

# Oracle Database Performance Tuning Tools

Speaker:

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**ORACLE®**

**Certified Professional**

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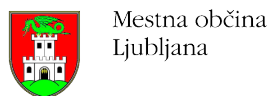
**Certified Professional**

Java SE 8 Programmer

# Abakus Plus d.o.o.

- Infrastructure Team
  - Services
    - OS & NET admin
    - DBA, Programming
  - Applications
    - Deja Vu
    - APPM
    - Arbiter
- Development Team
  - Enterprise Applications
  - Document Management
  - Newspaper Distribution
  - Flight Information System

# References

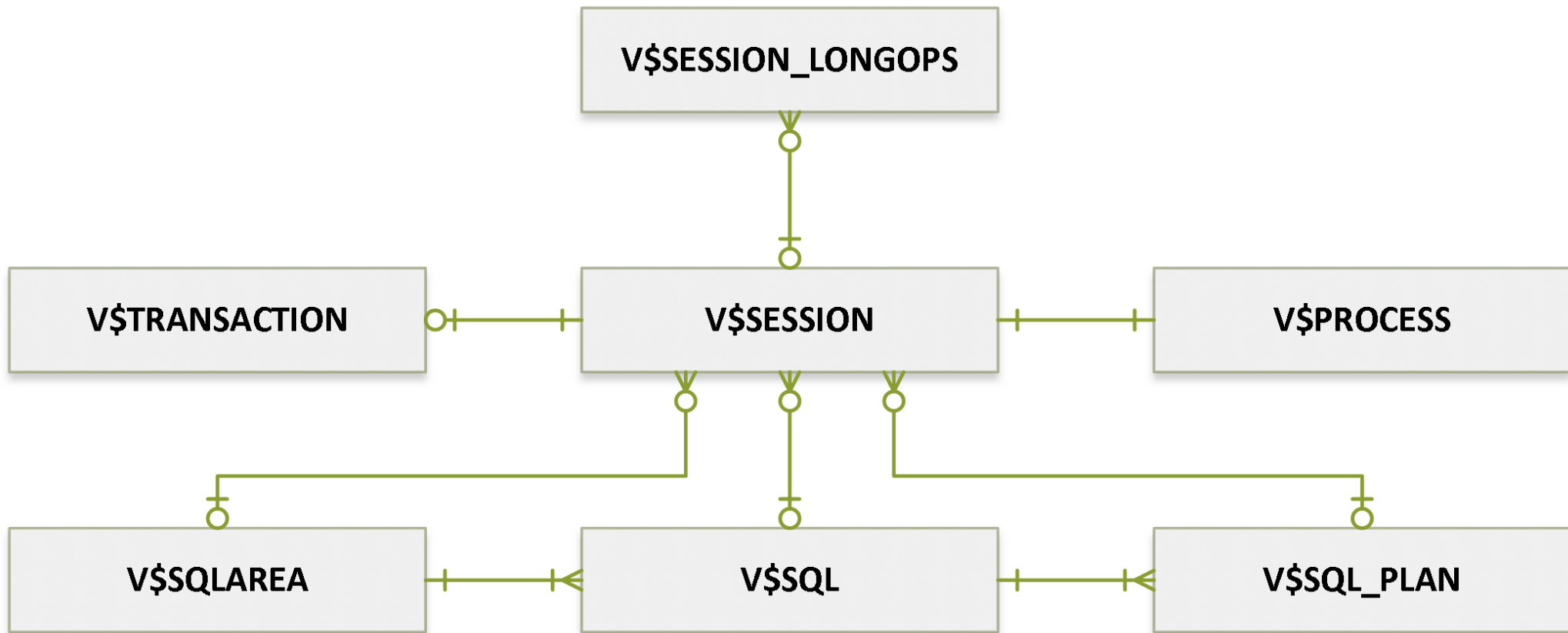


# Classical Linux Tools

- top
- vmstat
- iostat
- df & du
- strace
- watch
- sar
- nmon
- iotop
- free
- lsof
- fuser
- ...



# Basic Performance Views



# V\$SESSION

- sid
- username,
- **status**
- **event**
- logon\_time,
- [final\_]blocking\_session
- [final\_]blocking\_instance
- p[1|2|3]text, p[1|2|3]
- osuser
- machine
- program
- module
- action
- client\_info
- ... *and many more* ...

Can »username« be NULL?



# V\$PROCESS

`join on s.paddr = p.addr`

- pid
- spid
- stid
- sosid
- pga\_used\_mem
- cpu\_used
- tracefile



Is »spid« always unique?

# V\$TRANSACTION

`join on s.saddr = t.ses_addr`

- xid
- status
- used\_ublk
- start\_time

Can we convert the value from »used\_ublk« to MB?

## Session

Instance

Session ID

Refresh

Overview

Long Ops

SQL Trace

Statistics

### Session

Session ID	<b>388, 52131</b>	Program	
Instance ID	<b>1</b>	Module	
DB User	<b>SYSTEM</b>	Action	
OS User	<b>root</b>	Command	<b>#3 - SELECT</b>
OS Machine	<b>e1284ca5016e</b>	Status	<b>ACTIVE</b>
OS User	<b>root</b>		
Wait Class	<b>Other</b>	First Blocking Session	<b>n/a</b>
Wait Event	<b>PGA memory operation</b>	Final Blocking Session	<b>n/a</b>
Wait Param 1	<b>=0</b>	Seconds in Wait	<b>0</b>
Wait Param 2	<b>=0</b>		
Wait Param 3	<b>=0</b>		

### Process

PID	<b>27</b>	PGA Used	<b>2.35 mb</b>
SPID	<b>5940</b>	PGA Allocated	<b>3.24 mb</b>
Username	<b>oracle</b>	PGA Max	<b>9.99 mb</b>
Program			
Tracefile	<b>/oradmin/diag/rdbms/..._ora_5940.trc</b>		

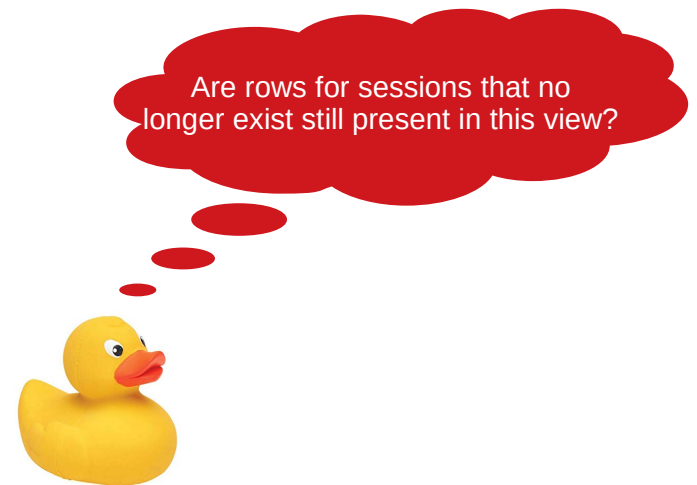
### Transaction

No transaction found for this session.

# V\$SESSION\_LONGOPS

join on on s.sid=l.sid and s.serial#=l.serial#

- opname
- target
- sofar
- totalwork
- units



SID, Serial#	Start Time	Finish Time	Last Update	Operation
<u>991,48053,@1</u>	2019-10-02 00:07:18		2019-10-02 00:07:52	RMAN: incremental da Count)
<u>991,48053,@1</u>	2019-10-02 00:07:18	2019-10-02 00:15:40	2019-10-02 00:07:52	RMAN: incremental da Count)
<u>6,50161,@1</u>	2019-10-02 00:07:16	2019-10-02 00:07:54	2019-10-02 00:07:17	RMAN: aggregate inpu

# V\$SQLAREA

`join on s.sql_id = a.sql_id`

- sql\_text
  - sql\_fulltext
  - sorts, fetches, executions
  - number of reads, writes, ...
  - ... *and other statistics* ...
- *The story of:*
    - sql\_id
    - child\_number
    - plan\_hash\_value

# V\$SQL

```
join on q.sql_id = s.sql_id  
and q.child_number = s.sql_child_number
```

- sql\_text
- sql\_fulltext
- sorts, fetches, executions
- number of reads, writes, ...
- ... *and other statistics* ...



# V\$SQL\_PLAN

join on s.sql\_id = p.sql\_id and  
s.sql\_child\_number = p.child\_number

- What about [full\_]plan\_hash\_value?

Id	Operation	Name
0	SELECT STATEMENT	
1	TABLE ACCESS FULL	DUAL

can we compare full\_plan\_hash\_value  
across different database releases?



## SQL Statement

Instance

SQL ID

Child Number

Refresh

SQL Text

Other Children

Execution Plan

SQL Patches

Statistics

Output Type:

dbms\_xplan.display

appm (graphical)


XPlan Format:

Refresh

ID	PID	Pos	Operation	Object Name
▼ 0		1	SELECT STATEMENT	
▼ 1	0	1	SORT	(SEL\$AF73C875)
▶ 2	1	1	NESTED LOOPS	

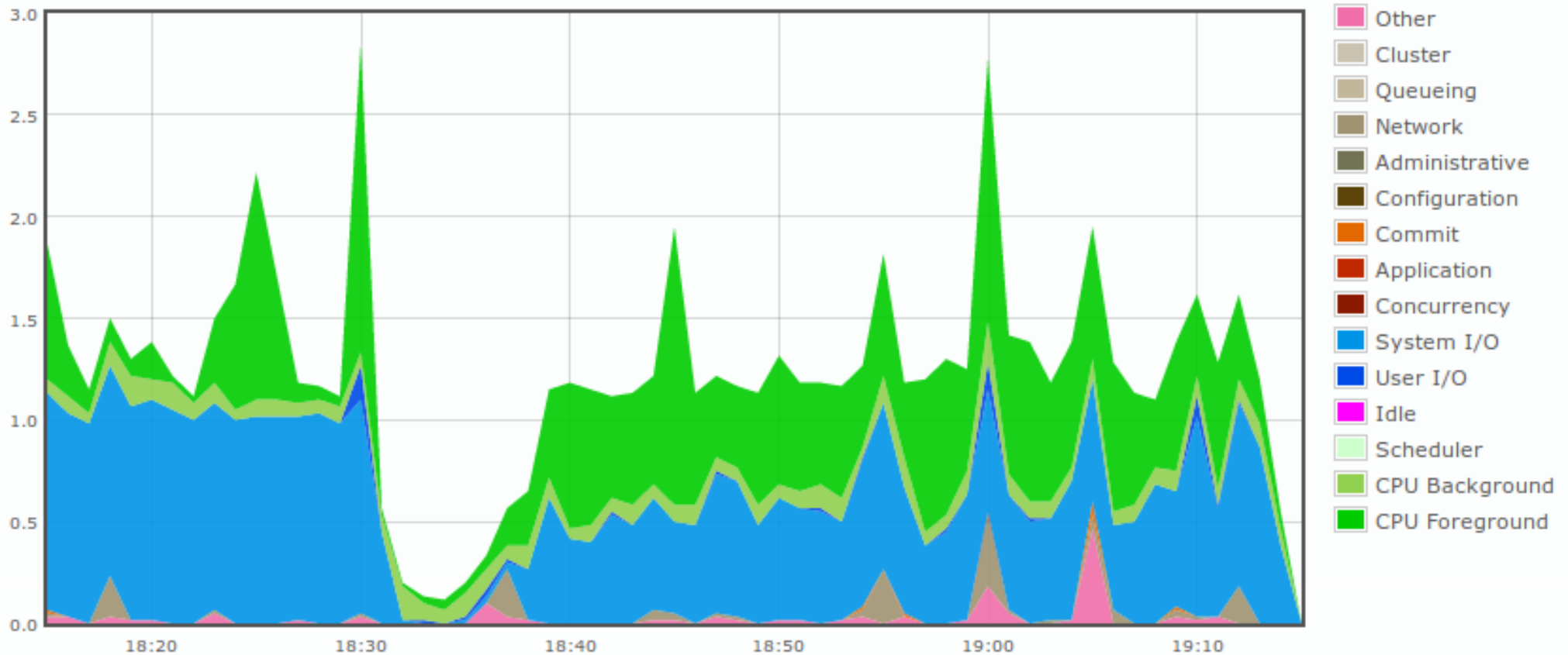
# A Quick Demo

```
select *  
  from v$session s  
 left join v$transaction t on t.addr = s.taddr  
  join v$process pr on pr.addr = s.paddr  
  join v$sqlarea a on s.sql_id = a.sql_id  
  join v$sql q on q.sql_id = s.sql_id and q.child_number = s.sql_child_number  
  join v$sql_plan p on s.sql_id = p.sql_id and s.sql_child_number = p.child_number;
```



How many columns would  
this query return?

# V\$ACTIVE\_SESSION\_HISTORY



# Automatic Workload Repository

- DBA\_HIST\_% tables
- AWR Reports
- ...

## WORKLOAD REPOSITORY report for

DB Name	DB Id	Instance	Inst num	Startup Time	Release	RAC
PAILPR	8260471407	PAILPR	1	12-Feb-15 13:17	11.2.0.3.0	NO

Host Name	Platform	CPUs	Cores	Sockets	Memory (GB)
R0508L0027	Linux x86 64-bit	12	6	1	62.82

	Snap Id	Snap Time	Sessions	Cursors/Session
Begin Snap:	62540	23-Apr-15 07:00:52	351	23.8
End Snap:	62541	23-Apr-15 08:00:57	343	21.8
Elapsed:		60.10 (mins)		
DB Time:		248.94 (mins)		

## Report Summary

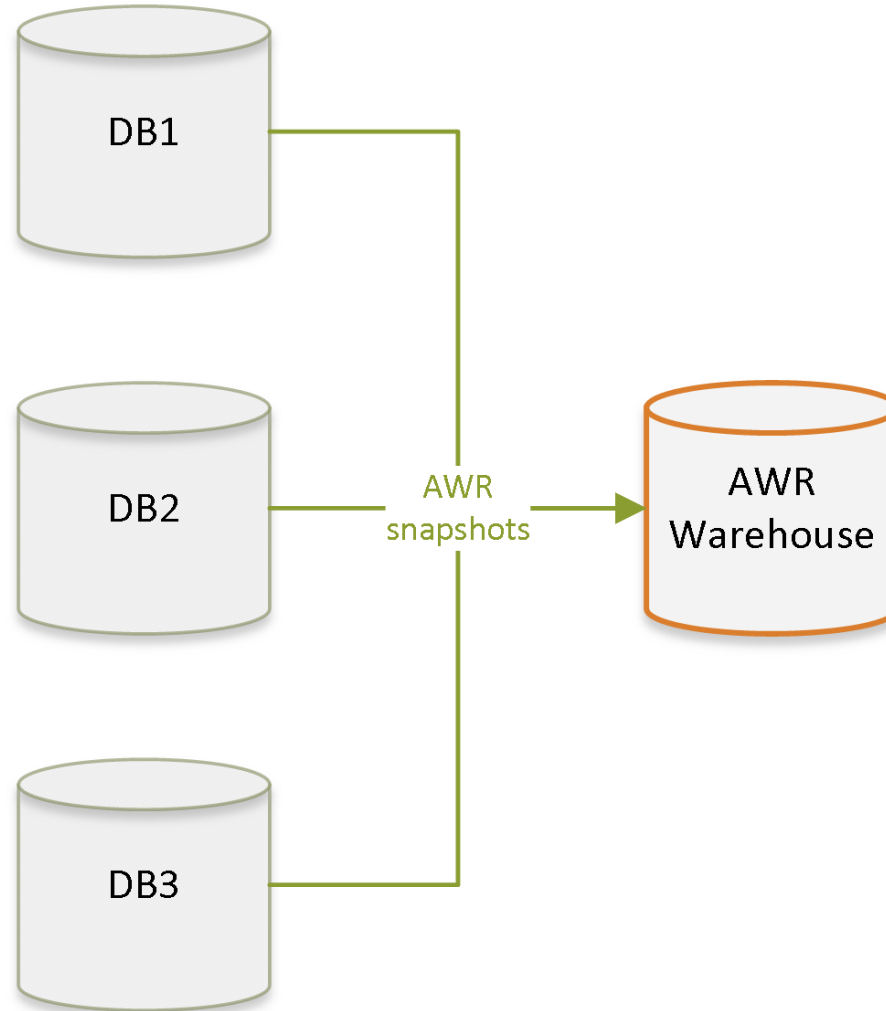
### Cache Sizes

	Begin	End		
Buffer Cache:	24,448M	24,448M	Std Block Size:	8K
Shared Pool Size:	1,664M	1,664M	Log Buffer:	53,972K

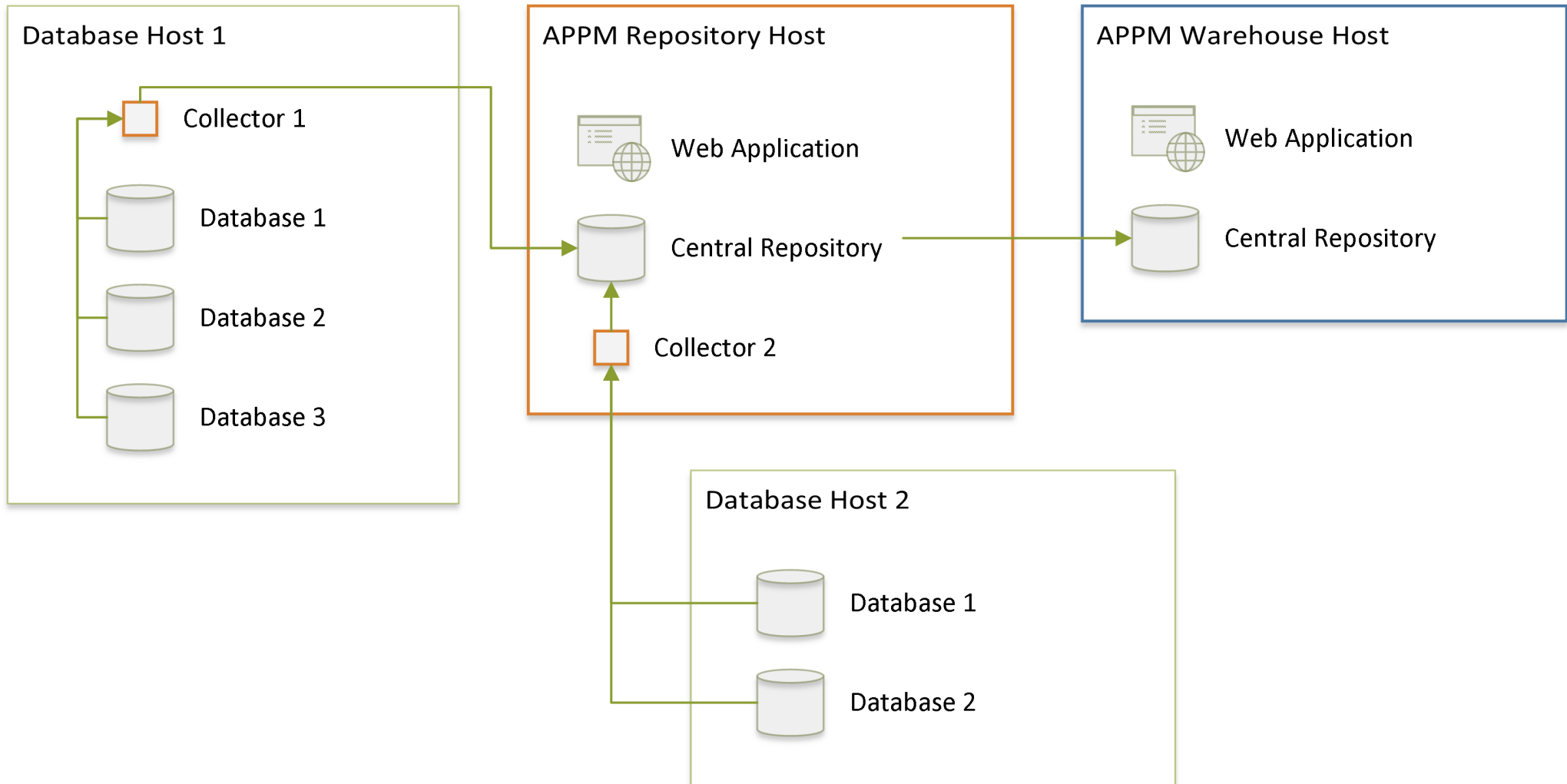
### Load Profile

	Per Second	Per Transaction	Per Exec	Per Call
DB Time(s):	4.1	0.0	0.01	0.00
DB CPU(s):	0.3	0.0	0.00	0.00
Redo size:	987,527.6	5,047.4		
Logical reads:	21,069.8	107.7		
Block changes:	4,505.4	23.0		
Physical reads:	1,057.2	5.4		
Physical writes:	108.0	0.6		

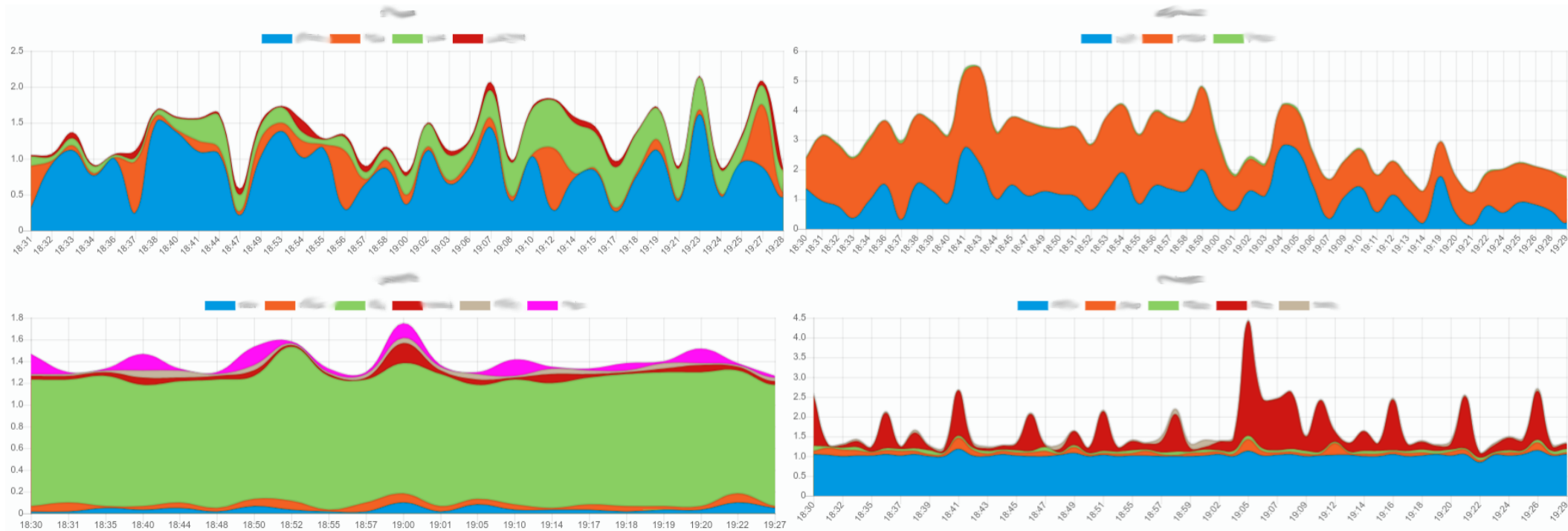
# AWR Warehouse



# APPM Repository



# APPM Dashboard





# dbms\_xplan

```
explain plan for select * from dual;
```


```
dbms_xplan.display(  
  table_name      IN VARCHAR2 DEFAULT 'PLAN_TABLE',  
  statement_id    IN VARCHAR2 DEFAULT NULL,  
  format          IN VARCHAR2 DEFAULT 'TYPICAL',  
  filter_preds    IN VARCHAR2 DEFAULT NULL);
```

```
select * from table(  
  dbms_xplan.display_cursor('0fuvy5t4x00xd', 0)  
);
```

# Sqlplus Shortcuts

```
set timing on;  
set autotrace traceonly;
```

```
select * from dual;  
select * from dba_objects;
```



Are selected rows sent to the client even though they're not shown when using »autotrace traceonly«?

# SQL Trace & tkprof

```
SQL> alter session set tracefile_identifier='demo';
```

```
SQL> alter session set events  
      '10046 trace name context forever, level 12';
```

```
exec dbms_system.set_sql_trace_in_session(  
      sid=>123,  
      serial#=>1234,  
      sql_trace=>TRUE);
```

```
$ tkprof orcl_ora_18222_urh1.trc \  
      orcl_ora_18222_urh1.tkprof
```

# tvdxat

- <https://antognini.ch/category/apmtools/tvdxat/>

## Resource Usage Profile [hide](#)

Component	Total Duration [s]	%	Number of Events	Duration per Event [s]
<a href="#">SQL*Net message from client</a>	122.140	99.829	35	3.490
<a href="#">CPU</a>	0.113	0.092	n/a	n/a
<a href="#">unaccounted-for</a>	0.058	0.047	n/a	n/a
<a href="#">db file sequential read</a>	0.024	0.020	7	0.003
<a href="#">db file scattered read</a>	0.008	0.006	1	0.008
<a href="#">db file direct read</a>	0.004	0.003	1	0.004
<a href="#">db file direct write</a>	0.001	0.001	966	0.000
<a href="#">db file scattered write</a>	0.001	0.001	965	0.000
<a href="#">db file sequential write</a>	0.001	0.001	59	0.000
<a href="#">db file direct read only</a>	0.000	0.000	2	0.000
<a href="#">db file direct write only</a>	0.000	0.000	36	0.000
<a href="#">db file direct read only</a>	0.000	0.000	1	0.000
<a href="#">db file direct write only</a>	0.000	0.000	2	0.000
<b>Total</b>	<b>122.349</b>	<b>100.000</b>		

## Introduce TVD\$XTAT



24 October 2008 | Written by Christian Antognini

13 Comments

Trivadis Extended Tracefile Analysis Tool (TVD\$XTAT) is a command-line tool. Like TKPROF, its main purpose is to take a raw SQL trace file as input and generate a formatted file as output.

## Session

Instance

Session ID

Refresh

Overview

Long Ops

SQL Trace

Statistics

Identifier

ABAU RH

Level

with BOTH (binds + waits)

Duration (minutes)

15

Start Trace

Stop Trace

SID, Serial#	Identifier	Trace File	Username	Logon Time	Options
6, 63951, @1	ABAU RH	ora_2833.trc (tkprof   tvdxtat)	SYSTEM	2019-10-07 10:17:43	<a href="#">Stop</a>   <a href="#">Remove</a>

SQL Traces

On-Logon Triggers

Username

Duration (minutes)

100

Identifier

Max Count

100

Level

minimal trace

Create Trigger

### Active Tracing Triggers

Username	Identifier	Binds	Waits	Triggered Count	Last Triggered	Expiration Date	Options
No records found.							

# Optimizer Trace

```
SQL> alter session set events  
      '10053 trace name context forever, level 12';
```

# oradebug

```
SQL> select p.spid from v$session s join  
v$process p on p.addr=s.paddr where  
s.sid=501;
```

```
SQL> oradebug setospid 19907
```

```
SQL> oradebug dump errorstack 1
```

- Such dump contains PL/SQL & Java stack trace

# SQL Patch

```
set serveroutput on;
declare
    l_tmp varchar(500 char);
begin
    l_tmp := dbms_sqldiag.create_sql_patch(
        sql_id      => '6avfua5g1gkh2',
        hint_text   => 'gather_plan_statistics',
        name        => 'my_demo_patch',
        description => 'some description',
        category    => 'DEFAULT',
        validate    => true);
    dbms_output.put_line('Created patch: [' || l_tmp || ']');
    for l_rec in (select distinct hash_value, address from gv$sql WHERE sql_id = '6avfua5g1gkh2')
    loop
        sys.dbms_shared_pool.purge(l_rec.address || ' ' || l_rec.hash_value, 'C');
    end loop;
end;
/
```



```
SQL> select * from table(dbms_xplan.display_cursor('6avfua5g1gkh2', 0, 'advanced allstats last +peeked_binds'));
```

```
SQL_ID 6avfua5g1gkh2, child number 0
```

```
select * from dba_objects
```

```
Plan hash value: 396466249
```

Id	Operation	Name	Starts	E-Rows	E-Bytes	Cost (%CPU)	E-Time	A-Rows	A-Time	Buffers	OMem	1Mem	Used-Mem
0	SELECT STATEMENT		1			144K(100)		61	00:00:00.01	241			
1	VIEW	DBA_OBJECTS	1	79858	36M	144K (1)	00:00:02	61	00:00:00.01	241			
2	UNION-ALL		1					61	00:00:00.01	241			
3	TABLE ACCESS BY INDEX ROWID	SUM\$	0	1	10	1 (0)	00:00:01	0	00:00:00.01	0			
* 4	INDEX UNIQUE SCAN	I_SUM\$_1	0	1		1 (0)	00:00:01	0	00:00:00.01	0			
* 5	TABLE ACCESS BY INDEX ROWID BATCHED	USER_EDITIONING\$	3	1	6	1 (0)	00:00:01	0	00:00:00.01	3			
* 6	INDEX RANGE SCAN	I_USER_EDITIONING	3	2		1 (0)	00:00:01	0	00:00:00.01	3			
7	TABLE ACCESS BY INDEX ROWID BATCHED	OBJ\$	0	1	37	1 (0)	00:00:01	0	00:00:00.01	0			
* 8	INDEX RANGE SCAN	I_OBJ1	0	1		1 (0)	00:00:01	0	00:00:00.01	0			
* 9	TABLE ACCESS BY INDEX ROWID	SUM\$	0	1	10	1 (0)	00:00:01	0	00:00:00.01	0			
* 10	INDEX UNIQUE SCAN	I_SUM\$_1	0	1		1 (0)	00:00:01	0	00:00:00.01	0			
* 11	FILTER		1					61	00:00:00.01	238			
* 12	HASH JOIN		1	97881	13M	396 (4)	00:00:01	61	00:00:00.01	34	1538K	1538K	1671K (0)
13	TABLE ACCESS FULL	USER\$	1	381	6477	6 (0)	00:00:01	381	00:00:00.01	23			
* 14	HASH JOIN		1	97881	12M	389 (4)	00:00:01	61	00:00:00.01	11	1695K	1695K	1699K (0)
15	INDEX FULL SCAN	I_USER2	1	381	8763	1 (0)	00:00:01	381	00:00:00.01	3			
* 16	TABLE ACCESS FULL	OBJ\$	1	97881	10M	387 (4)	00:00:01	61	00:00:00.01	8			
17	NESTED LOOPS		21	1	35	3 (0)	00:00:01	0	00:00:00.01	132			
18	NESTED LOOPS		21	1	22	2 (0)	00:00:01	18	00:00:00.01	73			
19	TABLE ACCESS BY INDEX ROWID	IND\$	21	1	12	1 (0)	00:00:01	21	00:00:00.01	47			
* 20	INDEX UNIQUE SCAN	I_IND1	21	1		1 (0)	00:00:01	21	00:00:00.01	26			
* 21	INDEX RANGE SCAN	I_OBJ1	21	1	10	1 (0)	00:00:01	18	00:00:00.01				
* 22	TABLE ACCESS CLUSTER	TAB\$	18	1	13	1 (0)	00:00:01						
* 23	INDEX UNIQUE SCAN	I_OBJ#	18	1		1 (0)	00:00:01						
* 24	TABLE ACCESS CLUSTER	TAB\$	37	1	13	1 (0)	00:00:01						
* 25	INDEX UNIQUE SCAN	I_OBJ#	37	1		1 (0)	00:00:01						
* 26	TABLE ACCESS BY INDEX ROWID	SEQ\$	0	1	9	1 (0)	00:00:01						
* 27	INDEX UNIQUE SCAN	I_SEQ1	0	1		1 (0)	00:00:01	0	00:00:00.01	0			
* 28	TABLE ACCESS BY INDEX ROWID BATCHED	USER_EDITIONING\$	0	1	6	1 (0)	00:00:01	0	00:00:00.01	0			
* 29	INDEX RANGE SCAN	I_USER_EDITIONING	0	2		1 (0)	00:00:01	0	00:00:00.01	0			
* 30	TABLE ACCESS BY INDEX ROWID BATCHED	USER_EDITIONING\$	0	1	6	1 (0)	00:00:01	0	00:00:00.01	0			
* 31	INDEX RANGE SCAN	I_USER_EDITIONING	0	2		1 (0)	00:00:01	0	00:00:00.01	0			
32	NESTED LOOPS SEMI		0	1	29	2 (0)		0	00:00:00.01	0			
* 33	INDEX RANGE SCAN	I_OBJ4	0	1	9	1 (0)		0	00:00:00.01	0			
* 34	INDEX RANGE SCAN	I_USER2	0	1	20	1 (0)		0	00:00:00.01	0			
* 35	HASH JOIN		0	47	2162	8 (0)		0	00:00:00.01	0	1152K	1152K	
36	TABLE ACCESS FULL	LINK\$	0	47	1363	2 (0)		0	00:00:00.01	0			
37	TABLE ACCESS FULL	USER\$	0	381	6477	6 (0)		0	00:00:00.01	0			

What can we compare  
»A-Rows« with?



## Create SQL Patch

SQL ID **85jv5b10f21y4**

Patch Name auto generated

Patch Hint

**GATHE**

**GATHER\_OPTIMIZER\_STATISTICS**

**GATHER\_PLAN\_STATISTICS**

### SQL Patches

SQL ID	Name	Hint	Status	F. Match	Created	Last Modified	Opts
85jv5b10f21y4	APPM_BZIBR_20180109023644	<a href="#">gather_plan_statistics</a>	ENABLED	NO	2018-01-09 02:36:44	2018-01-09 02:36:44	<a href="#">Edit</a>   <a href="#">Disable</a>   <a href="#">Delete</a>
8narauaky1ws0	APPM_BZIBR_20180108143313	<a href="#">gather_plan_statistics</a>	ENABLED	NO	2018-01-08 14:33:13	2018-01-08 14:33:13	<a href="#">Edit</a>   <a href="#">Disable</a>   <a href="#">Delete</a>
2ys1qzclrm6fh	APPM_BZIBR_20180109022414	<a href="#">gather_plan_statistics</a>	ENABLED	NO	2018-01-09 02:36:44	2018-01-09 02:36:44	<a href="#">Edit</a>   <a href="#">Disable</a>   <a href="#">Delete</a>
▶ 61xts245kp6sw	APPM_BZIBR_20180109023612	<a href="#">gather_plan_statistics</a>	ENABLED	NO	2018-01-09 02:36:44	2018-01-09 02:36:44	<a href="#">Edit</a>   <a href="#">Disable</a>   <a href="#">Delete</a>
7n1xx6bs5m62d	APPM_BZIBR_20180107052248	<a href="#">gather_plan_statistics</a>	ENABLED	NO	2018-01-07 05:22:48	2018-01-07 05:22:48	<a href="#">Edit</a>   <a href="#">Disable</a>   <a href="#">Delete</a>
dbx53xvzr003j	APPM_BZIBR_20180108093600	fff	ENABLED	NO	2018-01-08 09:36:00	2018-01-08 09:36:00	<a href="#">Edit</a>   <a href="#">Disable</a>   <a href="#">Delete</a>
▶ 6ym3yrtrs77cy	APPM_BZIBR_20180107053716	GATHER_PLAN_STATISTICS FULL (	DISABLED	NO	2018-01-07 05:37:16	2018-01-07 05:37:16	<a href="#">Edit</a>   <a href="#">Enable</a>   <a href="#">Delete</a>
bu1fvx637w1xv	APPM_BZIBR_20180109023505	<a href="#">gather_plan_statistics</a>	ENABLED	NO	2018-01-09 02:35:05	2018-01-09 02:35:05	<a href="#">Edit</a>   <a href="#">Disable</a>   <a href="#">Delete</a>
17907597969802104843	my_demo_patch	<a href="#">gather_plan_statistics</a>	ENABLED	NO	2019-10-07 14:30:48	2019-10-07 14:30:48	<a href="#">Edit</a>   <a href="#">Disable</a>   <a href="#">Delete</a>

»gather\_plan\_statistics« was awesome,  
What is »gather\_optimizer\_statistics« for?

\* To create new SQL Patch: go to **SQL Statements** and select specific SQL for patching.



# Statspack

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

```
SQL> create tablespace perfstat datafile '+SSD' size 100m  
autoextend on next 100m maxsize 4g;
```

```
SQL> @?/rdbms/admin/spcreate.sql
```

```
SQL> SELECT * FROM stats$level_description ORDER BY  
snap_level;
```

```
SQL> exec perfstat.statspack.snap(i_snap_level=>10);
```

```
SQL> select SNAP_ID, SNAP_TIME from STATS$SNAPSHOT; - list  
snapshots
```

```
SQL> @?/rdbms/admin/spreport
```

## StatsPack Reports

Begin Snapshot #48414 @ Mon Sep 30 00:00:22 CEST 2019 for [REDACTED] level 7

End Snapshot #48468 @ Mon Sep 30 18:00:21 CEST 2019 for [REDACTED] level 7

[Download Report](#)

[Create Snapshot](#)

### Select StatPack Snapshot

Snapshots taken after


Snap ID	Snapshot Taken	Instance	Level
48459	2019-09-30 15:00:25	[REDACTED]	7
48460	2019-09-30 15:20:21	[REDACTED]	7
48461	2019-09-30 15:40:25	[REDACTED]	7
48462	2019-09-30 16:00:25	[REDACTED]	7
48463	2019-09-30 16:20:21	[REDACTED]	7
48464	2019-09-30 16:40:25	[REDACTED]	7
48465	2019-09-30 17:00:25	[REDACTED]	7
48466	2019-09-30 17:20:25	[REDACTED]	7
48467	2019-09-30 17:40:25	[REDACTED]	7
48468	2019-09-30 18:00:21	[REDACTED]	7

# EM Database Express

```
SQL> alter session set container=orclp;  
SQL> exec dbms_xdb_config.sethttpsport(5501);  
SQL> commit;  
$ lsnrctl status # to check if it works
```

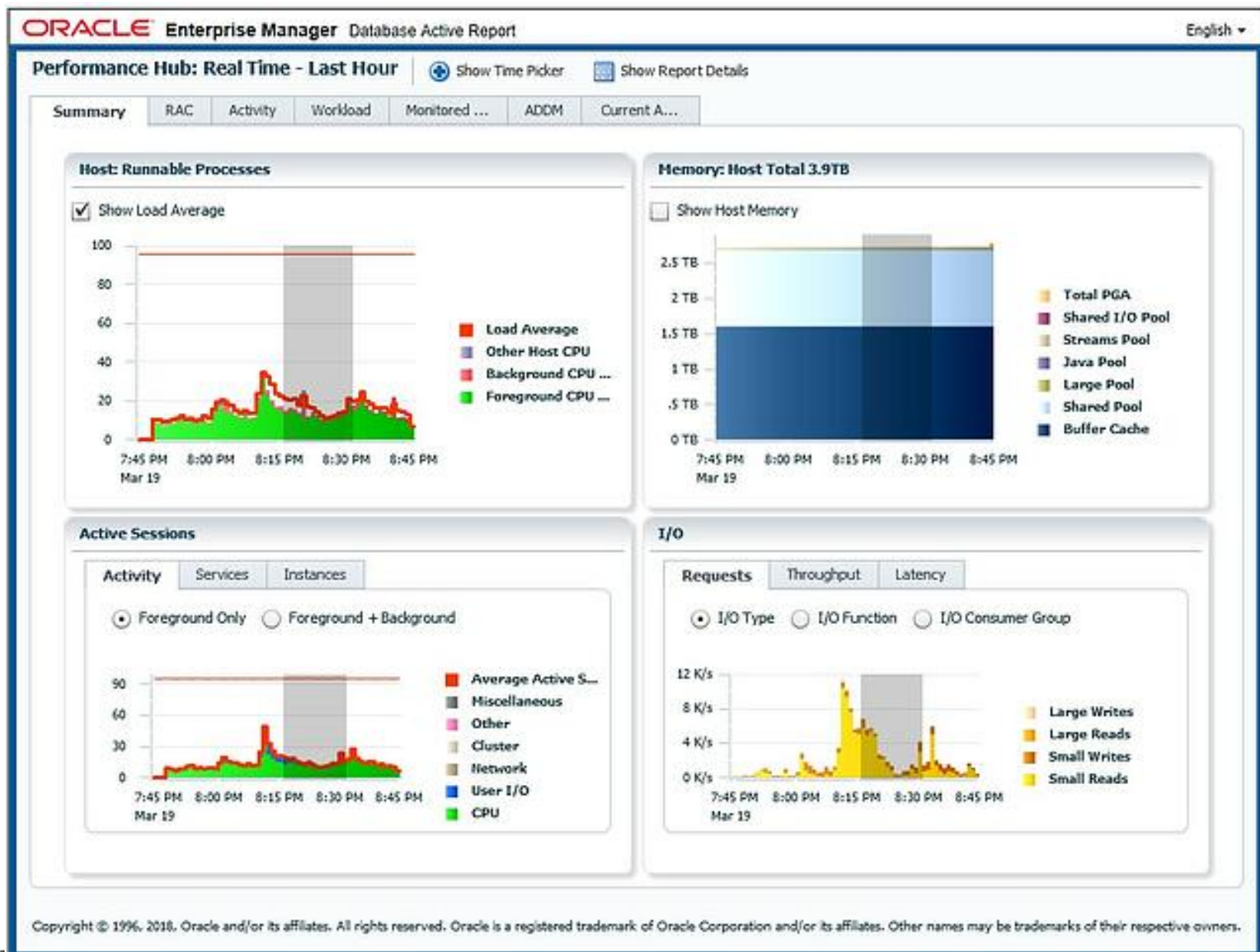
<https://tecaj1.abakus.si:5501/em/>

Go to »Performance Hub« :-)

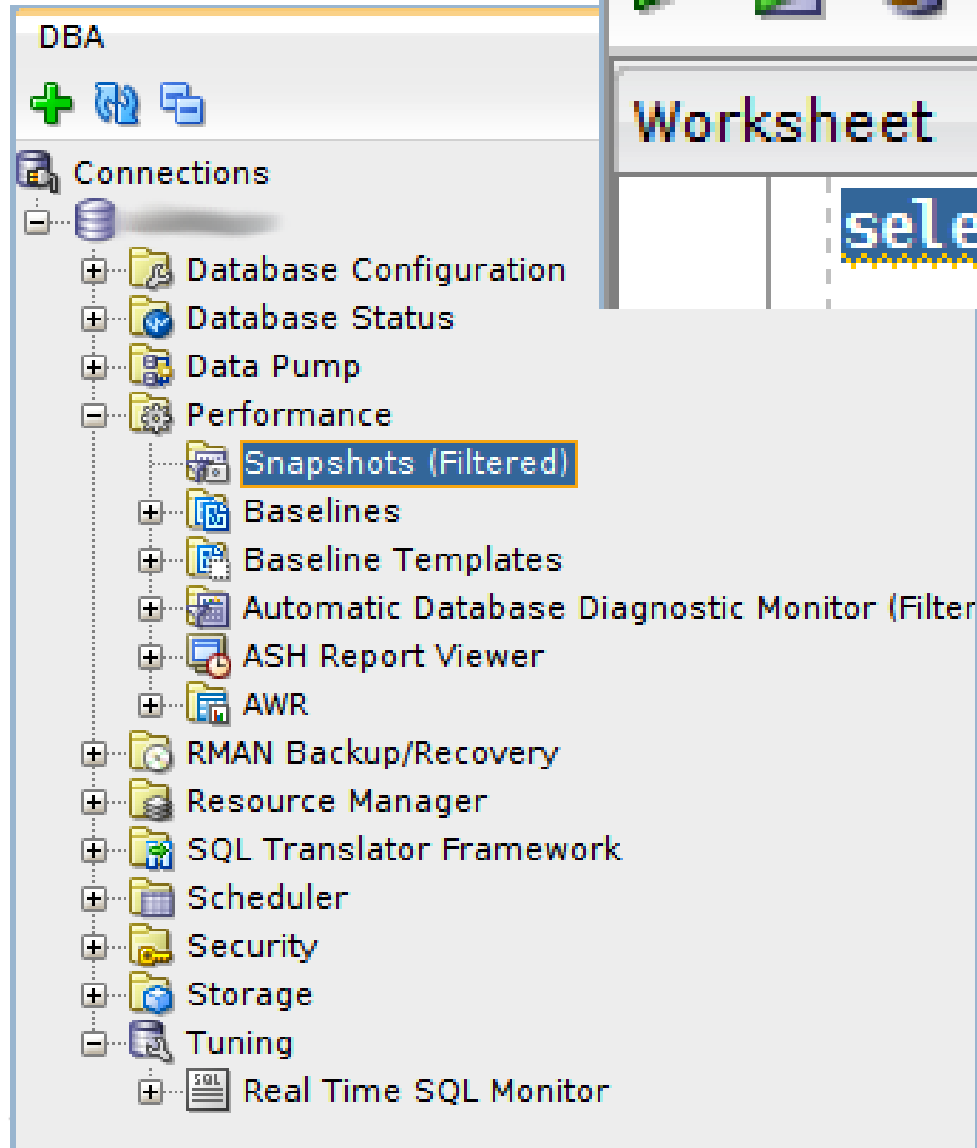
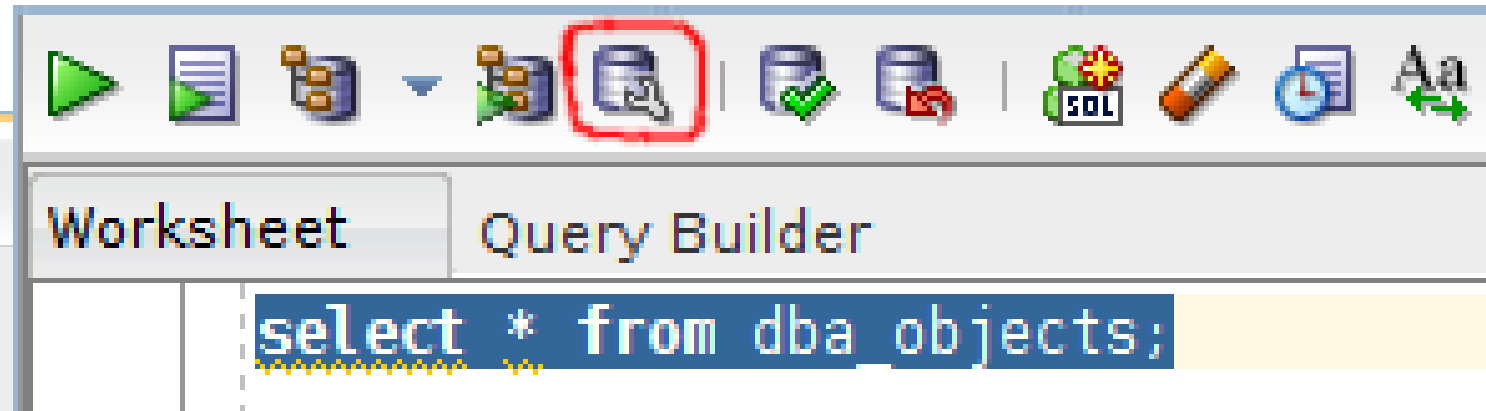


Are you sure this is all the steps  
you need if you want tls?

# EM Database Express



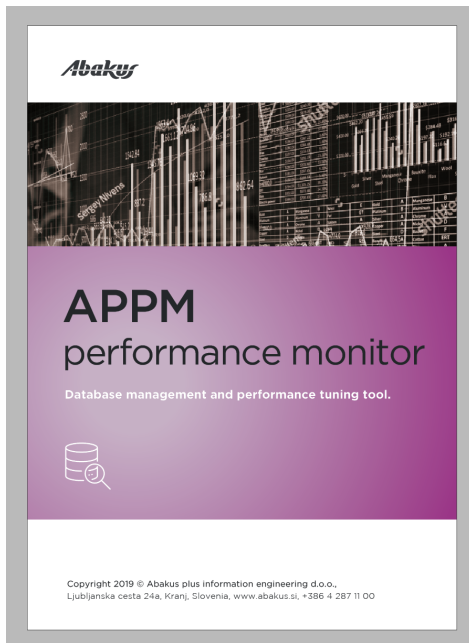
# SQL Developer



# Open/Free Tools

- Tanel Poder's Linux Process Snapper  
<https://blog.tanelpoder.com/psnapper/>
- Tanel Poder's Oracle Session Snapper  
<https://blog.tanelpoder.com/snapper/>
- OraSASH  
<https://pioro.github.io/orasash/>
- SwingBench  
<http://www.dominicgiles.com/swingbench.html>
- tvdxtat  
<https://antognini.ch/category/apmtools/tvdxtat/>





<http://www.abakus.si>

My next session is today at 14:10



## Oracle Grid Infrastructure Concepts and Fancy Features

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