ORACLE
SUPPORT

Advanced Customer Services

Report of Findings For

TWA

Prepared For

TECHCOMBANK

Prepared by Advanced Customer Services

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Data Collection:	From 20-APR-16 02:00 to 22-APR-16 23:00

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1. Contents

2. Executive Summary

Oracle Advanced Customer Services (ACS) conducted a technical assessment on the Techcombank TWA database hosted on Windows hosts named dc-card-db01, dc-card-db02. There were no changes made to the assessed system. This document recommends changes and identifies specific areas that require investigation that is more detailed.

The Engineered Assessment Performance (EAP) is a remote service that examines a customer system to make high-level performance recommendations and identify critical areas requiring immediate attention.
The goal of the technical assessment of the TWA environment, i.e., host, database, and I/O subsystem, was to identify factors that may be negatively affecting system performance and response time. Performance data was collected from 20-APR-16 02:00 to 22-APR-16 23:00.

Category	Information	Additional Comments
Database	Add multiplex redolog for group 1, 2 and 3	See Redo Transaction Activity
	Drop redundant indexes	See Redundant index
	Table partitioned but index non-partitioned	See Table partitioned but index non-partitioned
	Enable validate or drop DISABLED constraints	See Disable constraint
	Review SQL with high resource usage	See Resource Intensive SQL

Other areas were also identified that can be examined by reviewing the Findings and Recommendations Section in detail.

3. System Reviewed

The following system was reviewed during this engagement:

3.1. Host

Server Name	dc-card-db01, dc-card-db02
Running DB Instances	1
Purpose (Production, development, Q&A)	Production
Platform	Microsoft Windows x86 64-bit
Model	
Operating System	Windows
O/S Version and Release	Windows Server 2008 R2
Cluster Software / Version	N/A
# CPU	16
Processor / CPU Speed	
Memory	95 GB
Volume Manager / Version	ASM

3.2. Database

Database Name	twa
Instance Name	twa1, twa2
RAC-Configuration	No
Machine Name	dc-card-db01, dc-card-db02
RDBMS Version/Release	11.2.0.4.0
Usage (OLTP, DSS, etc.)	OLTP
File System / raw devices	File system
AIO	Yes
Disk Space (of all db files)	Datafiles: 160 GB Tempfiles: 4 GB
Archiving Enabled?	Yes

4. Overview

Unless otherwise noted, all findings are based on data collected from 20-APR-16 02:00 to 22-APR-16 23:00.

4.1. Database Response Time

Within the scope of the RDBMS, Response Time in its simplest form consists of Service Time + Wait Time. Service Time equates to time the request is actively being processed on the CPU, while Wait Time encompasses everything else. Oracle tracks Service Time in views related to system statistics and Wait Time within a set of views collectively known as the Wait Interface. By taking snapshots of the relevant views, deltas can be calculated and analyzed to explain precisely where user response time is being spent.

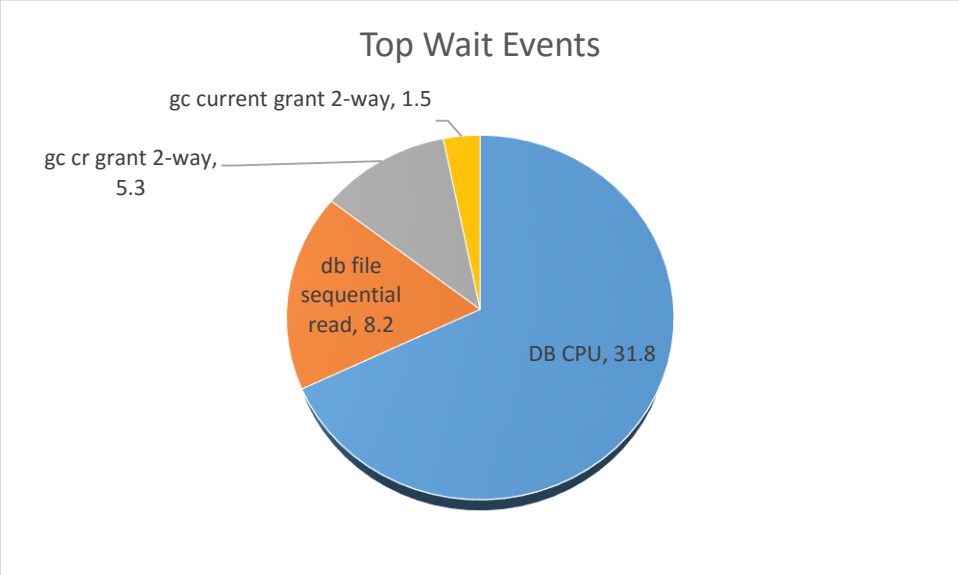

Figure 1: Top Foreground Waits for TWA1

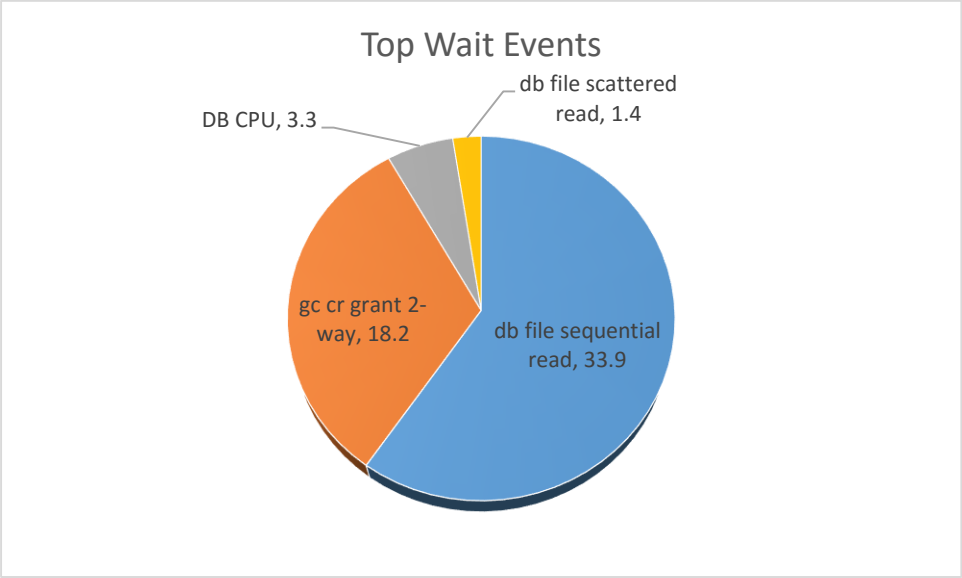

Figure 2: Top Foreground Waits for TWA2

4.2. Connection Balance

It is advisable for Oracle RAC databases to have connections load balanced to make optimum utilization of resources. Given below is connection load balance graph for both the instances.

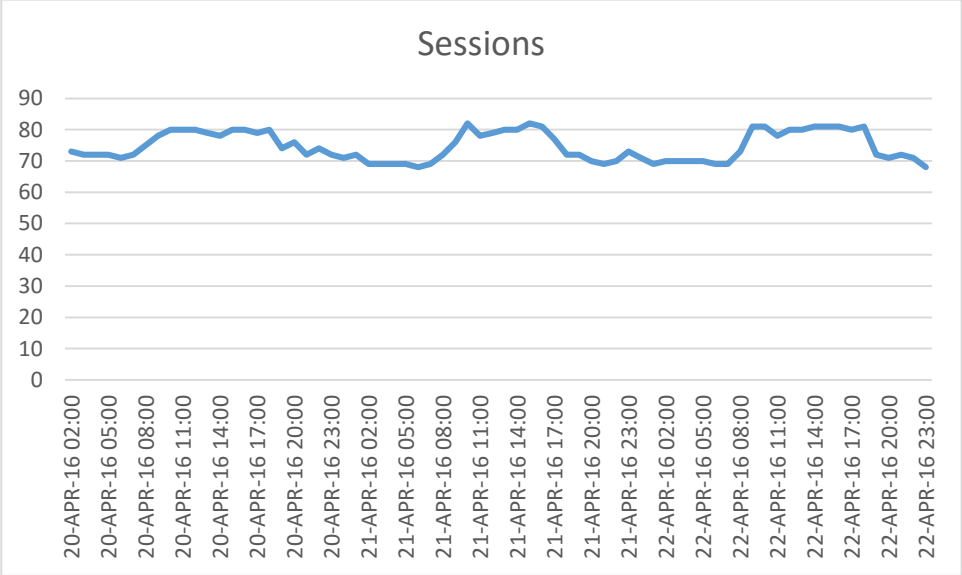

Figure 3: Average Database Sessions for TWA1

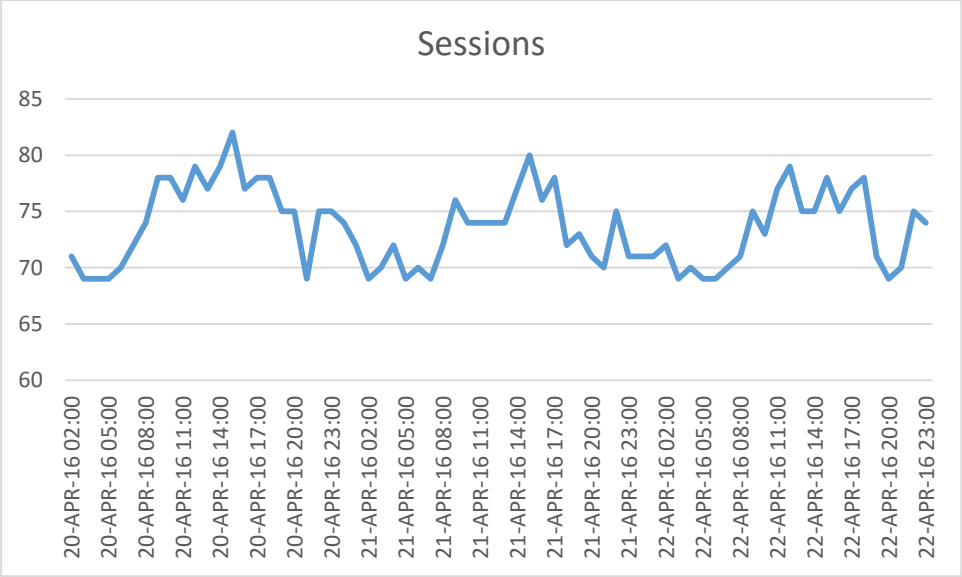

Figure 4: Average Database Sessions for TWA2

Observation: As seen from the data, average number of session is evenly distributed on both the instances. No connection spikes or logon/logoff storms are observed. This indicates that connections are successfully load balanced across all nodes in the cluster.

4.3. Average Active Session

The number of active session show how many users are waiting for Oracle to process it's task. The higher, the more load are put on database server.

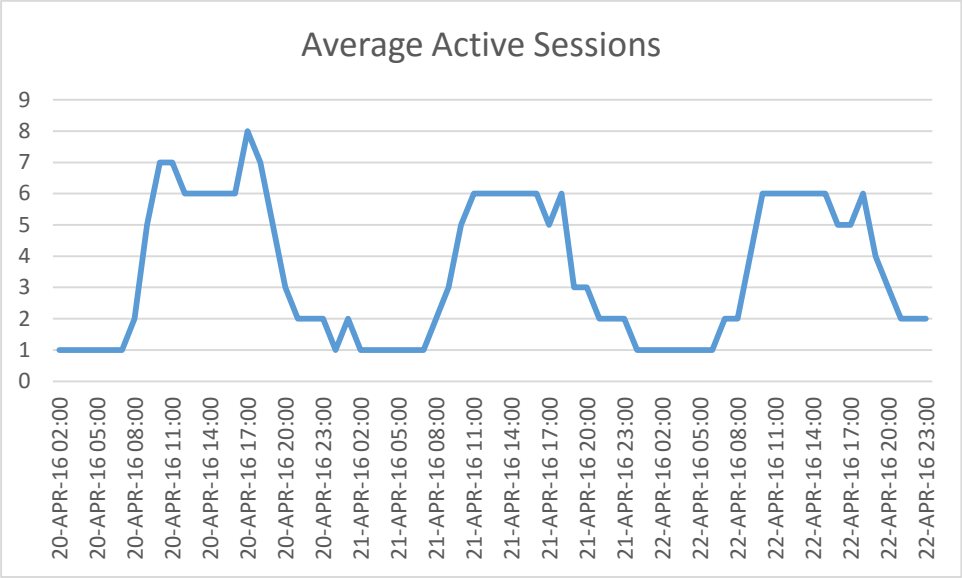

Figure 5: Average Active Sessions for TWA1

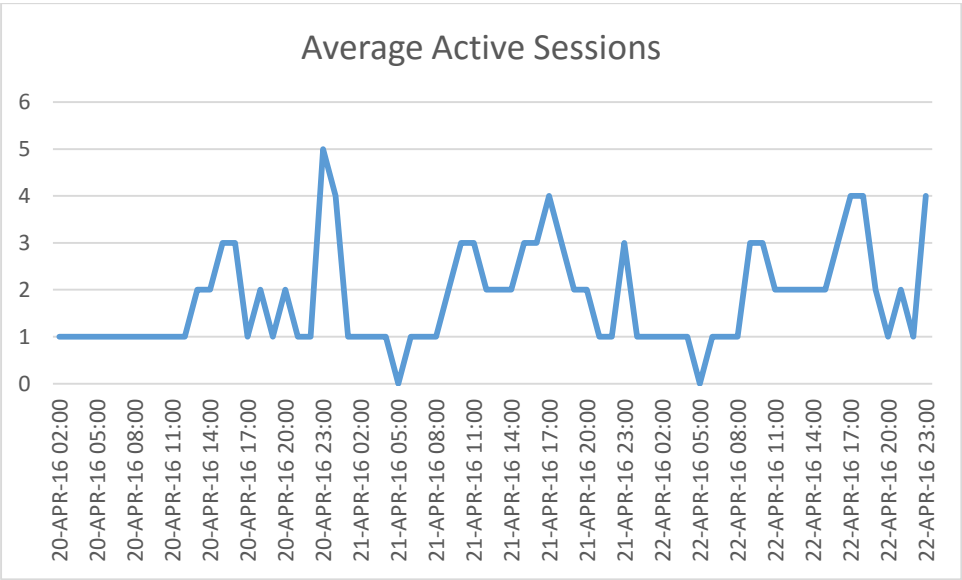

Figure 6: Average Active Sessions for TWA2

Observation: Average active session is within system capacity

4.4. CPU Utilization

CPU capacity is a critical resource that should remain below a sustained rate of seventy percent at nearly all times. Whenever CPU utilization is over this amount, response time and throughput

suffer, particularly if the saturation is sustained. This system was at all times well below seventy percent.

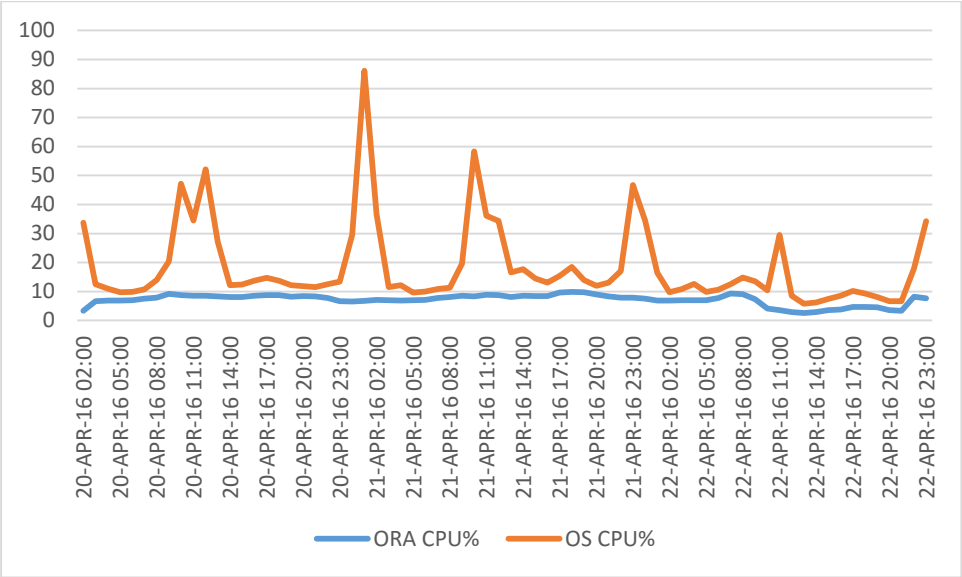

Figure 7: CPU Break Down for TWA1

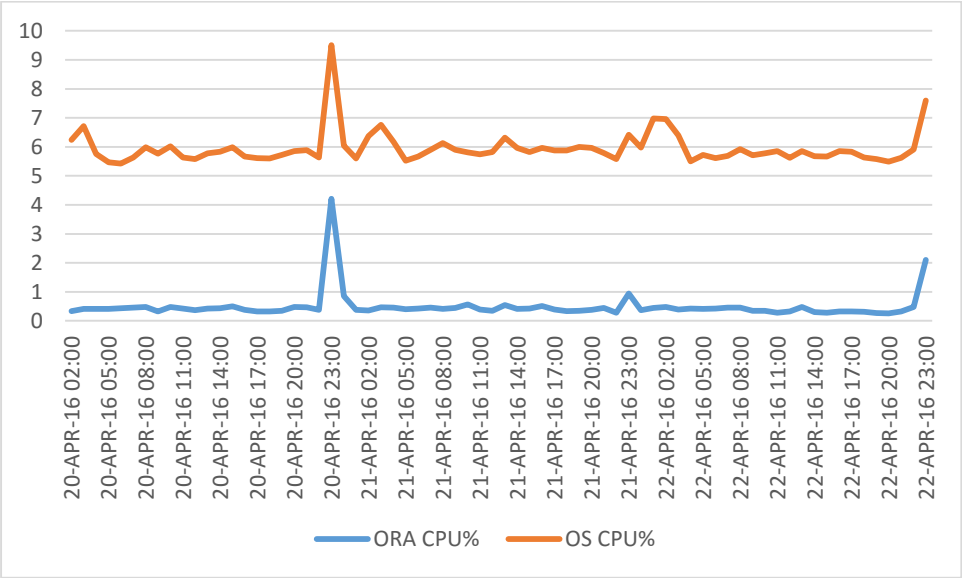

Figure 8: CPU Break Down for TWA2

4.5. Disk IO Activity

Physical Disk IO involves the transfer of data to or from the physical hardware. If a disk is more than 60% busy over sustained periods of time, this can indicate overuse of that resource.

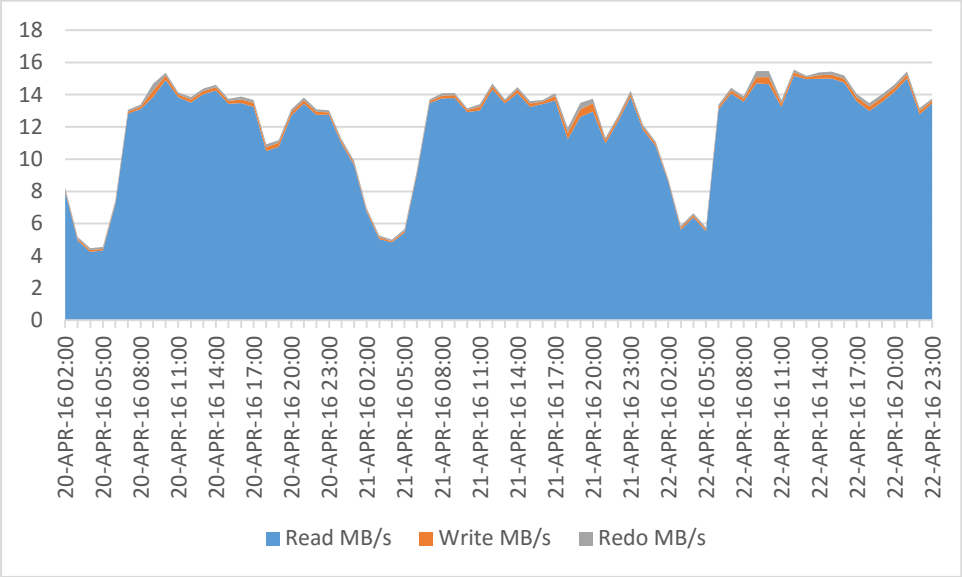

Figure 9: Disk IO for TWA1

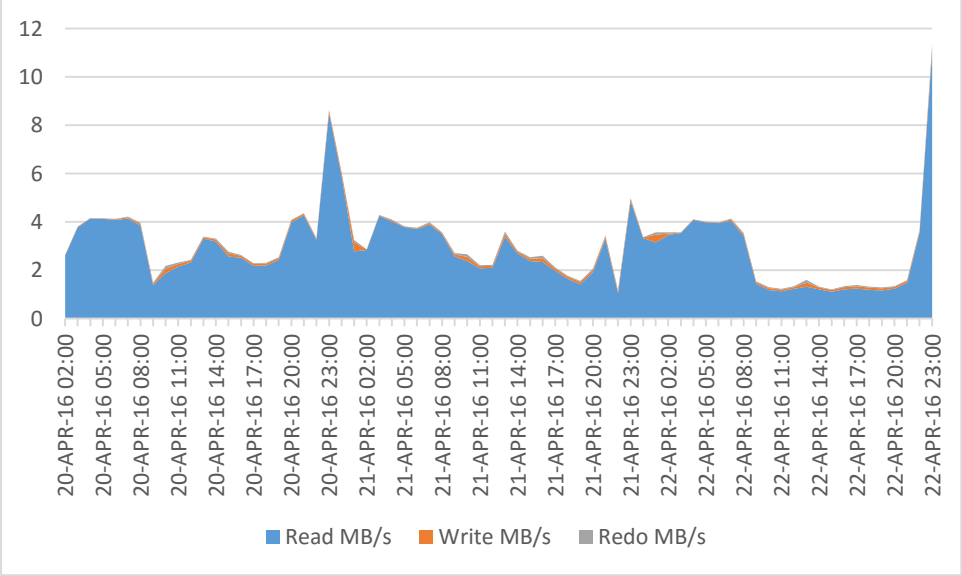

Figure 10: Disk IO for TWA2

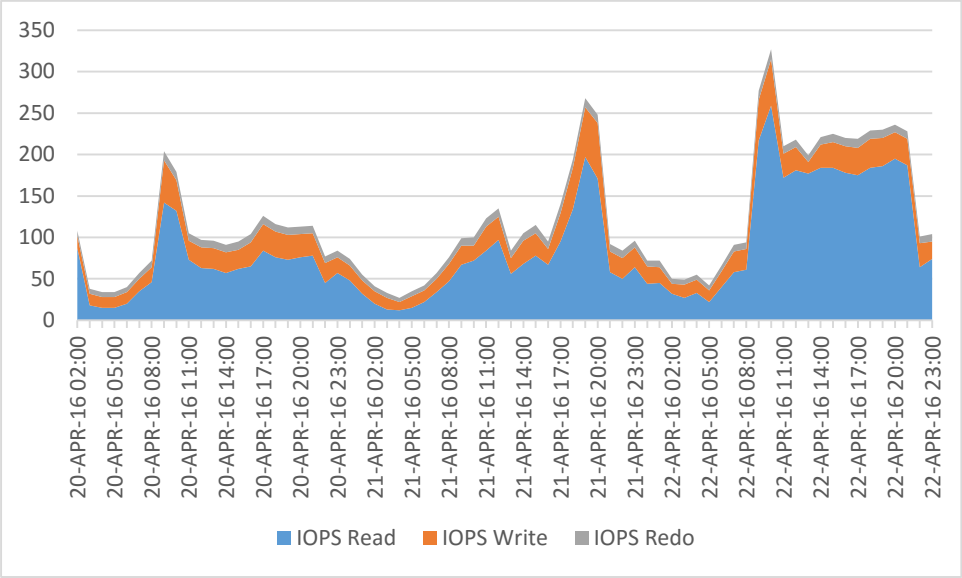

Figure 11: Read , Write Operations per Second (IOPS) for TWA1

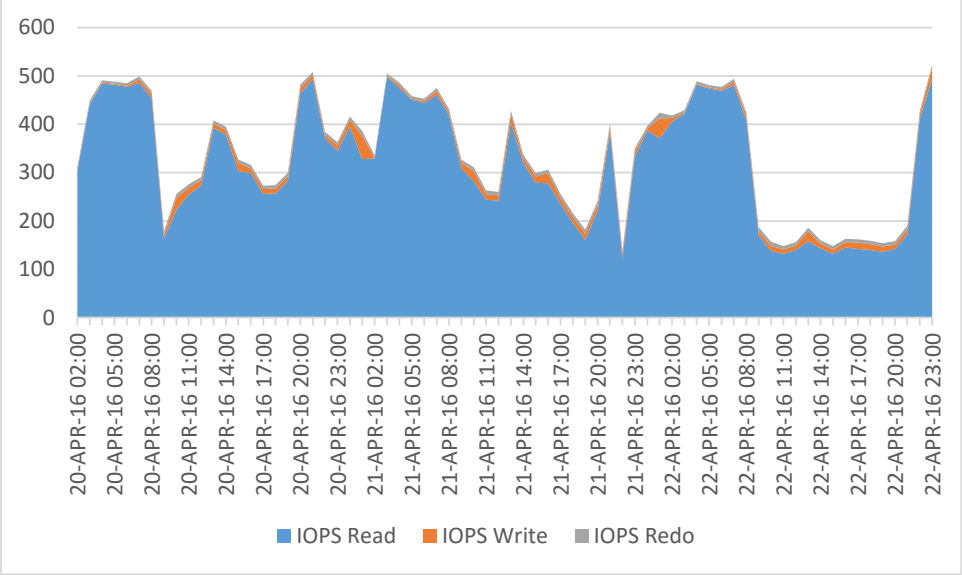

Figure 12: Read , Write Operations per Second (IOPS) for TWA2

4.6. Logical IO

Oracle Logical I/O is defined as whenever the Oracle kernel requests access to an Oracle block in the database buffer cache. If the kernel cannot find a specified Oracle block in the database buffer cache, then the Logical I/O causes physical I/O. Because of this, Logical Reads is a better measurement of internal database activity than Physical Reads. Additionally, Logical Reads do

require resources and affect response time to a much greater extent than once was thought.

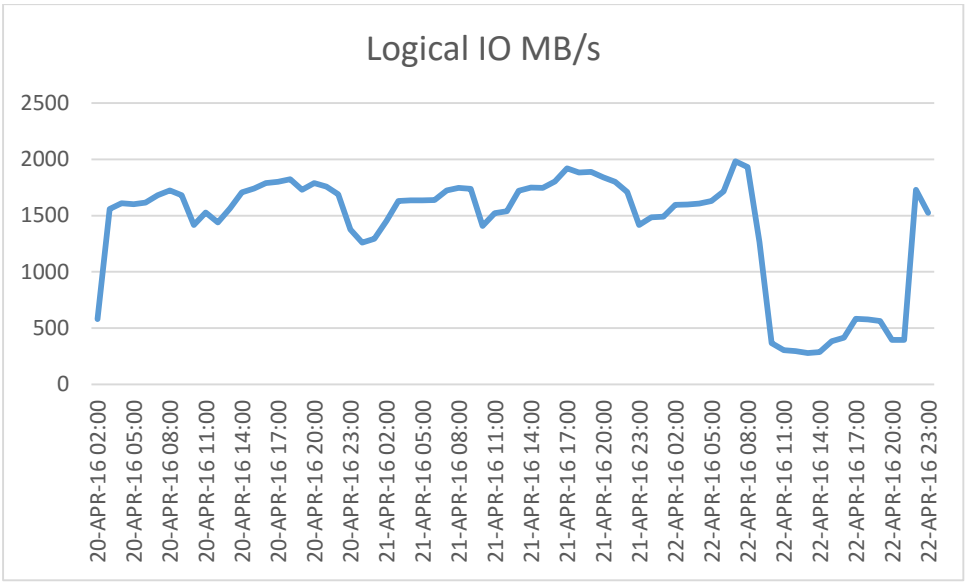

Figure 13: Logical IO for TWA1

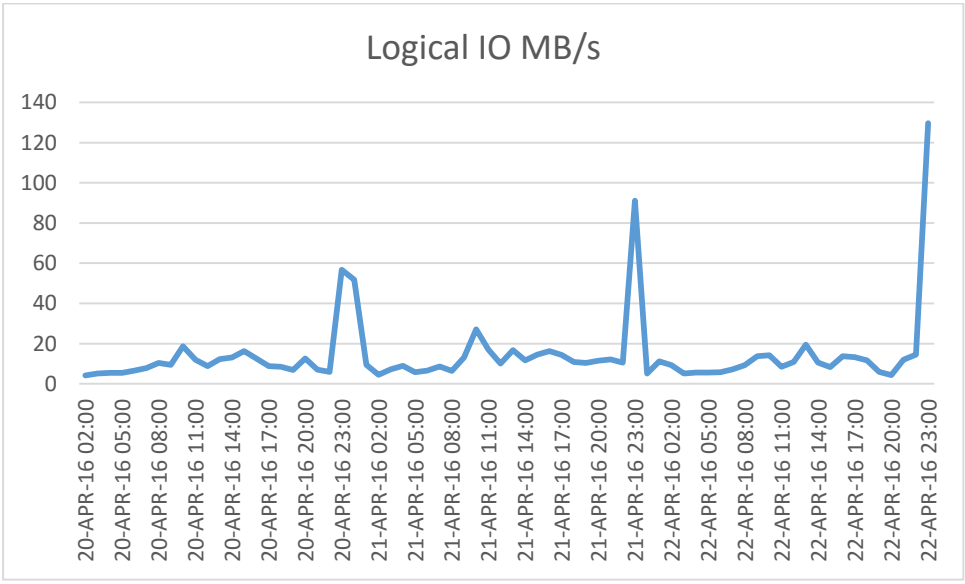

Figure 14: Logical IO for TWA2

4.7. Transactions Rate and User Calls

Peak periods are often defined by the transaction arrival rate. In Oracle, a transaction is defined by a series of operations that result in either a COMMIT operation, or a ROLLBACK operation.

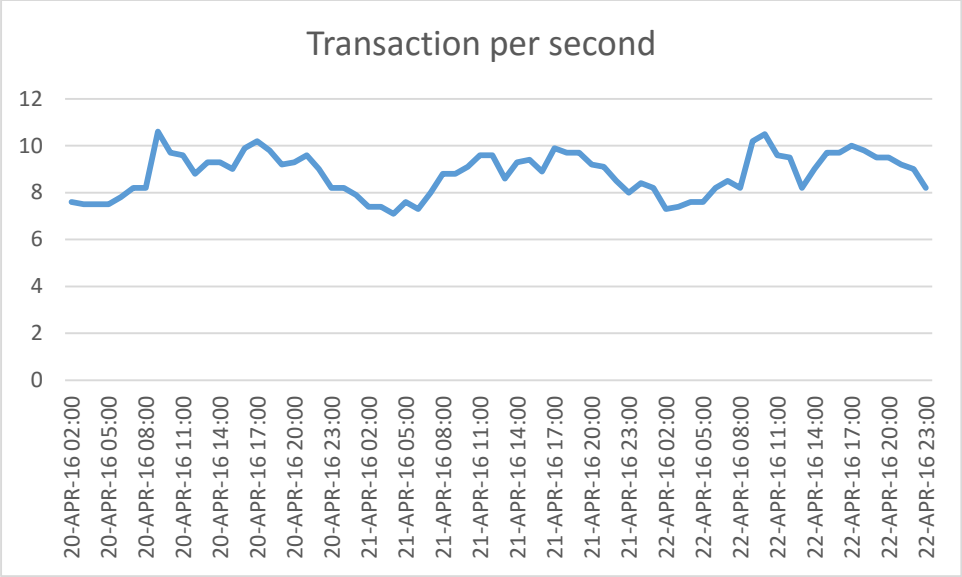

Figure 15: Transactions per Second for TWA1

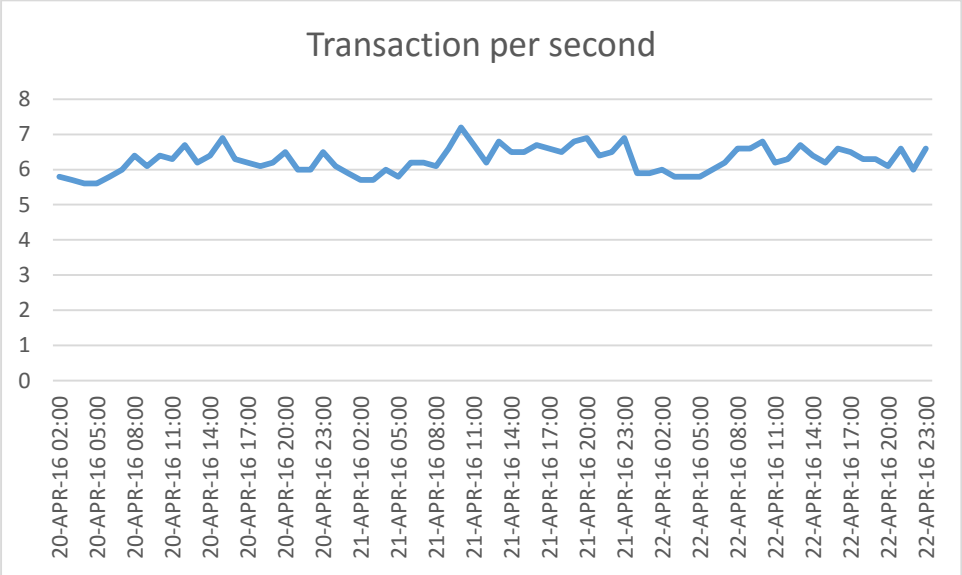

Figure 16: Transactions per Second for TWA2

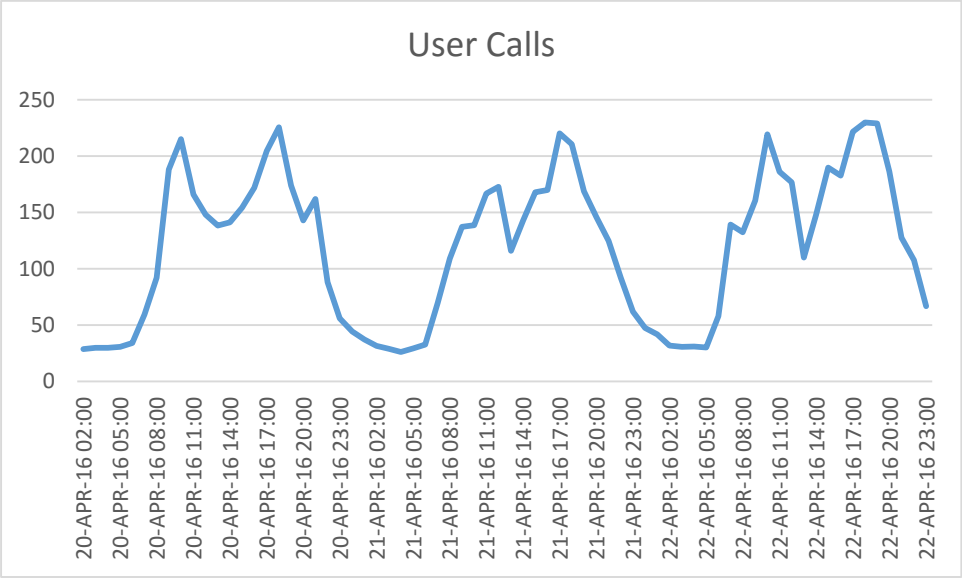

Figure 17: User call per seconds for TWA1

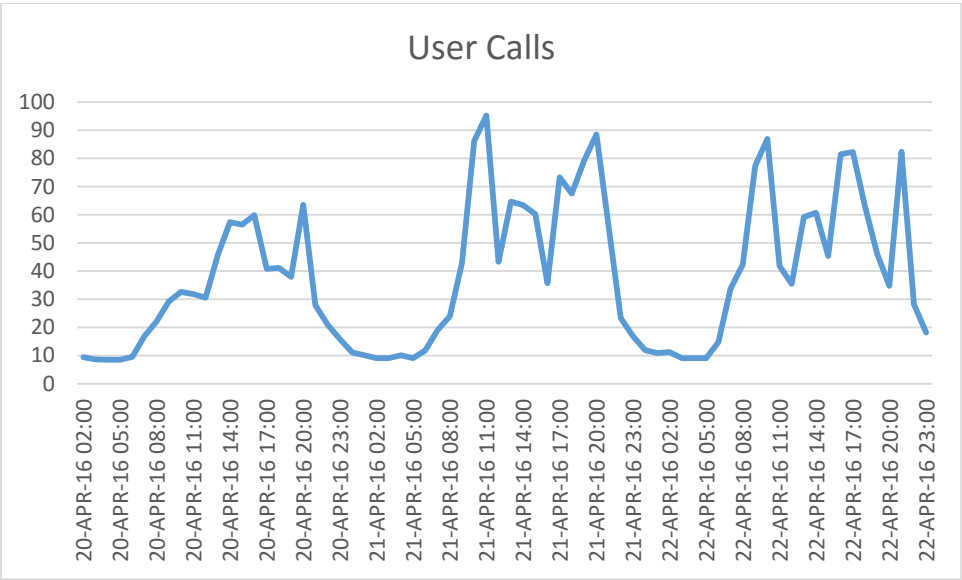

Figure 18: User call per seconds for TWA2

4.8. PGA Memory Statistics

The Program Global Area (PGA) is a memory buffer that contains data and control information for a server process. A PGA is created by Oracle when a server process is started. The information in a PGA depends on the Oracle configuration.
Access to it is exclusive to that server process and is read from and written to only by the Oracle code acting on behalf of it. An example of such information is the runtime area of a cursor. Each time a cursor is executed, a new runtime area is created for that cursor in the PGA memory

region of the server process executing that cursor. Analyze this section helps when using the new model to allocate PGA.

The goal is to have most work areas running with an optimal size (for example, more than 90% or even 100% for pure OLTP systems), while a smaller fraction of them are running with a one-pass size (for example, less than 10%). Multi-pass execution should be avoided. Even for DSS systems running large sorts and hash-joins, the memory requirement for the one-pass executions is relatively small. A system configured with a reasonable amount of PGA memory should not need to perform multiple passes over the input data.

Under automatic PGA memory management mode, Oracle honors the PGA_AGGREGATE_TARGET limit by controlling dynamically the amount of PGA memory allotted to SQL database areas. At the same time, Oracle maximizes the performance of all the memory-intensive SQL operators by maximizing the number of database areas that are using an optimal amount of PGA memory (cache memory). The rest of the database areas are executed in one-pass mode, unless the PGA memory limit set by PGA_AGGREGATE_TARGET is so low that multipass execution is required to reduce even more the consumption of PGA memory and honor the PGA target limit.

In 11g, PGA_AGGREGATE_TARGET controls work areas allocated by both dedicated and shared connections.
This metric is computed by Oracle to reflect the performance of the PGA memory component. It is cumulative from instance start-up. A value of 100% means that all work areas executed by the system since instance start-up have used an optimal amount of PGA memory. This is, of course, ideal but rarely happens except maybe for pure OLTP systems. In reality, some work areas run one-pass or even multi-pass, depending on the overall size of the PGA memory. When a work area cannot run optimally, one or more extra passes is performed over the input data. This reduces the cache-hit percentage in proportion to the size of the input data and the number of extra passes performed.

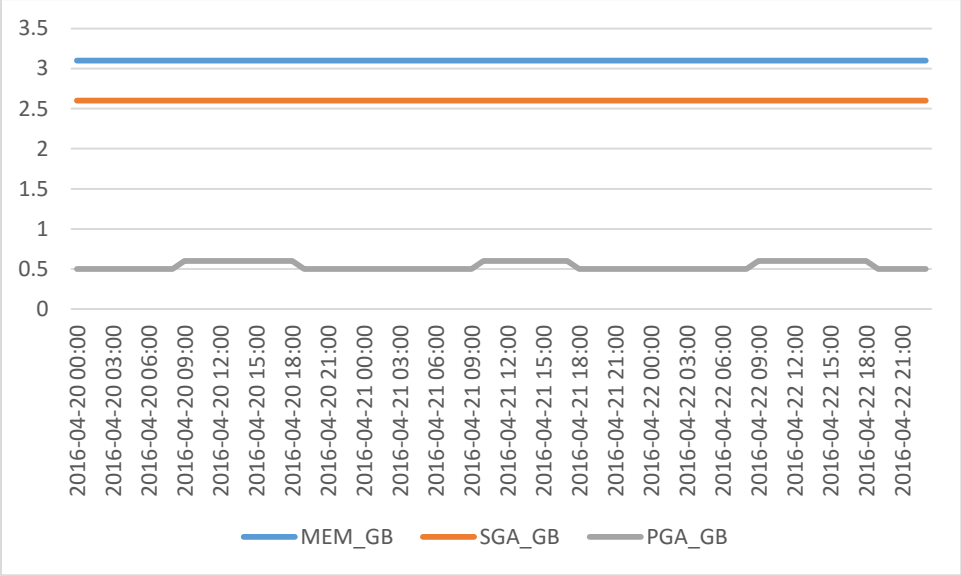

Figure 19: Memory allocated for TWA1

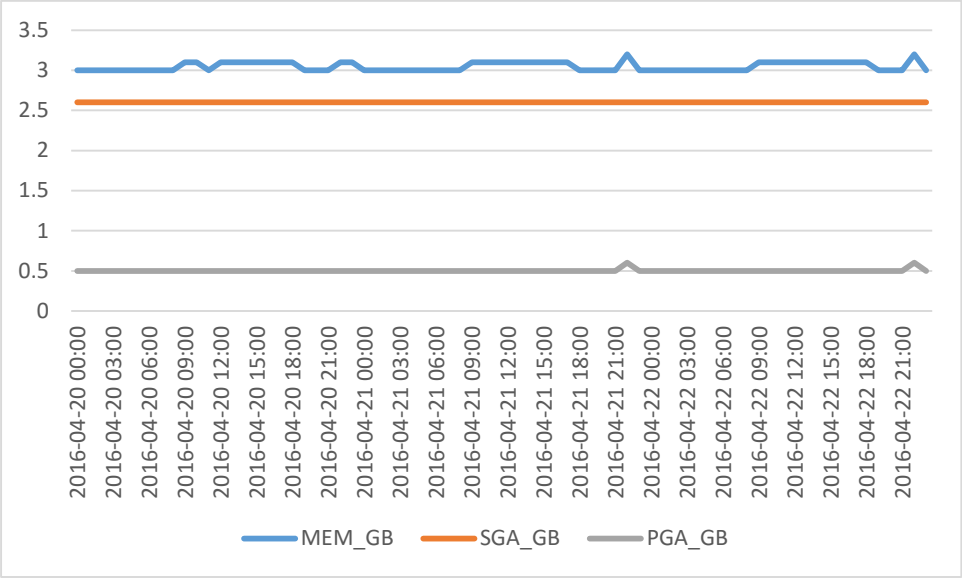

Figure 20: Memory allocated for TWA2

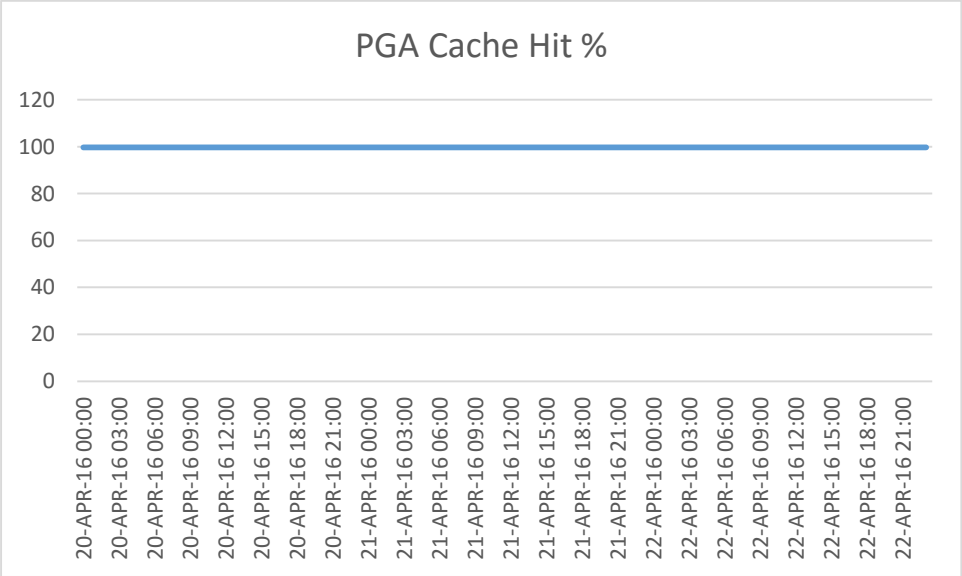

Figure 21: PGA cache hit % for TWA1

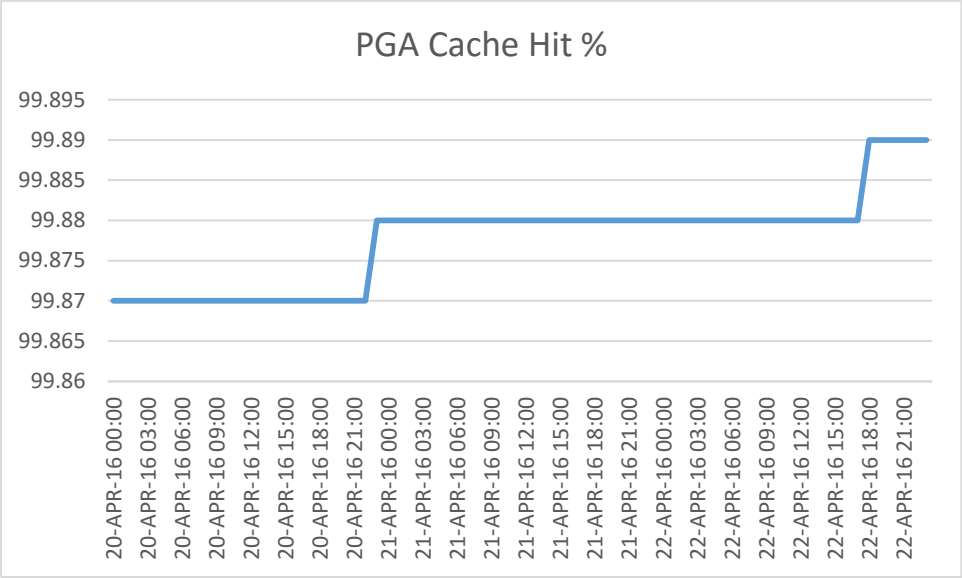

Figure 22: PGA cache hit % for TWA2

Observation:

The current size of PGA is already optimal.

4.9. Redo Transaction Activity

Redo logs contain the transaction data that is created when users submit changes to the database. As each redo log fills to capacity with these changes, it "switches" to the next redo log to continue, while the just filled redo log is then copied by the archiving process. If redo log switching is occurring too frequently, slowdowns may be experienced while waiting on the archiver process to finish, or for redo log space manipulation to occur. Increasing or decreasing the size of the redo logs can easily adjust the rate of switching.

#	GROUP#	MEMBER	SIZE (MB)
1	1	+FRA02/twa/onlinelog/redo01.log	512
2	1	+FRA02/twa/onlinelog/redo01a.log	512
3	2	+FRA02/twa/onlinelog/redo02.log	512
4	2	+FRA02/twa/onlinelog/redo02a.log	512
5	3	+FRA02/twa/onlinelog/redo03.log	512
6	3	+FRA02/twa/onlinelog/redo03a.log	512
7	11	+DATA02/twa/onlinelog/group_11.380.894111627	512
8	11	+FRA02/twa/onlinelog/group_11.389.894111629	512
9	12	+DATA02/twa/onlinelog/group_12.391.894816901	512
10	12	+FRA02/twa/onlinelog/group_12.637.894816901	512

11	13	+DATA02/twa/onlinelog/group_13.379.894844211	512
12	13	+FRA02/twa/onlinelog/group_13.379.894844211	512

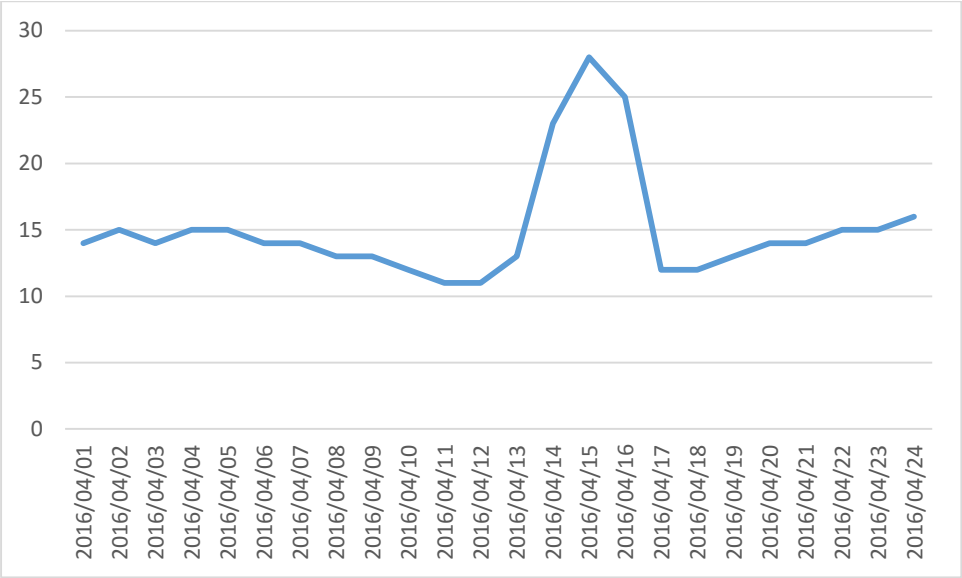

Figure 23: Redo log per day (GB) for TWA1

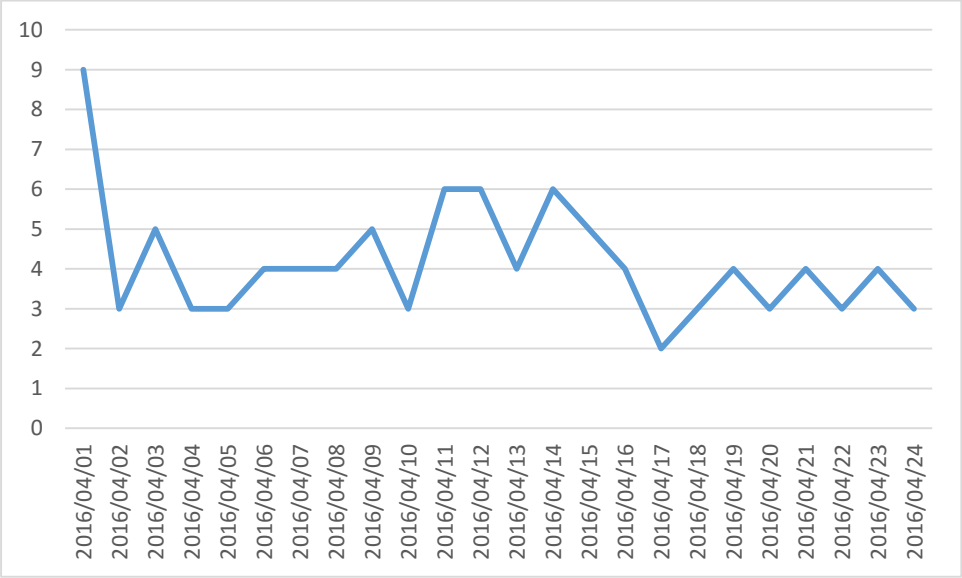

Figure 24: Redo log per day (GB) for TWA2

Recommendation: Redo log group 1, 2 and 3 should be placed on both DATA02 and FRA02 disk group - Oracle recommend 2 members in each redo log group, each belongs to different mount point/disk group.

5. Findings

5.1. Disable constraint

Constraints are used for data integrity and consistency. Disabled constraints can lead to inconsistent data.

#	OWNER	CONSTRAINT NAME	TABLE NAME	STATUS	LAST CHANGE
1	TWA	FK_ENTIRETRAN_ACCOUNT	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
2	TWA	FK_ENTIRETRAN_ACQBINID	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
3	TWA	FK_ENTIRETRAN_ACQBRANCH	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
4	TWA	FK_ENTIRETRAN_ACQINSTITUTION	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
5	TWA	FK_ENTIRETRAN_CARDPRODUCT	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
6	TWA	FK_ENTIRETRAN_CONTRACT	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
7	TWA	FK_ENTIRETRAN_COUNTRY	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
8	TWA	FK_ENTIRETRAN_CURRENCY_ACCT	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
9	TWA	FK_ENTIRETRAN_CURRENCY_AUTH	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
10	TWA	FK_ENTIRETRAN_CURRENCY_ORIG	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
11	TWA	FK_ENTIRETRAN_CURRENCY_SETTL	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
12	TWA	FK_ENTIRETRAN_CUSTOMER	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
13	TWA	FK_ENTIRETRAN_FRAUDCLASS	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
14	TWA	FK_ENTIRETRAN_ISSBINID	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
15	TWA	FK_ENTIRETRAN_ISSBRANCH	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
16	TWA	FK_ENTIRETRAN_ISSINSTITUTION	ENTIRETRAN	DISABLED	2013-06-07/19:50:21
17	TWA	FK_ENTIRETRAN_MRCHCOUNTRY	ENTIRETRAN	DISABLED	2013-06-07/19:50:22
18	TWA	FK_ENTIRETRAN_PANRANGE	ENTIRETRAN	DISABLED	2013-06-07/19:50:22
19	TWA	FK_ENTIRETRAN_PAYMENTSYSTEM	ENTIRETRAN	DISABLED	2013-06-07/19:50:22
20	TWA	FK_ENTIRETRAN_POSCONDITIONCODE	ENTIRETRAN	DISABLED	2013-06-07/19:50:22

21	TWA	FK_ENTIRETRAN_POSENTRYMODE	ENTIRETRAN	DISABLED	2013-06-07/19:50:22
22	TWA	FK_ENTIRETRAN_RESPONSECODE	ENTIRETRAN	DISABLED	2013-06-07/19:50:22
23	TWA	FK_ENTIRETRAN_RETAILER	ENTIRETRAN	DISABLED	2013-06-07/19:50:22
24	TWA	FK_ENTIRETRAN_SIC	ENTIRETRAN	DISABLED	2013-06-07/19:50:22
25	TWA	FK_ENTIRETRAN_TERMINAL	ENTIRETRAN	DISABLED	2013-06-07/19:50:22
26	TWA	FK_ENTIRETRAN_TRANCODE	ENTIRETRAN	DISABLED	2013-06-07/19:50:22
27	TWA	FK_TRAN_ACCOUNT	TRAN	DISABLED	2013-06-07/19:51:49
28	TWA	FK_TRAN_ACQBRANCH	TRAN	DISABLED	2013-06-07/19:51:49
29	TWA	FK_TRAN_ACQINSTITUTION	TRAN	DISABLED	2013-06-07/19:51:49
30	TWA	FK_TRAN_BIN_ACQBINID	TRAN	DISABLED	2013-06-07/19:51:49
31	TWA	FK_TRAN_BIN_ISSBINID	TRAN	DISABLED	2013-06-07/19:51:49
32	TWA	FK_TRAN_CARDPRODUCT	TRAN	DISABLED	2013-06-07/19:51:49
33	TWA	FK_TRAN_CONTRACT	TRAN	DISABLED	2013-06-07/19:51:49
34	TWA	FK_TRAN_COUNTRY	TRAN	DISABLED	2013-06-07/19:51:49
35	TWA	FK_TRAN_CURRENCY_ACCT	TRAN	DISABLED	2013-06-07/19:51:49
36	TWA	FK_TRAN_CURRENCY_AUTH	TRAN	DISABLED	2013-06-07/19:51:49
37	TWA	FK_TRAN_CURRENCY_ORIGINAL	TRAN	DISABLED	2013-06-07/19:51:49
38	TWA	FK_TRAN_CURRENCY_SETTL	TRAN	DISABLED	2013-06-07/19:51:49
39	TWA	FK_TRAN_CUSTOMER	TRAN	DISABLED	2013-06-07/19:51:49
40	TWA	FK_TRAN_FRAUDCLASS	TRAN	DISABLED	2013-06-07/19:51:49
41	TWA	FK_TRAN_ISSBRANCH	TRAN	DISABLED	2013-06-07/19:51:49
42	TWA	FK_TRAN_ISSINSTITUTION	TRAN	DISABLED	2013-06-07/19:51:49
43	TWA	FK_TRAN_MRCHCOUNTRY	TRAN	DISABLED	2013-06-07/19:51:49
44	TWA	FK_TRAN_PANRANGE	TRAN	DISABLED	2013-06-07/19:51:49
45	TWA	FK_TRAN_PAYMENTSYSTEM	TRAN	DISABLED	2013-06-07/19:51:50
46	TWA	FK_TRAN_POSCONDITIONCODE	TRAN	DISABLED	2013-06-07/19:51:49

47	TWA	FK_TRAN_POSENTRYMODE	TRAN	DISABLED	2013-06-07/19:51:49
48	TWA	FK_TRAN_RESPONSECODE	TRAN	DISABLED	2013-06-07/19:51:49
49	TWA	FK_TRAN_RETAILER	TRAN	DISABLED	2013-06-07/19:51:49
50	TWA	FK_TRAN_SIC	TRAN	DISABLED	2013-06-07/19:51:49
51	TWA	FK_TRAN_TERMINAL	TRAN	DISABLED	2013-06-07/19:51:50
52	TWA	FK_TRAN_TRANCODE	TRAN	DISABLED	2013-06-07/19:51:49

Recommendation: Enable validate or drop these constraints.

5.2. Redundant index

These indexes has other superset index which means Oracle can use the superset index:

#	TABLE OWNER	TABLE NAME	REDUNDANT INDEX	SUPERSET INDEX
1	TWA	ALERT2TRAN	IDX_ALERT2TRAN_ALERT (ALERTID)	PK_ALERT2TRAN (ALERTID:TRANDAY:TRANSEQ)
2	TWA	TMP_ACCOUNT2CARD	IDX_TMP_ACCOUNT2CARD_UNIT_CARD (UNITID:PAN:MBR)	PK_TMP_ACCOUNT2CARD (UNITID:PAN:MBR:ACCOUNTID)
3	TWA	TMP_BIN	IDX_TMP_BIN_UNIT (UNITID)	PK_TMP_BIN (UNITID:ID)
4	TWA	TMP_CONTRACTBALANCE	IDX_TMP_CONTRBAL_UNIT_CONTR (UNITID:CONTRACTEXTERNALID)	PK_TMP_CONTRACTBALANCE (UNITID:CONTRACTEXTERNALID:CURRENCY)
5	TWA	TMP_SECRETQUESTIONANSWER	IDX_TMP_SECRETQUESTIONANSWER_U (UNITID:CUSTOMEREXTERNALID)	PK_TMP_SECRETQUESTIONANSWER (UNITID:CUSTOMEREXTERNALID:SECRETQUESTION)
6	TWA	TRAN	IDX_TRAN_DAY (DAY)	IDX_TRAN_DAY_EXTID (DAY:EXTERNALID)
7	TWA	TRAN	IDX_TRAN_DAY (DAY)	IDX_TRAN_DAY_TIME (DAY:TIME)
8	TWA	TRAN	IDX_TRAN_DAY (DAY)	PK_TRAN (DAY:SEQ)

Recommendation: Drop redundant index to reduce overhead on DML & release storage space.

5.3. Table partitioned but index non-partitioned

Tables below are partitioned but some of its index is not partition. This is ineffective as index can not utilize benefit of smaller tree in case index is also partition. Index tree is bigger & when there is maintaining operation, index will be invalid if UPDATE GLOBAL INDEX option is not used.

OWNER	INDEX NAME	TABLE NAME	PARTITIONED
TWA	PK_ENTIRETRAN	ENTIRETRAN	NO
TWA	IDX_TRAN_ACCOUNT_TIME	TRAN	NO
TWA	IDX_TRAN_ACQBIN_TIME	TRAN	NO
TWA	IDX_TRAN_ACQBRANCH_TIME	TRAN	NO
TWA	IDX_TRAN_ACQINSTITUTION_TIME	TRAN	NO
TWA	IDX_TRAN_AGENTRTLR_TIME	TRAN	NO
TWA	IDX_TRAN_AGENTTERM_TIME	TRAN	NO
TWA	IDX_TRAN_ARN_PAN	TRAN	NO
TWA	IDX_TRAN_CARD_TIME	TRAN	NO
TWA	IDX_TRAN_CONTRACT_TIME	TRAN	NO
TWA	IDX_TRAN_CUSTOMER_TIME	TRAN	NO
TWA	IDX_TRAN_EXTID	TRAN	NO
TWA	IDX_TRAN_EXTTERM_TIME	TRAN	NO
TWA	IDX_TRAN_INTTERM_TIME	TRAN	NO
TWA	IDX_TRAN_ISSBIN_TIME	TRAN	NO
TWA	IDX_TRAN_ISSBRANCH_TIME	TRAN	NO
TWA	IDX_TRAN_ISSINSTITUTION_TIME	TRAN	NO
TWA	IDX_TRAN_ISSRANGE_TIME	TRAN	NO
TWA	IDX_TRAN_MERCHANTNAME	TRAN	NO
TWA	IDX_TRAN_MERCH_TIME	TRAN	NO
TWA	IDX_TRAN_RTLR_TIME	TRAN	NO
TWA	IDX_TRAN_SEQ	TRAN	NO
TWA	IDX_TRAN_TERMINALNAME	TRAN	NO
TWA	PK_TRAN	TRAN	NO

Recommendation: Recreate index with LOCAL option.

5.4. Resource Intensive SQL

Any effort of improving performance must involve reviewing the actual SQL code that is submitted in transactions to determine if it can be optimized. The largest performance improvements usually come from tuning the actual code, not from adjusting database parameters. It is important to periodically extract the most resource intensive SQL and examine it for improvement opportunities.

Following SQL statements should be tuned to gain maximum benefits.

5.4.1. SQL ID 066hwnn15skr4 - Module flora.exe

```
Select SEQ, DAY
from
    (Select SEQ, DAY, ROWNUM as N
     from
         (Select /*+ index_desc(DBP_T1 IDX_TRAN_RTLR_TIME) */ DBP_T1.SEQ SEQ,
              DBP_T1.DAY DAY
          from TRAN DBP_T1,
              (Select /*+ index(Tran PK_TRAN) */ *
               from Tran
               where
                   Day = :eq_par_7
                   and Seq = :eq_par_8) This
          where
              (DBP_T1.TIME >= :eq_par_3 and DBP_T1.TIME <= :eq_par_4)
              and DBP_T1.RETAILERID = :eq_par_5
              and DBP_T1.SEQ <> :eq_par_8
              and ((DBP_T1.TRANCODE IN (110) AND DBP_T1.ACQBIN = '888899' AND
DBP_T1.TRANTYPE <> 420 ))
          order by DBP_T1.TIME desc)
      where
          ROWNUM <= :eq_par_6)
where N = :eq_par_6;
```

```
Plan hash value: 88224157

-----------------------------------------------------------------------------------------------------------------
| Id  | Operation                                | Name               | Rows  | Bytes | Cost (%CPU)| Time     | Pstart| Pstop |
-----------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT                         |                    |       |       |    17 (100)|          |       |       |
|   1 |  VIEW                                    |                    |     1 |    35 |    17   (0)| 00:00:01 |       |       |
|   2 |   COUNT STOPKEY                          |                    |       |       |            |          |       |       |
|   3 |    VIEW                                  |                    |     2 |    44 |    17   (0)| 00:00:01 |       |       |
|   4 |     FILTER                               |                    |       |       |            |          |       |       |
|   5 |      NESTED LOOPS                        |                    |     2 |   116 |    17   (0)| 00:00:01 |       |       |
|   6 |       INDEX UNIQUE SCAN                  | PK_TRAN            |     1 |    15 |     2   (0)| 00:00:01 |       |       |
|   7 |       TABLE ACCESS BY GLOBAL INDEX ROWID| TRAN               |     2 |    86 |    15   (0)| 00:00:01 | ROWID | ROWID |
|   8 |        INDEX RANGE SCAN DESCENDING       | IDX_TRAN_RTLR_TIME |    15 |       |     2   (0)| 00:00:01 |       |       |
-----------------------------------------------------------------------------------------------------------------
```

Stat Name	Statement Total	Per Execution	% Snap Total
Elapsed Time (ms)	517,081,724	2,028.71	19.96
CPU Time (ms)	450,589,888	1,767.84	60.27
Executions	254,882		
Buffer Gets	63,032,031,754	247,298.87	76.51
Disk Reads	43,060,090	168.94	5.78
Parse Calls	56	0.00	0.00
Rows	14,475	0.06	

The plan is not effective as it filter RETAILERID of table TRAN, then filter by TIME in range but with RETAILERID = 3434, almost all rows is selected.

Verify data with this SQL:

```
SELECT COUNT (*) FROM TRAN
WHERE   TRUNC(TIME) <> DAY;
```
< no row return >

This means column DAY is actually TRUNC(TIME) – get only date value.
Table TRAN is partitioned by DAY, one partition per day.

To utilize partition pruning, recreate index IDX_TRAN_RTLR_TIME as LOCAL index & add this condition to SQL:

```
(DBP_T1.DAY >= :eq_par_3 and DBP_T1.DAY <= :eq_par_4 )
```

This will not change meaning of the SQL because it is the same as condition related to TIME, but it let Oracle knows which partition has required data.

```
SELECT SEQ, DAY
FROM
    (SELECT SEQ, DAY, ROWNUM AS N
     FROM
         (SELECT /*+ index_desc(DBP_T1 IDX_TRAN_RTLR_TIME) */

             DBP_T1.SEQ SEQ, DBP_T1.DAY DAY
          FROM TRAN DBP_T1,
             (SELECT /*+ index(Tran PK_TRAN) */
                    *
              FROM Tran
              WHERE
                  Day = :eq_par_7
                  AND Seq = :eq_par_8) This
          WHERE
             ( DBP_T1.DAY >= :eq_par_3 AND DBP_T1.DAY <= :eq_par_4)
             AND ( DBP_T1.TIME >= :eq_par_3 AND DBP_T1.TIME <= :eq_par_4)
             AND DBP_T1.RETAILERID = :eq_par_5
             AND DBP_T1.SEQ <> :eq_par_8
             AND ( ( DBP_T1.TRANCODE IN (110) AND DBP_T1.ACQBIN = '888899' AND
DBP_T1.TRANTYPE <> 420))
          ORDER BY DBP_T1.TIME DESC)
     WHERE
         ROWNUM <= :eq_par_6)
WHERE N = :eq_par_6;
```

Recommendation: Recreate Index as LOCAL & add DAY condition as above.

Other SQLs also has this issue & take large number of resource:

Buffer Gets	Executions	Gets per Exec	%Total	Elapsed Time (s)	%CPU	SQL Id	SQL Module	SQL Text
1,566,286,917	7,898	198,314.37	60.50	13,461.18	99.2	066hwnn15skr4	flora.exe	Select SEQ, DAY from (Select S...
96,716,952	10,213	9,469.98	3.74	693.31	95.1	gzt425wvzchg9	flora.exe	Select SEQ, DAY from (Select S...

96,716,900	10,212	9,470.91	3.74	660.36	98.9	4j1x0xdyaz7hc	flora.exe	Select SEQ, DAY from (Select S...
96,716,775	10,213	9,469.97	3.74	892.61	77.6	5yxndg25krax2	flora.exe	Select SEQ, DAY from (Select S...
96,706,778	10,212	9,469.92	3.74	670.39	98.1	d0b7p2rbh5z8c	flora.exe	Select SEQ, DAY from (Select S...
16,739,287	3,198	5,234.30	0.65	600.97	18.8	7jg2hngajmwpf	flora.exe	Select SEQ, DAY from (Select S...
12,034,640	1,204	9,995.55	0.46	2,083.18	97.1	1zfta4sxc9w8v	flora.exe	select max(ORIGTRANSEQ) from T...

SQL ID gzt425wvzchg9:

```
SELECT SEQ, DAY
  FROM (SELECT SEQ, DAY, ROWNUM AS N
          FROM (  SELECT /*+ index_desc(DBP_T1 IDX_TRAN_RTLR_TIME) */
                         DBP_T1.SEQ SEQ, DBP_T1.DAY DAY
                    FROM TRAN DBP_T1,
                         (SELECT /*+ index(Tran PK_TRAN) */
                                 *
                            FROM Tran
                           WHERE Day = :eq_par_7 AND Seq = :eq_par_8) This
                   WHERE     (    DBP_T1.TIME >= :eq_par_3
                              AND DBP_T1.TIME <= :eq_par_4)
                         AND DBP_T1.RETAILERID = :eq_par_5
                         AND DBP_T1.SEQ <> :eq_par_8
                         AND ( (    DBP_T1.TRANCODE IN (110,
                                                        113,
                                                        115,
                                                        145)
                                AND DBP_T1.ACQBIN = '888899'
                                AND DBP_T1.TRANTYPE <> 420))
                ORDER BY DBP_T1.TIME DESC)
         WHERE ROWNUM <= :eq_par_6)
 WHERE N = :eq_par_6
```

Appendix 1 – Other Documentation

MTS and Large Pool:

Note:62140.1	Fundamentals of the Large Pool
Note:268581.1	Obsolete / Deprecated Initialization Parameters in 10G

Checkpoints:

Note:265831.1	Automatic Checkpoint Tuning in 10g
Note:274264.1	REDO LOGS SIZING ADVISORY in 10g

Statistics:

Note: 266040.1	Automatic statistics Gathering in oracle 10G
Note: 252597.1	Relation between Table Monitoring and STATISTICS_LEVEL parameter in 10g
Note:281790.1	Oracle Database 10g DBMS_STATS Package FORCE argument
Note: 283890.1	Oracle Database 10g Locking Statistics

Locally Managed Tablespaces:

Note:93771.1	Introduction to Locally-Managed Tablespaces
Note:262472.1	10g: BIGFILE Type Tablespaces Versus SMALLFILE Type

Tuning CPU Resources

Note: 33824.1	Statistic - recursive cpu usage
Note: 164768.1	Diagnosing High CPU Utilization
Note: 33828.1	Statistic - cpu used by this session (Reference Note)
Note: 33854.1	Statistic - parse time elapsed (Reference Note)
Note: 33853.1	Statistic - parse time cpu (Reference Note)
Note: 33828.1	Statistic - cpu used by this session (Reference Note)
Note: 276103.1	PERFORMANCE TUNING USING 10g ADVISORS AND MANAGEABILITY FEATURES

MTS and Large Pool:

Tuning I/O

Note: 30286.1	I/O Tuning with Different RAID Configurations
Note: 1037322.6	WHAT IS THE DB_FILE_MULTIBLOCK_READ_COUNT PARAMETER
Note: 148342.1	Avoiding I/O Disk Contention
Note: 245055.1	Oracle Database 10g Enhanced wait model
Note: 272360.1	Tablespace Groups for SQL Operations in 10g
Note: 242090.1	10g NEW FEATURE on SEGMENT SHRINK

Optimizing SQL Statements

Note: 10585.1	Query and Application Tuning using Explain and TKProf
Note: 163563.1	START POINT: My Query runs slowly
Note: 33089.1	TROUBLESHOOTING GUIDE: SQL Tuning
Note: 67522.1	Why is my index not used?
Note: 69992.1	Why is my hint ignored?
Note: 34558.1	Waitevent - db file scattered read (Reference Note)
Note: 34396.1	Waitevent - SQL*Net message from dblink (Reference Note)
Note: 34559.1	Waitevent - db file sequential read (Reference Note)
Note 259188.1	Oracle10g: Using SQLAccess Advisor (DBMS_ADVISOR) with the Automatic Workload Repository
Note: 262687.1	How to use the Sql Tuning Advisor
Note:244192.1	10g NEW FEATURE Automatic Database Diagnostic Monitor (ADDM)
Note:250655.1	How to use the Automatic Database Diagnostic Monitor
Note: 290027.1	Computationally intensive PL/SQL programs run fast on 10G as compared to 9i

Tuning NeTWArk Resources

Note: 44694.1	SQL*Net Packet Sizes (SDU and TDU Parameters)
Note: 1005123.6	Tuning SQL*Net for better performance

MTS and Large Pool:

Tuning Memory

Note: 257643.1	Oracle Database 10g Automated SGA Memory Tuning
Note: 295626.1	How To Use Automatic Shared Memory Management (ASMM) In Oracle10g

Appendix 2 - Methodology

A number of tools and methods were involved in examining and reviewing the systems, and providing the recommendations:

Statspack

Statspack is an Oracle provided utility that collects information and stores the performance statistics data permanently in Oracle tables, which can later be used for reporting and analysis. The data collected can be analyzed using the report provided, which includes an "instance health and load" summary page, high resource SQL statements, as well as the traditional wait events and initialization parameters.

High-Water Mark Viewer

This Excel spreadsheet connects to a local Oracle database via OO4O and extracts high-water mark information on all tables. It then generates an Excel chart that depicts the impact on full table scans.

Oracle Trender

This Excel spreadsheet connects to a local Oracle database via OO4O and extracts information about wait events, statistics etc. Several Excel charts are automatically generated that depict the impact of these events on the overall system.

KM Repository on Oracle Support

KM Repository on Oracle Support is Oracle's electronic delivery of support information. A premier service for all Oracle-supported customers, it has a wealth of white papers, technical bulletins, user forums, Oracle documentation, and is used to open and work Technical Assistance Requests, verify supported configurations, etc. http://support.oracle.com

SAR

SAR is a performance data collection program found on most Unix platforms. It is configurable for interval and duration, and can capture critical CPU and disk performance data.

Remote Diagnostic Agent

The Remote Diagnostic Agent is an Oracle-developed tool that is designed to collect significant amounts of configuration information from both hosts and databases. Primarily used to diagnose problem issues, the information can also be used proactively.

Appendix 3 - Caveats

There are several potential issues with a health check of this nature.

- The data held internally in SYS or SYSTEM tables and views can be tainted by issues that are now rectified. For example, a database has been running for 4 weeks with a frequently executed query resulting in an expensive full table scan against a 1 million block table. Just prior to the health check a unique index was added to this table resulting in all queries using a unique index lookup. V$SYSTEM_EVENT would probably still show that too many db file scattered read' waits had occurred, and the original queries against that table are likely in the top x queries ordered by buffer gets/physical reads, yet the issue has now been rectified.

- Several of the findings in this document are based on ratios. These are not always a solid basis for analyzing a particular component's performance. Using the frequently quoted buffer cache example, a database can have 5 sql statements that constitute 90% of the load. These queries result in full table scans of a relatively large table and are executed frequently so that each full table scan results in mostly logical rather than physical I/Os. The outcome of this scenario might be that the Buffer Cache Hit Ratio is a very nice 99.99%. Say changing the statements to use indexes and altering the application to execute the sql less often resulted in an 80% drop in overall I/Os. Likely the Buffer Cache Hit Ratio has now dropped but the database is much healthier as a result!

- Most importantly, the Performance Review is based on the difference between TWA snapshots of how the database has been performing at particular points in time, based on its load and sql at those times. Reducing the load on the database, for example by reducing logical and physical I/O, or reducing parsing, may negate the need to implement some of the recommendations outlined below. To give an example, the Shared Pool Advisor may be indicating that the shared pool size needs to be increased. However, changing the code to use bind variables instead of literals may increase cursor shareability and therefore free space in the shared pool. Result, shared pool no longer needs resizing so the recommendation now becomes redundant.

- In some cases the 'av rd (ms)' columns in a statspack report can show unusually high numbers - in some cases this can be converted to much more time than there is between snapshots. If this is the case in your existing statspack snapshots, you may need to apply patch 4942939.