

## Avoid the confusion surrounding Automatic Memory Management

In Oracle Database 11g, the Automatic Memory Management feature requires more shared memory (/dev/shm) and file descriptors.

Metalink Note 169706.1 states that shared memory should be sized to be at least the greater of the database initialisation parameters; MEMORY\_MAX\_TARGET and MEMORY\_TARGET for each Oracle instance on the server.

However, I have discovered in most cases, that the shared memory needs to be at least 2G greater than MEMORY\_TARGET else the dynamic memory allocation becomes inappropriate and can crash the server.

When setting the MEMORY\_TARGET parameter, the Oracle RDBMS will dynamically size the SGA and PGA and write “underscore-underscore” parameters to the spfile. This is done to protect the database initialisation memory settings following an instance crash.

On Linux, if the shared memory is not sized (and mounted) to a value greater than MEMORY\_TARGET you will receive the following error when attempting to start the database instance.

ORA-00845: MEMORY\_TARGET not supported on this system

Below are some examples of the dynamic settings made by the Oracle RDBMS when setting the MEMORY\_TARGET parameter.

*(Note the small SGA and huge PGA size when MEMORY\_TARGET 1GB less than shared memory size)*

### With 20G MEMORY\_TARGET and 25G shared memory (stable)

```
# Oracle init.ora parameter file generated by instance ORCL1 on
08/26/2009 11:39:02
*.__db_cache_size=8G
*.__java_pool_size=256M
*.__large_pool_size=256M
*.__pga_aggregate_target=8G
*.__sga_target=12G
*.__shared_io_pool_size=0
*.__shared_pool_size=2816M
*.__streams_pool_size=512M
```

### With 24G MEMORY\_TARGET and 25G shared memory (unstable)

```
# Oracle init.ora parameter file generated by instance ORCL1 on
08/17/2009 14:30:08
ORCL1.__db_cache_size=512M
```

```

ORCL2.__db_cache_size=1G
*.__java_pool_size=256M
*.__large_pool_size=256M
*.__pga_aggregate_target=20736M
*.__sga_target=3840M
*.__shared_io_pool_size=0
ORCL1.__shared_pool_size=2G
ORCL2.__shared_pool_size=2304M
*.__streams_pool_size=512M

```

## Configuring Shared Memory

The shared memory can be configured using a swap partition or swap file. Best practice is to create an appropriately sized swap partition. However, if the existing swap partition exists and is too small, you can add a swap file by following the example below:

1. To determine the amount of shared memory available, enter the following command:

```

df -h /dev/shm/

```

Filesystem	Size	Used	Avail	Use%	Mounted on
shmfs	8G	0	8G	0%	/dev/shm

Create a 16G swap file:

```

dd if=/dev/zero of=/swapfile bs=1024 count=16777216

```

2. Setup the swap file with the command:

```

mkswap /swapfile

```

3. To enable the swap file immediately but not automatically at boot time:

```

swapon /swapfile

```

4. To enable it at boot time, edit /etc/fstab to include:

```

/swapfile swap swap defaults 0 0

```

5. To view swap space:

```

cat /proc/swaps

```

Filename	Type	Size	Used	Priority
/dev/cciss/c0d0p5	partition	8193108	0	-1
/swapfile	file	16777208	0	-2

vi /etc/fstab to set shmfs size at bootup:

```

shmfs /dev/shm tmpfs size=24g 0

```

6. To re-read /etc/fstab and set shmfs size on the fly:

```
mount -t tmpfs shmfs -o size=24g /dev/shm
```

### 7. View /etc/fstab

```
cat /etc/fstab
```

LABEL=/	/	ext3	defaults	1 1
LABEL=/u02	/u02	ext3	defaults	1 2
LABEL=/u01	/u01	ext3	defaults	1 2
LABEL=/boot	/boot	ext3	defaults	1 2
tmpfs	/dev/shm	tmpfs	defaults	0 0
shmfs	/dev/shm	tmpfs	size=24g	0
devpts	/dev/pts	devpts	gid=5,mode=620	0 0
sysfs	/sys	sysfs	defaults	0 0
proc	/proc	proc	defaults	0 0
LABEL=SW-cciss/c0d0p5	swap	swap	defaults	0 0
/swapfile	swap	swap	defaults	0 0

N.B.

MEMORY\_MAX\_TARGET and MEMORY\_TARGET cannot be used when LOCK\_SGA is enabled or with huge pages on Linux

## Conclusion

From experience I suggest sizing the shared memory partition (/dev/shm) to at least 2 GB greater than the MEMORY\_TARGET or MEMORY\_MAX\_TARGET for your database instance. This will enable Oracle to grow instance memory based on workload.

This is particularly important when using Automatic Storage Management. Oracle will set the MEMORY\_TARGET parameter by default for an ASM instance, which will of course also use the available shared memory on the server.

## More Gotchas

Another Oracle 11g gotcha to be aware of is; receiving the ORA-00845 error even though you have created a swap partition/file greater than your database MEMORY\_TARGET. This is because the default size of tmpfs on Linux (2.4 kernel and above) is approximately half the physical system memory.

This limitation can be dynamically changed by editing the /etc/fstab file, removing the “defaults” attribute and specifying a maximum size for tmpfs as shown in example below:

```
tmpfs /dev/shm tmpfs size=24g 0 0
```