SESSION 2 → DYNAMIC MEMORY MANAGEMENT & STARTUP STAGES

You use MOBAXTERM tool to open NEW SSH session and connect to your provided VM server with your PORT (as user oracle).
Password is PSmgi30

```
The Oracle base remains unchanged with value /opt/oracle
[oracle@oracloud12c ~]$ whoami
oracle
[oracle@oracloud12c ~]$ pwd
/home/oracle
```

Let's login to SQL*PLUS command line tool as super-user SYSDBA

```
[oracle@oracloud12c ~]$ sqlplus / as sysdba

SQL*Plus: Release 12.1.0.2.0 Production on Fri Dec 29 10:30:00 2017

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Connected to an idle instance.
```

Our Instance student is NOT running. Let's open it by using SPFILE.

```
SQL> STARTUP;
ORACLE instance started.

Total System Global Area 4127195136 bytes
Fixed Size                  2932144 bytes
Variable Size            2147484240 bytes
Database Buffers         1962934272 bytes
Redo Buffers               13844480 bytes
Database mounted.
Database opened.

SQL> SHOW PARAMETER TARGET

NAME                                 TYPE        VALUE
------------------------------------ ----------- -------
archive_lag_target                   integer     0
db_big_table_cache_percent_target    string      0
db_flashback_retention_target        integer     1440
fast_start_io_target                 integer     0
fast_start_mttr_target               integer     0
memory_max_target                    big integer 3936M
memory_target                        big integer 3936M
parallel_servers_target              integer     8
pga_aggregate_target                 big integer 0
sga_target                           big integer 0
```

SPFILE is using AMM (AUTO MEMORY MGMT) because MEMORY_TARGET>0 and SGA_TARGET=0

```
SQL> alter system set memory_max_target=2048M;
alter system set memory_max_target=2048M
                 *
ERROR at line 1:
ORA-02095: specified initialization parameter cannot be modified

SQL> alter system set memory_max_target=2048M SCOPE=SPFILE;

System altered.
```

This parameter is STATIC and may be changed only with the scope of SPFILE, i.e that change will be effective only after the next startup

```
SQL> alter system set memory_target=2048M;

System altered.

SQL> alter system set memory_target=1536M SCOPE=SPFILE;

System altered.
```

This parameter is DYNAMIC, so I could change it right now (to value of 2G) and also I can reduce it to 1.5G after the next startup

```
SQL> SHOW PARAMETER TARGET

NAME                                 TYPE        VALUE
------------------------------------ ----------- ------------
archive_lag_target                   integer     0
db_big_table_cache_percent_target    string      0
db_flashback_retention_target        integer     1440
fast_start_io_target                 integer     0
fast_start_mttr_target               integer     0
memory_max_target                    big integer 3936M
memory_target                        big integer 2G
parallel_servers_target              integer     8
pga_aggregate_target                 big integer 0
sga_target                           big integer 0

SQL> SHUTDOWN IMMEDIATE;
Database closed.
Database dismounted.
ORACLE instance shut down.

SQL> STARTUP;
ORACLE instance started.

Total System Global Area 2147483648 bytes
Fixed Size                  2926472 bytes
Variable Size            1577060472 bytes
Database Buffers          553648128 bytes
Redo Buffers               13848576 bytes
Database mounted.
Database opened.
```

```
SQL> SHOW PARAMETER TARGET

NAME                                 TYPE        VALUE
------------------------------------ ----------- -------------
archive_lag_target                   integer     0
db_big_table_cache_percent_target    string      0
db_flashback_retention_target        integer     1440
fast_start_io_target                 integer     0
fast_start_mttr_target               integer     0
memory_max_target                    big integer 2G
memory_target                        big integer 1536M
parallel_servers_target              integer     8
pga_aggregate_target                 big integer 0
sga_target                           big integer 0
```

Let's change values for SGA and PGA targets. If we still have MEMORY_TARGET>0 that would mean that these values would serve as MINIMAL values in AMM (AUTO MEMORY MGMT)

```
SQL> ALTER SYSTEM SET SGA_TARGET=1024M;

System altered.

SQL> ALTER SYSTEM SET PGA_AGGREGATE_TARGET= 256M;

System altered.

SQL>  SHOW PARAMETER TARGET

NAME                                 TYPE        VALUE
------------------------------------ ----------- ---------------
archive_lag_target                   integer     0
db_big_table_cache_percent_target    string      0
db_flashback_retention_target        integer     1440
fast_start_io_target                 integer     0
fast_start_mttr_target               integer     0
memory_max_target                    big integer 2G
memory_target                        big integer 1536M
parallel_servers_target              integer     8
pga_aggregate_target                 big integer 256M
sga_target                           big integer 1G

SQL> alter system set memory_target=0;

System altered.

SQL> ALTER SYSTEM SET MEMORY_MAX_TARGET=0 SCOPE=SPFILE;
System altered.
```

These two commands will turn off the AMM and establish the ASMM (AUTO SGA MEMORY MGMT), for we set the values for SGA and PGA target

```
SQL> SHOW PARAMETER TARGET

NAME                                 TYPE        VALUE
------------------------------------ ----------- ------------
archive_lag_target                   integer     0
db_big_table_cache_percent_target    string      0
db_flashback_retention_target        integer     1440
fast_start_io_target                 integer     0
fast_start_mttr_target               integer     0
memory_max_target                    big integer 2G
memory_target                        big integer 0
parallel_servers_target              integer     8
pga_aggregate_target                 big integer 512M
sga_target                           big integer 1G

SQL> SHUTDOWN IMMEDIATE;
Database closed.
Database dismounted.
ORACLE instance shut down.

SQL> STARTUP;
ORACLE instance started.

Total System Global Area 1073741824 bytes
Fixed Size                  2932632 bytes
Variable Size             377487464 bytes
Database Buffers          687865856 bytes
Redo Buffers                5455872 bytes
Database mounted.
Database opened.

SQL> SHOW PARAMETER TARGET

NAME                                 TYPE        VALUE
------------------------------------ ----------- -----------
archive_lag_target                   integer     0
db_big_table_cache_percent_target    string      0
db_flashback_retention_target        integer     1440
fast_start_io_target                 integer     0
fast_start_mttr_target               integer     0
memory_max_target                    big integer 0
memory_target                        big integer 0
parallel_servers_target              integer     8
pga_aggregate_target                 big integer 512M
sga_target                           big integer 1G

SQL> ALTER SYSTEM SET PGA_AGGREGATE_TARGET= 256M;

System altered.
```

```
SQL>  SHOW PARAMETER TARGET

NAME                                 TYPE        VALUE
------------------------------------ ----------- ---------------
archive_lag_target                   integer     0
db_big_table_cache_percent_target    string      0
db_flashback_retention_target        integer     1440
fast_start_io_target                 integer     0
fast_start_mttr_target               integer     0
memory_max_target                    big integer 0
memory_target                        big integer 0
parallel_servers_target              integer     8
pga_aggregate_target                 big integer 256M
sga_target                           big integer 1G

SQL> SHUTDOWN IMMEDIATE;
Database closed.
Database dismounted.
ORACLE instance shut down.

SQL> EXIT

oracle@oracloud12c ~]$ pwd
/home/oracle
[oracle@oracloud12c ~]$ cd /opt/oracle/admin/student
[oracle@oracloud12c student]$ ls -l
total 152
drwxr-x---. 2 oracle dba 143360 Dec 25 06:02 adump
drwxr-x---. 2 oracle dba   4096 Jul 24 11:33 dpdump
drwxr-x---. 2 oracle dba   4096 Dec 18 10:59 pfile
drwxr-x---. 2 oracle dba   4096 Jul 24 11:31 xdb_wallet

[oracle@oracloud12c student]$ cd pfile
[oracle@oracloud12c student]$ pwd
/opt/oracle/admin/student/pfile

     We will login to SQL from here, our PFILE sits in this folder

[oracle@oracloud12c pfile]$ sqlplus / as sysdba

SQL*Plus: Release 12.1.0.2.0 Production on Mon Dec 25 11:15:01 2017
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Connected to an idle instance.  <-Our Instance is NOT running (

SQL> set pagesize 120
SQL> set linesize 120


SQL> STARTUP PFILE=initstudent.ora;
ORACLE instance started.
```
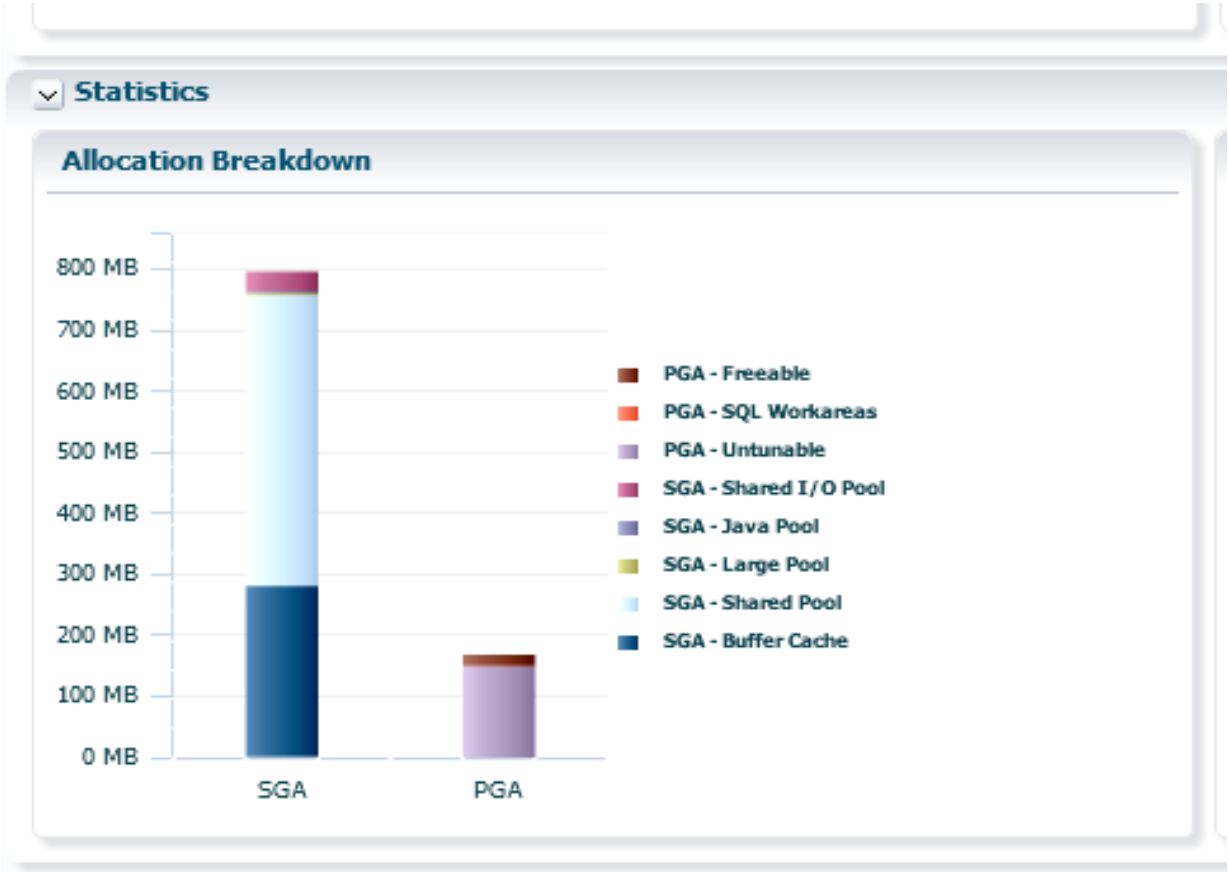

```
Total System Global Area  843055104 bytes
Fixed Size                   2929984 bytes
Variable Size              327158464 bytes
Database Buffers           507510784 bytes
Redo Buffers                 5455872 bytes
Database mounted.
Database opened.

SQL> SELECT name, open_mode FROM V$DATABASE;

NAME      OPEN_MODE
--------- --------------------   our Database student is OPEN to WRITE
STUDENT   READ WRITE

SQL> SHOW PARAMETER SPFILE

NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
spfile                               string
       Database was opened with PFILE (SPFILE value is blank)

SQL> SHOW PARAMETER TARGET

NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
archive_lag_target                   integer     0
db_big_table_cache_percent_target    string      0
db_flashback_retention_target        integer     1440
fast_start_io_target                 integer     0
fast_start_mttr_target               integer     0
memory_max_target                    big integer 0
memory_target                        big integer 0
parallel_servers_target              integer     32
pga_aggregate_target                 big integer 220M
sga_target                           big integer 804M

  We use ASMM option (AUTO SGA MEMORY MGMT)-- SGA and PGA targets are
set to values >0 and MEMORY_TARGET=0

SQL> SHOW PARAMETER LOG_BUFFER
NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
log_buffer                           big integer 5064K
```



DB was open with PFILE and the ASMM (AUTO SHARED MEMORY MGMT) option is turned ON by setting SGA_TARGET and PGA_AGGREGATE_TARGET > 0

I will open my **DATABASE EXPRESS** tool with http://myvmlab.senecacollege.ca:XXXX/em then we go for the CONFIGURATION page and MEMORY option

The current (active) values for Buffer Cache, Shared Pool, Java pool and PGA areas may be seen only through **Statistics page** → these values are approximately as shown in two bar graphs above.

DB_CACHE_SIZE **280M**
SHARED_POOL_SIZE **520M** (incl. SHARED I/O POOL)
JAVA POOL **0**
PGA (all 3 areas) **172M** ######

Let's manually change some SGA values !!!

```
SQL> ALTER SYSTEM SET SHARED_POOL_SIZE=300M;

System altered.
SQL> ALTER  SYSTEM SET DB_CACHE_SIZE=200M;

System altered.

SQL> ALTER SYSTEM SET LARGE_POOL_SIZE = 4M;
System altered.
```

```
SQL> ALTER SYSTEM SET JAVA_POOL_SIZE=80M;
ALTER SYSTEM SET JAVA_POOL_SIZE=80M
*
ERROR at line 1:
ORA-02097: parameter cannot be modified because specified value is
invalid
ORA-04033: Insufficient memory to grow pool
```

We can not grow Java pool TO 80M, but we can grow to 64M

```
SQL> ALTER SYSTEM SET JAVA_POOL_SIZE = 64M;
System altered.

SQL> SHOW PARAMETER POOL

NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
buffer_pool_keep                     string
buffer_pool_recycle                  string
global_context_pool_size             string
java_pool_size                       big integer 64M
large_pool_size                      big integer 4M
olap_page_pool_size                  big integer 0
shared_pool_reserved_size            big integer 9856614
shared_pool_size                     big integer 300M
streams_pool_size                    big integer 0

SQL> SHOW PARAMETER DB_CACHE

NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
db_cache_advice                      string      ON
db_cache_size                        big integer 200M
```

We can see that values for SHARED POOL and BUFFER CACHE are exactly what we manually requested. Is it really like that?
The Statistics page shows a completely different picture

DB_CACHE_SIZE around 228M
SHARED_POOL_SIZE around 480M

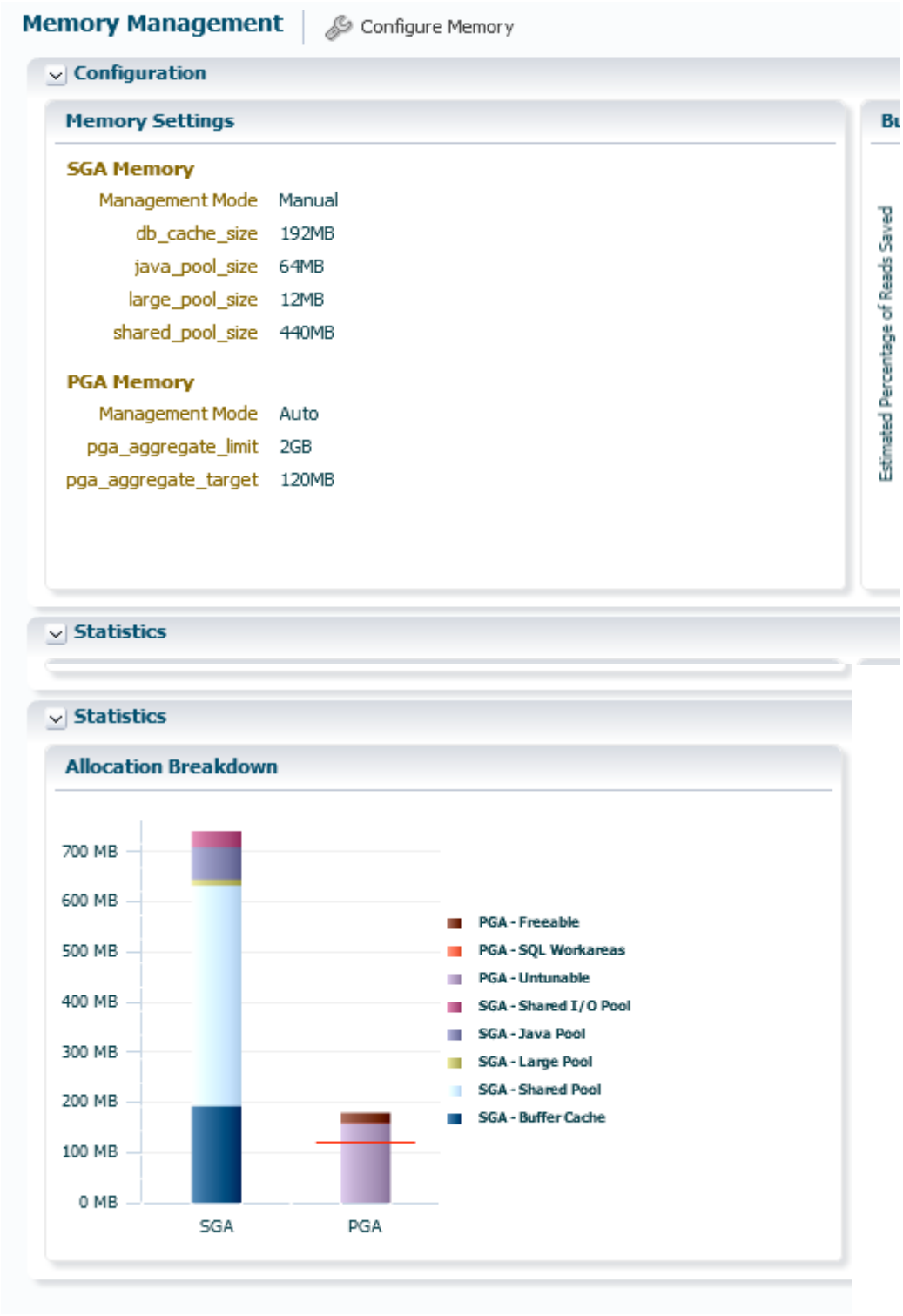
That is because in the ASMM mode, our manually set values s**erve only as MINIMAL targets and not as active values.** ######

Let's turn OFF the ASMM option, reduce PGA target and change some other values !!!

```
SQL> ALTER SYSTEM SET SGA_TARGET=0;
System altered.

SQL> ALTER SYSTEM SET PGA_AGGREGATE_TARGET=120M;
System altered.

SQL> SHOW PARAMETER TARGET

NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
archive_lag_target                   integer     0
db_big_table_cache_percent_target    string      0
db_flashback_retention_target        integer     1440
fast_start_io_target                 integer     0
fast_start_mttr_target               integer     0
memory_max_target                    big integer 0
memory_target                        big integer 0
parallel_servers_target              integer     32
pga_aggregate_target                 big integer 120M
sga_target                           big integer 0    → ASMM turned off

##### Now after turning off the ASSM option, we can see the REAL
(ACTIVE) values of ALL MEMORY parameters by issuing SHOW PARAMETER
command #######
```

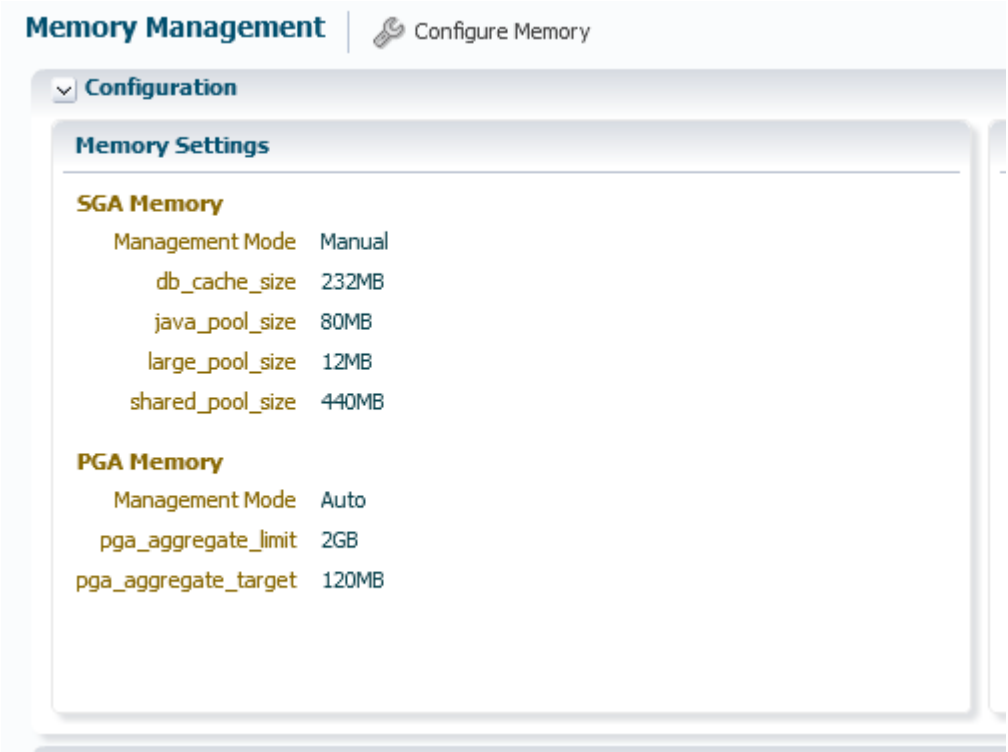
```
SQL> SHOW PARAMETER POOL
NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
_shared_io_pool_size                 big integer 32M
buffer_pool_keep                     string
buffer_pool_recycle                  string
global_context_pool_size             string
java_pool_size                       big integer 64M
large_pool_size                      big integer 12M
olap_page_pool_size                  big integer 0
shared_pool_reserved_size            big integer 9856614
shared_pool_size                     big integer 476M
streams_pool_size                    big integer 0

SQL> SHOW PARAMETER DB_CACHE_SIZE
NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
db_cache_size                        big integer 220M

SQL> ALTER SYSTEM SET SHARED_POOL_SIZE=360M;
ALTER SYSTEM SET SHARED_POOL_SIZE=360M
*
ERROR at line 1:
ORA-02097: parameter cannot be modified because specified value is
invalid
ORA-04034: unable to shrink pool to specified size

SQL> SHOW PARAMETER SHARED_POOL

NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
_shared_io_pool_size                 big integer 32M
shared_pool_size                     big integer 440M

##### Although, we got ORA-2097 error, the SET command did not fail.
It performed as much as it could (so, instead shrinking to 360M, it
stopped at 440M)   #####


SQL> ALTER SYSTEM SET DB_CACHE_SIZE=200M;
System altered.

SQL> SHOW PARAMETER DB_CACHE
NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
db_cache_advice                      string      ON
db_cache_size                        big integer 192M

##### Memory chunks are allocated (or removed) in size of 4M or 16M.
That is why we have here 192M. Quiz question - how come?
Well, I think that server firstly removed 3x4M and from 220M reached
208M, and then removed a 16M chunk, so we currently have 192M.
```

Now in the MANUAL memory mgmt. mode we can see also the PRINTED values of important parameters with MEMORY SETTINGS page #####



SQL> **alter system set db_cache_size = 320m;**
alter system set db_cache_size = 320m

```
*
ERROR at line 1:
ORA-02097: parameter cannot be modified because specified value is
invalid
ORA-00384: Insufficient memory to grow cache

SQL> show parameter db_cache

NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
db_cache_advice                      string      ON
db_cache_size                        big integer 248M

##### Although, we got ORA-2097 error, the SET command did not fail.
It performed as much as it could, so, instead expanding to 320M, it
stopped at 248M.
Sometimes, we need to expand one region and in order to succeed we
need to shrink some other region. This is shown below, where we need
to shrink Buffer Cache in order to expand Java Pool   #####

SQL> ALTER SYSTEM SET JAVA_POOL_SIZE = 80M;
ALTER SYSTEM SET JAVA_POOL_SIZE = 80M
*
ERROR at line 1:
ORA-02097: parameter cannot be modified, specified value is invalid
ORA-04033: Insufficient memory to grow pool
SQL> ALTER SYSTEM SET DB_CACHE_SIZE=230M;

System altered.

SQL> ALTER SYSTEM SET JAVA_POOL_SIZE = 80M;

System altered.

SQL> SHOW PARAMETER JAVA_POOL

NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
java_pool_size                       big integer 80M

SQL> SHOW PARAMETER DB_CACHE

NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
db_cache_advice                      string      ON
db_cache_size                        big integer 232M

##### Remember, memory regions must be multiples of 4. That is why got
232M and not 230M    #####
```



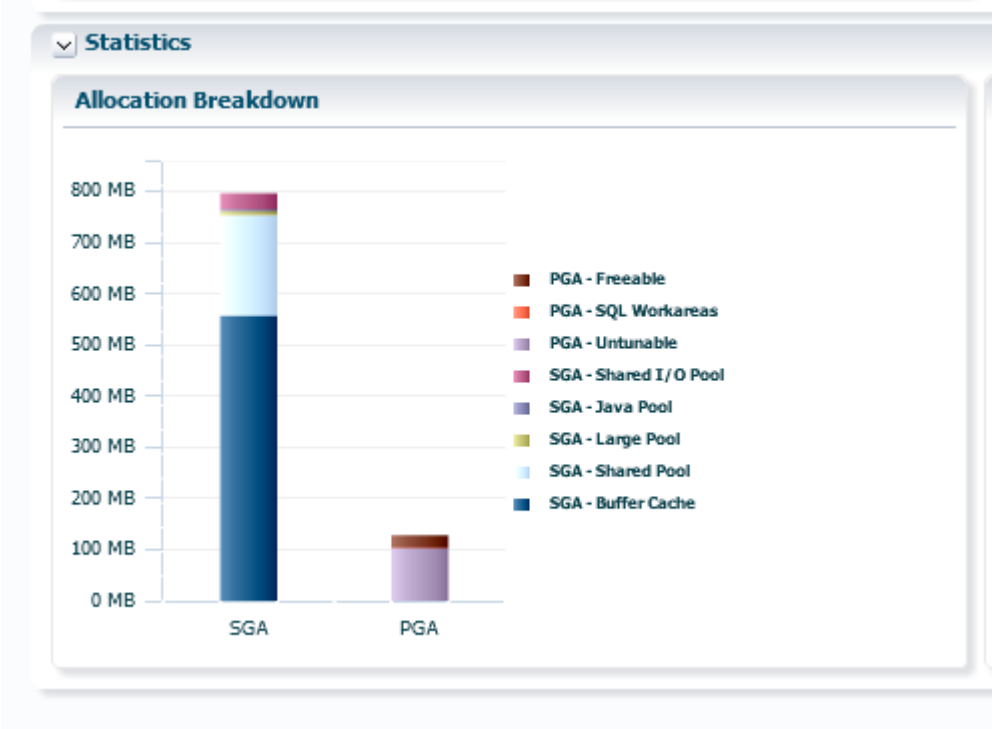

```
SQL> shutdown immediate;
Database closed.
Database dismounted.
ORACLE instance shut down.
```

Let's learn about STARTUP stages -- going from NOMOUNT to MOUNT and finally OPEN stage and see what Performance/Dictionary views may be used. We will use PFILE to see these stages.

```
SQL> STARTUP PFILE=initstudent.ora NOMOUNT;
ORACLE instance started.

Total System Global Area  843055104 bytes
Fixed Size                  2929984 bytes
Variable Size             327158464 bytes
Database Buffers          507510784 bytes
Redo Buffers                5455872 bytes

SQL> show parameter sga
NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
lock_sga                             boolean     FALSE
pre_page_sga                         boolean     TRUE
sga_max_size                         big integer 804M
sga_target                           big integer 804M
unified_audit_sga_queue_size         integer     1048576
```

```
SQL> show parameter pga
NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
pga_aggregate_limit                  big integer 2G
pga_aggregate_target                 big integer 220M

SQL> SHOW PARAMETER POOL
NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
buffer_pool_keep                     string
buffer_pool_recycle                  string
global_context_pool_size             string
java_pool_size                       big integer 0
large_pool_size                      big integer 0
olap_page_pool_size                  big integer 0
shared_pool_reserved_size            big integer 9856614
shared_pool_size                     big integer 0
streams_pool_size                    big integer 0

SQL> SHOW PARAMETER DB_CACHE
NAME                                 TYPE        VALUE
------------------------------------ ----------- ----------------------
db_cache_advice                      string      ON
db_cache_size                        big integer 0
```

Whenever we use PFILE to start, the ASMM option is turned ON (because PFILE is static and not persistent) and all SGA regions are set to 0 (it means that NO minimal values are set for them)



After startup, ASMM allocates much more to Buffer Cache (around

```
540M) and much less to Shared Pool (around 260M)    #####

SQL> SELECT instance_name, status FROM V$INSTANCE;

INSTANCE_NAME    STATUS
---------------- ------------
student          STARTED

SQL> SELECT * FROM V$TABLESPACE;
SELECT * FROM V$TABLESPACE
              *
ERROR at line 1:
ORA-01507: database not mounted

##### In the NOMOUNT phase we can only see Views related to our
Instance, but not the ones related to our Database #####

SQL> ALTER DATABASE MOUNT;

Database altered.

SQL> SELECT instance_name, status FROM V$INSTANCE;

INSTANCE_NAME    STATUS
---------------- ------------
student          MOUNTED


SQL> SELECT name, open_mode FROM V$DATABASE;

NAME      OPEN_MODE
--------- --------------------
STUDENT   MOUNTED
SQL> DESC dba_objects
ERROR:
ORA-04043: object dba_objects does not exist

##### In the MOUNT phase we can NOT see Views related to our Data
Dictionary, meaning DBA_  views. We must open Database for that. #####

SQL> ALTER DATABASE OPEN;

Database altered.

SQL> SELECT instance_name, status FROM V$INSTANCE;

INSTANCE_NAME    STATUS
---------------- ------------
student          OPEN
```

```
SQL> SELECT name, open_mode FROM V$DATABASE;

NAME      OPEN_MODE
--------- --------------------
STUDENT   READ WRITE

SQL> DESC dba_objects
 Name
Null?    Type
 ----------------------------------------------------------------- ---
 OWNER
VARCHAR2(128)
 OBJECT_NAME
VARCHAR2(128)
 SUBOBJECT_NAME
VARCHAR2(128)
 OBJECT_ID
NUMBER
 DATA_OBJECT_ID
NUMBER
 OBJECT_TYPE
VARCHAR2(23)
 CREATED
DATE
 LAST_DDL_TIME
DATE
 TIMESTAMP
VARCHAR2(19)
 STATUS
VARCHAR2(7)
 TEMPORARY             etc

SQL> EXIT
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application
Testing options
[oracle@oracloud12c pfile]$ exit
logout
```

```
Session stopped
    - Press <return> to exit tab
    - Press R to restart session
    - Press S to save terminal output to file
```