

ORACLE®

Diagnosing Performance Problems with AWR Reports

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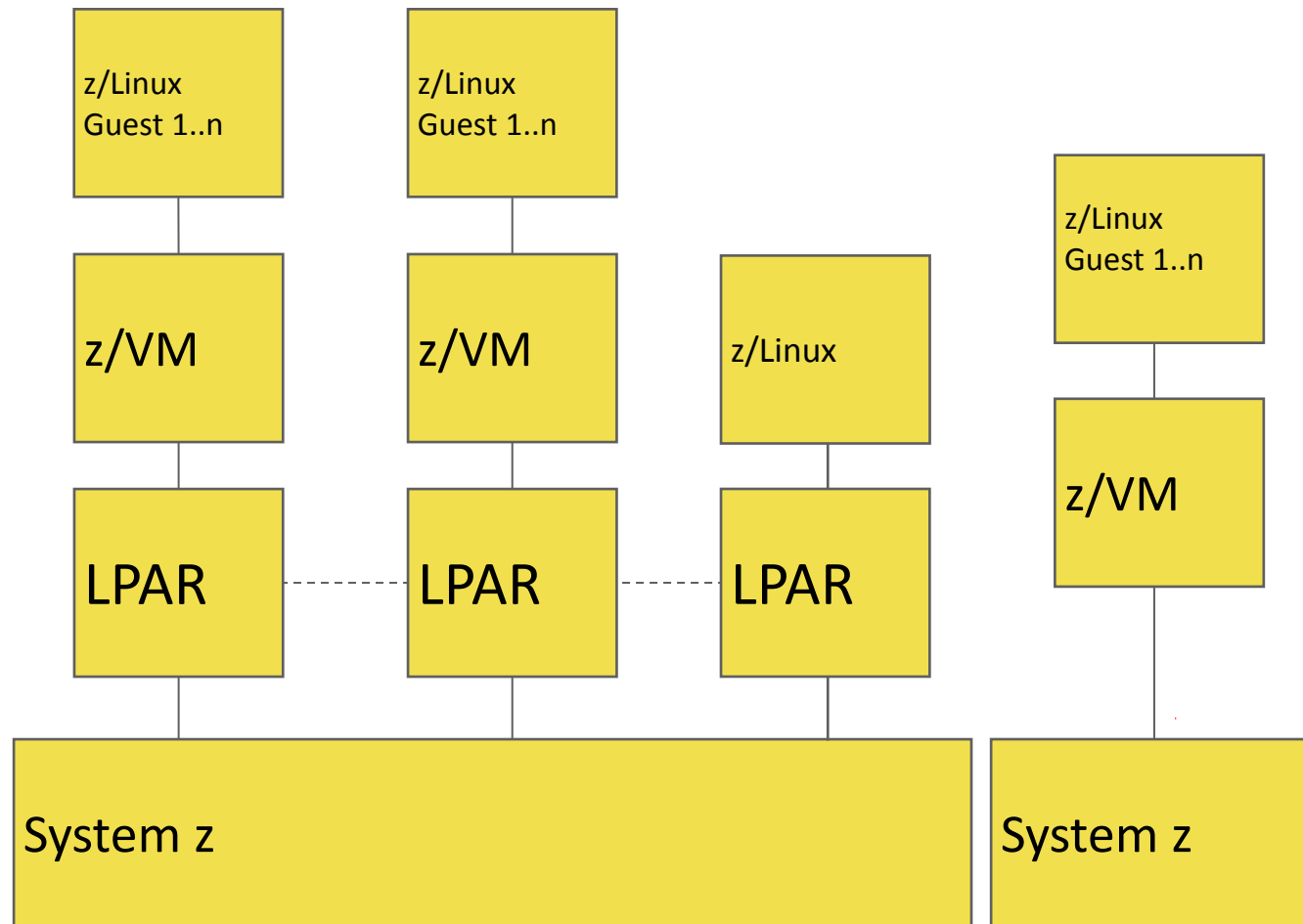
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Agenda

- 1 Linux on System z: OS – Configuration / Monitoring
- 2 Diagnosing Performance Problems with AWR Reports

System z Configuration



- Virtual machines
 - VM-Guests
 - Linux for z
- z/VM Operating System
- Logical partitions
 - 1 - 85 LPAR's (z13)

System z - Linux guest monitoring

```
oracle@strkf36:~  
top - 10:10:56 up 149 days, 23:53, 7 users, load average: 4.25, 4.13, 3.81  
Tasks: 573 total, 4 running, 567 sleeping, 2 stopped, 0 zombie  
Cpu(s): 65.6%us, 27.3%sy, 0.0%ni, 0.0%id, 0.0%wa, 0.7%hi, 0.2%si, 6.2%st  
Mem: 3978520k total, 3878232k used, 100288k free, 86836k buffers  
Swap: 6209516k total, 1007484k used, 5202032k free, 2642660k cached
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
63162	oracle	20	0	1237m	1560	360	R	89.0	0.0	301:56.19	oracle
1263	oracle	20	0	1237m	1548	360	R	46.3	0.0	226:27.18	oracle
58819	oracle	20	0	1237m	1552	360	R	43.3	0.0	417:11.68	oracle
7762	oracle	20	0	3352	1672	964	R	1.3	0.0	0:37.23	top
8361	oracle	20	0	99072	756	660	S	1.3	0.0	0:02.79	sadc
49283	grid	20	0	1085m	22m	10m	S	1.0	0.6	656:31.73	oraagent.bin
60060	oracle	-2	0	813m	6992	5252	S	1.0	0.2	4:52.41	oracle
49819	grid	-2	0	1276m	5676	5380	S	0.7	0.1	652:39.61	oracle
53691	oracle	-2	0	1450m	19m	17m	S	0.7	0.5	7:07.98	ora_vktm_v12cr2
62649	oracle	-2	0	1237m	7152	5296	S	0.7	0.2	4:15.66	oracle
49187	grid	20	0	1100m	17m	7452	S	0.3	0.5	369:21.59	ohasd.bin
49813	grid	20	0	1278m	8064	7576	S	0.3	0.2	28:36.99	oracle
60073	oracle	20	0	813m	7584	5844	S	0.3	0.2	0:02.59	oracle
62677	oracle	20	0	1238m	7088	4636	S	0.3	0.2	0:01.12	oracle
1	root	20	0	3248	1168	964	S	0.0	0.0	8:24.68	init

System z - Linux guest monitoring

```
10:07:42 AM all 68.60 0.00 20.33 0.00 10.47 0.00
10:07:45 AM all 73.67 0.00 22.67 0.00 3.67 0.00
^C
[oracle@strkf36 tnieuwel]$ sar -u 3 3333
Linux 2.6.32-358.el6.s390x (strkf36.us.oracle.com) 03/04/2016 _s390x_ (
2 CPU)

10:07:50 AM CPU %user %nice %system %iowait %steal %idle
10:07:53 AM all 70.38 0.00 21.13 0.00 8.49 0.00
10:07:56 AM all 74.25 0.00 22.07 0.00 3.68 0.00
10:07:59 AM all 74.21 0.00 22.30 0.00 3.49 0.00
10:08:02 AM all 75.21 0.00 22.63 0.00 2.16 0.00
10:08:05 AM all 73.46 0.00 21.54 0.00 5.01 0.00
10:08:08 AM all 66.39 0.00 20.13 0.00 13.48 0.00
10:08:11 AM all 67.00 0.00 20.33 0.00 12.67 0.00
10:08:14 AM all 68.90 0.00 20.40 0.00 10.70 0.00
10:08:17 AM all 54.06 0.00 14.10 0.00 31.84 0.00
10:08:20 AM all 73.71 0.00 22.13 0.00 4.16 0.00
10:08:23 AM all 74.79 0.00 22.70 0.00 2.50 0.00
10:08:26 AM all 74.00 0.00 22.00 0.00 4.00 0.00
10:08:29 AM all 75.21 0.00 22.63 0.00 2.16 0.00
```

```
oracle@strkf36:~/tniewel
Percentage of CPU utilization that occurred while execut-
ing at the system level (kernel). Note that this field
does NOT include time spent servicing hardware or soft-
ware interrupts.

%iowait
Percentage of time that the CPU or CPUs were idle during
which the system had an outstanding disk I/O request.

%steal
Percentage of time spent in involuntary wait by the vir-
tual CPU or CPUs while the hypervisor was servicing
another virtual processor.

%irq
Percentage of time spent by the CPU or CPUs to service
hardware interrupts.

%soft
Percentage of time spent by the CPU or CPUs to service
software interrupts.
```

Memory usage - Huge Pages

Minimize memory usage/overhead

Expected per process system memlock (soft) limit to lock

SHARED GLOBAL AREA (SGA) into memory: 1170M

Thu Mar 03 16:07:53 2016

Available system pagesizes:

4K, 2048K

Thu Mar 03 16:07:53 2016

Supported system pagesize(s):

Thu Mar 03 16:07:53 2016

	PAGESIZE	AVAILABLE_PAGES	EXPECTED_PAGES	ALLOCATED_PAGES	ERROR(s)
Thu Mar 03 16:07:53 2016	4K	Configured	2	299010	NONE
Thu Mar 03 16:07:53 2016	2048K	0	585	0	NONE

Thu Mar 03 16:07:53 2016

RECOMMENDATION:

Thu Mar 03 16:07:53 2016

1. For optimal performance, configure system with expected number of pages for every supported system pagesize prior to the next instance restart operation.

Thu Mar 03 16:07:53 2016

2. Increase per process memlock (soft) limit to at least 1170MB to lock 100% of SHARED GLOBAL AREA (SGA) pages into physical memory

Thu Mar 03 16:07:53 2016

Memory usage - Huge Pages

Minimize memory usage/overhead

Storage used by the Linux page allocation table

Each Oracle process needs 8 Bytes of memory (64 Bit architecture) per page in the Linux page allocation table

Example: Memory consumption for each Oracle process (pagesize 4k)

SGA Size	Memory consumed
4 MB	8 KB
4 GB	8 MB
40 GB	80 MB
200 GB	400 MB

ASMM required

Agenda

1 Linux on System z: OS - Configuration / Monitoring

2 Diagnosing Performance Problems with AWR Reports

Oracle Monitoring Tools

- **Automatic Workload Repository (AWR)**
 - Is the Oracle performance warehouse
 - AWR allows the collection and analysis of performance data
 - Offers more Information than statspack
- **Enterprise Manager - Cloud Control**
 - Graphical web-based console which provides a single, integrated solution for administration, monitoring, testing, deploying, operating, diagnosing, and resolving problems for Oracle and for non Oracle Systems

Automatic Workload Repository (AWR)

Automatically collects database instance statistics

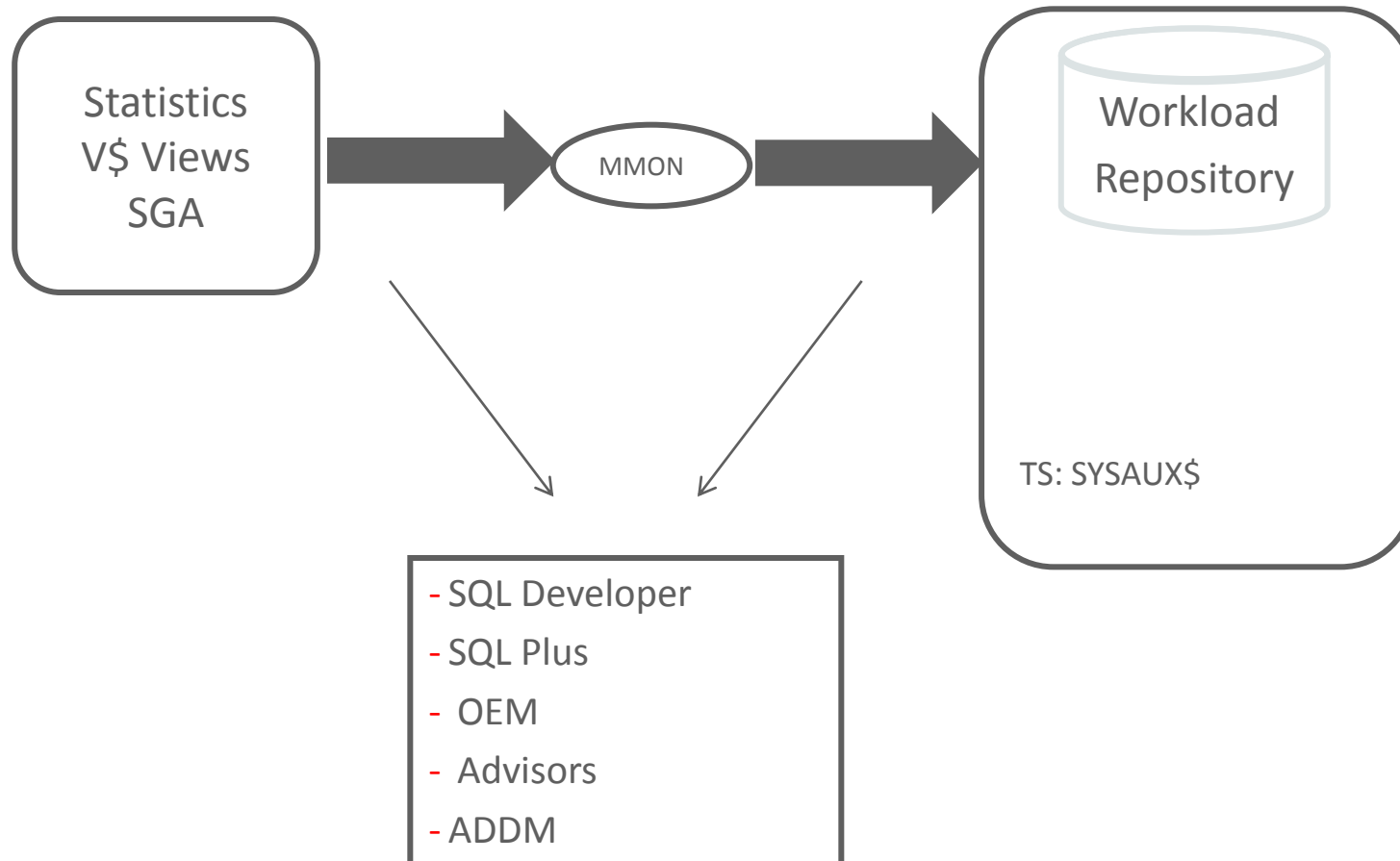
- Licensed in the Diagnostics Pack
- Captures statistical data
 - Used by
 - AWR-Reports
 - Oracle database advisors
 - self-management features
 - ADDM

Automatic Workload Repository (AWR) - Scripts

Reports can be generated / viewed by

- Oracle Enterprise Manager
- SQLDeveloper
- Scripts
 - awrrpt.sql
 - awrrpti.sql
 - awrddrpt.sql
 - awrddrpti.sql
 - awrsqrpt.sql
 - awrsqrpi.sql
 - awrgrpt.sql
 - awrgrpti.sql
 - awrgdrp.sql
 - awrgdrpi.sql
 - awrload.sql
 - ashrpt.sql

Automatic Workload Repository (AWR)



- Base Statistics, Metrics, SQL-Statistics, Active Session History
- Automatic Snapshots (default 1h)
- “Historic” Data (default 7 days)
- “Light Weight-Capture”

Automatic Workload Repository (AWR)

- Creating Snapshots

```
DBMS_WORKLOAD_REPOSITORY.CREATE_SNAPSHOT ();
```

- Dropping Snapshots

```
DBMS_WORKLOAD_REPOSITORY.DROP_SNAPSHOT_RANGE (low_snap_id => 22,  
high_snap_id => 32, dbid => 3310949047);
```

- Modifying Snapshot Settings

```
DBMS_WORKLOAD_REPOSITORY.MODIFY_SNAPSHOT_SETTINGS( retention => 43200, interval => 30, dbid =>  
3310949047);
```

- Dropping Baselines

```
DBMS_WORKLOAD_REPOSITORY.DROP_BASELINE (baseline_name => 'peak baseline', cascade => FALSE,  
dbid => 3310949047);
```

AWR Report – Report Sections

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
- Active Session History (ASH) Report
- ADDM Reports

AWR Report – Report Summary

WORKLOAD REPOSITORY report for

DB Name	DB Id	Instance	Inst num	Startup Time	Release	RAC
V12CR2	3582554155	V12CR2	1	03-Mar-16 16:03	12.1.0.2.0	NO

Host Name	Platform	CPUs	Cores	Sockets	Memory (GB)
strkf36.us.oracle.com	IBM zSeries Based Linux	2			3.79

	Snap Id	Snap Time	Sessions	Cursors/Session
Begin Snap:	272	04-Mar-16 07:51:42	35	1.3
End Snap:	273	04-Mar-16 08:03:53	39	1.2
Elapsed:		12.17 (mins)		
DB Time:		21.80 (mins)		

Report Summary

Top ADDM Findings by Average Active Sessions

Finding Name	Avg active sessions of the task	Percent active sessions of finding	Task Name	Begin Snap Time	End Snap Time
Top SQL Statements	1.79	99.22	ADDM:3582554155_1_273	04-Mar-16 07:51	04-Mar-16 08:03
CPU Usage	1.79	38.43	ADDM:3582554155_1_273	04-Mar-16 07:51	04-Mar-16 08:03
Log File Switches	1.79	3.37	ADDM:3582554155_1_273	04-Mar-16 07:51	04-Mar-16 08:03

AWR Report – Report Summary

Load Profile

	Per Second	Per Transaction	Per Exec	Per Call
DB Time(s):	1.8	11.0	0.12	8.90
DB CPU(s):	0.5	3.0	0.03	2.40
Background CPU(s):	0.1	0.5	0.00	0.00
Redo size (bytes):	3,933,065.9	24,139,671.0		
Logical read (blocks):	68,910.3	422,945.1		
Block changes:	23,543.8	144,503.2		
Physical read (blocks):	1.0	6.2		
Physical write (blocks):	203.3	1,247.6		
Read IO requests:	0.9	5.6		
Write IO requests:	63.5	389.9		
Read IO (MB):	0.0	0.1		
Write IO (MB):	1.6	9.8		
IM scan rows:	0.0	0.0		
Session Logical Read IM:				
User calls:	0.2	1.2		
Parses (SQL):	6.3	38.5		
Hard parses (SQL):	0.7	4.5		
SQL Work Area (MB):	0.2	1.4		
Logons:	0.1	0.4		
Executes (SQL):	15.5	95.3		
Rollbacks:	0.0	0.0		
Transactions:	0.2			

Instance Efficiency Percentages (Target 100%)

Buffer Nowait %:	99.99	Redo NoWait %:	99.99
Buffer Hit %:	100.00	In-memory Sort %:	100.00
Library Hit %:	89.87	Soft Parse %:	88.22
Execute to Parse %:	59.64	Latch Hit %:	100.00
Parse CPU to Parse Elapsed %:	35.39	% Non-Parse CPU:	99.37
Flash Cache Hit %:	0.00		

AWR Report – Report Summary

Example 1

Top 10 Foreground Events by Total Wait Time

Event	Waits	Total Wait Time (sec)	Wait Avg(ms)	% DB time	Wait Class
enq: TX - row lock contention	1	1038.7	1.0E+06	59.2	Application
DB CPU		260.9		14.9	
db file sequential read	1,298	4.5	3.48	.3	User I/O
log file sync	64	1.1	17.90	.1	Commit
db file scattered read	127	1	8.05	.1	User I/O
Disk file operations I/O	754	.5	0.62	.0	User I/O
direct path sync	124	.4	3.30	.0	User I/O
JS kgl get object wait	1	.1	91.68	.0	Administrative
control file sequential read	1,251	.1	0.06	.0	System I/O
direct path read	105	.1	0.63	.0	User I/O

Example 2

Top 10 Foreground Events by Total Wait Time

Event	Waits	Total Wait Time (sec)	Wait Avg(ms)	% DB time	Wait Class
DB CPU		353.1		27.0	
log file switch (checkpoint incomplete)	132	43.2	326.93	3.3	Configuration
Data file init write	1,212	15.8	13.00	1.2	User I/O
latch: cache buffers chains	505	3.3	6.50	.3	Concurrency
buffer busy waits	2,338	3	1.28	.2	Concurrency
rdbms ipc reply	92	1.9	20.17	.1	Other
control file parallel write	423	1.3	3.16	.1	System I/O
log file switch completion	15	1	64.15	.1	Configuration
Disk file operations I/O	440	.7	1.70	.1	User I/O
db file sequential read	371	.7	1.91	.1	User I/O



AWR Report – Report Summary

Wait Classes by Total Wait Time

Wait Class	Waits	Total Wait Time (sec)	Avg Wait (ms)	% DB time	Avg Active Sessions
Application	6	1,039	173109.59	59.2	0.1
DB CPU		261		14.9	0.0
Other	2,220	87	39.39	5.0	0.0
System I/O	23,159	45	1.93	2.5	0.0
User I/O	5,105	10	1.88	.5	0.0
Commit	75	1	16.33	.1	0.0
Concurrency	56	0	2.59	.0	0.0
Administrative	1	0	91.68	.0	0.0
Configuration	3	0	23.20	.0	0.0
Network	871	0	0.00	.0	0.0

AWR Report - Report Summary

Host CPU

CPUs	Cores	Sockets	Load Average Begin	Load Average End	%User	%System	%WIO	%Idle
2			3.81	4.65	76.2	22.2	0.0	0.0

Instance CPU

%Total CPU	%Busy CPU	%DB time waiting for CPU (Resource Manager)
32.7	32.7	0.0

IO Profile

	Read+Write Per Second	Read per Second	Write Per Second
Total Requests:	105.4	15.9	89.5
Database Requests:	64.4	0.9	63.5
Optimized Requests:	0.0	0.0	0.0
Redo Requests:	19.1	0.4	18.8
Total (MB):	10.8	0.2	10.5
Database (MB):	1.6	0.0	1.6
Optimized Total (MB):	0.0	0.0	0.0
Redo (MB):	7.6	0.0	7.6
Database (blocks):	204.3	1.0	203.3
Via Buffer Cache (blocks):	204.0	1.0	203.0
Direct (blocks):	0.3	0.0	0.3

Memory Statistics

	Begin	End
Host Mem (MB):	3,885.3	3,885.3
SGA use (MB):	1,168.0	1,168.0
PGA use (MB):	125.6	131.9
% Host Mem used for SGA+PGA:	33.29	33.46

Cache Sizes

	Begin	End
Buffer Cache:	800M	800M Std Block Size: 8K
Shared Pool Size:	256M	256M Log Buffer: 13,448K
In-Memory Area:	0M	0M

Shared Pool Statistics

	Begin	End
Memory Usage %:	92.13	92.23
% SQL with executions>1:	77.84	74.09
% Memory for SQL w/exec>1:	58.09	44.05

AWR Report – Wait Events Statistics

Wait Events Statistics

- [Time Model Statistics](#)
- [Operating System Statistics](#)
- [Operating System Statistics - Detail](#)
- [Foreground Wait Class](#)
- [Foreground Wait Events](#)
- [Background Wait Events](#)
- [Wait Event Histogram](#)
- [Wait Event Histogram Detail \(64 msec to 2 sec\)](#)
- [Wait Event Histogram Detail \(4 sec to 2 min\)](#)
- [Wait Event Histogram Detail \(4 min to 1 hr\)](#)
- [Service Statistics](#)
- [Service Wait Class Stats](#)

AWR Report – Wait Events Statistics

Time Model Statistics

- DB Time represents total time in user calls
- DB CPU represents CPU time of foreground processes
- Total CPU Time represents foreground and background processes
- Statistics including the word "background" measure background process time, therefore do not contribute to the DB time statistic
- Ordered by % of DB time in descending order, followed by Statistic Name

Statistic Name	Time (s)	% of DB Time	% of Total CPU Time
sql execute elapsed time	1,306.48	99.89	
DB CPU	353.13	27.00	86.80
parse time elapsed	9.66	0.74	
hard parse elapsed time	9.28	0.71	
PL/SQL execution elapsed time	1.75	0.13	
hard parse (sharing criteria) elapsed time	1.21	0.09	
PL/SQL compilation elapsed time	0.46	0.04	
connection management call elapsed time	0.14	0.01	
repeated bind elapsed time	0.01	0.00	
failed parse elapsed time	0.01	0.00	
sequence load elapsed time	0.01	0.00	
DB time	1,307.93		
background elapsed time	362.49		
background cpu time	53.72		13.20
total CPU time	406.85		

AWR Report – Wait Events Statistics

Operating System Statistics

- *TIME statistic values are diffed. All others display actual values. End Value is displayed if different
- ordered by statistic type (CPU Use, Virtual Memory, Hardware Config), Name

Statistic	Value	End Value
FREE_MEMORY_BYTES	97,550,336	112,709,632
INACTIVE_MEMORY_BYTES	2,461,143,040	2,145,521,664
SWAP_FREE_BYTES	5,408,419,840	5,380,013,312
BUSY_TIME	124,437	
NICE_TIME	0	
SYS_TIME	27,651	
USER_TIME	94,808	
LOAD	4	5
RSRC_MGR_CPU_WAIT_TIME	0	
VM_IN_BYTES	121,394,960	
VM_OUT_BYTES	170,070,016	
PHYSICAL_MEMORY_BYTES	4,074,004,480	
NUM_CPUS	2	
GLOBAL_RECEIVE_SIZE_MAX	4,194,304	
GLOBAL_SEND_SIZE_MAX	1,048,576	
TCP_RECEIVE_SIZE_DEFAULT	87,380	
TCP_RECEIVE_SIZE_MAX	4,194,304	
TCP_RECEIVE_SIZE_MIN	4,096	
TCP_SEND_SIZE_DEFAULT	16,384	
TCP_SEND_SIZE_MAX	4,194,304	
TCP_SEND_SIZE_MIN	4,096	

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Operating System Statistics - Detail

Snap Time	Load	%busy	%user	%sys	%idle	%iowait
04-Mar 07:51:42	3.81					
04-Mar 08:03:53	4.65	100.00	76.19	22.22	0.00	0.00

AWR Report – Wait Events Statistics

```
Operating System Statistics          DB/Inst: V12CR2/V12CR2 Snaps: 3111-3112
-> *TIME statistic values are diffed.
    All others display actual values.  End Value is displayed if different
-> ordered by statistic type (CPU Use, Virtual Memory, Hardware Config), Name
```

Statistic	Value	End Value
FREE_MEMORY_BYTES	6,988,824,576	2,201,493,504
INACTIVE_MEMORY_BYTES	6,304,014,336	6,518,775,808
SWAP_FREE_BYTES	8,998,805,504	312,754,176
BUSY_TIME	624,590	
IDLE_TIME	7,911,107	
IOWAIT_TIME	3,828,151	
NICE_TIME	120	

AWR Report – Wait Events Statistics

Foreground Wait Events

- s - second, ms - millisecond - 1000th of a second
- Only events with Total Wait Time (s) >= .001 are shown
- ordered by wait time desc, waits desc (idle events last)
- %Timeouts: value of 0 indicates value was < .5%. Value of null is truly 0

Event	Waits	%Time -outs	Total Wait Time (s)	Avg wait (ms)	Waits /txn	% DB time
enq: TX - row lock contention	1		1,039	1038655.51	0.00	59.16
db file sequential read	1,298		5	3.48	4.34	0.26
log file sync	64		1	17.90	0.21	0.07
db file scattered read	127		1	8.05	0.42	0.06
Disk file operations I/O	754		0	0.62	2.52	0.03
direct path sync	124		0	3.30	0.41	0.02
JS kgl get object wait	1	100	0	91.68	0.00	0.01
control file sequential read	1,251		0	0.06	4.18	0.00
direct path read	105		0	0.63	0.35	0.00
log file switch (private strand flush incomplete)	1		0	42.75	0.00	0.00
direct path write temp	124		0	0.31	0.41	0.00
latch: shared pool	15		0	1.87	0.05	0.00
log file switch completion	1		0	26.67	0.00	0.00
latch: row cache objects	4		0	3.55	0.01	0.00
direct path write	4		0	3.42	0.01	0.00
library cache: mutex X	1		0	6.23	0.00	0.00
SQL*Net break/reset to client	5		0	0.40	0.02	0.00
SQL*Net message to client	826		0	0.00	2.76	0.00
latch: cache buffers chains	1		0	1.15	0.00	0.00
SQL*Net message from client	824		7,062	8570.90	2.76	
jobq slave wait	2,101	98	1,056	502.44	7.03	

AWR Report – SQL Statistics

SQL Statistics

- [SQL ordered by Elapsed Time](#)
- [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](#)
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- [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 102.3% of Total DB Time (s): 1,308
- Captured PL/SQL account for 101.8% of Total DB Time (s): 1,308

Elapsed Time (s)	Executions	Elapsed Time per Exec (s)	%Total	%CPU	%IO	SQL Id	SQL Module	SQL Text
650.88	1	650.88	49.78	28.12	2.58	4qa7kqxgzgvt9	SQL*Plus	Declare l Number; Max_Loop Num...
640.68	1	640.68	48.98	27.76	0.00	gymh978cbhk6d	SQL*Plus	Declare l Number; Max_Loop Num...
338.41	680	0.50	25.87	27.56	0.00	5v7ukr0jwsnb3	SQL*Plus	SELECT TO_NUMBER(MAX(EMPNO), 9...
331.27	39	8.49	25.33	26.11	3.33	94vfk7tp1t3bj	SQL*Plus	UPDATE ZSIG.EMP SET SAL=SAL+1
314.16	39	8.06	24.02	26.21	1.84	1r7rdpmyw1q28	SQL*Plus	UPDATE ZSIG.EMP SET SAL=SAL+1
300.77	681	0.44	23.00	27.98	0.00	4c5cwz1w9sq6p	SQL*Plus	SELECT COUNT(*) FROM ZSIG.EMP
20.66	2	10.33	1.58	34.04	3.28	fhf8upax5cxsz	MMON_SLAVE	BEGIN sys.dbms_auto_report_int...
10.77	1	10.77	0.82	38.89	3.02	0w26sk6t6gg98	MMON_SLAVE	SELECT XMLTYPE(DBMS_REPORT.GET...
10.64	1	10.64	0.81	38.93	13.18	1uk5m5qbzj1vt	SQL*Plus	BEGIN dbms_workload_repository...
9.97	1	9.97	0.78	39.44	2.88	dffkcnqfystw	MMON_SLAVE	WITH MONITOR_DATA AS (SELECT I...

AWR Report – SQL Statistics

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 103.2% of Total CPU Time (s): 353
- Captured PL/SQL account for 102.3% of Total CPU Time (s): 353

CPU Time (s)	Executions	CPU per Exec (s)	%Total	Elapsed Time (s)	%CPU	%IO	SQL Id	SQL Module	SQL Text
177.85	1	177.85	50.38	640.88	27.78	0.00	gymh978cbhk6d	SQL*Plus	Declare l Number; Max_Loop Num...
170.03	1	170.03	48.15	650.88	26.12	2.58	4qa7kqzgyt9	SQL*Plus	Declare l Number; Max_Loop Num...
93.25	680	0.14	26.41	338.41	27.58	0.00	5v7ukr0jwsnb3	SQL*Plus	SELECT TO_NUMBER(MAX(EMPNO), 9...
88.50	39	2.22	24.50	331.27	26.11	3.33	94vfk7tp1t3bj	SQL*Plus	UPDATE ZSIG.EMP SET SAL=SAL-1
84.11	681	0.12	23.82	300.77	27.98	0.00	4c5cwz1w9sq6p	SQL*Plus	SELECT COUNT(*) FROM ZSIG.EMP
82.33	39	2.11	23.31	314.16	26.21	1.84	1r7rdpmyw1q28	SQL*Plus	UPDATE ZSIG.EMP SET SAL=SAL+1
7.03	2	3.52	1.99	20.68	34.04	3.28	fhf8upax5cxsz	MMON_SLAVE	BEGIN sys.dbms_auto_report_int...
4.19	1	4.19	1.19	10.77	38.89	3.02	0w26sk6t6qq98	MMON_SLAVE	SELECT XMLTYPE(DBMS_REPORT.GET...
3.93	1	3.93	1.11	9.97	39.44	2.88	dffkcnqfystw	MMON_SLAVE	WITH MONITOR_DATA AS (SELECT I...
3.93	1	3.93	1.11	10.64	38.93	13.18	1uk5m5qbj1vt	SQL*Plus	BEGIN dbms_workload_repository...

AWR Report – Instance Activity Statistics

Instance Activity Statistics

- [Key Instance Activity Stats](#)
- [Instance Activity Stats](#)
- [Instance Activity Stats - Absolute Values](#)
- [Instance Activity Stats - Thread Activity](#)

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Key Instance Activity Stats

- Ordered by statistic name

Statistic	Total	per Second	per Trans
db block changes	1,030,192	147.04	3,445.46
execute count	47,293	6.75	158.17
logons cumulative	397	0.06	1.33
opened cursors cumulative	45,658	6.52	152.70
parse count (total)	27,148	3.87	90.80
parse time elapsed	3,865	0.55	12.93
physical reads	4,639	0.66	15.52
physical writes	9,014	1.29	30.15
redo size	89,714,548	12,805.15	300,048.66
session cursor cache hits	38,761	5.53	129.64
session logical reads	12,107,554	1,728.14	40,493.49
user calls	1,797	0.26	6.01
user commits	296	0.04	0.99
user rollbacks	3	0.00	0.01
workarea executions - optimal	10,109	1.44	33.81

table fetch by rowid	12,717	17.41	106.87
table fetch continued row	236	0.32	1.98
table scan blocks gotten	950,602	1,301.52	7,988.25
table scan disk non-IMC rows gotten	176,136,018	241,157.67	1,480,134.61
table scan rows gotten	176,136,018	241,157.67	1,480,134.61
table scans (long tables)	0	0.00	0.00
table scans (short tables)	2,683	3.67	22.55
temp space allocated (bytes)	0	0.00	0.00
total cf enq hold time	7,822	10.71	65.73
total number of cf enq holders	1,216	1.66	10.22
total number of times SMON posted	163	0.22	1.37
transaction rollbacks	1	0.00	0.01
undo change vector size	1,007,053,248	1,378,812.93	8,462,632.34
user calls	147	0.20	1.24
user commits	119	0.16	1.00
user logons cumulative	2	0.00	0.02
user logouts cumulative	2	0.00	0.02

AWR Report – IO Stats

IO Stats

- [IOStat by Function summary](#)
- [IOStat by Filetype summary](#)
- [IOStat by Function/Filetype summary](#)
- [Tablespace IO Stats](#)
- [File IO Stats](#)

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IOStat by Filetype summary

- 'Data' columns suffixed with M,G,T,P are in multiples of 1024 other columns suffixed with K,M,G,T,P are in multiples of 1000
- Small Read and Large Read are average service times, in milliseconds
- Ordered by (Data Read + Write) desc

Filetype Name	Reads: Data	Reqs per sec	Data per sec	Writes: Data	Reqs per sec	Data per sec	Small Read	Large Read
Log File	1M	0.36	.001M	5.4G	18.76	7.576M	0.00	
Data File	10M	1.81	.014M	1.1G	64.04	1.591M	1.53	
Control File	158M	13.89	.216M	59M	5.15	.081M	0.03	
Temp File	0M	0.04	0M	1M	0.06	.001M	0.97	
TOTAL:	169M	16.09	.231M	6.6G	88.01	9.249M	0.20	

AWR Report – IO Stats

Tablespace IO Stats

- ordered by IOs (Reads + Writes) desc

Tablespace	Reads	Av Rds/s	Av Rd(ms)	Av Blks/Rd	1-bk Rds/s	Av 1-bk Rd(ms)	% Opt Reads	Writes	Writes avg/s	Buffer Waits	Av Buf Wt(ms)
UNDOTBS1	0	0	0.00	0.00	0	0.00	0.00	39,678	54	2,497	1.15
USERS	0	0	0.00	0.00	0	0.00	0.00	5,553	8	36	1.39
SYSAUX	547	1	1.74	1.00	1	1.76	0.00	1,082	1	5	0.00
SYSTEM	175	0	6.11	1.00	0	6.17	0.00	57	0	0	0.00
TEMP	30	0	1.33	3.10	0	1.58		45	0	0	0.00

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File IO Stats

- ordered by Tablespace, File

Tablespace	Filename	Reads	Av Rds/s	Av Rd(ms)	Av Blks/Rd	1-bk Rds/s	Av 1-bk Rd(ms)	% Opt Reads	Writes	Writes avg/s	Buffer Waits	Av Buf Wt(ms)
SYSAUX	/refresh/u01/app/oracle/oradata/V12CR2/datafile/o1_mf_sysaux_c6fgslm7_.dbf	547	1	1.74	1.00	1	1.76	0.00	1,082	1	5	0.00
SYSTEM	/refresh/u01/app/oracle/oradata/V12CR2/datafile/o1_mf_system_c6fgf6do_.dbf	175	0	6.11	1.00	0	6.17	0.00	57	0	0	0.00
TEMP	/refresh/u01/app/oracle/oradata/V12CR2/datafile/o1_mf_temp_c6fh599k_.tmp	30	0	1.33	3.10	0	1.58		45	0	0	
UNDOTBS1	/refresh/u01/app/oracle/oradata/V12CR2/datafile/o1_mf_undotbs1_c6fh1w3_.dbf	0	0			0			39,678	54	2,497	1.15
USERS	/refresh/u01/app/oracle/oradata/V12CR2/datafile/o1_mf_users_c6fh20g9_.dbf	0	0			0			5,553	8	36	1.39

I/O - rules of thumb

- dbfile sequential read < 5 ms
- dbfile scattered read 10 - 20ms (dependent on I/O-Size)
- log file parallel write < 5ms (into disk cache)
- dbfile parallel write < 5ms (into disk cache)

AWR – Advisory Statistics

Advisory Statistics

- [Instance Recovery Stats](#)
- [MTTR Advisory](#)
- [Buffer Pool Advisory](#)
- [PGA Aggr Summary](#)
- [PGA Aggr Target Stats](#)
- [PGA Aggr Target Histogram](#)
- [PGA Memory Advisory](#)
- [Shared Pool Advisory](#)
- [SGA Target Advisory](#)
- [Streams Pool Advisory](#)
- [Java Pool Advisory](#)

SGA Target Advisory

SGA Target Size (M)	SGA Size Factor	Est DB Time (s)	Est Physical Reads
292	0.25	0	102,163
584	0.50	10,571	120,297
876	0.75	7,816	108,364
1,168	1.00	6,694	102,163
1,460	1.25	6,426	100,692
1,752	1.50	5,903	97,862
2,044	1.75	5,899	97,852
2,336	2.00	5,899	97,852

AWR – Advisory Statistics

Buffer Pool Advisory

- Only rows with estimated physical reads >0 are displayed
- ordered by Block Size, Buffers For Estimate

P	Size for Est (M)	Size Factor	Buffers (thousands)	Est Phys Read Factor	Estimated Phys Reads (thousands)	Est Phys Read Time	Est %DBtime for Rds
D	80	0.10	10	1.33	136	1	190014.00
D	160	0.20	20	1.23	126	1	162525.00
D	240	0.30	30	1.18	120	1	147750.00
D	320	0.40	39	1.11	114	1	130383.00
D	400	0.50	49	1.09	112	1	124310.00
D	480	0.60	59	1.06	108	1	115396.00
D	560	0.70	69	1.06	108	1	114011.00
D	640	0.80	79	1.04	107	1	110566.00
D	720	0.90	89	1.02	104	1	104067.00
D	800	1.00	98	1.00	102	1	98633.00
D	880	1.10	108	1.00	102	1	97994.00
D	960	1.20	118	1.00	102	1	97283.00
D	1,040	1.30	128	0.99	102	1	96893.00
D	1,120	1.40	138	0.99	101	1	94620.00
D	1,200	1.50	148	0.96	99	1	88689.00
D	1,280	1.60	157	0.96	98	1	86948.00
D	1,360	1.70	167	0.96	98	1	86948.00
D	1,440	1.80	177	0.96	98	1	86913.00
D	1,520	1.90	187	0.96	98	1	86913.00
D	1,600	2.00	197	0.96	98	1	86913.00

AWR – Segment statistics

Segment Statistics

- [Segments by Logical Reads](#)
- [Segments by Physical Reads](#)
- [Segments by Physical Read Requests](#)
- [Segments by UnOptimized Reads](#)
- [Segments by Optimized Reads](#)
- [Segments by Direct Physical Reads](#)
- [Segments by Physical Writes](#)
- [Segments by Physical Write Requests](#)
- [Segments by Direct Physical Writes](#)
- [Segments by Table Scans](#)
- [Segments by DB Blocks Changes](#)
- [Segments by Row Lock Waits](#)
- [Segments by ITL Waits](#)
- [Segments by Buffer Busy Waits](#)

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Segments by Logical Reads

- Total Logical Reads: 12,107,554
- Captured Segments account for 11.2% of Total
- When ** MISSING ** occurs, some of the object attributes may not be available

Owner	Tablespace Name	Object Name	Subobject Name	Obj. Type	Obj#	Dataobj#	Logical Reads	%Total
ZSIG	USERS	EMP		TABLE	94872	94872	1,001,728	8.27
** MISSING **	TEMP	** MISSING: -40016211/4195328	** MISSING **	UNDEFINED	4254951085	4195328	30,448	0.25
SYS	SYSAUX	WRH\$_STAT_NAME_PK		INDEX	8461	8461	23,424	0.19
SYS	SYSAUX	WRH\$_SYSSTAT	WRH\$_SYSSTA_3582554155_238	TABLE PARTITION	94764	94764	19,792	0.16
SYS	SYSTEM	VIEW\$		TABLE	95	95	16,160	0.13

AWR – Segment statistics

Segments by DB Blocks Changes

- % of Capture shows % of DB Block Changes for each top segment compared
- with total DB Block Changes for all segments captured by the Snapshot
- When ** MISSING ** occurs, some of the object attributes may not be available

Owner	Tablespace Name	Object Name	Subobject Name	Obj. Type	Obj#	Dataobj#	DB Block Changes	% of Capture
ZSIG	USERS	EMP		TABLE	94872	94872	10,650,304	99.81
** MISSING **	TEMP	** MISSING: -40016211/4195328	** MISSING **	UNDEFINED	4254951085	4195328	9,520	0.09
SYS	TEMP	SYS_TEMP_0FD9D6752_2C432B		TABLE	4254951250	4194688	1,888	0.02
SYS	SYSAUX	WRHS_SYSSTAT_PK	WRHS_SYSSTA_3582554155_238	INDEX PARTITION	94766	94766	1,696	0.02
SYS	SYSAUX	WRHS_SQL_PLAN		TABLE	8312	8312	1,328	0.01

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Segments by Row Lock Waits

- % of Capture shows % of row lock waits for each top segment compared
- with total row lock waits for all segments captured by the Snapshot
- When ** MISSING ** occurs, some of the object attributes may not be available

Owner	Tablespace Name	Object Name	Subobject Name	Obj. Type	Obj#	Dataobj#	Row Lock Waits	% of Capture
ZSIG	USERS	EMP		TABLE	94872	94872	1	100.00

ASH Report

Active Session History (ASH) Report

- [Top SQL with Top Events](#)
- [Top SQL with Top Row Sources](#)
- [Top Sessions](#)
- [Top Blocking Sessions](#)
- [Top PL/SQL Procedures](#)
- [Top Events](#)
- [Top Event P1/P2/P3 Values](#)
- [Top DB Objects](#)
- [Activity Over Time](#)

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Top SQL with Top Events

- Top SQL statements by DB Time along with the top events by DB Time for those SQLs.
- % Activity is the percentage of DB Time due to the SQL.
- % Event is the percentage of DB Time due to the event that the SQL is waiting on.
- % Row Source is the percentage of DB Time due to the row source for the SQL waiting on the event.
- Executions is the number of executions of the SQL that were sampled in ASH.

SQL ID	Plan Hash	Executions	% Activity	Event	% Event	Top Row Source	% Row Source	SQL Text
da2rkdupxvfx0	3797409222	1	40.08	enq: TX - row lock contention	40.08	UPDATE	40.08	update zsig.emp set sal=sal+1
4c5cwz1w9sq6p	1849991560	18	7.00	CPU + Wait for CPU	7.00	TABLE ACCESS - FULL	7.00	SELECT COUNT(*) FROM ZSIG.EMP
5v7ukr0jwsnb3	1849991560	16	6.23	CPU + Wait for CPU	6.23	TABLE ACCESS - FULL	5.45	SELECT TO_NUMBER(MAX(EMPNO), 9...

ASH Report

Top SQL with Top Row Sources

- Top SQL statements by DB Time along with the top row sources by DB Time for those SQLs.
- % Activity is the percentage of DB Time due to the SQL.
- % Row Source is the percentage of DB Time spent on the row source by that SQL.
- % Event is the percentage of DB Time spent on the event by the SQL executing the row source.
- Executions is the number of executions of the SQL that were sampled in ASH.

SQL ID	Plan Hash	Executions	% Activity	Row Source	% Row Source	Top Event	% Event	SQL Text
da2rkdupxvfx0	3797409222	1	40.08	UPDATE	40.08	enq: TX - row lock contention	40.08	update zsig.emp set sal=sal+1
4c5cwz1w9sq6p	1849991560	18	7.00	TABLE ACCESS - FULL	7.00	CPU + Wait for CPU	7.00	SELECT COUNT(*) FROM ZSIG.EMP
5v7ukr0jwsnb3	1849991560	16	6.23	TABLE ACCESS - FULL	5.45	CPU + Wait for CPU	5.45	SELECT TO_NUMBER(MAX(EMPNO), 9...

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Top Sessions

- '# Samples Active' shows the number of ASH samples in which the session was found waiting for that particular event. The percentage shown in this column is calculated with respect to wall clock time and not total database activity.
- 'XIDs' shows the number of distinct transaction IDs sampled in ASH when the session was waiting for that particular event

Sid, Serial#	% Activity	Event	% Event	User	Program	# Samples Active	XIDs
261,52999	40.08	enq: TX - row lock contention	40.08	ZSIG	sqlplus@strkf3...m (TNS V1-V3)	103/701 [15%]	0
240,63710	13.23	CPU + Wait for CPU	13.23	ZSIG	sqlplus@strkf3...m (TNS V1-V3)	34/701 [5%]	0
263,30333	8.17	CPU + Wait for CPU	8.17	SYS	sqlplus@strkf3...m (TNS V1-V3)	21/701 [3%]	0
242,59968	7.39	CPU + Wait for CPU	7.39	SYS	oracle@strkf36...le.com (DIA0)	19/701 [3%]	0
238,10478	6.61	CPU + Wait for CPU	6.23	SYS	oracle@strkf36...le.com (PSP0)	16/701 [2%]	0

ASH Report

Top Blocking Sessions

- Blocking session activity percentages are calculated with respect to waits on enqueues, latches and "buffer busy" only
- '% Activity' represents the load on the database caused by a particular blocking session
- '# Samples Active' shows the number of ASH samples in which the blocking session was found active.
- 'XIDs' shows the number of distinct transaction IDs sampled in ASH when the blocking session was found active.

Blocking Sid (Inst)	% Activity	Event Caused	% Event	User	Program	# Samples Active	XIDs
20,46048(1)	40.08	enq: TX - row lock contention	40.08	** NOT FOUND **	BLOCKING SESSION NOT FOUND	0/701 [0%]	

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ASH Report

Top Events

- Top Events by DB Time
- % Activity is the percentage of DB Time due to the event

Event	Event Class	Session Type	% Activity	Avg Active Sessions
enq: TX - row lock contention	Application	FOREGROUND	40.08	0.15
CPU + Wait for CPU	CPU	BACKGROUND	29.18	0.11
CPU + Wait for CPU	CPU	FOREGROUND	27.24	0.10

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Top Event P1/P2/P3 Values

- Top Events by DB Time and the top P1/P2/P3 values for those events.
- % Event is the percentage of DB Time due to the event
- % Activity is the percentage of DB Time due to the event with the given P1,P2,P3 Values.

Event	% Event	P1, P2, P3 Values	% Activity	Parameter 1	Parameter 2	Parameter 3
enq: TX - row lock contention	40.08	"1415053318","131105","3454"	40.08	name mode	usn<<16 slot sequence	

ADDM Report

ADDM Task ADDM:3582554155_1_275

ADDM Report for Task 'ADDM:3582554155_1_275'

Analysis Period

AWR snapshot range from 274 to 275.
Time period starts at 04-MAR-16 09.00.53 AM
Time period ends at 04-MAR-16 10.00.39 AM

Analysis Target

Database 'V12CR2' with DB ID 3582554155.
Database version 12.1.0.2.0.
ADDM performed an analysis of instance V12CR2, numbered 1 and hosted at strkf36.us.oracle.com.

Activity During the Analysis Period

Total database time was 1591 seconds.
The average number of active sessions was .44.

Summary of Findings

Description	Active Sessions	Recommendations
-----	Percent of Activity	-----
1 Top SQL Statements	.38 86.71	3
2 Row Lock Waits	.29 65.29	1
3 Undersized SGA	.09 20.49	1
4 CPU Usage	.01 1.21	2

ADDM Report

Finding 2: Row Lock Waits

Impact is .29 active sessions, 65.29% of total activity.

SQL statements were found waiting for row lock waits.

Recommendation 1: Application Analysis

Estimated benefit is .29 active sessions, 65.29% of total activity.

Action

Significant row contention was detected in the TABLE "ZSIG.EMP" with object ID 94872. Trace the cause of row contention in the application logic using the given blocked SQL.

Related Object

Database object with ID 94872.

Rationale

The SQL statement with SQL_ID "da2rkdupxvfx0" was blocked on row locks.

Related Object

SQL statement with SQL_ID da2rkdupxvfx0.
update zsig.emp set sal=sal+1

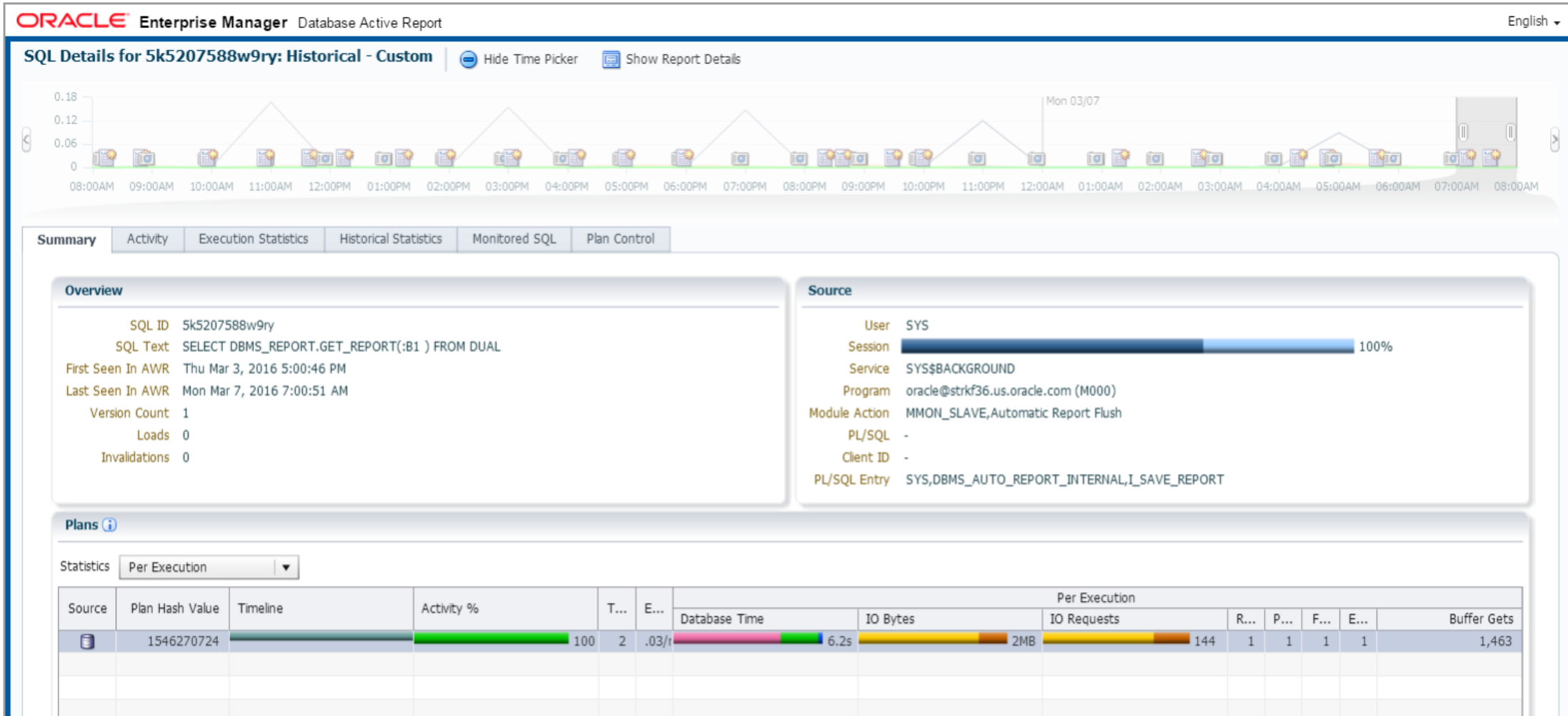
Rationale

The session with ID 20 and serial number 46048 in instance number 1 was the blocking session responsible for 100% of this recommendation's benefit.

Symptoms That Led to the Finding:

Wait class "Application" was consuming significant database time.
Impact is .29 active sessions, 65.29% of total activity.

AWR – active-html Report



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