\$SGASTAT X\$KCFIO  
X\$KMG SOP V\$QUEUE X\$KEWMDRMV X\$KEWRSQLSUM  
V\$MTTR\_TARGET\_ADVICE V\$ENQUEUE\_STATISTICS  
X\$KSUXSINST X\$KCCTF V\$RESOURCE\_LIMIT X\$KSPPSV2  
X\$KCCTS V\$LOG X\$KSFQP V\$LATCH X\$KMCQS  
V\$WAITSTAT V\$SGA\_TARGET\_ADVICE X\$KEWRSQLIDTAB V\$BACKUP X\$KCCRT  
V\$OSSTAT X\$KCBSC V\$ACTIVE\_SERVICES X\$KGLCURSOR\_CHILD\_SQLIDPH  
X\$KMMDI V\$BUFFER\_POOL\_STATISTICS X\$KSPPI V\$PARAMETER X\$KCFTIO  
V\$TEMPFILE V\$SHARED\_POOL\_ADVICE V\$SYSTEM\_EVENT  
V\$DATAFILE X\$KCBWBP X\$KMMHST V\$JAVA\_POOL\_ADVICE X\$KEWRTSQLTEXT  
V\$SQL\_WORKAREA\_HISTOGRAM V\$MEMORY\_TARGET\_ADVICE  
V\$PGASTAT V\$INSTANCE\_RECOVERY X\$KEWMEVMV  
X\$KCCFN X\$KEWRTOPTENV V\$SQL\_PLAN X\$KMG SCT  
X\$KEWRTSQLPLAN V\$LATCH\_MISSES X\$KTTEFINFO X\$KEWMSMDV  
X\$KTUSMST2 V\$PGA\_TARGET\_ADVICE  
V\$SQL\_BIND\_CAPTURE X\$KSPPSV

# WORKLOAD

## CAPTURED BY AWR

- **Object statistics** that determine both access and usage statistics of database segments
- **Time model statistics** based on time usage for activities, displayed in the V\$SYS\_TIME\_MODEL and V\$SESS\_TIME\_MODEL views
- Some of the **system and session statistics** collected in the V\$SYSSTAT and V\$SESSTAT views
- **SQL statements** that are producing the highest load on the system, based on criteria such as elapsed time and CPU time
- **Active Session History (ASH) statistics**, representing the history of recent sessions activity

# AWR SNAPSHOT

## “THE SELFIE”

- MMON or `dbms_workload_repository.create_snapshot()`
- DBA HIST WR CONTROL

```
SQL> select * from dba_hist_wr_control;
```

| DBID       | SNAP_INTERVAL     | RETENTION         | TOPNSQL | CON_ID |
|------------|-------------------|-------------------|---------|--------|
| 1388947913 | +00000 01:00:00.0 | +00008 00:00:00.0 | DEFAULT | 1      |

- TOPNSQL “DEFAULT” depends on the STATISTICS\_LEVEL
  - TYPICAL => 30 (is this enough?)
  - ALL => 100
- DBMS\_WORKLOAD\_REPOSITORY
  - Modify settings: `MODIFY_SNAPSHOT_SETTINGS`
  - Colored SQL: `ADD_COLORED_SQL`



# SNAPSHOT

## 2 WAYS OF COLLECTING STATISTICS

- DELTAs & TOTALS

- Captures current values
- Pre-calculates  $\Delta$  values
- DBA\_HIST\_SQLSTAT
- DBA\_HIST\_SEG\_STAT

- TOTALS

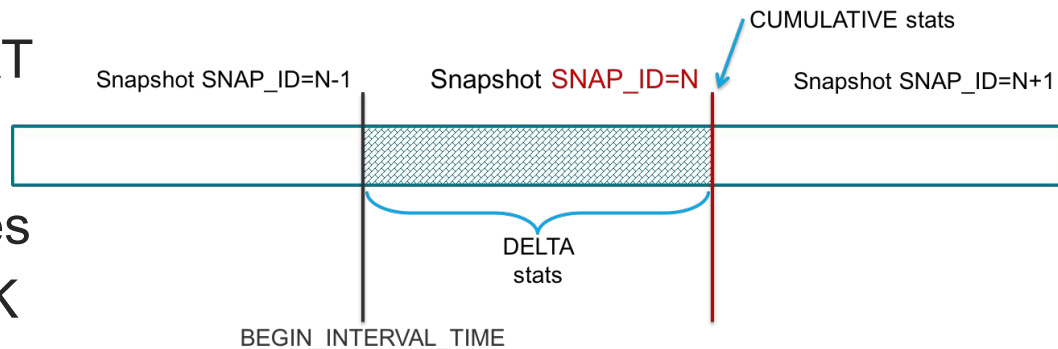
- Captures current values
- Similar to STATSPACK
- DBA\_HIST\_IOSTAT\_DETAIL and others

Listing the last day's Completed Snapshots

| Instance | DB Name | Snap Id | Snap Started      | Snap Level |
|----------|---------|---------|-------------------|------------|
| orcl     | ORCL    | 200     | 03 Mar 2015 07:18 | 1          |
|          |         | 201     | 03 Mar 2015 07:30 | 1          |
|          |         | 202     | 03 Mar 2015 07:40 | 1          |
|          |         | 203     | 03 Mar 2015 07:50 | 1          |

Specify the Begin and End Snapshot Ids

Enter value for begin\_snap: █





# REPOSITORY

## METADATA

- DBA\_HIST\_ASM\_DISKGROUP
- DBA\_HIST\_BASELINE
- DBA\_HIST\_BASELINE\_DETAILS
- DBA\_HIST\_BASELINE\_METADATA
- DBA\_HIST\_BASELINE\_TEMPLATE
- DBA\_HIST\_CELL\_CONFIG
- DBA\_HIST\_CELL\_IOREASON\_NAME
- DBA\_HIST\_CELL\_METRIC\_DESC
- DBA\_HIST\_COLORED\_SQL
- DBA\_HIST\_DATABASE\_INSTANCE
- DBA\_HIST\_DATAFILE
- DBA\_HIST\_EVENT\_NAME
- DBA\_HIST\_IM\_SEG\_STAT\_OBJ
- DBA\_HIST\_IOSTAT\_FILETYPE\_NAME
- DBA\_HIST\_IOSTAT\_FUNCTION\_NAME
- DBA\_HIST\_LATCH\_NAME
- DBA\_HIST\_METRIC\_NAME
- DBA\_HIST\_OPTIMIZER\_ENV
- DBA\_HIST\_OSSTAT\_NAME
- DBA\_HIST\_PARAMETER\_NAME
- DBA\_HIST\_PDB\_INSTANCE
- DBA\_HIST\_PLAN\_OPERATION\_NAME
- DBA\_HIST\_PLAN\_OPTION\_NAME
- DBA\_HIST\_REPORTS\_CONTROL
- DBA\_HIST\_SEG\_STAT\_OBJ
- DBA\_HIST\_SERVICE\_NAME
- DBA\_HIST\_SQLCOMMAND\_NAME
- DBA\_HIST\_SQLTEXT
- DBA\_HIST\_SQL\_BIND\_METADATA
- DBA\_HIST\_SQL\_PLAN
- DBA\_HIST\_STAT\_NAME
- DBA\_HIST\_TABLESPACE
- DBA\_HIST\_TEMPFILE
- DBA\_HIST\_TOPLEVELCALL\_NAME
- DBA\_HIST\_WR\_CONTROL



DEMO

# THANK YOU LARRY FOR AWR REPORTS!

file:///Users/melsins/Dropbox/Conferences/2015.10.25%20OOW15%20-%20%20Mining%20Aut

## WORKLOAD REPOSITORY report for

| DB Name | DB Id      | Instance | Inst num | Startup Time    | Release    | RAC |
|---------|------------|----------|----------|-----------------|------------|-----|
| ORCL    | 1388947913 | orcl     | 1        | 17-Oct-14 08:10 | 12.1.0.1.0 | NO  |

| Host Name      | Platform         | CPUs | Cores | Sockets | Memory (GB) |
|----------------|------------------|------|-------|---------|-------------|
| DB12c.maris.lv | Linux x86 64-bit | 4    | 4     | 1       | 7.80        |

|             | Snap Id | Snap Time          | Sessions | Cursors/Session | Pluggable Databases Open |
|-------------|---------|--------------------|----------|-----------------|--------------------------|
| Begin Snap: | 24      | 19-Oct-14 10:39:43 | 47       | 2.7             | 1                        |
| End Snap:   | 50      | 19-Oct-14 14:51:00 | 46       | 3.0             | 1                        |
| Elapsed:    |         | 251.29 (mins)      |          |                 |                          |
| DB Time:    |         | 136.69 (mins)      |          |                 |                          |

### Report Summary

#### Load Profile

|                          | Per Second | Per Transaction | Per Exec | Per Call |
|--------------------------|------------|-----------------|----------|----------|
| DB Time(s):              | 0.5        | 0.0             | 0.00     | 0.00     |
| DB CPU(s):               | 0.4        | 0.0             | 0.00     | 0.00     |
| Redo size (bytes):       | 195,940.0  | 4,352.1         |          |          |
| Logical read (blocks):   | 4,327.6    | 96.1            |          |          |
| Block changes:           | 1,080.1    | 24.0            |          |          |
| Physical read (blocks):  | 10.9       | 0.2             |          |          |
| Physical write (blocks): | 116.2      | 2.6             |          |          |
| Read IO requests:        | 10.1       | 0.2             |          |          |
| Write IO requests:       | 52.8       | 1.2             |          |          |

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## Main Report

- [Report Summary](#)
- [Wait Events Statistics](#)
- [SQL Statistics](#)
- [Instance Activity Statistics](#)
- [IO Stats](#)
- [Buffer Pool Statistics](#)
- [Advisory Statistics](#)
- [Wait Statistics](#)
- [Undo Statistics](#)
- [Latch Statistics](#)
- [Segment Statistics](#)
- [Dictionary Cache Statistics](#)
- [Library Cache Statistics](#)
- [Memory Statistics](#)
- [Replication Statistics \(GoldenGate, XStream\)](#)
- [Streams Statistics](#)
- [Resource Limit Statistics](#)
- [Shared Server Statistics](#)
- [init.ora Parameters](#)
- [ADDM Reports](#)

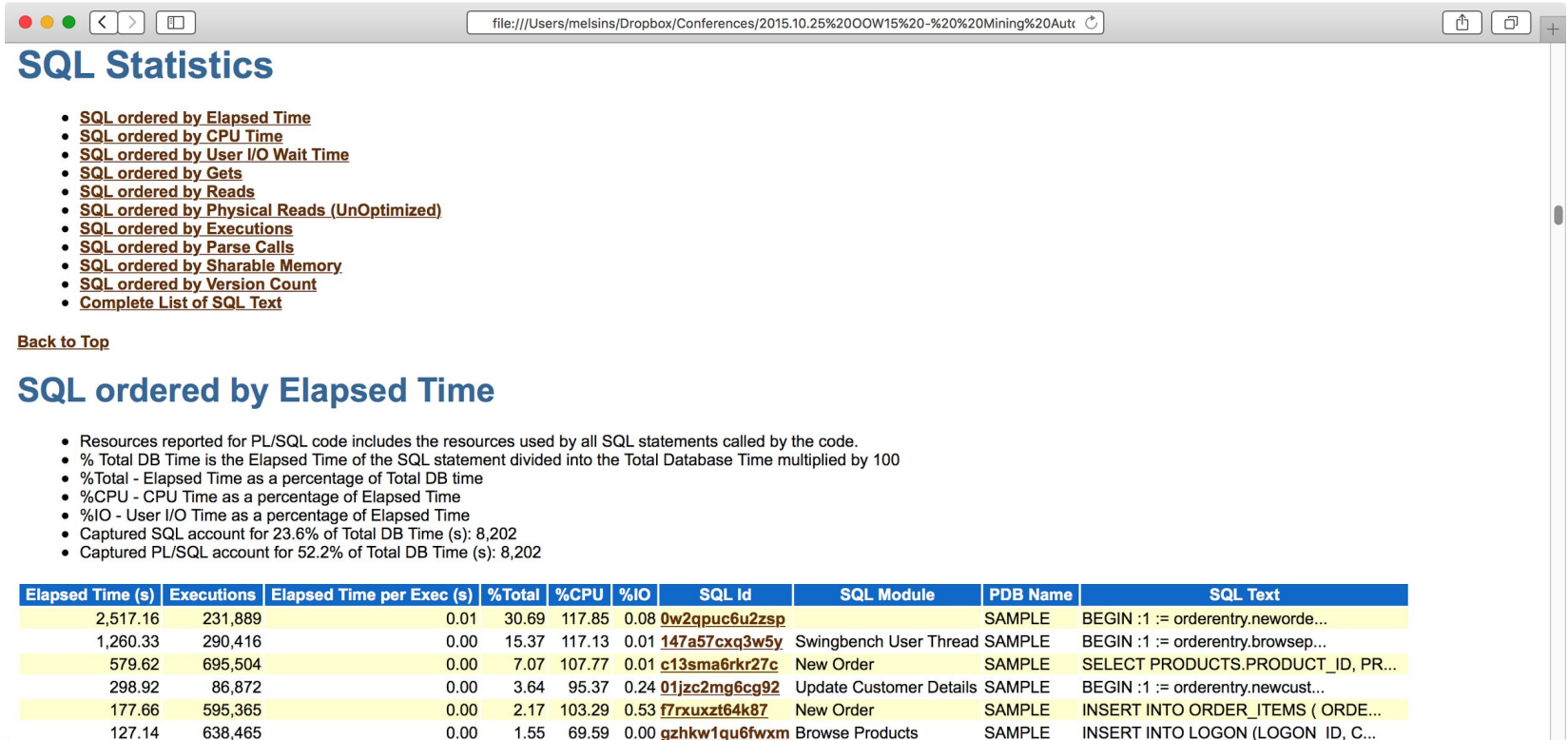
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## Wait Events Statistics

- [Time Model Statistics](#)
- [Operating System Statistics](#)
- [Operating System Statistics - Detail](#)
- [Foreground Wait Class](#)
- [Foreground Wait Events](#)
- [Background Wait Events](#)



# THANK YOU LARRY FOR AWR REPORTS!



**SQL Statistics**

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- [SQL ordered by CPU Time](#)
- [SQL ordered by User I/O Wait Time](#)
- [SQL ordered by Gets](#)
- [SQL ordered by Reads](#)
- [SQL ordered by Physical Reads \(UnOptimized\)](#)
- [SQL ordered by Executions](#)
- [SQL ordered by Parse Calls](#)
- [SQL ordered by Sharable Memory](#)
- [SQL ordered by Version Count](#)
- [Complete List of SQL Text](#)

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## SQL ordered by Elapsed Time

- Resources reported for PL/SQL code includes the resources used by all SQL statements called by the code.
- % Total DB Time is the Elapsed Time of the SQL statement divided into the Total Database Time multiplied by 100
- % Total - Elapsed Time as a percentage of Total DB time
- % CPU - CPU Time as a percentage of Elapsed Time
- % IO - User I/O Time as a percentage of Elapsed Time
- Captured SQL account for 23.6% of Total DB Time (s): 8,202
- Captured PL/SQL account for 52.2% of Total DB Time (s): 8,202

| Elapsed Time (s) | Executions | Elapsed Time per Exec (s) | %Total | %CPU   | %IO  | SQL Id                        | SQL Module              | PDB Name | SQL Text                          |
|------------------|------------|---------------------------|--------|--------|------|-------------------------------|-------------------------|----------|-----------------------------------|
| 2,517.16         | 231,889    | 0.01                      | 30.69  | 117.85 | 0.08 | <a href="#">0w2qpuc6u2zsp</a> |                         | SAMPLE   | BEGIN :1 := orderentry.neworde... |
| 1,260.33         | 290,416    | 0.00                      | 15.37  | 117.13 | 0.01 | <a href="#">147a57cxq3w5y</a> | Swingbench User Thread  | SAMPLE   | BEGIN :1 := orderentry.browsep... |
| 579.62           | 695,504    | 0.00                      | 7.07   | 107.77 | 0.01 | <a href="#">c13sma6rkr27c</a> | New Order               | SAMPLE   | SELECT PRODUCTS.PRODUCT_ID, PR... |
| 298.92           | 86,872     | 0.00                      | 3.64   | 95.37  | 0.24 | <a href="#">01jzc2mg6cg92</a> | Update Customer Details | SAMPLE   | BEGIN :1 := orderentry.newcust... |
| 177.66           | 595,365    | 0.00                      | 2.17   | 103.29 | 0.53 | <a href="#">f7rxuxzt64k87</a> | New Order               | SAMPLE   | INSERT INTO ORDER_ITEMS ( ORDE... |
| 127.14           | 638,465    | 0.00                      | 1.55   | 69.59  | 0.00 | <a href="#">gzhkw1qu6fwxm</a> | Browse Products         | SAMPLE   | INSERT INTO LOGON (LOGON_ID, C... |

# THANK YOU LARRY FOR AWR REPORTS!

## SQL ordered by CPU Time

- Resources reported for PL/SQL code includes the resources used by all SQL statements called by the code.
- %Total - CPU Time as a percentage of Total DB CPU
- %CPU - CPU Time as a percentage of Elapsed Time
- %IO - User I/O Time as a percentage of Elapsed Time
- Captured SQL account for 26.0% of Total CPU Time (s): 6,611
- Captured PL/SQL account for 74.7% of Total CPU Time (s): 6,611

| CPU Time (s) | Executions | CPU per Exec (s) | %Total | Elapsed Time (s) | %CPU   | %IO  | SQL Id                        | SQL Module              | PDB Name | SQL Text                          |
|--------------|------------|------------------|--------|------------------|--------|------|-------------------------------|-------------------------|----------|-----------------------------------|
| 2,966.52     | 231,889    | 0.01             | 44.87  | 2,517.16         | 117.85 | 0.08 | <a href="#">0w2qpuc6u2zsp</a> |                         | SAMPLE   | BEGIN :1 := orderentry.neworde... |
| 1,476.17     | 290,416    | 0.01             | 22.33  | 1,260.33         | 117.13 | 0.01 | <a href="#">147a57cxq3w5y</a> | Swingbench User Thread  | SAMPLE   | BEGIN :1 := orderentry.browsep... |
| 624.63       | 695,504    | 0.00             | 9.45   | 579.62           | 107.77 | 0.01 | <a href="#">c13sma6rkr27c</a> | New Order               | SAMPLE   | SELECT PRODUCTS.PRODUCT_ID, PR... |
| 285.07       | 86,872     | 0.00             | 4.31   | 298.92           | 95.37  | 0.24 | <a href="#">01jzc2mg6cg92</a> | Update Customer Details | SAMPLE   | BEGIN :1 := orderentry.newcust... |
| 183.50       | 595,365    | 0.00             | 2.78   | 177.66           | 103.29 | 0.53 | <a href="#">f7rxuzt64k87</a>  | New Order               | SAMPLE   | INSERT INTO ORDER_ITEMS ( ORDE... |
| 90.75        | 231,877    | 0.00             | 1.37   | 122.99           | 73.79  | 0.05 | <a href="#">3fw75k1snsddx</a> | New Order               | SAMPLE   | INSERT INTO ORDERS ( ORDER_ID,... |
| 88.48        | 638,465    | 0.00             | 1.34   | 127.14           | 69.59  | 0.00 | <a href="#">gzhkw1qu6fwxm</a> | Browse Products         | SAMPLE   | INSERT INTO LOGON (LOGON_ID, C... |
| 85.47        | 29,082     | 0.00             | 1.29   | 83.98            | 101.78 | 1.48 | <a href="#">apgb2g9g2zjh1</a> |                         | SAMPLE   | BEGIN :1 := orderentry.browsea... |
| 68.70        | 57,765     | 0.00             | 1.04   | 64.34            | 106.77 | 0.15 | <a href="#">cmndgkbcz5s9</a>  |                         | SAMPLE   | BEGIN :1 := orderentry.updateC... |
| 58.88        | 86,873     | 0.00             | 0.89   | 54.87            | 106.94 | 0.92 | <a href="#">gh2g2tynpcpv1</a> | Update Customer Details | SAMPLE   | INSERT INTO CUSTOMERS ( CUSTOM... |

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## SQL ordered by User I/O Wait Time

- Resources reported for PL/SQL code includes the resources used by all SQL statements called by the code.
- %Total - User I/O Time as a percentage of Total User I/O Wait time
- %CPU - CPU Time as a percentage of Elapsed Time
- %IO - User I/O Time as a percentage of Elapsed Time
- Captured SQL account for 46.0% of Total User I/O Wait Time (s): 11

# THANK YOU LARRY FOR AWR REPORTS!

## SQL ordered by Reads

- %Total - Physical Reads as a percentage of Total Disk Reads
- %CPU - CPU Time as a percentage of Elapsed Time
- %IO - User I/O Time as a percentage of Elapsed Time
- Total Disk Reads: 164,118
- Captured SQL account for 82.6% of Total

| Physical Reads | Executions | Reads per Exec | %Total | Elapsed Time (s) | %CPU   | %IO  | SQL Id                        | SQL Module               | PDB Name | SQL Text                          |
|----------------|------------|----------------|--------|------------------|--------|------|-------------------------------|--------------------------|----------|-----------------------------------|
| 58,971         | 231,889    | 0.25           | 35.93  | 2,517.16         | 117.85 | 0.08 | <a href="#">0w2qpuc6u2zsp</a> |                          | SAMPLE   | BEGIN :1 := orderentry.neworde... |
| 38,878         | 29,082     | 1.34           | 23.69  | 83.98            | 101.78 | 1.48 | <a href="#">apgb2g9q2zjh1</a> |                          | SAMPLE   | BEGIN :1 := orderentry.browsea... |
| 26,787         | 595,365    | 0.04           | 16.32  | 177.66           | 103.29 | 0.53 | <a href="#">f7rxuxzt64k87</a> | New Order                | SAMPLE   | INSERT INTO ORDER_ITEMS ( ORDE... |
| 24,590         | 29,081     | 0.85           | 14.98  | 8.57             | 61.02  | 9.75 | <a href="#">7t0959msvyt5g</a> | Browse and Update Orders | SAMPLE   | SELECT ORDER_ID, ORDER_DATE, O... |
| 22,116         | 86,872     | 0.25           | 13.48  | 298.92           | 95.37  | 0.24 | <a href="#">01jzc2mg6cg92</a> | Update Customer Details  | SAMPLE   | BEGIN :1 := orderentry.newcust... |
| 18,987         | 260,969    | 0.07           | 11.57  | 29.34            | 80.77  | 1.98 | <a href="#">g81cbrq5yamf5</a> | New Order                | SAMPLE   | SELECT ADDRESS_ID, CUSTOMER_ID... |
| 15,273         | 86,873     | 0.18           | 9.31   | 54.87            | 106.94 | 0.92 | <a href="#">gh2g2tynpcpv1</a> | Update Customer Details  | SAMPLE   | INSERT INTO CUSTOMERS ( CUSTOM... |
| 10,522         | 13,459     | 0.78           | 6.41   | 3.36             | 104.01 | 8.88 | <a href="#">1qf3b7a46jm3u</a> | Browse and Update Orders | SAMPLE   | SELECT ORDER_ID, LINE_ITEM_ID,... |
| 8,142          | 231,903    | 0.04           | 4.96   | 21.61            | 99.31  | 1.18 | <a href="#">7ws837zynp1zv</a> | New Order                | SAMPLE   | SELECT CARD_ID, CUSTOMER_ID, C... |
| 6,981          | 29,213     | 0.24           | 4.25   | 53.92            | 97.47  | 0.46 | <a href="#">a9gvfh5hx9u98</a> | Swingbench User Thread   | SAMPLE   | BEGIN :1 := orderentry.process... |
| 4,454          | 638,509    | 0.01           | 2.71   | 73.01            | 73.04  | 0.21 | <a href="#">5ckxyqfvu60pj</a> | Browse Products          | SAMPLE   | SELECT CUSTOMER_ID, CUST_FIRST... |
| 4,249          | 29,209     | 0.15           | 2.59   | 16.18            | 67.91  | 1.06 | <a href="#">f9u2k84v884y7</a> | Process Orders           | SAMPLE   | UPDATE /*+ index(orders, order... |
| 3,644          | 96,723     | 0.04           | 2.22   | 29.14            | 100.77 | 0.41 | <a href="#">9t3n2wpr7my63</a> | Update Customer Details  | SAMPLE   | INSERT INTO ADDRESSES ( ADDRES... |
| 3,609          | 86,873     | 0.04           | 2.20   | 30.22            | 91.02  | 0.35 | <a href="#">budtrjayjvww3</a> | Update Customer Details  | SAMPLE   | INSERT INTO CARD_DETAILS ( CAR... |
| 3,449          | 290,416    | 0.01           | 2.10   | 1,260.33         | 117.13 | 0.01 | <a href="#">147a57cxq3w5y</a> | Swingbench User Thread   | SAMPLE   | BEGIN :1 := orderentry.browsep... |
| 2,811          | 57,765     | 0.05           | 1.71   | 64.34            | 106.77 | 0.15 | <a href="#">cmndgkbcz5s9</a>  |                          | SAMPLE   | BEGIN :1 := orderentry.updateC... |
| 2,733          | 29,213     | 0.09           | 1.67   | 7.58             | 77.23  | 1.05 | <a href="#">7hk2m2702ua0g</a> | Process Orders           | SAMPLE   | WITH NEED_TO_PROCESS AS (SELEC... |
| 2,319          | 695,504    | 0.00           | 1.41   | 579.62           | 107.77 | 0.01 | <a href="#">c13sma6rkr27c</a> | New Order                | SAMPLE   | SELECT PRODUCTS.PRODUCT_ID, PR... |
| 2,304          | 57,755     | 0.04           | 1.40   | 7.33             | 69.36  | 1.03 | <a href="#">8zz6y2yxdqjp0</a> | Update Customer Details  | SAMPLE   | SELECT CUSTOMER_ID, CUST_FIRST... |
| 1,734          | 231,877    | 0.01           | 1.06   | 122.99           | 73.79  | 0.05 | <a href="#">3fw75k1snsddx</a> | New Order                | SAMPLE   | INSERT INTO ORDERS ( ORDER_ID,... |

## AWR REPORT

- “SQL Statistics” section is aggregated by SQL\_ID
- Do you know what’s **good** about SQL\_ID?
  - It uniquely identifies a SQL statement
- Do you know what’s **bad** about SQL\_ID?
  - It uniquely identifies a SQL statement

Not a Copy / Paste Issue

# SQL ID AND OTHER IDENTIFICATION METHODS

- DEMO - `identification_demo.sql`



```
[oracle@DB12c AWR_MINING3]$
```

```
[oracle@DB12c AWR_MINING3]$ sqlplus / as sysdba
```

```
SQL*Plus: Release 12.1.0.1.0 Production on Thu Oct 22 05:33:53 2015
```

```
Copyright (c) 1982, 2013, Oracle. All rights reserved.
```

```
Connected to:
```

```
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production
```

```
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
```

```
SQL> @identification_demo.sql
```

```
SQL>
```

```
SQL>
```

```
SQL> alter system flush shared_pool;
```

```
System altered.
```

```
SQL> /
```

```
System altered.
```

```
SQL> /
```

```
System altered.
```

```
SQL> alter session set container = sample;
```

```
Session altered.
```

```
SQL>
```

```
SQL> -- Take a look at different SQL_IDs!
```

```
SQL> pause
```

Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production  
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

```
SQL> @identification_demo.sql
```

```
SQL>
```

```
SQL>
```

```
SQL> alter system flush shared_pool;
```

```
System altered.
```

```
SQL> /
```

```
System altered.
```

```
SQL> /
```

```
System altered.
```

```
SQL> alter session set container = sample;
```

```
Session altered.
```

```
SQL>
```

```
SQL> -- Take a look at different SQL_IDs!
```

```
SQL> pause
```

```
SQL>
```

```
SQL> select /*testquery*/ count(*) from oe.orders;
```

```
  COUNT(*)
```

```
-----
```

```
      105
```

```
SQL> pause
```

```
SQL> /
System altered.

SQL> /
System altered.

SQL> alter session set container = sample;
Session altered.

SQL>
SQL> -- Take a look at different SQL_IDs!
SQL> pause

SQL>
SQL> select /*testquery*/ count(*) from oe.orders;

  COUNT(*)
-----
        105

SQL> pause

SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '%/*test'||'query%*%' order by LAST_LOAD_TIME;

SQL_ID          SQL_TEXT                                                                                               SQL_LENGTH
-----
f3jjwdqz71dcy  select /*testquery*/ count(*) from oe.orders                                                         44

SQL> pause
```

```
SQL> alter session set container = sample;
```

```
Session altered.
```

```
SQL>
```

```
SQL> -- Take a look at different SQL_IDs!
```

```
SQL> pause
```

```
SQL>
```

```
SQL> select /*testquery*/ count(*) from oe.orders;
```

```
  COUNT(*)  
-----  
         105
```

```
SQL> pause
```

```
SQL>
```

```
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/*' order by LAST_LOAD_TIME;
```

| SQL_ID        | SQL_TEXT                                     | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders | 44         |

```
SQL> pause
```

```
SQL>
```

```
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS;
```

```
  COUNT(*)  
-----  
         105
```

```
SQL> pause
```

```

COUNT(*)
-----
      105

SQL> pause

SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/*' order by LAST_LOAD_TIME;

SQL_ID          SQL_TEXT                                                SQL_LENGTH
-----
f3jjwdqz71dcy  select /*testquery*/ count(*) from oe.orders                                44

SQL> pause

SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS;

COUNT(*)
-----
      105

SQL> pause

SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/*' order by LAST_LOAD_TIME;

SQL_ID          SQL_TEXT                                                SQL_LENGTH
-----
f3jjwdqz71dcy  select /*testquery*/ count(*) from oe.orders                                44
fh24xkqaw0553  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                                44

SQL> pause

```



| SQL_ID        | SQL_TEXT                                     | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders | 44         |

SQL> pause

SQL>  
SQL> SELECT /\*testquery\*/ COUNT(\*) FROM OE.ORDERS;

```
  COUNT(*)  
-----  
      105
```

SQL> pause

SQL>  
SQL> select sql\_id, sql\_text, length(sql\_text) sql\_length from v\$sql where sql\_text like '/\*test'||'query%\*/%' order by LAST\_LOAD\_TIME;

| SQL_ID        | SQL_TEXT                                     | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 44         |

SQL> pause

SQL>  
SQL> SELECT /\*testquery\*/ COUNT(\*) FROM OE.ORDERS ;

```
  COUNT(*)  
-----  
      105
```

SQL> pause

```
-----  
105
```

```
SQL> pause
```

```
SQL>
```

```
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '%/*test'||'query%*/*%' order by LAST_LOAD_TIME;
```

| SQL_ID        | SQL_TEXT                                     | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 44         |

```
SQL> pause
```

```
SQL>
```

```
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS ;
```

```
COUNT(*)
```

```
-----  
105
```

```
SQL> pause
```

```
SQL>
```

```
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '%/*test'||'query%*/*%' order by LAST_LOAD_TIME;
```

| SQL_ID        | SQL_TEXT                                     | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 54         |

```
SQL> pause
```

```
-----
f3jjwdqz71dcy select /*testquery*/ count(*) from oe.orders          44
fh24xkqaw0553 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS          44
```

SQL> pause

```
SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS          ;
```

```

COUNT(*)
-----
      105
```

SQL> pause

```
SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/*' order by LAST_LOAD_TIME;
```

```
SQL_ID          SQL_TEXT                                                    SQL_LENGTH
-----
f3jjwdqz71dcy select /*testquery*/ count(*) from oe.orders          44
fh24xkqaw0553 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS          44
7ufgv9vacpz85 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS          54
```

SQL> pause

```
SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM    OE.ORDERS;
```

```

COUNT(*)
-----
      105
```

SQL> pause

```
SQL> pause

SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '%/*test'||'query%*%' order by LAST_LOAD_TIME;

SQL_ID          SQL_TEXT                                               SQL_LENGTH
-----
f3jjwdqz71dcy  select /*testquery*/ count(*) from oe.orders                44
fh24xkqaw0553  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                44
7ufgv9vacpz85  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                54

SQL> pause

SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM    OE.ORDERS;

COUNT(*)
-----
      105

SQL> pause

SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '%/*test'||'query%*%' order by LAST_LOAD_TIME;

SQL_ID          SQL_TEXT                                               SQL_LENGTH
-----
f3jjwdqz71dcy  select /*testquery*/ count(*) from oe.orders                44
fh24xkqaw0553  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                44
7ufgv9vacpz85  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                54
5r3bkn8z76sq5  SELECT /*testquery*/ COUNT(*) FROM    OE.ORDERS                47

SQL> pause
```

```
fh24xkqaw0553 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS 44
7ufgv9vacpz85 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS 54
```

SQL> pause

```
SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS;
```

```
COUNT(*)
-----
      105
```

SQL> pause

```
SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/%' order by LAST_LOAD_TIME;
```

| SQL_ID        | SQL_TEXT                                     | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 47         |

SQL> pause

```
SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1;
```

```
COUNT(*)
-----
      105
```

SQL> pause



```
SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '%/*test'||'query%*/*%' order by LAST_LOAD_TIME;
```

| SQL_ID        | SQL_TEXT                                     | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS | 47         |

```
SQL> pause
```

```
SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1;
```

```

COUNT(*)
-----
         105
```

```
SQL> pause
```

```
SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '%/*test'||'query%*/*%' order by LAST_LOAD_TIME;
```

| SQL_ID        | SQL_TEXT   | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders           | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS           | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS           | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS           | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1 | 54         |

```
SQL> pause
```

```
5r3bkn8z76sq5 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS
```

```
SQL> pause
```

```
SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1;
```

```
COUNT(*)
```

```
-----
105
```

```
SQL> pause
```

```
SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/%' order by LAST_LOAD_TIME;
```

| SQL_ID        | SQL_TEXT   | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders           | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS           | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS           | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS           | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1 | 54         |

```
SQL> pause
```

```
SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1;
```

```
COUNT(*)
```

```
-----
105
```

```
SQL> pause
```

| SQL_ID        | SQL_TEXT   | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders           | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS           | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS           | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS           | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1 | 54         |

SQL> pause

SQL>  
SQL> SELECT /\*testquery\*/ COUNT(\*) FROM OE.ORDERS WHERE order\_id>-1;

```

COUNT(*)
-----
      105

```

SQL> pause

SQL>  
SQL> select sql\_id, sql\_text, length(sql\_text) sql\_length from v\$sql where sql\_text like '/\*test'||'query%\*%' order by LAST\_LOAD\_TIME;

| SQL_ID        | SQL_TEXT   | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders                   | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                   | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                   | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                   | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1         | 54         |
| byypbc0t7q2br | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1 | 62         |

6 rows selected.

SQL> pause

```
SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1;
```

```
  COUNT(*)
-----
        105
```

```
SQL> pause
```

```
SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/*' order by LAST_LOAD_TIME;
```

| SQL_ID        | SQL_TEXT   | SQL_LENGTH |
|---------------|--|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders                   | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                   | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                   | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                   | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1         | 54         |
| byypbc0t7q2br | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1 | 62         |

```
6 rows selected.
```

```
SQL> pause
```

```
SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000;
```

```
  COUNT(*)
-----
        105
```

```
SQL> pause
```

```

7ufgv9vacpz85 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS 54
5r3bkn8z76sq5 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS 47
bcr3qj4vmuzj1 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1 54
byypbc0t7q2br SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1 62
    
```

6 rows selected.

SQL> pause

```

SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000;
    
```

```

COUNT(*)
-----
105
    
```

SQL> pause

```

SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test' || 'query%*/%' order by LAST_LOAD_TIME;
    
```

| SQL_ID        | SQL_TEXT  | SQL_LENGTH |
|---------------|---|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders                      | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |
| byypbc0t7q2br | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |
| 9kj5umranz695 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |

7 rows selected.

SQL> pause



-----  
105

SQL> pause

SQL>

SQL> select sql\_id, sql\_text, length(sql\_text) sql\_length from v\$sql where sql\_text like '%/\*test'||'query%\*/\*%' order by LAST\_LOAD\_TIME;

| SQL_ID        | SQL_TEXT  | SQL_LENGTH |
|---------------|---|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders                      | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |
| byypbc0t7q2br | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |
| 9kj5umranz695 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |

7 rows selected.

SQL> pause

SQL>

SQL> var a number

SQL> var b number

SQL> exec :a:=-1

PL/SQL procedure successfully completed.

SQL> exec :b:=-1

PL/SQL procedure successfully completed.

SQL> pause

```

f3jjwdqz71dcy select /*testquery*/ count(*) from oe.orders 44
fh24xkqaw0553 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS 44
7ufgv9vacpz85 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS 54
5r3bkn8z76sq5 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS 47
bcr3qj4vmuzj1 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1 54
byypbc0t7q2br SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1 62
9kj5umranz695 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 65

```

7 rows selected.

SQL> pause

SQL>

SQL> var a number

SQL> var b number

SQL> exec :a:=-1

PL/SQL procedure successfully completed.

SQL> exec :b:=-1

PL/SQL procedure successfully completed.

SQL> pause

SQL>

SQL> SELECT /\*testquery\*/ COUNT(\*) FROM OE.ORDERS WHERE order\_id>:a;

COUNT(\*)

-----

105

SQL> pause

PL/SQL procedure successfully completed.

SQL> exec :b:=-1

PL/SQL procedure successfully completed.

SQL> pause

SQL>

SQL> SELECT /\*testquery\*/ COUNT(\*) FROM OE.ORDERS WHERE order\_id>:a;

```

COUNT(*)
-----
      105

```

SQL> pause

SQL>

SQL> select sql\_id, sql\_text, length(sql\_text) sql\_length from v\$sql where sql\_text like '/\*test'||'query%\*/\*' order by LAST\_LOAD\_TIME;

| SQL_ID        | SQL_TEXT  | SQL_LENGTH |
|---------------|---|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders                      | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |
| byypbc0t7q2br | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |
| 9kj5umranz695 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |
| 2jxwr5vdfp1zv | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:a    | 62         |

8 rows selected.

SQL> pause

```
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>a;
```

```
COUNT(*)
```

```
-----  
105
```

```
SQL> pause
```

```
SQL>
```

```
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/*%' order by LAST_LOAD_TIME;
```

| SQL_ID        | SQL_TEXT  | SQL_LENGTH |
|---------------|---|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders                      | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |
| byypbc0t7q2br | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |
| 9kj5umranz695 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |
| 2jxwr5vdfp1zv | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>a     | 62         |

```
8 rows selected.
```

```
SQL> pause
```

```
SQL>
```

```
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>b;
```

```
COUNT(*)
```

```
-----  
105
```

```
SQL> pause
```

```
9kj5umranz695 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 65
2jxwr5vdfp1zv SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>a 62
```

8 rows selected.

SQL> pause

SQL>

SQL> SELECT /\*testquery\*/ COUNT(\*) FROM OE.ORDERS WHERE order\_id>b;

```
  COUNT(*)
-----
        105
```

SQL> pause

SQL>

SQL> select sql\_id, sql\_text, length(sql\_text) sql\_length from v\$sql where sql\_text like '/\*test'||'query%\*/%' order by LAST\_LOAD\_TIME;

| SQL_ID        | SQL_TEXT  | SQL_LENGTH |
|---------------|---|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders                      | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |
| byypbc0t7q2br | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |
| 9kj5umranz695 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |
| 2jxwr5vdfp1zv | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>a     | 62         |
| f90ycm0wk1urp | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>b     | 62         |

9 rows selected.

SQL> pause

```
SQL> pause

SQL>
SQL> SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>b;

COUNT(*)
-----
105

SQL> pause

SQL>
SQL> select sql_id, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*%' order by LAST_LOAD_TIME;

SQL_ID          SQL_TEXT                                                                                               SQL_LENGTH
-----
f3jjwdqz71dcy  select /*testquery*/ count(*) from oe.orders                                                         44
fh24xkqaw0553  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                                                         44
7ufgv9vacpz85  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                                                         54
5r3bkn8z76sq5  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                                                         47
bcr3qj4vmuzj1  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1                                             54
byypbc0t7q2br  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1                                     62
9kj5umranz695  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000                                  65
2jxwr5vdfp1zv  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>a                                       62
f90ycm0wk1urp  SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>b                                       62

9 rows selected.

SQL> pause

SQL>
SQL> -- Do you know of any other SQL identification methods?
SQL> pause
```



SQL>

SQL> SELECT /\*testquery\*/ COUNT(\*) FROM OE.ORDERS WHERE order\_id>:b;

```

COUNT(*)
-----
      105

```

SQL> pause

SQL>

SQL> select sql\_id, sql\_text, length(sql\_text) sql\_length from v\$sql where sql\_text like '/\*test'||'query%\*/%' order by LAST\_LOAD\_TIME;

| SQL_ID        | SQL_TEXT  | SQL_LENGTH |
|---------------|---|------------|
| f3jjwdqz71dcy | select /*testquery*/ count(*) from oe.orders                      | 44         |
| fh24xkqaw0553 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 7ufgv9vacpz85 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| byypbc0t7q2br | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |
| 5r3bkn8z76sq5 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| bcr3qj4vmuzj1 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |
| 9kj5umranz695 | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |
| 2jxwr5vdfp1zv | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:a    | 62         |
| f90ycm0wk1urp | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:b    | 62         |

9 rows selected.

SQL> pause

SQL>

SQL> -- Do you know of any other SQL identification methods?

SQL> pause

SQL> -- What about EXACT\_MATCHING\_SIGNATURE?

SQL> pause

```
SQL> pause

SQL>
SQL> -- Do you know of any other SQL identification methods?
SQL> pause

SQL> -- What about EXACT_MATCHING_SIGNATURE?
SQL> pause

SQL>
SQL> break on EXACT_MATCHING_SIGNATURE duplicates skip 1
SQL> select sql_id, exact_matching_signature, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/%' order by 2, LAST_LOAD_TIME;

SQL_ID          EXACT_MATCHING_SIGNATURE SQL_TEXT                                                    SQL_LENGTH
-----
bcr3qj4vmuzj1   1917735050037348462 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1                                           54
f90ycm0wk1urp   5642286950026349691 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:b                                     62
9kj5umranz695   6861089955825787148 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000                                  65
f3jjwdqz71dcy   7560235921535299854 select /*testquery*/ count(*) from oe.orders                                                         44
fh24xkqaw0553   7560235921535299854 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                                                         44
7ufgv9vacpz85   7560235921535299854 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                                                         54
5r3bkn8z76sq5   7560235921535299854 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                                                         47
2jxwr5vdfp1zv   13805308688061585668 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:a                                     62
byypbc0t7q2br   15411379419093560071 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1                                     62

9 rows selected.

SQL> pause
```

SQL&gt; pause

SQL&gt; -- What about EXACT\_MATCHING\_SIGNATURE?

SQL&gt; pause

SQL&gt;

SQL&gt; break on EXACT\_MATCHING\_SIGNATURE duplicates skip 1

SQL&gt; select sql\_id, exact\_matching\_signature, sql\_text, length(sql\_text) sql\_length from v\$sql where sql\_text like '/\*test'||'query%\*/%' order by 2, LAST\_LOAD\_TIME;

| SQL_ID        | EXACT_MATCHING_SIGNATURE | SQL_TEXT  | SQL_LENGTH |
|---------------|--------------------------|---|------------|
| bcr3qj4vmuzj1 | 1917735050037348462      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |
| f90ycm0wk1urp | 5642286950026349691      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:b    | 62         |
| 9kj5umranz695 | 6861089955825787148      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |
| f3jjwdqz71dcy | 7560235921535299854      | select /*testquery*/ count(*) from oe.orders                      | 44         |
| fh24xkqaw0553 | 7560235921535299854      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 7ufgv9vacpz85 | 7560235921535299854      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| 5r3bkn8z76sq5 | 7560235921535299854      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| 2jxwr5vdfp1zv | 13805308688061585668     | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:a    | 62         |
| byypbc0t7q2br | 15411379419093560071     | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |

9 rows selected.

SQL&gt; pause

SQL&gt;

SQL&gt; -- You must have heard of FORCE\_MATCHING\_SIGNATURE too

SQL&gt; pause

9 rows selected.

SQL> pause

SQL>  
 SQL> -- You must have heard of FORCE\_MATCHING\_SIGNATURE too  
 SQL> pause

SQL>  
 SQL> clear breaks  
 SQL> break on FORCE\_MATCHING\_SIGNATURE duplicates skip 1;  
 SQL> select sql\_id, force\_matching\_signature, sql\_text, length(sql\_text) sql\_length from v\$sql where sql\_text like '/\*test'||'query%\*/%' order by 2, 3, LAST\_LOAD\_TIME;

| SQL_ID        | FORCE_MATCHING_SIGNATURE | SQL_TEXT  | SQL_LENGTH |
|---------------|--------------------------|---|------------|
| f90ycm0wk1urp | 5642286950026349691      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>b     | 62         |
| 5r3bkn8z76sq5 | 7560235921535299854      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| fh24xkqaw0553 | 7560235921535299854      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 7ufgv9vacpz85 | 7560235921535299854      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| f3jjwdqz71dcy | 7560235921535299854      | select /*testquery*/ count(*) from oe.orders                      | 44         |
| byypbc0t7q2br | 8639627088589992892      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |
| 9kj5umranz695 | 8639627088589992892      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |
| 2jxwr5vdfp1zv | 13805308688061585668     | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>a     | 62         |
| bcr3qj4vmuzj1 | 15184701051591850165     | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |

9 rows selected.

SQL> pause

```
SQL>
SQL> -- You must have heard of FORCE_MATCHING_SIGNATURE too
SQL> pause
```

```
SQL>
SQL> clear breaks
SQL> break on FORCE_MATCHING_SIGNATURE duplicates skip 1;
SQL> select sql_id, force_matching_signature, sql_text, length(sql_text) sql_length from v$sql where sql_text like '/*test'||'query%*/%' order by 2, 3, LAST_LOAD_TIME;
```

| SQL_ID        | FORCE_MATCHING_SIGNATURE | SQL_TEXT  | SQL_LENGTH |
|---------------|--------------------------|---|------------|
| f90ycm0wk1urp | 5642286950026349691      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:b    | 62         |
| 5r3bkn8z76sq5 | 7560235921535299854      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| fh24xkqaw0553 | 7560235921535299854      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 7ufgv9vacpz85 | 7560235921535299854      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| f3jjwdqz71dcy | 7560235921535299854      | select /*testquery*/ count(*) from oe.orders                      | 44         |
| byypbc0t7q2br | 8639627088589992892      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |
| 9kj5umranz695 | 8639627088589992892      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |
| 2jxwr5vdfp1zv | 13805308688061585668     | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:a    | 62         |
| bcr3qj4vmuzj1 | 15184701051591850165     | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |

9 rows selected.

```
SQL> pause
SQL>
SQL> -- This doesn't really identify the SQL statement, but take a look what happens if we group them by PLAN_HASH_VALUE
SQL> pause
```



```
bcr3qj4vmuzj1      15184701051591850165 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1
```

```
9 rows selected.
```

```
SQL> pause
```

```
SQL>
```

```
SQL> -- This doesn't really identify the SQL statement, but take a look what happens if we group them by PLAN_HASH_VALUE
```

```
SQL> pause
```

```
SQL>
```

```
SQL> clear breaks
```

```
SQL> break on PLAN_HASH_VALUE duplicates skip 1;
```

```
SQL> select sql_id, plan_hash_value, sql_text, length(sql_text) sql_length from v$sql where sql_text like '%/*test'||'query%/%' order by 2, 4, LAST_LOAD_TIME;
```

| SQL_ID        | PLAN_HASH_VALUE | SQL_TEXT  | SQL_LENGTH |
|---------------|-----------------|---|------------|
| f3jjwdqz71dcy | 2738315105      | select /*testquery*/ count(*) from oe.orders                      | 44         |
| fh24xkqaw0553 | 2738315105      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 44         |
| 5r3bkn8z76sq5 | 2738315105      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 47         |
| 7ufgv9vacpz85 | 2738315105      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS                      | 54         |
| bcr3qj4vmuzj1 | 2738315105      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1            | 54         |
| byypbc0t7q2br | 4223739315      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1    | 62         |
| 2jxwr5vdfp1zv | 4223739315      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:a    | 62         |
| f90ycm0wk1urp | 4223739315      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:b    | 62         |
| 9kj5umranz695 | 4223739315      | SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 | 65         |

```
9 rows selected.
```

```
SQL> pause
```



```
SQL> pause

SQL>
SQL> -- This doesn't really identify the SQL statement, but take a look what happens if we group them by PLAN_HASH_VALUE
SQL> pause

SQL>
SQL> clear breaks
SQL> break on PLAN_HASH_VALUE duplicates skip 1;
SQL> select sql_id, plan_hash_value, sql_text, length(sql_text) sql_length from v$sql where sql_text like '%/*test'||'query%*/%' order by 2, 4, LAST_LOAD_TIME;

SQL_ID          PLAN_HASH_VALUE SQL_TEXT                                                    SQL_LENGTH
-----
f3jjwdqz71dcy    2738315105 select /*testquery*/ count(*) from oe.orders                44
fh24xkqaw0553    2738315105 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS              44
5r3bkn8z76sq5    2738315105 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS              47
7ufgv9vacpz85    2738315105 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS              54
bcr3qj4vmuzj1    2738315105 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE 1=1    54

byypbc0t7q2br    4223739315 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1 62
2jxwr5vdfp1zv    4223739315 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:a 62
f90ycm0wk1urp    4223739315 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>:b 62
9kj5umranz695    4223739315 SELECT /*testquery*/ COUNT(*) FROM OE.ORDERS WHERE order_id>-1000 65

9 rows selected.

SQL> pause

SQL>
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
[oracle@DB12c AWR_MINING3]$ █
```

# CHALLENGES WITH UNIQUE IDENTIFICATION

- Different formatting of a SQL statement
  - Misuse of constants in SQL statements
  - Use of constants in semantically equivalent statements (should these be separated?)
  - Different names for bind variables in equivalent SQL statements
- 
- Does EXACT\_MATCHING\_SIGNATURE help?
  - Does FORCE\_MATCHING\_SIGNATURE help?
  - Does PLAN\_HASH\_VALUE help?

# LET'S MINE THE AWR!

- DEMO - `awr_top_sqlid_demo.sql`

```
[oracle@DB12c AWR_MINING3]$ sqlplus / as sysdba
```

```
SQL*Plus: Release 12.1.0.1.0 Production on Thu Oct 22 05:47:16 2015
```

```
Copyright (c) 1982, 2013, Oracle. All rights reserved.
```

```
Connected to:
```

```
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production  
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
```

```
SQL> @awr_top_sqlid_demo.sql
```

```
SQL> alter session set container = sample;
```

```
Session altered.
```

```
SQL>
```

```
SQL> -- if you want to stat digging into AWR you don't have to know all the tables - 2 is enough!
```

```
SQL> pause
```

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Connected to:  
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production  
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

```
SQL> @awr_top_sqlid_demo.sql  
SQL> alter session set container = sample;
```

Session altered.

```
SQL>  
SQL> -- if you want to stat digging into AWR you don't have to know all the tables - 2 is enough!  
SQL> pause
```

```
SQL>  
SQL> desc dba_hist_snapshot
```

| Name                | Null?    | Type                         |
|---------------------|----------|------------------------------|
| SNAP_ID             | NOT NULL | NUMBER                       |
| DBID                | NOT NULL | NUMBER                       |
| INSTANCE_NUMBER     | NOT NULL | NUMBER                       |
| STARTUP_TIME        | NOT NULL | TIMESTAMP(3)                 |
| BEGIN_INTERVAL_TIME | NOT NULL | TIMESTAMP(3)                 |
| END_INTERVAL_TIME   | NOT NULL | TIMESTAMP(3)                 |
| FLUSH_ELAPSED       |          | INTERVAL DAY(5) TO SECOND(1) |
| SNAP_LEVEL          |          | NUMBER                       |
| ERROR_COUNT         |          | NUMBER                       |
| SNAP_FLAG           |          | NUMBER                       |
| SNAP_TIMEZONE       |          | INTERVAL DAY(0) TO SECOND(0) |
| CON_ID              |          | NUMBER                       |

```
SQL> pause
```



SQL&gt; desc dba\_hist\_sqlstat

| Name                     | Null?    | Type          |
|--------------------------|----------|---------------|
| SNAP_ID                  | NOT NULL | NUMBER        |
| DBID                     | NOT NULL | NUMBER        |
| INSTANCE_NUMBER          | NOT NULL | NUMBER        |
| SQL_ID                   | NOT NULL | VARCHAR2(13)  |
| PLAN_HASH_VALUE          | NOT NULL | NUMBER        |
| OPTIMIZER_COST           |          | NUMBER        |
| OPTIMIZER_MODE           |          | VARCHAR2(10)  |
| OPTIMIZER_ENV_HASH_VALUE |          | NUMBER        |
| SHARABLE_MEM             |          | NUMBER        |
| LOADED_VERSIONS          |          | NUMBER        |
| VERSION_COUNT            |          | NUMBER        |
| MODULE                   |          | VARCHAR2(64)  |
| ACTION                   |          | VARCHAR2(64)  |
| SQL_PROFILE              |          | VARCHAR2(64)  |
| FORCE_MATCHING_SIGNATURE |          | NUMBER        |
| PARSING_SCHEMA_ID        |          | NUMBER        |
| PARSING_SCHEMA_NAME      |          | VARCHAR2(128) |
| PARSING_USER_ID          |          | NUMBER        |
| FETCHES_TOTAL            |          | NUMBER        |
| FETCHES_DELTA            |          | NUMBER        |
| END_OF_FETCH_COUNT_TOTAL |          | NUMBER        |
| END_OF_FETCH_COUNT_DELTA |          | NUMBER        |
| SORTS_TOTAL              |          | NUMBER        |
| SORTS_DELTA              |          | NUMBER        |
| EXECUTIONS_TOTAL         |          | NUMBER        |
| EXECUTIONS_DELTA         |          | NUMBER        |
| PX_SERVERS_EXECS_TOTAL   |          | NUMBER        |
| PX_SERVERS_EXECS_DELTA   |          | NUMBER        |
| LOADS_TOTAL              |          | NUMBER        |
| LOADS_DELTA              |          | NUMBER        |
| INVALIDATIONS_TOTAL      |          | NUMBER        |
| INVALIDATIONS_DELTA      |          | NUMBER        |



```

PARSE_CALLS_DELTA          NUMBER
DISK_READS_TOTAL           NUMBER
DISK_READS_DELTA           NUMBER
BUFFER_GETS_TOTAL          NUMBER
BUFFER_GETS_DELTA          NUMBER
ROWS_PROCESSED_TOTAL        NUMBER
ROWS_PROCESSED_DELTA        NUMBER
CPU_TIME_TOTAL              NUMBER
CPU_TIME_DELTA              NUMBER
ELAPSED_TIME_TOTAL          NUMBER
ELAPSED_TIME_DELTA          NUMBER
IOWAIT_TOTAL                NUMBER
IOWAIT_DELTA                NUMBER
CLWAIT_TOTAL                NUMBER
CLWAIT_DELTA                NUMBER
APWAIT_TOTAL                NUMBER
APWAIT_DELTA                NUMBER
CCWAIT_TOTAL                NUMBER
CCWAIT_DELTA                NUMBER
DIRECT_WRITES_TOTAL         NUMBER
DIRECT_WRITES_DELTA         NUMBER
PLSEXEC_TIME_TOTAL          NUMBER
PLSEXEC_TIME_DELTA          NUMBER
JAVEXEC_TIME_TOTAL          NUMBER
JAVEXEC_TIME_DELTA          NUMBER
IO_OFFLOAD_ELIG_BYTES_TOTAL NUMBER
IO_OFFLOAD_ELIG_BYTES_DELTA NUMBER
IO_INTERCONNECT_BYTES_TOTAL NUMBER
IO_INTERCONNECT_BYTES_DELTA NUMBER
PHYSICAL_READ_REQUESTS_TOTAL NUMBER
PHYSICAL_READ_REQUESTS_DELTA NUMBER
PHYSICAL_READ_BYTES_TOTAL   NUMBER
PHYSICAL_READ_BYTES_DELTA   NUMBER
PHYSICAL_WRITE_REQUESTS_TOTAL NUMBER
PHYSICAL_WRITE_REQUESTS_DELTA NUMBER

```

|                                |           |
|--------------------------------|-----------|
| APWAIT_TOTAL                   | NUMBER    |
| APWAIT_DELTA                   | NUMBER    |
| CCWAIT_TOTAL                   | NUMBER    |
| CCWAIT_DELTA                   | NUMBER    |
| DIRECT_WRITES_TOTAL            | NUMBER    |
| DIRECT_WRITES_DELTA            | NUMBER    |
| PLSEEXEC_TIME_TOTAL            | NUMBER    |
| PLSEEXEC_TIME_DELTA            | NUMBER    |
| JAVEXEC_TIME_TOTAL             | NUMBER    |
| JAVEXEC_TIME_DELTA             | NUMBER    |
| IO_OFFLOAD_ELIG_BYTES_TOTAL    | NUMBER    |
| IO_OFFLOAD_ELIG_BYTES_DELTA    | NUMBER    |
| IO_INTERCONNECT_BYTES_TOTAL    | NUMBER    |
| IO_INTERCONNECT_BYTES_DELTA    | NUMBER    |
| PHYSICAL_READ_REQUESTS_TOTAL   | NUMBER    |
| PHYSICAL_READ_REQUESTS_DELTA   | NUMBER    |
| PHYSICAL_READ_BYTES_TOTAL      | NUMBER    |
| PHYSICAL_READ_BYTES_DELTA      | NUMBER    |
| PHYSICAL_WRITE_REQUESTS_TOTAL  | NUMBER    |
| PHYSICAL_WRITE_REQUESTS_DELTA  | NUMBER    |
| PHYSICAL_WRITE_BYTES_TOTAL     | NUMBER    |
| PHYSICAL_WRITE_BYTES_DELTA     | NUMBER    |
| OPTIMIZED_PHYSICAL_READS_TOTAL | NUMBER    |
| OPTIMIZED_PHYSICAL_READS_DELTA | NUMBER    |
| CELL_UNCOMPRESSED_BYTES_TOTAL  | NUMBER    |
| CELL_UNCOMPRESSED_BYTES_DELTA  | NUMBER    |
| IO_OFFLOAD_RETURN_BYTES_TOTAL  | NUMBER    |
| IO_OFFLOAD_RETURN_BYTES_DELTA  | NUMBER    |
| BIND_DATA                      | RAW(2000) |
| FLAG                           | NUMBER    |
| CON_DBID                       | NUMBER    |
| CON_ID                         | NUMBER    |

SQL> pause

```
col elapsed_time_s for 9999999.999
col cpu_time_s for 9999999.999
col iowait_s for 9999999.999
col clwait_s for 9999999.999
col apwait_s for 9999999.999
col ccwait_s for 9999999.999
col buffer_gets for 999999999999999999
col disk_reads for 999999999999999999
col direct_writes for 999999999999999999
col diff_plan for a10
col diff_fms for a20

select * from (
select
  hss.sql_id,
  decode(count(unique(plan_hash_value)),1,to_char(max(plan_hash_value)),'#'||count(unique(plan_hash_value))) diff_plan,
  decode(count(unique(force_matching_signature)),1,to_char(max(force_matching_signature)),'#'||count(unique(force_matching_signature))) diff_fms,
  sum(hss.executions_delta) executions,
  round(sum(hss.elapsed_time_delta)/1000000,3) elapsed_time_s,
  round(sum(hss.cpu_time_delta)/1000000,3) cpu_time_s,
  round(sum(hss.iowait_delta)/1000000,3) iowait_s,
--   round(sum(hss.clwait_delta)/1000000,3) clwait_s,
--   round(sum(hss.apwait_delta)/1000000,3) apwait_s,
--   round(sum(hss.ccwait_delta)/1000000,3) ccwait_s,
  round(sum(hss.rows_processed_delta),3) rows_processed,
  round(sum(hss.buffer_gets_delta),3) buffer_gets,
  round(sum(hss.disk_reads_delta),3) disk_reads,
  round(sum(hss.direct_writes_delta),3) direct_writes
from dba_hist_sqlstat hss, dba_hist_snapshot hs
where hss.snap_id=hs.snap_id and hs.snap_id between &snap_id_from and &snap_id_to
group by sql_id order by &sort_col_nr desc nulls last)
where rownum<=&top_n;
```

SQL> pause

```
-- round(sum(hss.clwait_delta)/1000000,3) clwait_s,
-- round(sum(hss.apwait_delta)/1000000,3) apwait_s,
-- round(sum(hss.ccwait_delta)/1000000,3) ccwait_s,
round(sum(hss.rows_processed_delta),3) rows_processed,
round(sum(hss.buffer_gets_delta),3) buffer_gets,
round(sum(hss.disk_reads_delta),3) disk_reads,
round(sum(hss.direct_writes_delta),3) direct_writes
from dba_hist_sqlstat hss, dba_hist_snapshot hs
where hss.snap_id=hs.snap_id and hs.snap_id between &snap_id_from and &snap_id_to
group by sql_id order by &sort_col_nr desc nulls last)
where rownum<=&top_n;
```

```
SQL> pause
SQL>
SQL> @awr_top_by_sqlid_snaps.sql 25 50 5 10
SQL> set ver off pages 50000 lines 260 tab off echo off
```

| SQL_ID        | DIFF_PLAN  | DIFF_FMS             | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|---------------|------------|----------------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0w2qpuc6u2zsp | 0          | 0                    | 231889     | 2517.160       | 2966.522   | 1.957    | 231889.000     | 45060626    | 58971      | 0             |
| 147a57cxq3w5y | 0          | 0                    | 290416     | 1260.332       | 1476.165   | .119     | 290432.000     | 10062391    | 3449       | 0             |
| c13sma6rkr27c | #3         | 18298161888330075667 | 695504     | 579.615        | 624.629    | .068     | 3141269.000    | 19270840    | 2319       | 0             |
| 01jzc2mg6cg92 | 0          | 0                    | 86872      | 298.917        | 285.065    | .715     | 86872.000      | 3726085     | 22116      | 0             |
| f7rxuxzt64k87 | 0          | 0                    | 595365     | 177.662        | 183.504    | .940     | 595368.000     | 9466095     | 26787      | 0             |
| gzhkw1qu6fwxm | 3241608609 | 0                    | 638465     | 127.138        | 88.481     | .006     | 638463.000     | 2052941     | 58         | 0             |
| 3fw75k1snsddx | 494735477  | 0                    | 231877     | 122.990        | 90.754     | .065     | 231876.000     | 3933240     | 1734       | 0             |
| 5mddt5kt45rg3 | 1628223527 | 14366533292145951164 | 231905     | 88.169         | 50.906     | .030     | 231904.000     | 2234211     | 743        | 0             |
| apgb2g9q2zjh1 | 0          | 0                    | 29082      | 83.980         | 85.473     | 1.244    | 29082.000      | 644899      | 38878      | 0             |
| 8z3542ffmp562 | 1655552467 | 17991828121679737456 | 666150     | 75.843         | 39.644     | .009     | 602153.000     | 3805721     | 296        | 0             |

10 rows selected.

```
SQL> pause
```

|                            |                      |        |          |          |       |             |          |       |   |
|----------------------------|----------------------|--------|----------|----------|-------|-------------|----------|-------|---|
| 147a57cxq3w5y 0            | 0                    | 290416 | 1260.332 | 1476.165 | .119  | 290432.000  | 10062391 | 3449  | 0 |
| c13sma6rkr27c #3           | 18298161888330075667 | 695504 | 579.615  | 624.629  | .068  | 3141269.000 | 19270840 | 2319  | 0 |
| 01jzc2mg6cg92 0            | 0                    | 86872  | 298.917  | 285.065  | .715  | 86872.000   | 3726085  | 22116 | 0 |
| f7rxuxzt64k87 0            | 0                    | 595365 | 177.662  | 183.504  | .940  | 595368.000  | 9466095  | 26787 | 0 |
| gzhkw1qu6fwxm 3241608609 0 | 0                    | 638465 | 127.138  | 88.481   | .006  | 638463.000  | 2052941  | 58    | 0 |
| 3fw75k1snsddx 494735477 0  | 0                    | 231877 | 122.990  | 90.754   | .065  | 231876.000  | 3933240  | 1734  | 0 |
| 5mddt5kt45rg3 1628223527   | 14366533292145951164 | 231905 | 88.169   | 50.906   | .030  | 231904.000  | 2234211  | 743   | 0 |
| apgb2g9q2zjh1 0            | 0                    | 29082  | 83.980   | 85.473   | 1.244 | 29082.000   | 644899   | 38878 | 0 |
| 8z3542ffmp562 1655552467   | 17991828121679737456 | 666150 | 75.843   | 39.644   | .009  | 602153.000  | 3805721  | 296   | 0 |

10 rows selected.

SQL> pause

SQL>  
 SQL> @awr\_top\_by\_sqlid\_snaps.sql 25 50 7 10  
 SQL> set ver off pages 50000 lines 260 tab off echo off

| SQL_ID                   | DIFF_PLAN            | DIFF_FMS | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|--------------------------|----------------------|----------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0w2qpu6u2zsp 0           | 0                    |          | 231889     | 2517.160       | 2966.522   | 1.957    | 231889.000     | 45060626    | 58971      | 0             |
| apgb2g9q2zjh1 0          | 0                    |          | 29082      | 83.980         | 85.473     | 1.244    | 29082.000      | 644899      | 38878      | 0             |
| f7rxuxzt64k87 0          | 0                    |          | 595365     | 177.662        | 183.504    | .940     | 595368.000     | 9466095     | 26787      | 0             |
| 7t0959msvvt5g 856749079  | 4574318657274276452  |          | 29081      | 8.571          | 5.230      | .836     | 45474.000      | 133222      | 24590      | 0             |
| 16bb7yq3ps4f9 0          | 0                    |          | 2          | 2.810          | 2.154      | .763     | 2.000          | 121068      | 372        | 791           |
| 01jzc2mg6cg92 0          | 0                    |          | 86872      | 298.917        | 285.065    | .715     | 86872.000      | 3726085     | 22116      | 0             |
| g81cbrq5yamf5 2480532011 | 15722349611718065978 |          | 260969     | 29.337         | 23.695     | .582     | 393409.000     | 1177450     | 18987      | 0             |
| gh2g2tynpcpv1 0          | 0                    |          | 86873      | 54.870         | 58.681     | .507     | 86873.000      | 1668076     | 15273      | 0             |
| buw7nxuggu81s 1404293401 | 17230481863806651164 |          | 18         | 37.235         | 35.943     | .407     | 507204.000     | 815703      | 384        | 0             |
| 1qf3b7a46jm3u 1322380957 | 17373762679661231169 |          | 13459      | 3.358          | 3.493      | .298     | 39773.000      | 55391       | 10522      | 0             |

10 rows selected.

SQL> pause



|                          |                      |        |         |         |       |            |         |       |     |
|--------------------------|----------------------|--------|---------|---------|-------|------------|---------|-------|-----|
| apgb2g9q2zjh1 0          | 0                    | 29082  | 83.980  | 85.473  | 1.244 | 29082.000  | 644899  | 38878 | 0   |
| f7rxuxzt64k87 0          | 0                    | 595365 | 177.662 | 183.504 | .940  | 595368.000 | 9466095 | 26787 | 0   |
| 7t0959msvvt5g 856749079  | 4574318657274276452  | 29081  | 8.571   | 5.230   | .836  | 45474.000  | 133222  | 24590 | 0   |
| 16bb7yq3ps4f9 0          | 0                    | 2      | 2.810   | 2.154   | .763  | 2.000      | 121068  | 372   | 791 |
| 01jzc2mg6cg92 0          | 0                    | 86872  | 298.917 | 285.065 | .715  | 86872.000  | 3726085 | 22116 | 0   |
| g81cbrq5yamf5 2480532011 | 15722349611718065978 | 260969 | 29.337  | 23.695  | .582  | 393409.000 | 1177450 | 18987 | 0   |
| gh2g2tynpcpv1 0          | 0                    | 86873  | 54.870  | 58.681  | .507  | 86873.000  | 1668076 | 15273 | 0   |
| buw7nxuggu81s 1404293401 | 17230481863806651164 | 18     | 37.235  | 35.943  | .407  | 507204.000 | 815703  | 384   | 0   |
| 1qf3b7a46jm3u 1322380957 | 17373762679661231169 | 13459  | 3.358   | 3.493   | .298  | 39773.000  | 55391   | 10522 | 0   |

10 rows selected.

SQL> pause

SQL>  
 SQL> @awr\_top\_by\_sqlid\_snaps.sql 25 50 9 10  
 SQL> set ver off pages 50000 lines 260 tab off echo off

| SQL_ID                   | DIFF_PLAN            | DIFF_FMS | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|--------------------------|----------------------|----------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0w2qpuc6u2zsp 0          | 0                    |          | 231889     | 2517.160       | 2966.522   | 1.957    | 231889.000     | 45060626    | 58971      | 0             |
| c13sma6rkr27c #3         | 18298161888330075667 |          | 695504     | 579.615        | 624.629    | .068     | 3141269.000    | 19270840    | 2319       | 0             |
| 147a57cxq3w5y 0          | 0                    |          | 290416     | 1260.332       | 1476.165   | .119     | 290432.000     | 10062391    | 3449       | 0             |
| f7rxuxzt64k87 0          | 0                    |          | 595365     | 177.662        | 183.504    | .940     | 595368.000     | 9466095     | 26787      | 0             |
| 3fw75k1snsddx 494735477  | 0                    |          | 231877     | 122.990        | 90.754     | .065     | 231876.000     | 3933240     | 1734       | 0             |
| 8z3542ffmp562 1655552467 | 17991828121679737456 |          | 666150     | 75.843         | 39.644     | .009     | 602153.000     | 3805721     | 296        | 0             |
| 01jzc2mg6cg92 0          | 0                    |          | 86872      | 298.917        | 285.065    | .715     | 86872.000      | 3726085     | 22116      | 0             |
| 5ckxyqfvu60pj 900611645  | 6486229150489758732  |          | 638509     | 73.013         | 53.327     | .150     | 638514.000     | 2554314     | 4454       | 0             |
| 7r7636982atn9 2141863993 | 8080224161820109919  |          | 220567     | 42.672         | 50.602     | .001     | 602140.000     | 2421991     | 41         | 0             |
| 5mddt5kt45rg3 1628223527 | 14366533292145951164 |          | 231905     | 88.169         | 50.906     | .030     | 231904.000     | 2234211     | 743        | 0             |

10 rows selected.

SQL> pause



|                           |                      |        |         |         |      |            |         |       |   |
|---------------------------|----------------------|--------|---------|---------|------|------------|---------|-------|---|
| 01jzc2mg6cg92 0           | 0                    | 86872  | 298.917 | 285.065 | .715 | 86872.000  | 3726085 | 22116 | 0 |
| g81cbrnq5yamf5 2480532011 | 15722349611718065978 | 260969 | 29.337  | 23.695  | .582 | 393409.000 | 1177450 | 18987 | 0 |
| gh2g2tynpcpv1 0           | 0                    | 86873  | 54.870  | 58.681  | .507 | 86873.000  | 1668076 | 15273 | 0 |
| buw7nxuggu81s 1404293401  | 17230481863806651164 | 18     | 37.235  | 35.943  | .407 | 507204.000 | 815703  | 384   | 0 |
| 1qf3b7a46jm3u 1322380957  | 17373762679661231169 | 13459  | 3.358   | 3.493   | .298 | 39773.000  | 55391   | 10522 | 0 |

10 rows selected.

SQL> pause

SQL>  
 SQL> @awr\_top\_by\_sqlid\_snaps.sql 25 50 9 10  
 SQL> set ver off pages 50000 lines 260 tab off echo off

| SQL_ID                    | DIFF_PLAN            | DIFF_FMS | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|---------------------------|----------------------|----------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0w2qpuc6u2zsp 0           | 0                    |          | 231889     | 2517.160       | 2966.522   | 1.957    | 231889.000     | 45060626    | 58971      | 0             |
| c13sma6rkr27c #3          | 18298161888330075667 |          | 695504     | 579.615        | 624.629    | .068     | 3141269.000    | 19270840    | 2319       | 0             |
| 147a57cxq3w5y 0           | 0                    |          | 290416     | 1260.332       | 1476.165   | .119     | 290432.000     | 10062391    | 3449       | 0             |
| f7rxuzt64k87 0            | 0                    |          | 595365     | 177.662        | 183.504    | .940     | 595368.000     | 9466095     | 26787      | 0             |
| 3fw75k1snsddx 494735477 0 |                      |          | 231877     | 122.990        | 90.754     | .065     | 231876.000     | 3933240     | 1734       | 0             |
| 8z3542ffmp562 1655552467  | 17991828121679737456 |          | 666150     | 75.843         | 39.644     | .009     | 602153.000     | 3805721     | 296        | 0             |
| 01jzc2mg6cg92 0           | 0                    |          | 86872      | 298.917        | 285.065    | .715     | 86872.000      | 3726085     | 22116      | 0             |
| 5ckxyqfvu60pj 900611645   | 6486229150489758732  |          | 638509     | 73.013         | 53.327     | .150     | 638514.000     | 2554314     | 4454       | 0             |
| 7r7636982atn9 2141863993  | 8080224161820109919  |          | 220567     | 42.672         | 50.602     | .001     | 602140.000     | 2421991     | 41         | 0             |
| 5mdt5kt45rg3 1628223527   | 14366533292145951164 |          | 231905     | 88.169         | 50.906     | .030     | 231904.000     | 2234211     | 743        | 0             |

10 rows selected.

SQL> pause

SQL>  
 SQL> -- Why is it good to see DIFF\_PLANS?  
 SQL> pause

|               |            |                      |       |        |        |      |            |        |       |   |
|---------------|------------|----------------------|-------|--------|--------|------|------------|--------|-------|---|
| buw7nxuggu81s | 1404293401 | 17230481863806651164 | 18    | 37.235 | 35.943 | .407 | 507204.000 | 815703 | 384   | 0 |
| 1qf3b7a46jm3u | 1322380957 | 17373762679661231169 | 13459 | 3.358  | 3.493  | .298 | 39773.000  | 55391  | 10522 | 0 |

10 rows selected.

SQL> pause

SQL>  
 SQL> @awr\_top\_by\_sqlid\_snaps.sql 25 50 9 10  
 SQL> set ver off pages 50000 lines 260 tab off echo off

| SQL_ID           | DIFF_PLAN  | DIFF_FMS             | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|------------------|------------|----------------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0w2qpuc6u2zsp    | 0          | 0                    | 231889     | 2517.160       | 2966.522   | 1.957    | 231889.000     | 45060626    | 58971      | 0             |
| c13sma6rkr27c #3 |            | 18298161888330075667 | 695504     | 579.615        | 624.629    | .068     | 3141269.000    | 19270840    | 2319       | 0             |
| 147a57cxq3w5y    | 0          | 0                    | 290416     | 1260.332       | 1476.165   | .119     | 290432.000     | 10062391    | 3449       | 0             |
| f7rxuxt64k87     | 0          | 0                    | 595365     | 177.662        | 183.504    | .940     | 595368.000     | 9466095     | 26787      | 0             |
| 3fw75k1snsddx    | 494735477  | 0                    | 231877     | 122.990        | 90.754     | .065     | 231876.000     | 3933240     | 1734       | 0             |
| 8z3542ffmp562    | 1655552467 | 17991828121679737456 | 666150     | 75.843         | 39.644     | .009     | 602153.000     | 3805721     | 296        | 0             |
| 01jzc2mg6cg92    | 0          | 0                    | 86872      | 298.917        | 285.065    | .715     | 86872.000      | 3726085     | 22116      | 0             |
| 5ckxyqfvu60pj    | 900611645  | 6486229150489758732  | 638509     | 73.013         | 53.327     | .150     | 638514.000     | 2554314     | 4454       | 0             |
| 7r7636982atn9    | 2141863993 | 8080224161820109919  | 220567     | 42.672         | 50.602     | .001     | 602140.000     | 2421991     | 41         | 0             |
| 5mddt5kt45rg3    | 1628223527 | 14366533292145951164 | 231905     | 88.169         | 50.906     | .030     | 231904.000     | 2234211     | 743        | 0             |

10 rows selected.

SQL> pause

SQL>  
 SQL> -- Why is it good to see DIFF\_PLANS?  
 SQL> pause

SQL> -- Look at the row for sql\_id = c13sma6rkr27c  
 SQL> pause

SQL> pause

SQL> @awr\_sqlid\_perf\_trend\_by\_plan.sql 25 50 c13sma6rkr27c

SQL> set ver off pages 50000 lines 260 tab off echo off

| TIME                | PLAN_HASH_VALUE | EXECUTIONS | ELAPSED_TIME_S_1E | CPU_TIME_S_1E | IOWAIT_S_1E | ROWS_PROCESSED_1E | BUFFER_GETS_1E | DISK_READS_1E | DIRECT_WRITES_1E |
|---------------------|-----------------|------------|-------------------|---------------|-------------|-------------------|----------------|---------------|------------------|
| 19.10.2014 10:39:43 | 725271039       | 29559      | .001              | .001          | .000        | 4.531             | 27.113         | .075          | .000             |
| 19.10.2014 10:50:11 | 725271039       | 30005      | .001              | .001          | .000        | 4.521             | 27.124         | .000          | .000             |
| 19.10.2014 11:00:14 | 725271039       | 30097      | .001              | .001          | .000        | 4.508             | 27.003         | .000          | .000             |
| 19.10.2014 11:10:16 | 725271039       | 29691      | .001              | .001          | .000        | 4.531             | 27.139         | .000          | .000             |
| 19.10.2014 11:20:17 | 725271039       | 30228      | .001              | .001          | .000        | 4.531             | 27.106         | .000          | .000             |
| 19.10.2014 11:30:19 | 725271039       | 30514      | .001              | .001          | .000        | 4.505             | 27.069         | .000          | .000             |
| 19.10.2014 11:40:21 | 725271039       | 29676      | .001              | .001          | .000        | 4.543             | 27.163         | .000          | .000             |
| 19.10.2014 11:50:23 | 725271039       | 29144      | .001              | .001          | .000        | 4.511             | 27.081         | .000          | .000             |
| 19.10.2014 12:00:25 | 725271039       | 29151      | .001              | .001          | .000        | 4.525             | 27.090         | .000          | .000             |
| 19.10.2014 12:10:26 | 725271039       | 29531      | .001              | .001          | .000        | 4.513             | 27.012         | .000          | .000             |
| 19.10.2014 12:20:30 | 725271039       | 29266      | .001              | .001          | .000        | 4.517             | 27.039         | .000          | .000             |
| 19.10.2014 12:30:31 | 725271039       | 29094      | .001              | .001          | .000        | 4.521             | 27.107         | .000          | .000             |
| 19.10.2014 12:40:34 | 725271039       | 29233      | .001              | .001          | .000        | 4.509             | 27.031         | .000          | .000             |
| 19.10.2014 12:50:35 | 725271039       | 29709      | .001              | .001          | .000        | 4.503             | 27.008         | .000          | .000             |
| 19.10.2014 13:00:37 | 725271039       | 29428      | .001              | .001          | .000        | 4.541             | 27.174         | .000          | .000             |
| 19.10.2014 13:10:38 | 725271039       | 29508      | .001              | .001          | .000        | 4.517             | 27.058         | .000          | .000             |
| 19.10.2014 13:20:42 | 725271039       | 28915      | .001              | .001          | .000        | 4.504             | 26.980         | .000          | .000             |
| 19.10.2014 13:30:43 | 725271039       | 29960      | .001              | .001          | .000        | 4.518             | 27.088         | .000          | .000             |
| 19.10.2014 13:40:45 | 725271039       | 29613      | .001              | .001          | .000        | 4.531             | 27.109         | .000          | .000             |
| 19.10.2014 13:50:46 | 725271039       | 29585      | .001              | .001          | .000        | 4.497             | 27.028         | .000          | .000             |
| 19.10.2014 14:00:51 | 725271039       | 45763      | .001              | .001          | .000        | 4.507             | 27.021         | .000          | .000             |
| 19.10.2014 14:10:54 | 214043693       | 49428      | .001              | .001          | .000        | 4.505             | 27.426         | .001          | .000             |
| 19.10.2014 14:20:56 | 3004904301      | 8406       | .001              | .001          | .000        | 4.485             | 77.567         | .009          | .000             |

23 rows selected.

SQL> pause

```
SQL> --let's look at two of the plans
SQL> select * from table(dbms_xplan.display_awr('c13sma6rkr27c',725271039));
```

PLAN\_TABLE\_OUTPUT

-----  
 SQL\_ID c13sma6rkr27c  
 -----

```
SELECT PRODUCTS.PRODUCT_ID, PRODUCT_NAME, PRODUCT_DESCRIPTION,
CATEGORY_ID, WEIGHT_CLASS, WARRANTY_PERIOD, SUPPLIER_ID,
PRODUCT_STATUS, LIST_PRICE, MIN_PRICE, CATALOG_URL, QUANTITY_ON_HAND
FROM PRODUCTS, INVENTORIES WHERE PRODUCTS.CATEGORY_ID = :B3 AND
INVENTORIES.PRODUCT_ID = PRODUCTS.PRODUCT_ID AND
INVENTORIES.WAREHOUSE_ID = :B2 AND ROWNUM < :B1
```

Plan hash value: 725271039

| Id | Operation                           | Name                 | Rows | Bytes | Cost (%CPU) | Time     |
|----|-------------------------------------|----------------------|------|-------|-------------|----------|
| 0  | SELECT STATEMENT                    |                      |      |       | 33 (100)    |          |
| 1  | COUNT STOPKEY                       |                      |      |       |             |          |
| 2  | NESTED LOOPS                        |                      | 14   | 5670  | 33 (0)      | 00:00:01 |
| 3  | HASH JOIN OUTER                     |                      | 9    | 3519  | 15 (0)      | 00:00:01 |
| 4  | TABLE ACCESS BY INDEX ROWID BATCHED | PRODUCT_INFORMATION  | 9    | 1584  | 10 (0)      | 00:00:01 |
| 5  | INDEX RANGE SCAN                    | PROD_CATEGORY_IX     | 9    |       | 1 (0)       | 00:00:01 |
| 6  | TABLE ACCESS BY INDEX ROWID BATCHED | PRODUCT_DESCRIPTIONS | 2    | 430   | 5 (0)       | 00:00:01 |
| 7  | INDEX SKIP SCAN                     | PRD_DESC_PK          | 2    |       | 4 (0)       | 00:00:01 |
| 8  | TABLE ACCESS BY INDEX ROWID         | INVENTORIES          | 2    | 28    | 2 (0)       | 00:00:01 |
| 9  | INDEX UNIQUE SCAN                   | INVENTORY_PK         | 1    |       | 1 (0)       | 00:00:01 |

Note

-----  
 - this is an adaptive plan

```
SQL> select * from table(dbms_xplan.display_awr('c13sma6rkr27c',3004904301));
```

```
PLAN_TABLE_OUTPUT
```

```
-----
SQL_ID c13sma6rkr27c
-----
```

```
SELECT PRODUCTS.PRODUCT_ID, PRODUCT_NAME, PRODUCT_DESCRIPTION,
CATEGORY_ID, WEIGHT_CLASS, WARRANTY_PERIOD, SUPPLIER_ID,
PRODUCT_STATUS, LIST_PRICE, MIN_PRICE, CATALOG_URL, QUANTITY_ON_HAND
FROM PRODUCTS, INVENTORIES WHERE PRODUCTS.CATEGORY_ID = :B3 AND
INVENTORIES.PRODUCT_ID = PRODUCTS.PRODUCT_ID AND
INVENTORIES.WAREHOUSE_ID = :B2 AND ROWNUM < :B1
```

```
Plan hash value: 3004904301
```

```
-----
```

| Id | Operation                           | Name                 | Rows | Bytes | Cost (%CPU) | Time     |
|----|-------------------------------------|----------------------|------|-------|-------------|----------|
| 0  | SELECT STATEMENT                    |                      |      |       | 33 (100)    |          |
| 1  | COUNT STOPKEY                       |                      |      |       |             |          |
| 2  | NESTED LOOPS                        |                      | 14   | 5670  | 33 (0)      | 00:00:01 |
| 3  | NESTED LOOPS OUTER                  |                      | 9    | 3519  | 15 (0)      | 00:00:01 |
| 4  | TABLE ACCESS BY INDEX ROWID BATCHED | PRODUCT_INFORMATION  | 9    | 1584  | 10 (0)      | 00:00:01 |
| 5  | INDEX RANGE SCAN                    | PROD_CATEGORY_IX     | 9    |       | 1 (0)       | 00:00:01 |
| 6  | TABLE ACCESS BY INDEX ROWID         | PRODUCT_DESCRIPTIONS | 1    | 215   | 5 (0)       | 00:00:01 |
| 7  | INDEX UNIQUE SCAN                   | PRD_DESC_PK          | 2    |       | 4 (0)       | 00:00:01 |
| 8  | TABLE ACCESS BY INDEX ROWID         | INVENTORIES          | 2    | 28    | 2 (0)       | 00:00:01 |
| 9  | INDEX UNIQUE SCAN                   | INVENTORY_PK         | 1    |       | 1 (0)       | 00:00:01 |

```
-----
```

```
Note
```

```
-----
- this is an adaptive plan
```



```
INVENTORIES.PRODUCT_ID = PRODUCTS.PRODUCT_ID AND
INVENTORIES.WAREHOUSE_ID = :B2 AND ROWNUM < :B1
```

Plan hash value: 3004904301

| Id | Operation                           | Name                 | Rows | Bytes | Cost (%CPU) | Time     |
|----|-------------------------------------|----------------------|------|-------|-------------|----------|
| 0  | SELECT STATEMENT                    |                      |      |       | 33 (100)    |          |
| 1  | COUNT STOPKEY                       |                      |      |       |             |          |
| 2  | NESTED LOOPS                        |                      | 14   | 5670  | 33 (0)      | 00:00:01 |
| 3  | NESTED LOOPS OUTER                  |                      | 9    | 3519  | 15 (0)      | 00:00:01 |
| 4  | TABLE ACCESS BY INDEX ROWID BATCHED | PRODUCT_INFORMATION  | 9    | 1584  | 10 (0)      | 00:00:01 |
| 5  | INDEX RANGE SCAN                    | PROD_CATEGORY_IX     | 9    |       | 1 (0)       | 00:00:01 |
| 6  | TABLE ACCESS BY INDEX ROWID         | PRODUCT_DESCRIPTIONS | 1    | 215   | 5 (0)       | 00:00:01 |
| 7  | INDEX UNIQUE SCAN                   | PRD_DESC_PK          | 2    |       | 4 (0)       | 00:00:01 |
| 8  | TABLE ACCESS BY INDEX ROWID         | INVENTORIES          | 2    | 28    | 2 (0)       | 00:00:01 |
| 9  | INDEX UNIQUE SCAN                   | INVENTORY_PK         | 1    |       | 1 (0)       | 00:00:01 |

Note

- this is an adaptive plan

30 rows selected.

SQL> pause

SQL>

SQL> -- Querying the AWR tables directly gives more flexibility, but provides basically the same results as The AWR report.

SQL> exit

Disconnected from Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production

With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

[oracle@DB12c AWR\_MINING3]\$



# LET'S MINE THE AWR!

- DEMO - `awr_top_fms_demo.sql`

```
[oracle@DB12c AWR_MINING3]$ sqlplus / as sysdba
```

```
SQL*Plus: Release 12.1.0.1.0 Production on Thu Oct 22 05:55:48 2015
```

```
Copyright (c) 1982, 2013, Oracle. All rights reserved.
```

```
Connected to:
```

```
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production  
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
```

```
SQL> @awr_top_fms_demo.sql
```

```
SQL> alter session set container = sample;
```

```
Session altered.
```

```
SQL>
```

```
SQL> -- Let's see how sorting by elapsed time looks when we aggregate by FORCE_MATCHING_SIGNATURE
```

```
SQL> pause
```

```
col iowait_s for 9999999.999
col clwait_s for 9999999.999
col apwait_s for 9999999.999
col ccwait_s for 9999999.999
col buffer_gets for 999999999999999999
col disk_reads for 999999999999999999
col direct_writes for 999999999999999999
col diff_sqlid for a13
col diff_plan for a10
col diff_fms for a20

select * from (
select to_char(force_matching_signature) diff_fms,
       decode(count(unique(plan_hash_value)),1,to_char(max(plan_hash_value)),'#'||count(unique(plan_hash_value))) diff_plan,
       decode(count(unique(sql_id)),1,max(sql_id),'#'||count(unique(sql_id))) diff_sqlid,
       sum(hss.executions_delta) executions,
       round(sum(hss.elapsed_time_delta)/1000000,3) elapsed_time_s,
       round(sum(hss.cpu_time_delta)/1000000,3) cpu_time_s,
       round(sum(hss.iowait_delta)/1000000,3) iowait_s,
--      round(sum(hss.clwait_delta)/1000000,3) clwait_s,
--      round(sum(hss.apwait_delta)/1000000,3) apwait_s,
--      round(sum(hss.ccwait_delta)/1000000,3) ccwait_s,
       round(sum(hss.rows_processed_delta),3) rows_processed,
       round(sum(hss.buffer_gets_delta),3) buffer_gets,
       round(sum(hss.disk_reads_delta),3) disk_reads,
       round(sum(hss.direct_writes_delta),3) direct_writes
from dba_hist_sqlstat hss, dba_hist_snapshot hs
where hss.snap_id=hs.snap_id
      and hs.snap_id between &snap_id_from and &snap_id_to
group by force_matching_signature
order by &sort_col_nr desc)
where rownum<=&top_n;
```

SQL> pause

```
-- round(sum(hss.ccwait_delta)/100000,3) ccwait_s,
   round(sum(hss.rows_processed_delta),3) rows_processed,
   round(sum(hss.buffer_gets_delta),3) buffer_gets,
   round(sum(hss.disk_reads_delta),3) disk_reads,
   round(sum(hss.direct_writes_delta),3) direct_writes
from dba_hist_sqlstat hss, dba_hist_snapshot hs
where hss.snap_id=hs.snap_id
      and hs.snap_id between &snap_id_from and &snap_id_to
group by force_matching_signature
order by &sort_col_nr desc)
where rownum<=&top_n;
```

SQL> pause

```
SQL>
SQL> @awr_top_by_fms_snaps.sql 25 50 5 10
SQL> set ver off pages 50000 lines 260 tab off echo off
```

| DIFF_FMS             | DIFF_PLAN  | DIFF_SQLID     | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|----------------------|------------|----------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0                    | #23        | #57            | 2462768    | 4825.257       | 5416.525   | 6.905    | 2462955        | 79731662    | 185393     | 791           |
| 18298161888330075667 | #3         | c13sma6rkr27c  | 695504     | 579.615        | 624.629    | .068     | 3141269        | 19270840    | 2319       | 0             |
| 5985318870031566873  | 1081153563 | #999           | 835562     | 306.699        | 253.610    | .034     | 11697868       | 7571650     | 1029       | 0             |
| 14366533292145951164 | 1628223527 | 5mddt5kt45rg3  | 231905     | 88.169         | 50.906     | .030     | 231904         | 2234211     | 743        | 0             |
| 17991828121679737456 | 1655552467 | 8z3542ffmp562  | 666150     | 75.843         | 39.644     | .009     | 602153         | 3805721     | 296        | 0             |
| 6486229150489758732  | 900611645  | 5ckxyqfvu60pj  | 638509     | 73.013         | 53.327     | .150     | 638514         | 2554314     | 4454       | 0             |
| 2672114946588399948  | 1388734953 | c749bc43qqfz3  | 638186     | 47.942         | 16.981     | .000     | 638465         | 3           | 0          | 0             |
| 8080224161820109919  | 2141863993 | 7r7636982atn9  | 220567     | 42.672         | 50.602     | .001     | 602140         | 2421991     | 41         | 0             |
| 17230481863806651164 | 1404293401 | buw7nxuggu81s  | 18         | 37.235         | 35.943     | .407     | 507204         | 815703      | 384        | 0             |
| 15722349611718065978 | 2480532011 | g81cbrq75yamf5 | 260969     | 29.337         | 23.695     | .582     | 393409         | 1177450     | 18987      | 0             |

10 rows selected.

SQL> pause

```
round(sum(hss.direct_writes_delta),3) direct_writes
from dba_hist_sqlstat hss, dba_hist_snapshot hs
where hss.snap_id=hs.snap_id
and hs.snap_id between &snap_id_from and &snap_id_to
group by force_matching_signature
order by &sort_col_nr desc)
where rownum<=&top_n;
```

SQL> pause

```
SQL>
SQL> @awr_top_by_fms_snaps.sql 25 50 5 10
SQL> set ver off pages 50000 lines 260 tab off echo off
```

| DIFF_FMS             | DIFF_PLAN  | DIFF_SQLID    | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|----------------------|------------|---------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0                    | #23        | #57           | 2462768    | 4825.257       | 5416.525   | 6.905    | 2462955        | 79731662    | 185393     | 791           |
| 18298161888330075667 | #3         | c13sma6rkr27c | 695504     | 579.615        | 624.629    | .068     | 3141269        | 19270840    | 2319       | 0             |
| 5985318870031566873  | 1081153563 | #999          | 835562     | 306.699        | 253.610    | .034     | 11697868       | 7571650     | 1029       | 0             |
| 14366533292145951164 | 1628223527 | 5mddt5kt45rg3 | 231905     | 88.169         | 50.906     | .030     | 231904         | 2234211     | 743        | 0             |
| 17991828121679737456 | 1655552467 | 8z3542ffmp562 | 666150     | 75.843         | 39.644     | .009     | 602153         | 3805721     | 296        | 0             |
| 6486229150489758732  | 900611645  | 5ckxyqfvu60pj | 638509     | 73.013         | 53.327     | .150     | 638514         | 2554314     | 4454       | 0             |
| 2672114946588399948  | 1388734953 | c749bc43qqfz3 | 638186     | 47.942         | 16.981     | .000     | 638465         | 3           | 0          | 0             |
| 8080224161820109919  | 2141863993 | 7r7636982atn9 | 220567     | 42.672         | 50.602     | .001     | 602140         | 2421991     | 41         | 0             |
| 17230481863806651164 | 1404293401 | buw7nxuggu81s | 18         | 37.235         | 35.943     | .407     | 507204         | 815703      | 384        | 0             |
| 15722349611718065978 | 2480532011 | g81cbrq5yamf5 | 260969     | 29.337         | 23.695     | .582     | 393409         | 1177450     | 18987      | 0             |

10 rows selected.

SQL> pause

```
SQL>
SQL> -- What is FMS=0?
SQL> pause
```

```
15722349611718065978 2480532011 g81cbrq5yamf5 260969 29.337 23.695 .582 393409 1177450 18987 0
```

10 rows selected.

SQL> pause

SQL>

SQL> -- What is FMS=0?

SQL> pause

SQL> @awr\_top\_by\_fms\_detail\_snaps.sql 25 50 5 15 0

SQL> set ver off pages 50000 lines 260 tab off echo off

| DIFF_FMS | DIFF_PLAN  | SQL_ID        | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|----------|------------|---------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0        | 0          | 0w2qpuc6u2zsp | 231889     | 2517.160       | 2966.522   | 1.957    | 231889         | 45060626    | 58971      | 0             |
| 0        | 0          | 147a57cxq3w5y | 290416     | 1260.332       | 1476.165   | .119     | 290432         | 10062391    | 3449       | 0             |
| 0        | 0          | 01jzc2mg6cg92 | 86872      | 298.917        | 285.065    | .715     | 86872          | 3726085     | 22116      | 0             |
| 0        | 0          | f7rxuxzt64k87 | 595365     | 177.662        | 183.504    | .940     | 595368         | 9466095     | 26787      | 0             |
| 0        | 3241608609 | gzhkw1qu6fwxm | 638465     | 127.138        | 88.481     | .006     | 638463         | 2052941     | 58         | 0             |
| 0        | 494735477  | 3fw75k1snsddx | 231877     | 122.990        | 90.754     | .065     | 231876         | 3933240     | 1734       | 0             |
| 0        | 0          | apgb2g9q2zjh1 | 29082      | 83.980         | 85.473     | 1.244    | 29082          | 644899      | 38878      | 0             |
| 0        | 0          | cmdngkbcz5s9  | 57765      | 64.341         | 68.699     | .096     | 57765          | 414169      | 2811       | 0             |
| 0        | 0          | gh2g2tynpcpv1 | 86873      | 54.870         | 58.681     | .507     | 86873          | 1668076     | 15273      | 0             |
| 0        | 0          | a9gvfh5hx9u98 | 29213      | 53.916         | 52.549     | .251     | 29213          | 847081      | 6981       | 0             |
| 0        | 0          | budtrjayjnvw3 | 86873      | 30.219         | 27.506     | .106     | 86873          | 658802      | 3609       | 0             |
| 0        | 0          | 9t3n2wpr7my63 | 96723      | 29.138         | 29.363     | .119     | 96723          | 1057785     | 3644       | 0             |
| 0        | 0          | 16bb7yq3ps4f9 | 2          | 2.810          | 2.154      | .763     | 2              | 121068      | 372        | 791           |
| 0        | 0          | 39k4gf5t0831y | 55         | .370           | .353       | .002     | 0              | 1615        | 72         | 0             |
| 0        | 0          | adzjh275fvvx4 | 8          | .324           | .309       | .004     | 0              | 3237        | 160        | 0             |

15 rows selected.

SQL> pause



SQL> pause

SQL>

SQL> -- What is FMS=0?

SQL> pause

SQL> @awr\_top\_by\_fms\_detail\_snaps.sql 25 50 5 15 0

SQL> set ver off pages 50000 lines 260 tab off echo off

| DIFF_FMS | DIFF_PLAN  | SQL_ID        | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|----------|------------|---------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0        | 0          | 0w2qpu6u2zsp  | 231889     | 2517.160       | 2966.522   | 1.957    | 231889         | 45060626    | 58971      | 0             |
| 0        | 0          | 147a57cxq3w5y | 290416     | 1260.332       | 1476.165   | .119     | 290432         | 10062391    | 3449       | 0             |
| 0        | 0          | 01jzc2mg6cg92 | 86872      | 298.917        | 285.065    | .715     | 86872          | 3726085     | 22116      | 0             |
| 0        | 0          | f7rxuzzt64k87 | 595365     | 177.662        | 183.504    | .940     | 595368         | 9466095     | 26787      | 0             |
| 0        | 3241608609 | gzhkw1qu6fwxm | 638465     | 127.138        | 88.481     | .006     | 638463         | 2052941     | 58         | 0             |
| 0        | 494735477  | 3fw75k1snsddx | 231877     | 122.990        | 90.754     | .065     | 231876         | 3933240     | 1734       | 0             |
| 0        | 0          | apgb2g9q2zjh1 | 29082      | 83.980         | 85.473     | 1.244    | 29082          | 644899      | 38878      | 0             |
| 0        | 0          | cmdgkbbkcz5s9 | 57765      | 64.341         | 68.699     | .096     | 57765          | 414169      | 2811       | 0             |
| 0        | 0          | gh2g2tynpcpv1 | 86873      | 54.870         | 58.681     | .507     | 86873          | 1668076     | 15273      | 0             |
| 0        | 0          | a9gvfh5hx9u98 | 29213      | 53.916         | 52.549     | .251     | 29213          | 847081      | 6981       | 0             |
| 0        | 0          | budtrjayjnvw3 | 86873      | 30.219         | 27.506     | .106     | 86873          | 658802      | 3609       | 0             |
| 0        | 0          | 9t3n2wpr7my63 | 96723      | 29.138         | 29.363     | .119     | 96723          | 1057785     | 3644       | 0             |
| 0        | 0          | 16bb7yq3ps4f9 | 2          | 2.810          | 2.154      | .763     | 2              | 121068      | 372        | 791           |
| 0        | 0          | 39k4gf5t0831y | 55         | .370           | .353       | .002     | 0              | 1615        | 72         | 0             |
| 0        | 0          | adzjh275fvvx4 | 8          | .324           | .309       | .004     | 0              | 3237        | 160        | 0             |

15 rows selected.

SQL> pause

SQL>

SQL> -- Let's look at some of these queries

SQL> pause

|   |   |               |       |        |        |      |       |         |      |     |
|---|---|---------------|-------|--------|--------|------|-------|---------|------|-----|
| 0 | 0 | a9gvfh5hx9u98 | 29213 | 53.916 | 52.549 | .251 | 29213 | 847081  | 6981 | 0   |
| 0 | 0 | budtrjayjnvw3 | 86873 | 30.219 | 27.506 | .106 | 86873 | 658802  | 3609 | 0   |
| 0 | 0 | 9t3n2wpr7my63 | 96723 | 29.138 | 29.363 | .119 | 96723 | 1057785 | 3644 | 0   |
| 0 | 0 | 16bb7yq3ps4f9 | 2     | 2.810  | 2.154  | .763 | 2     | 121068  | 372  | 791 |
| 0 | 0 | 39k4gf5t0831y | 55    | .370   | .353   | .002 | 0     | 1615    | 72   | 0   |
| 0 | 0 | adzjh275fvvx4 | 8     | .324   | .309   | .004 | 0     | 3237    | 160  | 0   |

15 rows selected.

SQL> pause

SQL>

SQL> -- Let's look at some of these queries

SQL> pause

SQL> @awr\_show\_sqlid.sql 0w2qpuc6u2zsp

SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off

### Occurrences in ASH (DBA\_HIST\_ACTIVE\_SESS\_HISTORY):

| SQL_ID        | PROGRAM          | MODULE    | ACTION                      | CLIENT_ID  | COUNT(*) |
|---------------|------------------|-----------|-----------------------------|------------|----------|
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order |                             | Swingbench | 220      |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | getProductQuantity          | Swingbench | 24       |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | logon                       | Swingbench | 19       |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | getProductDetailsByCategory | Swingbench | 18       |
| 0w2qpuc6u2zsp | JDBC Thin Client |           |                             | Swingbench | 9        |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | getCardDetailsByCustomerID  | Swingbench | 1        |

6 rows selected.

### The Statement (DBA\_HIST\_SQLTEXT):

```
BEGIN :1 := orderentry.neworder(:2 ,:3 ,:4 ); END;
```

SQL> pause

```
SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off
### Occurrences in ASH (DBA_HIST_ACTIVE_SESS_HISTORY):
```

| SQL_ID        | PROGRAM          | MODULE    | ACTION                      | CLIENT_ID  | COUNT(*) |
|---------------|------------------|-----------|-----------------------------|------------|----------|
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order |                             | Swingbench | 220      |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | getProductQuantity          | Swingbench | 24       |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | logon                       | Swingbench | 19       |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | getProductDetailsByCategory | Swingbench | 18       |
| 0w2qpuc6u2zsp | JDBC Thin Client |           |                             | Swingbench | 9        |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | getCardDetailsByCustomerID  | Swingbench | 1        |

6 rows selected.

```
### The Statement (DBA_HIST_SQLTEXT):
```

```
BEGIN :1 := orderentry.neworder(:2 ,:3 ,:4 ); END;
```

```
SQL> pause
```

```
SQL> @awr_show_sqlid.sql gzhkw1qu6fwxm
```

```
SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off
### Occurrences in ASH (DBA_HIST_ACTIVE_SESS_HISTORY):
```

| SQL_ID        | PROGRAM          | MODULE                   | ACTION | CLIENT_ID  | COUNT(*) |
|---------------|------------------|--------------------------|--------|------------|----------|
| gzhkw1qu6fwxm | JDBC Thin Client | Update Customer Details  | logon  | Swingbench | 4        |
| gzhkw1qu6fwxm | JDBC Thin Client | Browse Products          | logon  | Swingbench | 2        |
| gzhkw1qu6fwxm | JDBC Thin Client | New Order                | logon  | Swingbench | 2        |
| gzhkw1qu6fwxm | JDBC Thin Client | Browse and Update Orders | logon  | Swingbench | 2        |

```
### The Statement (DBA_HIST_SQLTEXT):
```

```
INSERT INTO LOGON (LOGON_ID,CUSTOMER_ID, LOGON_DATE) VALUES (LOGON_SEQ.NEXTVAL, :B2 , :B1 )
```

```
SQL> pause
```

LOAD TABLE CONVENTIONAL

```
-----
```

| SQL ID        | PROGRAM          | MODULE    | ACTION                      | CLIENT_ID  | COUNT(*) |
|---------------|------------------|-----------|-----------------------------|------------|----------|
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order |                             | Swingbench | 220      |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | getProductQuantity          | Swingbench | 24       |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | logon                       | Swingbench | 19       |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | getProductDetailsByCategory | Swingbench | 18       |
| 0w2qpuc6u2zsp | JDBC Thin Client |           |                             | Swingbench | 9        |
| 0w2qpuc6u2zsp | JDBC Thin Client | New Order | getCardDetailsByCustomerID  | Swingbench | 1        |

6 rows selected.

### The Statement (DBA\_HIST\_SQLTEXT):

```
BEGIN :1 := orderentry.neworder(:2 ,:3 ,:4 ); END;
```

SQL> pause

SQL> @awr\_show\_sqlid.sql gzhkw1qu6fwxm

SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off

### Occurrences in ASH (DBA\_HIST\_ACTIVE\_SESS\_HISTORY):

```
-----
```

| SQL_ID        | PROGRAM          | MODULE                   | ACTION | CLIENT_ID  | COUNT(*) |
|---------------|------------------|--------------------------|--------|------------|----------|
| gzhkw1qu6fwxm | JDBC Thin Client | Update Customer Details  | logon  | Swingbench | 4        |
| gzhkw1qu6fwxm | JDBC Thin Client | Browse Products          | logon  | Swingbench | 2        |
| gzhkw1qu6fwxm | JDBC Thin Client | New Order                | logon  | Swingbench | 2        |
| gzhkw1qu6fwxm | JDBC Thin Client | Browse and Update Orders | logon  | Swingbench | 2        |

### The Statement (DBA\_HIST\_SQLTEXT):

```
INSERT INTO LOGON (LOGON_ID,CUSTOMER_ID, LOGON_DATE) VALUES (LOGON_SEQ.NEXTVAL, :B2 , :B1 )
```

SQL> pause

SQL>

SQL> -- Let's take a closer look at these 999 queries in the TOP 3rd place.

SQL> pause

```
### The Statement (DBA_HIST_SQLTEXT):
INSERT INTO LOGON (LOGON_ID,CUSTOMER_ID, LOGON_DATE) VALUES (LOGON_SEQ.NEXTVAL, :B2 , :B1 )
```

```
SQL> pause
```

```
SQL>
```

```
SQL> -- Let's take a closer look at these 999 queries in the TOP 3rd place.
```

```
SQL> pause
```

```
SQL> @awr_top_by_fms_detail_snaps.sql 25 50 5 15 5985318870031566873
```

```
SQL> set ver off pages 50000 lines 260 tab off echo off
```

| DIFF_FMS            | DIFF_PLAN  | SQL_ID        | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|---------------------|------------|---------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 5985318870031566873 | 1081153563 | 2y383xj04ztf6 | 812        | 4.587          | 4.544      | .000     | 11368          | 7319        | 1          | 0             |
| 5985318870031566873 | 1081153563 | dra5r5s03kmad | 891        | .447           | .354       | .000     | 12474          | 8461        | 9          | 0             |
| 5985318870031566873 | 1081153563 | 4v95sjusy6ba3 | 822        | .394           | .308       | .000     | 11508          | 8465        | 3          | 0             |
| 5985318870031566873 | 1081153563 | 6j47tkwf6as3j | 824        | .365           | .261       | .000     | 11536          | 7509        | 3          | 0             |
| 5985318870031566873 | 1081153563 | 535x28j7nyrr2 | 940        | .362           | .315       | .000     | 13160          | 8468        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 0ab0gy4bczs5b | 886        | .362           | .300       | .000     | 12404          | 7982        | 1          | 0             |
| 5985318870031566873 | 1081153563 | agb1t4y0yaqgn | 983        | .361           | .306       | .000     | 13762          | 8871        | 1          | 0             |
| 5985318870031566873 | 1081153563 | fh5pm06vpmr94 | 816        | .356           | .275       | .000     | 11424          | 7359        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 80jvzncm78pvc | 916        | .353           | .303       | .000     | 12824          | 8252        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 6hkpmmcft2k1  | 899        | .353           | .291       | .000     | 12586          | 9897        | 2          | 0             |
| 5985318870031566873 | 1081153563 | 57m0ndunjn7nr | 912        | .350           | .296       | .000     | 12768          | 8216        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 6d2mtjqhduv5y | 882        | .350           | .315       | .000     | 12348          | 8831        | 2          | 0             |
| 5985318870031566873 | 1081153563 | b3mnsjcwsa39x | 830        | .349           | .321       | .000     | 11620          | 8323        | 2          | 0             |
| 5985318870031566873 | 1081153563 | 7kd85hj9xp0vs | 950        | .348           | .306       | .000     | 13300          | 8558        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 1wjyhzcswq737 | 931        | .346           | .273       | .000     | 13034          | 8387        | 1          | 0             |

```
15 rows selected.
```

```
SQL> pause
```



SQL> pause

SQL>

SQL> -- Let's take a closer look at these 999 queries in the TOP 3rd place.

SQL> pause

SQL> @awr\_top\_by\_fms\_detail\_snaps.sql 25 50 5 15 5985318870031566873

SQL> set ver off pages 50000 lines 260 tab off echo off

| DIFF_FMS            | DIFF_PLAN  | SQL_ID         | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|---------------------|------------|----------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 5985318870031566873 | 1081153563 | 2y383xj04ztf6  | 812        | 4.587          | 4.544      | .000     | 11368          | 7319        | 1          | 0             |
| 5985318870031566873 | 1081153563 | dra5rjs03kmad  | 891        | .447           | .354       | .000     | 12474          | 8461        | 9          | 0             |
| 5985318870031566873 | 1081153563 | 4v95sjsusy6ba3 | 822        | .394           | .308       | .000     | 11508          | 8465        | 3          | 0             |
| 5985318870031566873 | 1081153563 | 6j47tkwf6as3j  | 824        | .365           | .261       | .000     | 11536          | 7509        | 3          | 0             |
| 5985318870031566873 | 1081153563 | 535x28j7nyrr2  | 940        | .362           | .315       | .000     | 13160          | 8468        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 0ab0gy4bczs5b  | 886        | .362           | .300       | .000     | 12404          | 7982        | 1          | 0             |
| 5985318870031566873 | 1081153563 | agb1t4y0yaqgn  | 983        | .361           | .306       | .000     | 13762          | 8871        | 1          | 0             |
| 5985318870031566873 | 1081153563 | fh5pm06vpmr94  | 816        | .356           | .275       | .000     | 11424          | 7359        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 80jvzncm78pvc  | 916        | .353           | .303       | .000     | 12824          | 8252        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 6hkpmmcft2k1   | 899        | .353           | .291       | .000     | 12586          | 9897        | 2          | 0             |
| 5985318870031566873 | 1081153563 | 57m0ndunjn7nr  | 912        | .350           | .296       | .000     | 12768          | 8216        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 6d2mtjqhduv5y  | 882        | .350           | .315       | .000     | 12348          | 8831        | 2          | 0             |
| 5985318870031566873 | 1081153563 | b3mnsjcwsa39x  | 830        | .349           | .321       | .000     | 11620          | 8323        | 2          | 0             |
| 5985318870031566873 | 1081153563 | 7kd85hj9xp0vs  | 950        | .348           | .306       | .000     | 13300          | 8558        | 1          | 0             |
| 5985318870031566873 | 1081153563 | 1wjyhzcsqw737  | 931        | .346           | .273       | .000     | 13034          | 8387        | 1          | 0             |

15 rows selected.

SQL> pause

SQL>

SQL> -- Let's look at some of these queries

SQL> pause



```
SQL> pause
```

```
SQL>
```

```
SQL> -- Let's look at some of these queries
```

```
SQL> pause
```

```
SQL> @awr_show_sqlid.sql 2y383xj04ztf6
```

```
SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off
```

```
### Occurrences in ASH (DBA_HIST_ACTIVE_SESS_HISTORY):
```

```
no rows selected
```

```
### The Statement (DBA_HIST_SQLTEXT):
```

```
SELECT products.PRODUCT_ID,  
PRODUCT_NAME,  
PRODUCT_DESCRIPTION,  
CATEGORY_ID,  
WEIGHT_CLASS,  
WARRANTY_PERIOD,  
SUPPLIER_ID,  
PRODUCT_STATUS,  
LIST_PRICE,  
MIN_PRICE,  
CATALOG_URL,  
QUANTITY_ON_HAND  
FROM products,  
inventories  
WHERE products.product_id = 782  
AND inventories.product_id = products.product_id  
AND rownum < 15
```

```
SQL> pause
```

```
AND inventories.product_id = products.product_id  
AND rownum < 15
```

```
SQL> pause
```

```
SQL>
```

```
SQL> @awr_show_sqlid.sql dra5rjs03kmad
```

```
SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off
```

```
### Occurrences in ASH (DBA_HIST_ACTIVE_SESS_HISTORY):
```

```
no rows selected
```

```
### The Statement (DBA_HIST_SQLTEXT):
```

```
SELECT products.PRODUCT_ID,  
PRODUCT_NAME,  
PRODUCT_DESCRIPTION,  
CATEGORY_ID,  
WEIGHT_CLASS,  
WARRANTY_PERIOD,  
SUPPLIER_ID,  
PRODUCT_STATUS,  
LIST_PRICE,  
MIN_PRICE,  
CATALOG_URL,  
QUANTITY_ON_HAND  
FROM products,  
inventories  
WHERE products.product_id = 195  
AND inventories.product_id = products.product_id  
AND rownum < 15
```

```
SQL> pause
```

```
SQL> @awr_show_sqlid.sql dra5rjs03kmad
SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off
### Occurrences in ASH (DBA_HIST_ACTIVE_SESS_HISTORY):

no rows selected

### The Statement (DBA_HIST_SQLTEXT):
SELECT products.PRODUCT_ID,
PRODUCT_NAME,
PRODUCT_DESCRIPTION,
CATEGORY_ID,
WEIGHT_CLASS,
WARRANTY_PERIOD,
SUPPLIER_ID,
PRODUCT_STATUS,
LIST_PRICE,
MIN_PRICE,
CATALOG_URL,
QUANTITY_ON_HAND
FROM products,
inventories
WHERE products.product_id = 195
AND inventories.product_id = products.product_id
AND rownum < 15

SQL> pause

SQL>
SQL> -- Sorting by FORCE_MATCHING_SIGNATURE allowed me to identify a significant consumer query that doesn't utilize binds
SQL>
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
[oracle@DB12c AWR_MINING3]$
```

# LET'S MINE THE AWR!

- DEMO - `awr_top_plan_demo.sql`

```
[oracle@DB12c AWR_MINING3]$ sqlplus / as sysdba
```

```
SQL*Plus: Release 12.1.0.1.0 Production on Fri Oct 23 10:41:14 2015
```

```
Copyright (c) 1982, 2013, Oracle. All rights reserved.
```

```
Connected to:
```

```
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production  
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
```

```
SQL> @awr_top_plan_demo.sql
```

```
SQL> alter session set container = sample;
```

```
Session altered.
```

```
SQL>
```

```
SQL> -- Let's see how sorting by elapsed time looks when we aggregate by PLAN_HASH_VALUE
```

```
SQL> pause
```

```
col iowait_s for 9999999.999
col clwait_s for 9999999.999
col apwait_s for 9999999.999
col ccwait_s for 9999999.999
col buffer_gets for 9999999999999999999
col disk_reads for 9999999999999999999
col direct_writes for 9999999999999999999
col diff_sqlid for a13
col diff_plan for a10
col diff_fms for a20

select * from (
select to_char(plan_hash_value) diff_plan,
       decode(count(unique(sql_id)),1,max(sql_id),'#'||count(unique(sql_id))) diff_sqlid,
       decode(count(unique(force_matching_signature)),1,to_char(max(force_matching_signature)),'#'||count(unique(force_matching_signature))) diff_fms,
       sum(hss.executions_delta) executions,
       round(sum(hss.elapsed_time_delta)/1000000,3) elapsed_time_s,
       round(sum(hss.cpu_time_delta)/1000000,3) cpu_time_s,
       round(sum(hss.iowait_delta)/1000000,3) iowait_s,
--      round(sum(hss.clwait_delta)/1000000,3) clwait_s,
--      round(sum(hss.apwait_delta)/1000000,3) apwait_s,
--      round(sum(hss.ccwait_delta)/1000000,3) ccwait_s,
       round(sum(hss.rows_processed_delta),3) rows_processed,
       round(sum(hss.buffer_gets_delta),3) buffer_gets,
       round(sum(hss.disk_reads_delta),3) disk_reads,
       round(sum(hss.direct_writes_delta),3) direct_writes
from dba_hist_sqlstat hss, dba_hist_snapshot hs
where hss.snap_id=hs.snap_id
      and hs.snap_id between &snap_id_from and &snap_id_to
group by plan_hash_value
order by &sort_col_nr desc)
where rownum<=&top_n;

SQL> pause
```



```
-- round(sum(hss.ccwait_delta)/100000,3) ccwait_s,
   round(sum(hss.rows_processed_delta),3) rows_processed,
   round(sum(hss.buffer_gets_delta),3) buffer_gets,
   round(sum(hss.disk_reads_delta),3) disk_reads,
   round(sum(hss.direct_writes_delta),3) direct_writes
from dba_hist_sqlstat hss, dba_hist_snapshot hs
where hss.snap_id=hs.snap_id
     and hs.snap_id between &snap_id_from and &snap_id_to
group by plan_hash_value
order by &sort_col_nr desc)
where rownum<=&top_n;
```

SQL> pause

```
SQL>
SQL> @awr_top_by_plan_snaps.sql 25 50 5 10
SQL> set ver off pages 50000 lines 260 tab off echo off
```

| DIFF_PLAN  | DIFF_SQLID    | DIFF_FMS             | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|------------|---------------|----------------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0          | #32           | 0                    | 1591480    | 4574.840       | 5237.021   | 6.831    | 1591422        | 73737483    | 183290     | 791           |
| 725271039  | c13sma6rkr27c | 18298161888330075667 | 637670     | 521.987        | 571.116    | .063     | 2880918        | 17263182    | 2209       | 0             |
| 1081153563 | #999          | 5985318870031566873  | 835562     | 306.699        | 253.610    | .034     | 11697868       | 7571650     | 1029       | 0             |
| 3241608609 | gzhkw1qu6fwxm | 0                    | 638465     | 127.138        | 88.481     | .006     | 638463         | 2052941     | 58         | 0             |
| 494735477  | 3fw75k1snsddx | 0                    | 231877     | 122.990        | 90.754     | .065     | 231876         | 3933240     | 1734       | 0             |
| 1628223527 | #3            | #3                   | 274516     | 106.226        | 63.743     | .201     | 274515         | 2667630     | 4995       | 0             |
| 1655552467 | 8z3542ffmp562 | 17991828121679737456 | 666150     | 75.843         | 39.644     | .009     | 602153         | 3805721     | 296        | 0             |
| 900611645  | 5ckxyqfvu60pj | 6486229150489758732  | 638509     | 73.013         | 53.327     | .150     | 638514         | 2554314     | 4454       | 0             |
| 214043693  | c13sma6rkr27c | 18298161888330075667 | 49428      | 52.195         | 48.078     | .003     | 222650         | 1355632     | 36         | 0             |
| 1388734953 | #2            | #2                   | 638196     | 47.943         | 16.982     | .000     | 638475         | 3           | 0          | 0             |

10 rows selected.

SQL> pause

```
round(sum(hss.direct_writes_delta),3) direct_writes
from dba_hist_sqlstat hss, dba_hist_snapshot hs
where hss.snap_id=hs.snap_id
and hs.snap_id between &snap_id_from and &snap_id_to
group by plan_hash_value
order by &sort_col_nr desc)
where rownum<=&top_n;
```

SQL> pause

```
SQL>
SQL> @awr_top_by_plan_snaps.sql 25 50 5 10
SQL> set ver off pages 50000 lines 260 tab off echo off
```

| DIFF_PLAN  | DIFF_SQLID    | DIFF_FMS             | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|------------|---------------|----------------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0          | #32           | 0                    | 1591480    | 4574.840       | 5237.021   | 6.831    | 1591422        | 73737483    | 183290     | 791           |
| 725271039  | c13sma6rkr27c | 18298161888330075667 | 637670     | 521.987        | 571.116    | .063     | 2880918        | 17263182    | 2209       | 0             |
| 1081153563 | #999          | 5985318870031566873  | 835562     | 306.699        | 253.610    | .034     | 11697868       | 7571650     | 1029       | 0             |
| 3241608609 | gzhkw1qu6fwxm | 0                    | 638465     | 127.138        | 88.481     | .006     | 638463         | 2052941     | 58         | 0             |
| 494735477  | 3fw75k1snsddx | 0                    | 231877     | 122.990        | 90.754     | .065     | 231876         | 3933240     | 1734       | 0             |
| 1628223527 | #3            | #3                   | 274516     | 106.226        | 63.743     | .201     | 274515         | 2667630     | 4995       | 0             |
| 165552467  | 8z3542ffmp562 | 17991828121679737456 | 666150     | 75.843         | 39.644     | .009     | 602153         | 3805721     | 296        | 0             |
| 900611645  | 5ckxyqfvu60pj | 6486229150489758732  | 638509     | 73.013         | 53.327     | .150     | 638514         | 2554314     | 4454       | 0             |
| 214043693  | c13sma6rkr27c | 18298161888330075667 | 49428      | 52.195         | 48.078     | .003     | 222650         | 1355632     | 36         | 0             |
| 1388734953 | #2            | #2                   | 638196     | 47.943         | 16.982     | .000     | 638475         | 3           | 0          | 0             |

10 rows selected.

SQL> pause

```
SQL>
SQL> -- What is plan 1628223527?
SQL> pause
```

```
SQL> @awr_top_by_plan_snaps.sql 25 50 5 10
SQL> set ver off pages 50000 lines 260 tab off echo off
```

| DIFF_PLAN  | DIFF_SQLID    | DIFF_FMS             | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|------------|---------------|----------------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 0          | #32           | 0                    | 1591480    | 4574.840       | 5237.021   | 6.831    | 1591422        | 73737483    | 183290     | 791           |
| 725271039  | c13sma6rkr27c | 18298161888330075667 | 637670     | 521.987        | 571.116    | .063     | 2880918        | 17263182    | 2209       | 0             |
| 1081153563 | #999          | 5985318870031566873  | 835562     | 306.699        | 253.610    | .034     | 11697868       | 7571650     | 1029       | 0             |
| 3241608609 | gzhkw1qu6fwxm | 0                    | 638465     | 127.138        | 88.481     | .006     | 638463         | 2052941     | 58         | 0             |
| 494735477  | 3fw75k1snsddx | 0                    | 231877     | 122.990        | 90.754     | .065     | 231876         | 3933240     | 1734       | 0             |
| 1628223527 | #3            | #3                   | 274516     | 106.226        | 63.743     | .201     | 274515         | 2667630     | 4995       | 0             |
| 1655552467 | 8z3542ffmp562 | 17991828121679737456 | 666150     | 75.843         | 39.644     | .009     | 602153         | 3805721     | 296        | 0             |
| 900611645  | 5ckxyqfvu60pj | 6486229150489758732  | 638509     | 73.013         | 53.327     | .150     | 638514         | 2554314     | 4454       | 0             |
| 214043693  | c13sma6rkr27c | 18298161888330075667 | 49428      | 52.195         | 48.078     | .003     | 222650         | 1355632     | 36         | 0             |
| 1388734953 | #2            | #2                   | 638196     | 47.943         | 16.982     | .000     | 638475         | 3           | 0          | 0             |

10 rows selected.

```
SQL> pause
```

```
SQL>
```

```
SQL> -- What is plan 1628223527?
```

```
SQL> pause
```

```
SQL> @awr_top_by_plan_detail_snaps.sql 25 50 5 15 1628223527
```

```
SQL> set ver off pages 50000 lines 260 tab off echo off
```

| DIFF_PLAN  | DIFF_SQLID    | DIFF_FMS             | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|------------|---------------|----------------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 1628223527 | 5mddt5kt45rg3 | 14366533292145951164 | 231905     | 88.169         | 50.906     | .030     | 231904         | 2234211     | 743        | 0             |
| 1628223527 | f9u2k84v884y7 | 2971448457592404441  | 29209      | 16.175         | 10.984     | .171     | 29209          | 379803      | 4249       | 0             |
| 1628223527 | 3hatpjzrqvfn7 | 13119154137972506400 | 13402      | 1.882          | 1.853      | .000     | 13402          | 53616       | 3          | 0             |

```
SQL> pause
```

```
-----
```

|            |               |                      |         |          |          |       |          |          |        |     |
|------------|---------------|----------------------|---------|----------|----------|-------|----------|----------|--------|-----|
| 0          | #32           | 0                    | 1591480 | 4574.840 | 5237.021 | 6.831 | 1591422  | 73737483 | 183290 | 791 |
| 725271039  | c13sma6rkr27c | 18298161888330075667 | 637670  | 521.987  | 571.116  | .063  | 2880918  | 17263182 | 2209   | 0   |
| 1081153563 | #999          | 5985318870031566873  | 835562  | 306.699  | 253.610  | .034  | 11697868 | 7571650  | 1029   | 0   |
| 3241608609 | gzhkw1qu6fwxm | 0                    | 638465  | 127.138  | 88.481   | .006  | 638463   | 2052941  | 58     | 0   |
| 494735477  | 3fw75k1snsddx | 0                    | 231877  | 122.990  | 90.754   | .065  | 231876   | 3933240  | 1734   | 0   |
| 1628223527 | #3            | #3                   | 274516  | 106.226  | 63.743   | .201  | 274515   | 2667630  | 4995   | 0   |
| 165552467  | 8z3542ffmp562 | 17991828121679737456 | 666150  | 75.843   | 39.644   | .009  | 602153   | 3805721  | 296    | 0   |
| 900611645  | 5ckxyqfv60pj  | 6486229150489758732  | 638509  | 73.013   | 53.327   | .150  | 638514   | 2554314  | 4454   | 0   |
| 214043693  | c13sma6rkr27c | 18298161888330075667 | 49428   | 52.195   | 48.078   | .003  | 222650   | 1355632  | 36     | 0   |
| 1388734953 | #2            | #2                   | 638196  | 47.943   | 16.982   | .000  | 638475   | 3        | 0      | 0   |

10 rows selected.

SQL> pause

SQL>

SQL> -- What is plan 1628223527?

SQL> pause

SQL> @awr\_top\_by\_plan\_detail\_snaps.sql 25 50 5 15 1628223527

SQL> set ver off pages 50000 lines 260 tab off echo off

```
-----
```

| DIFF_PLAN  | DIFF_SQLID    | DIFF_FMS             | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|------------|---------------|----------------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 1628223527 | 5mddt5kt45rg3 | 14366533292145951164 | 231905     | 88.169         | 50.906     | .030     | 231904         | 2234211     | 743        | 0             |
| 1628223527 | f9u2k84v884y7 | 2971448457592404441  | 29209      | 16.175         | 10.984     | .171     | 29209          | 379803      | 4249       | 0             |
| 1628223527 | 3hatpjzrqvfn7 | 13119154137972506400 | 13402      | 1.882          | 1.853      | .000     | 13402          | 53616       | 3          | 0             |

SQL> pause

SQL>

SQL> -- Let's look at some of these queries

SQL> pause

SQL> pause

SQL>

SQL> -- What is plan 1628223527?

SQL> pause

SQL> @awr\_top\_by\_plan\_detail\_snaps.sql 25 50 5 15 1628223527

SQL> set ver off pages 50000 lines 260 tab off echo off

| DIFF_PLAN  | DIFF_SQLID    | DIFF_FMS             | EXECUTIONS | ELAPSED_TIME_S | CPU_TIME_S | IOWAIT_S | ROWS_PROCESSED | BUFFER_GETS | DISK_READS | DIRECT_WRITES |
|------------|---------------|----------------------|------------|----------------|------------|----------|----------------|-------------|------------|---------------|
| 1628223527 | 5mddt5kt45rg3 | 14366533292145951164 | 231905     | 88.169         | 50.906     | .030     | 231904         | 2234211     | 743        | 0             |
| 1628223527 | f9u2k84v884y7 | 2971448457592404441  | 29209      | 16.175         | 10.984     | .171     | 29209          | 379803      | 4249       | 0             |
| 1628223527 | 3hatpjzrqvfn7 | 13119154137972506400 | 13402      | 1.882          | 1.853      | .000     | 13402          | 53616       | 3          | 0             |

SQL> pause

SQL>

SQL> -- Let's look at some of these queries

SQL> pause

SQL> @awr\_show\_sqlid.sql 5mddt5kt45rg3

SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off

### Occurrences in ASH (DBA\_HIST\_ACTIVE\_SESS\_HISTORY):

| SQL_ID        | PROGRAM          | MODULE    | ACTION | CLIENT_ID  | COUNT(*) |
|---------------|------------------|-----------|--------|------------|----------|
| 5mddt5kt45rg3 | JDBC Thin Client | New Order |        | Swingbench | 18       |

### The Statement (DBA\_HIST\_SQLTEXT):

UPDATE ORDERS SET ORDER\_MODE = 'online', ORDER\_STATUS = FLOOR(DBMS\_RANDOM.VALUE(0, :B3 )), ORDER\_TOTAL = :B2 WHERE ORDER\_ID = :B1

SQL> pause



|            |               |                      |       |        |        |      |       |        |      |   |
|------------|---------------|----------------------|-------|--------|--------|------|-------|--------|------|---|
| 1628223527 | f9u2k84v884y7 | 2971448457592404441  | 29209 | 16.175 | 10.984 | .171 | 29209 | 379803 | 4249 | 0 |
| 1628223527 | 3hatpjzrqvfn7 | 13119154137972506400 | 13402 | 1.882  | 1.853  | .000 | 13402 | 53616  | 3    | 0 |

SQL> pause

SQL>  
 SQL> -- Let's look at some of these queries  
 SQL> pause

SQL> @awr\_show\_sqlid.sql 5mddt5kt45rg3  
 SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off  
 ### Occurrences in ASH (DBA\_HIST\_ACTIVE\_SESS\_HISTORY):

| SQL_ID        | PROGRAM          | MODULE    | ACTION | CLIENT_ID  | COUNT(*) |
|---------------|------------------|-----------|--------|------------|----------|
| 5mddt5kt45rg3 | JDBC Thin Client | New Order |        | Swingbench | 18       |

### The Statement (DBA\_HIST\_SQLTEXT):  
 UPDATE ORDERS SET ORDER\_MODE = 'online', ORDER\_STATUS = FLOOR(DBMS\_RANDOM.VALUE(0, :B3 )), ORDER\_TOTAL = :B2 WHERE ORDER\_ID = :B1

SQL> pause

SQL> @awr\_show\_sqlid.sql f9u2k84v884y7  
 SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off  
 ### Occurrences in ASH (DBA\_HIST\_ACTIVE\_SESS\_HISTORY):

| SQL_ID        | PROGRAM          | MODULE         | ACTION | CLIENT_ID  | COUNT(*) |
|---------------|------------------|----------------|--------|------------|----------|
| f9u2k84v884y7 | JDBC Thin Client | Process Orders |        | Swingbench | 3        |

### The Statement (DBA\_HIST\_SQLTEXT):  
 UPDATE /\*+ index(orders, order\_pk) \*/ ORDERS SET ORDER\_STATUS = FLOOR(DBMS\_RANDOM.VALUE(:B3 + 1, :B2 )) WHERE ORDER\_ID = :B1

SQL> pause



```
SQL>
SQL> -- Let's look at some of these queries
SQL> pause
```

```
SQL> @awr_show_sqlid.sql 5mddt5kt45rg3
SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off
### Occurrences in ASH (DBA_HIST_ACTIVE_SESS_HISTORY):
```

| SQL_ID        | PROGRAM          | MODULE    | ACTION | CLIENT_ID  | COUNT(*) |
|---------------|------------------|-----------|--------|------------|----------|
| 5mddt5kt45rg3 | JDBC Thin Client | New Order |        | Swingbench | 18       |

```
### The Statement (DBA_HIST_SQLTEXT):
UPDATE ORDERS SET ORDER_MODE = 'online', ORDER_STATUS = FLOOR(DBMS_RANDOM.VALUE(0, :B3 )), ORDER_TOTAL = :B2 WHERE ORDER_ID = :B1
```

```
SQL> pause
```

```
SQL> @awr_show_sqlid.sql f9u2k84v884y7
SQL> set ver off pages 50000 lines 32000 tab off long 9999999 timing off echo off
### Occurrences in ASH (DBA_HIST_ACTIVE_SESS_HISTORY):
```

| SQL_ID        | PROGRAM          | MODULE         | ACTION | CLIENT_ID  | COUNT(*) |
|---------------|------------------|----------------|--------|------------|----------|
| f9u2k84v884y7 | JDBC Thin Client | Process Orders |        | Swingbench | 3        |

```
### The Statement (DBA_HIST_SQLTEXT):
UPDATE /*+ index(orders, order_pk) */ ORDERS SET ORDER_STATUS = FLOOR(DBMS_RANDOM.VALUE(:B3 + 1, :B2 )) WHERE ORDER_ID = :B1
```

```
SQL> pause
```

```
SQL>
SQL> -- Is the plan the same, really?
SQL> pause
```

| SQL_ID        | PROGRAM          | MODULE         | ACTION | CLIENT_ID  | COUNT(*) |
|---------------|------------------|----------------|--------|------------|----------|
| f9u2k84v884y7 | JDBC Thin Client | Process Orders |        | Swingbench | 3        |

### The Statement (DBA\_HIST\_SQLTEXT):

```
UPDATE /*+ index(orders, order_pk) */ ORDERS SET ORDER_STATUS = FLOOR(DBMS_RANDOM.VALUE(:B3 + 1, :B2 )) WHERE ORDER_ID = :B1
```

SQL> pause

SQL>

SQL> -- Is the plan the same, really?

SQL> pause

SQL> select \* from table(dbms\_xplan.display\_awr('5mddt5kt45rg3',1628223527));

SQL\_ID 5mddt5kt45rg3

```
-----
UPDATE ORDERS SET ORDER_MODE = 'online', ORDER_STATUS =
FLOOR(DBMS_RANDOM.VALUE(0, :B3 )), ORDER_TOTAL = :B2 WHERE ORDER_ID =
:B1
```

Plan hash value: 1628223527

| Id | Operation         | Name     | Rows | Bytes | Cost (%CPU) | Time     |
|----|-------------------|----------|------|-------|-------------|----------|
| 0  | UPDATE STATEMENT  |          |      |       | 3 (100)     |          |
| 1  | UPDATE            | ORDERS   |      |       |             |          |
| 2  | INDEX UNIQUE SCAN | ORDER_PK | 1    | 58    | 2 (0)       | 00:00:01 |

16 rows selected.

SQL> pause

```
-----
```

| Id | Operation         | Name     | Rows | Bytes | Cost (%CPU) | Time     |
|----|-------------------|----------|------|-------|-------------|----------|
| 0  | UPDATE STATEMENT  |          |      |       | 3 (100)     |          |
| 1  | UPDATE            | ORDERS   |      |       |             |          |
| 2  | INDEX UNIQUE SCAN | ORDER_PK | 1    | 58    | 2 (0)       | 00:00:01 |

```
-----
```

16 rows selected.

SQL> pause

```
SQL> select * from table(dbms_xplan.display_awr('f9u2k84v884y7',1628223527));
SQL_ID f9u2k84v884y7
```

```
-----
UPDATE /*+ index(orders, order_pk) */ ORDERS SET ORDER_STATUS =
FLOOR(DBMS_RANDOM.VALUE(:B3 + 1, :B2 )) WHERE ORDER_ID = :B1
```

Plan hash value: 1628223527

```
-----
```

| Id | Operation         | Name     | Rows | Bytes | Cost (%CPU) | Time     |
|----|-------------------|----------|------|-------|-------------|----------|
| 0  | UPDATE STATEMENT  |          |      |       | 3 (100)     |          |
| 1  | UPDATE            | ORDERS   |      |       |             |          |
| 2  | INDEX UNIQUE SCAN | ORDER_PK | 1    | 39    | 2 (0)       | 00:00:01 |

```
-----
```

15 rows selected.

SQL> pause

|   |                   |          |   |    |   |     |          |
|---|-------------------|----------|---|----|---|-----|----------|
| 2 | INDEX UNIQUE SCAN | ORDER_PK | 1 | 58 | 2 | (0) | 00:00:01 |
|---|-------------------|----------|---|----|---|-----|----------|

16 rows selected.

SQL> pause

```
SQL> select * from table(dbms_xplan.display_awr('f9u2k84v884y7',1628223527));
SQL_ID f9u2k84v884y7
```

```
UPDATE /*+ index(orders, order_pk) */ ORDERS SET ORDER_STATUS =
FLOOR(DBMS_RANDOM.VALUE(:B3 + 1, :B2 )) WHERE ORDER_ID = :B1
```

Plan hash value: 1628223527

| Id | Operation         | Name     | Rows | Bytes | Cost (%CPU) | Time     |
|----|-------------------|----------|------|-------|-------------|----------|
| 0  | UPDATE STATEMENT  |          |      |       | 3 (100)     |          |
| 1  | UPDATE            | ORDERS   |      |       |             |          |
| 2  | INDEX UNIQUE SCAN | ORDER_PK | 1    | 39    | 2 (0)       | 00:00:01 |

15 rows selected.

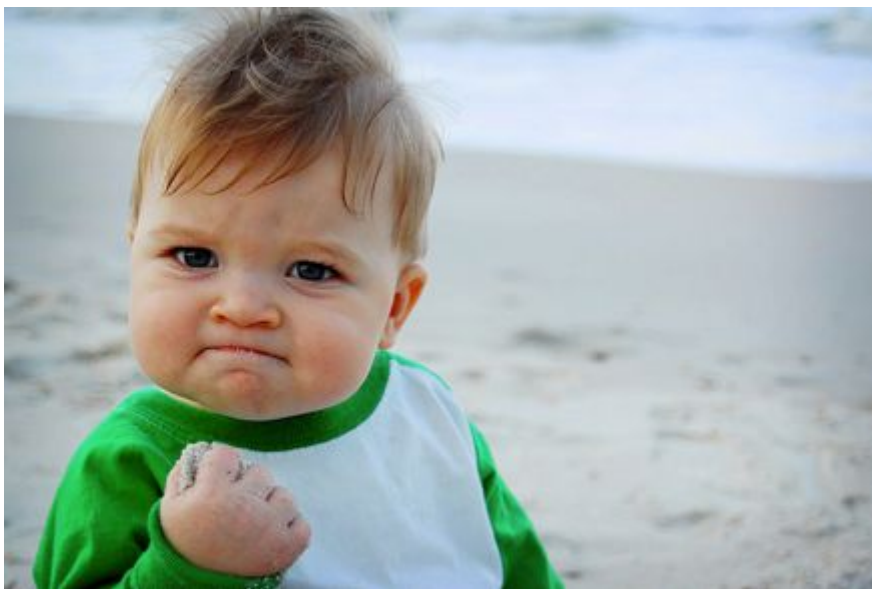
SQL> pause

```
SQL> -- Looking at the top execution plans in the system can help finding inefficient access paths to the data
```

```
SQL>
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
[oracle@DB12c AWR_MINING3]$
```

# SUMMARY

- AWR report is sufficient, except when it's not
  - No clear top consumer
  - Dynamic SQL
  - Combined reporting intervals
- Overhead of creating an AWR report
- TOPNSQL
- FORCE\_MATCHING\_SIGNATURE
- PLAN\_HASH\_VALUE
- Don't stop ! You decide how to filter and aggregate the data
  - Module
  - Action
  - ...



AWR is a complex beast, but it's not necessary to know much to start mining

Be Brave!  
But buy the “[Diagnostics Pack](#)” licenses first!



# CONTACT INFORMATION

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**Pythian.com**

**@pythian**

Let's continue tomorrow!

14:50

DBA

**MINING THE AWR V2:  
TREND ANALYSIS (410)**

Maris Elsins - Pythian



Dvorana A  
Trajanje: 45'



Demo scripts available here: <http://bit.ly/MiningAWRv1>