Oracle Flex ASM and Flex Cluster

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Patterns SDI

ABOUT ME

ORACLE CERTIFIED MASTER (OCM)
http://education.oracle.com/education/otn/10g_OCM_17_Jun_11/ykumar.htm

ORACLE ACE
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AUTHOR OF ORACLE TECHNOLOGY NETWORK (OTN) ARTICLES
http://www.oracle.com/tecchnetwork/es/articles/index.html - (17 Articles for OTN Spanish)
http://www.oracle.com/tecchnetwork/pt/articles/index.html - (14 Articles for OTN Portuguese)
http://www.oracle.com/tecchnetwork/articles/index.html - - (2 Articles for OTN English)

ORACLE TECHNOLOGY SPEAKER @USER GROUPS
Speaker @Sangam Y2014
Speaker @Independent Oracle User Group (IOUG) Y2014
Speaker @Oracle Technology Network (OTN) Yathra Y2013, Y2014 & Y2015
Speaker @All India Oracle User Group (AIOUG) Tech Day Y2013 & Y2014
Speaker @All India Oracle User Group (AIOUG) ExadataSIG Y2014

AUTHOR OF TOAD WORLD (CONNECTED INTELLIGENCE)
https://www.toadworld.com

Author Of OTech Magazine
http://otechmag.com/magazine/2015/summer/ravikumar-yv.html

ORACLE CERTIFICATIONS
Oracle Database 10g: Certified Master (10g OCM)
Oracle Database 10g & 11g: Administering RAC Certified Expert
Oracle Database 11g: Performance Tuning Certified Expert
Oracle Exadata 11g Essentials
Oracle Golden Gate 10 Essentials
Oracle Database 11g: SQL Tuning Certified Expert
Oracle 9i & 10g: Managing Oracle on Linux Certified Expert
Oracle Certified Professional (OCP) – Oracle 11g, 10g, 9i and 8i
SUN Certified – Solaris System Administrator in SUN Solaris 9

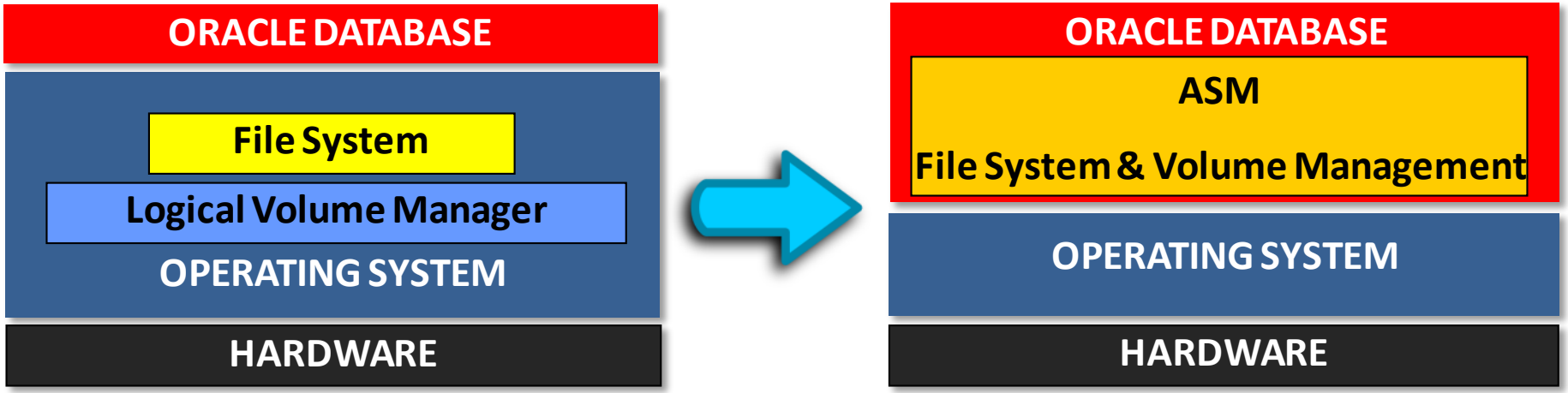
Author Of All things ORACLE from redgate
http://allthingsoracle.com/upgrading-a-database-using-recovery-manager-rman-duplicate-command-in-oracle-12c/

CO-FOUNDER OF ORAWORLD
http://www.oraworld-team.com/

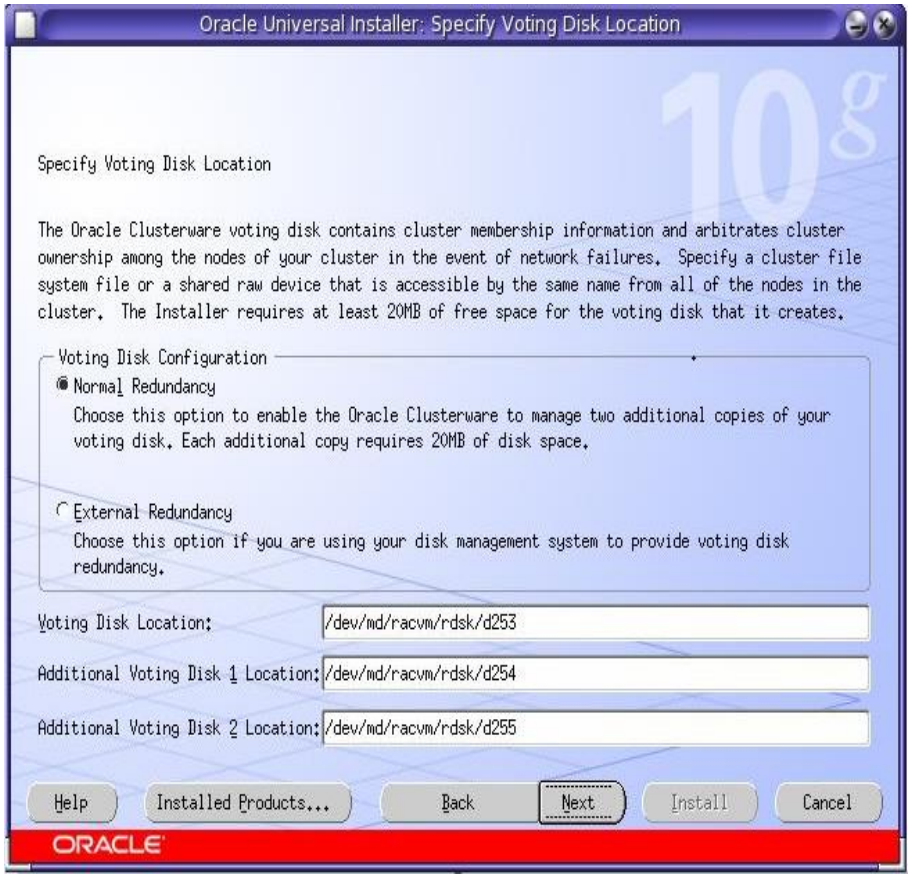
ORACLE

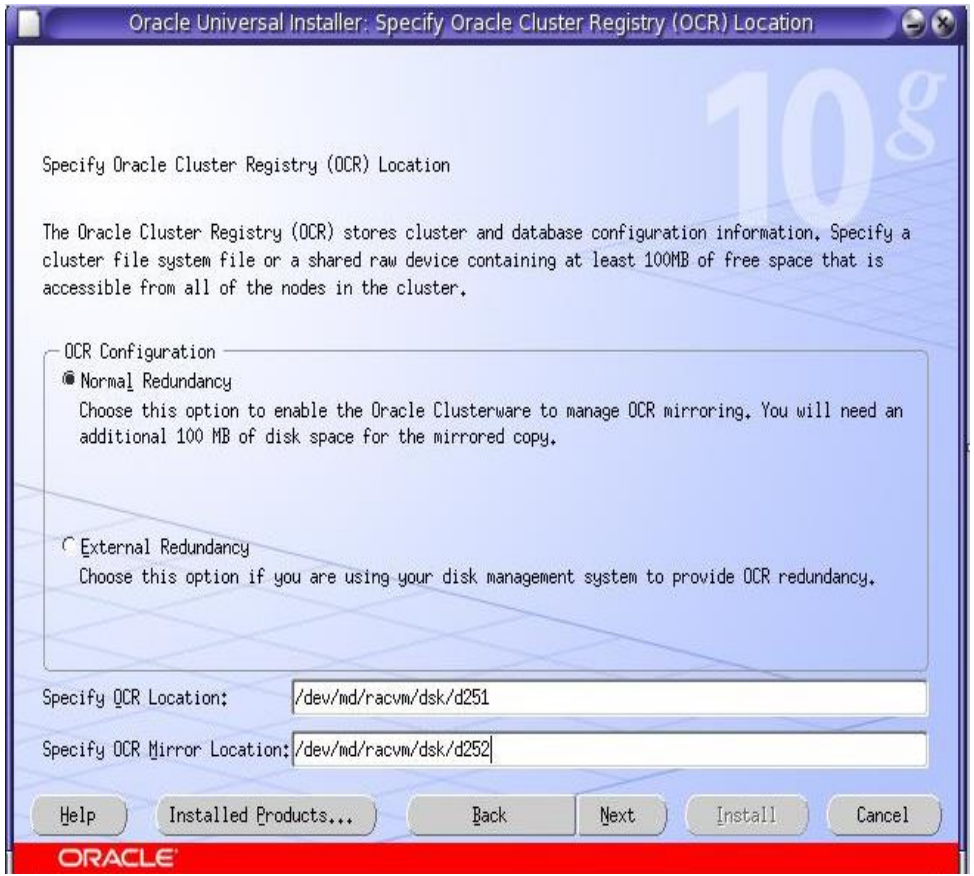
Flex ASM and Flex Cluster

ARCHITECTURE OF ASM

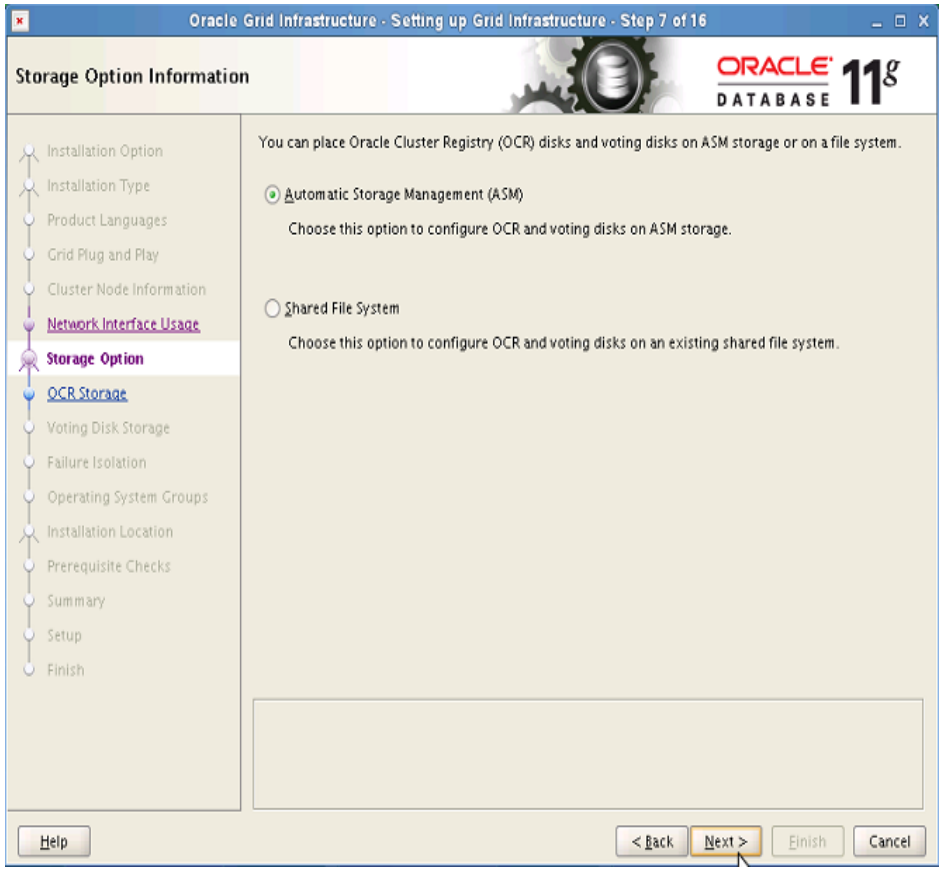


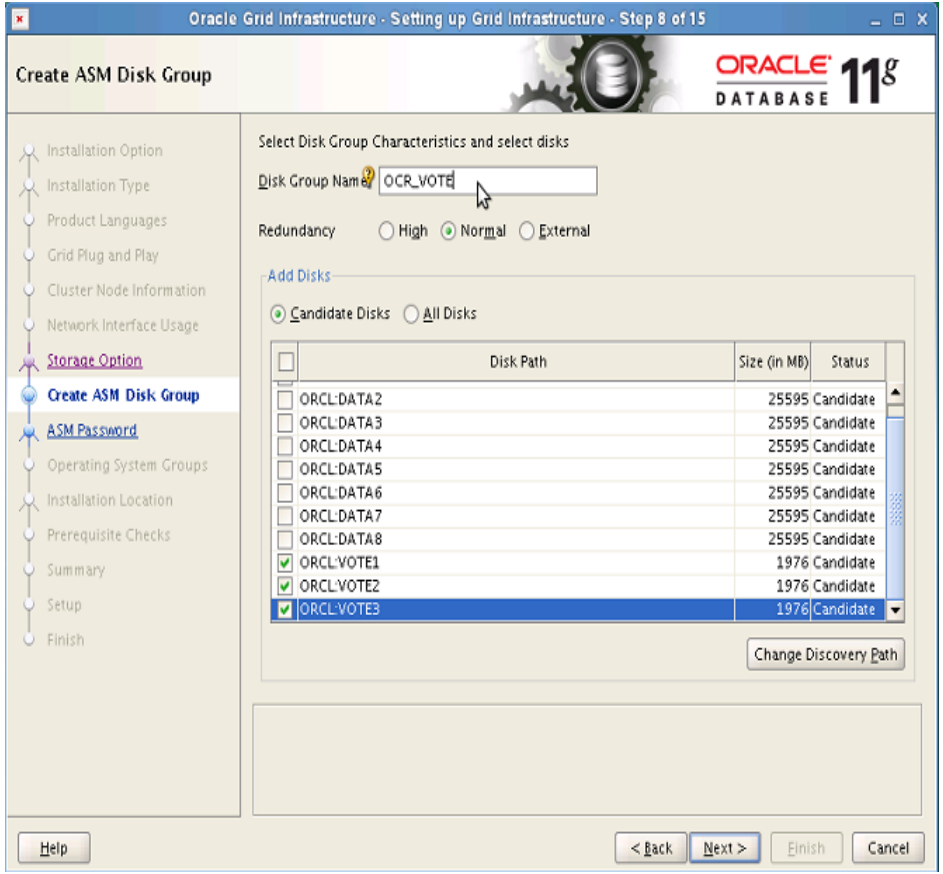
Oracle 10g RAC – VD & OCR Locations



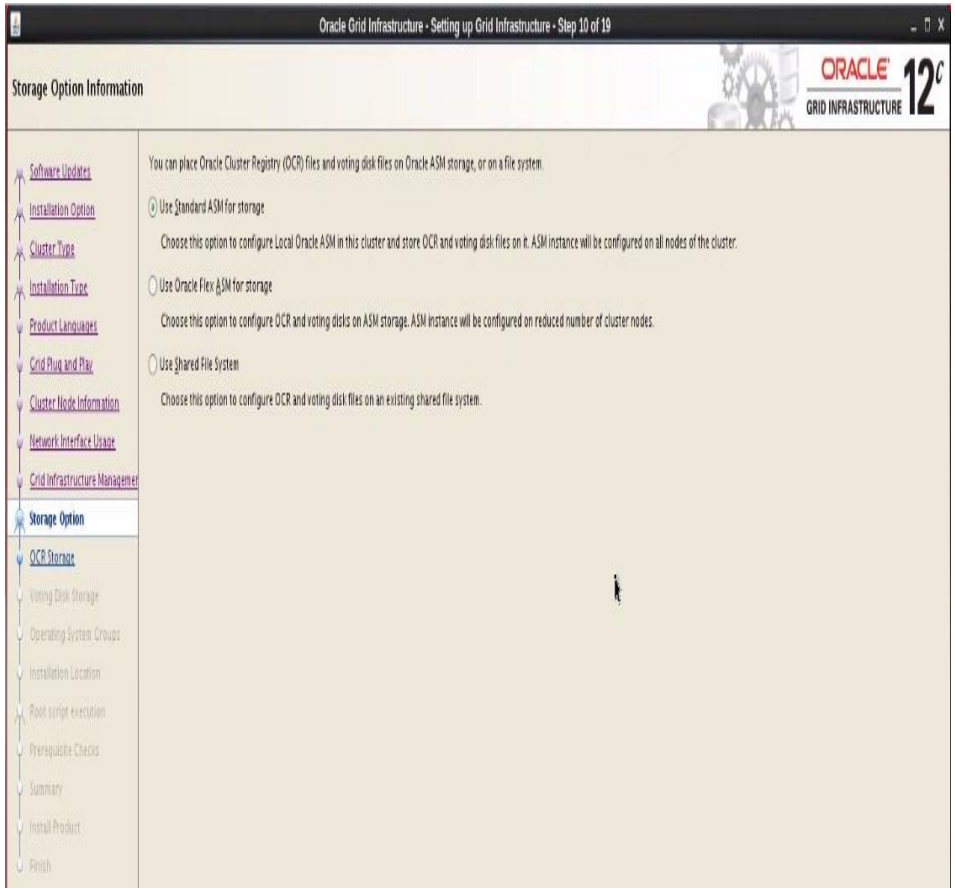


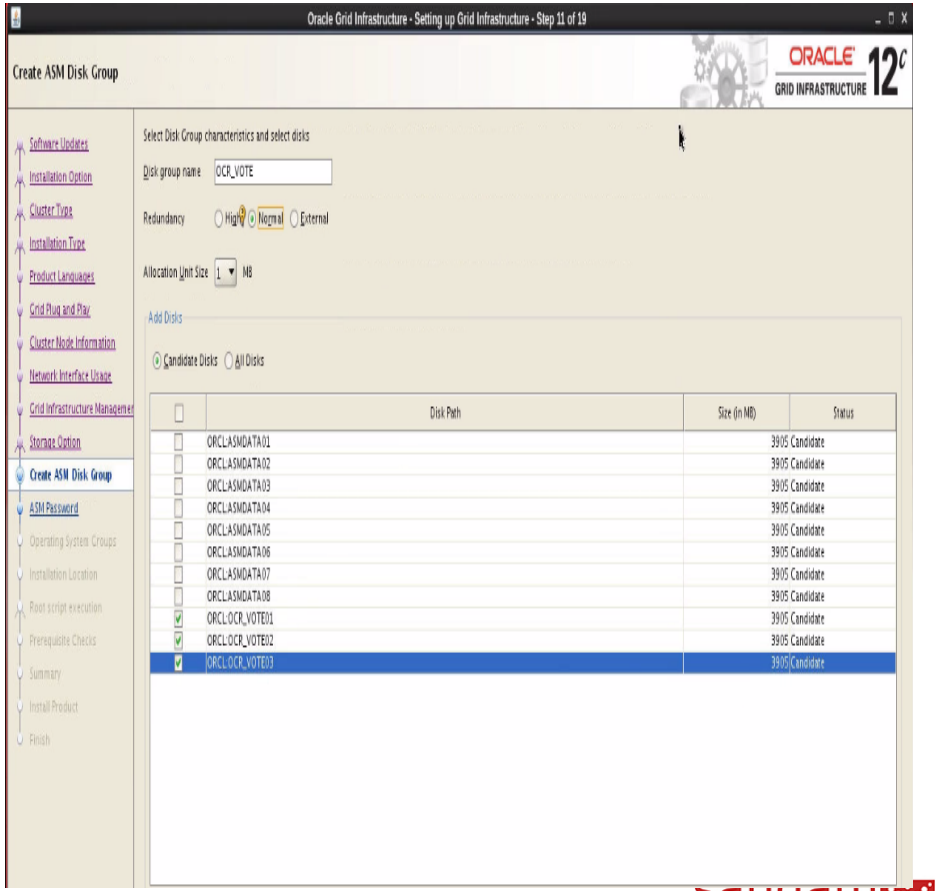
Oracle 11g RAC – VD & OCR Locations



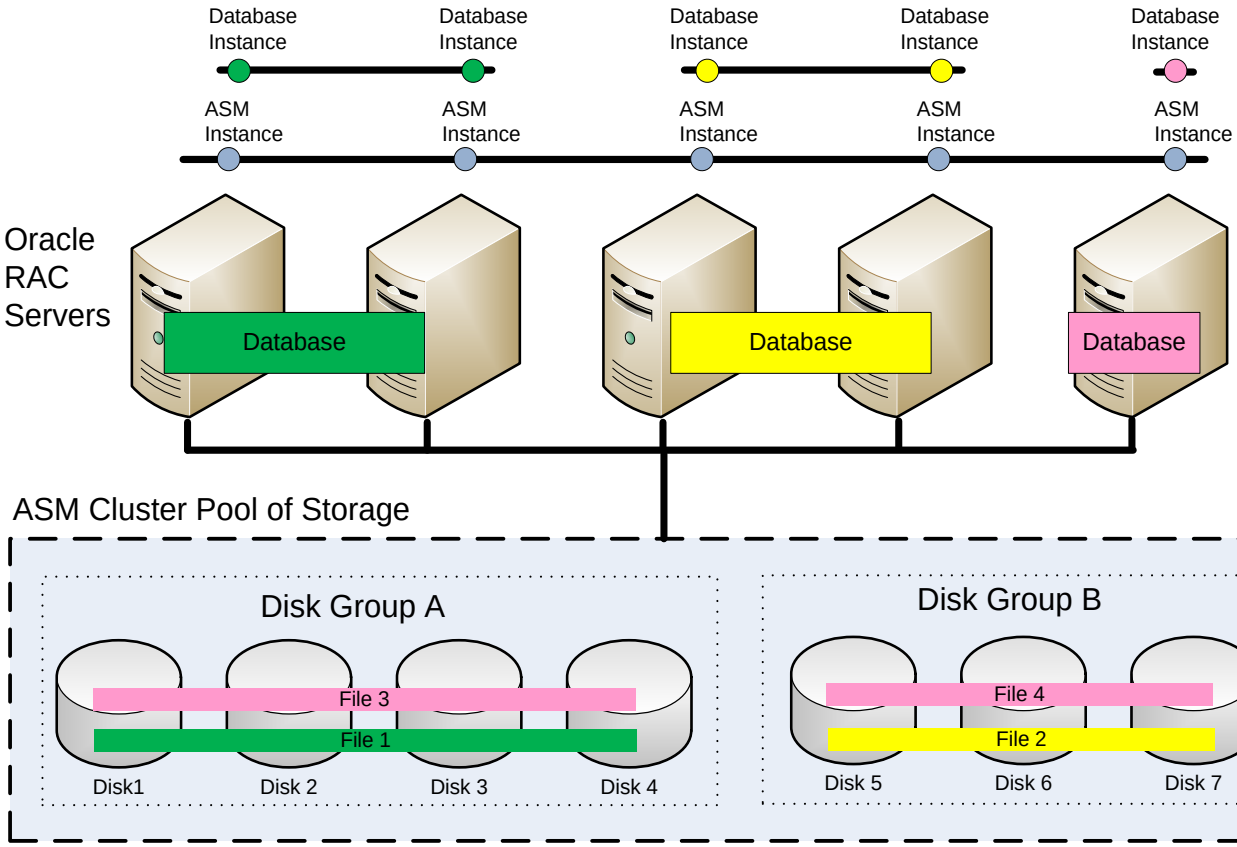


Oracle 12c RAC – VD & OCR Locations





CAPABILITIES OF ASM



1-1 ASM to SERVER

SHARED DISK GROUPS

WIDE FILE STRIPING

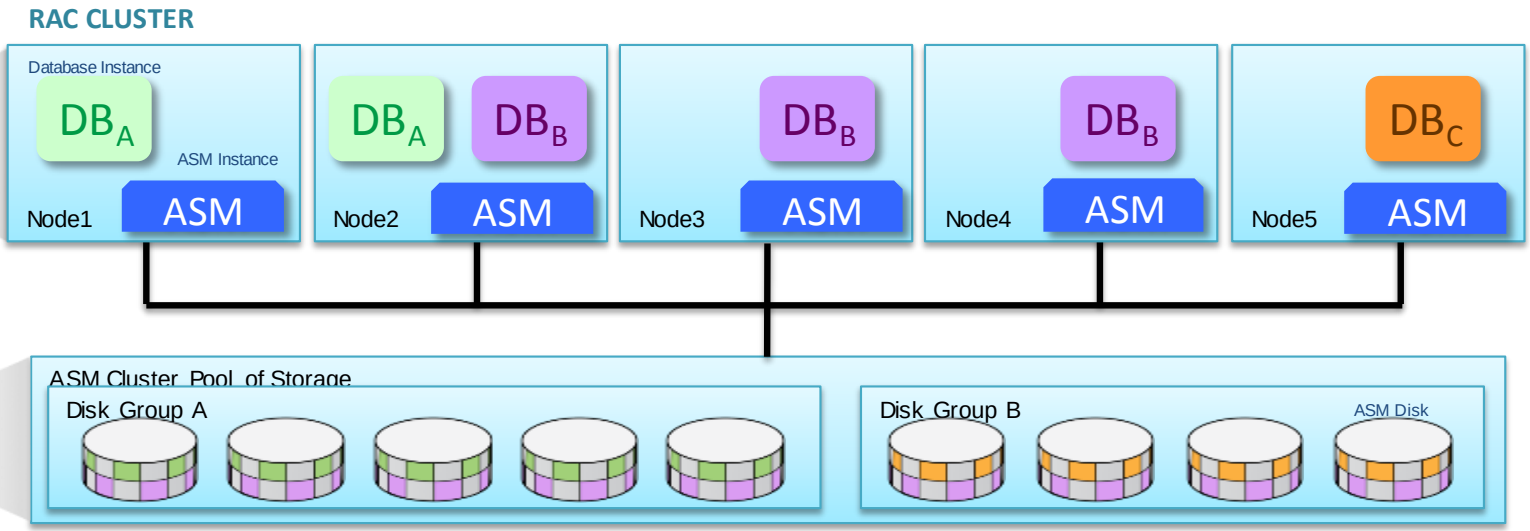
AUTOMATIC STORAGE MANAGEMENT (ASM) OVERVIEW

Current State ↘

ONE TO ONE MAPPING OF ASM INSTANCES TO SERVERS

SHARED DISK GROUPS

WIDE FILE STRIPING



Oracle Database 11g*R2* with ASM

```
login as: oracle
oracle@192.168.xx.xx's password: ********
Last login: Fri Sep 27 06:05:44 2013

[oracle@rac1 ~]$ps -ef | grep pmon
oracle   3053    1  0 05:56 ?    00:00:00 asm_pmon +ASM1
oracle   3849    1  0 05:57 ?    00:00:00 ora_p

[oracle@rac1 ~]$srvctl status asm
ASM is running on rac2,rac1

[oracle@rac1 ~]$crsctl check cluster
CRS-4537: Cluster Ready Services is online
CRS-4529: Cluster Synchronization Services is online
CRS-4533: Event Manager is online

[oracle@rac1 ~]$srvctl stop asm -n rac1 -o abort -f
```

LOG INTO RAC DATABASE INSTANCE (RAC1)

CHECK STATUS OF ASM & RAC DATABASE INSTANCES

CHECK STATUS OF ASM INSTANCE IN RAC DATABASE INSTANCES1 (RAC1)

CHECK STATUS OF CLUSTER IN RAC DATABASE INSTANCES1 (RAC1)

STOP THE ASM INSTANCE IN RAC DATABASE INSTANCE1 (RAC1)

```
oracle@192.168.xx.xx's password:********
Last login: Fri Sep 27 06:05:44 2013

[oracle@rac1 ~]$ps -ef | grep pmon
oracle   3053    1  0 05:56 ?    00:00:00 asm_pmon_+ASM1
oracle   3849    1  0 05:57 ?    00:00:00 ora_pmon_flavia1

[oracle@rac1 ~]$srvctl status asm
ASM is running on rac2,rac1

[oracle@rac1 ~]$crsctl check cluster
CRS-4537: Cluster Ready Services is online
CRS-4529: Cluster Synchronization Services i
CRS-4533: Event Manager is online
[oracle@rac1 ~]$srvctl stop asm -n rac1 -o abort -f
[oracle@rac1 ~]$srvctl status asm
```

CHECK THE STATUS OF ASM INSTANCE IN RAC DATABASE INSTANCE1 (RAC1)

```
Last login: Fri Sep 27 06:05:44 2013

[oracle@rac1 ~]$ps -ef | grep pmon
oracle   3053    1  0 05:56 ?    00:00:00 asm_pmon_+ASM1
oracle   3849    1  0 05:57 ?    00:00:00 ora_pmon_flavia1

[oracle@rac1 ~]$srvctl status asm
ASM is running on rac2,rac1

[oracle@rac1 ~]$crsctl check cluster
CRS-4537: Cluster Ready Services is online
CRS-4529: Cluster Synchronization Services is online
CRS-4533: Event Manager is online

[oracle@rac1 ~]$srvctl stop asm -n rac1 -o abort -f
[oracle@rac1 ~]$srvctl status asm
ASM is running on rac2
```

```
[oracle@rac1 ~]$ps -ef | grep pmon
oracle   3053    1  0 05:56 ?    00:00:00 asm_pmon_+ASM1
oracle   3849    1  0 05:57 ?    00:00:00 ora_pmon_flavia1

[oracle@rac1 ~]$srvctl status asm
ASM is running on rac2,rac1

[oracle@rac1 ~]$crsctl check cluster
CRS-4537: Cluster Ready Services is online
CRS-4529: Cluster Synchronization Services is online
CRS-4533: Event Manager is online

[oracle@rac1 ~]$srvctl stop asm -n rac1 -o a
[oracle@rac1 ~]$srvctl status asm
ASM is running on rac2
[oracle@rac1 ~]$ps -ef | grep pmon
```

CHECK THE STATUS OF ASM & RAC DATABASE INSTANCE (RAC1)

```
oracle   3053    1   0 05:56 ?    00:00:00 asm_pmon_+ASM1
oracle   3849    1   0 05:57 ?    00:00:00 ora_pmon_      a1
```

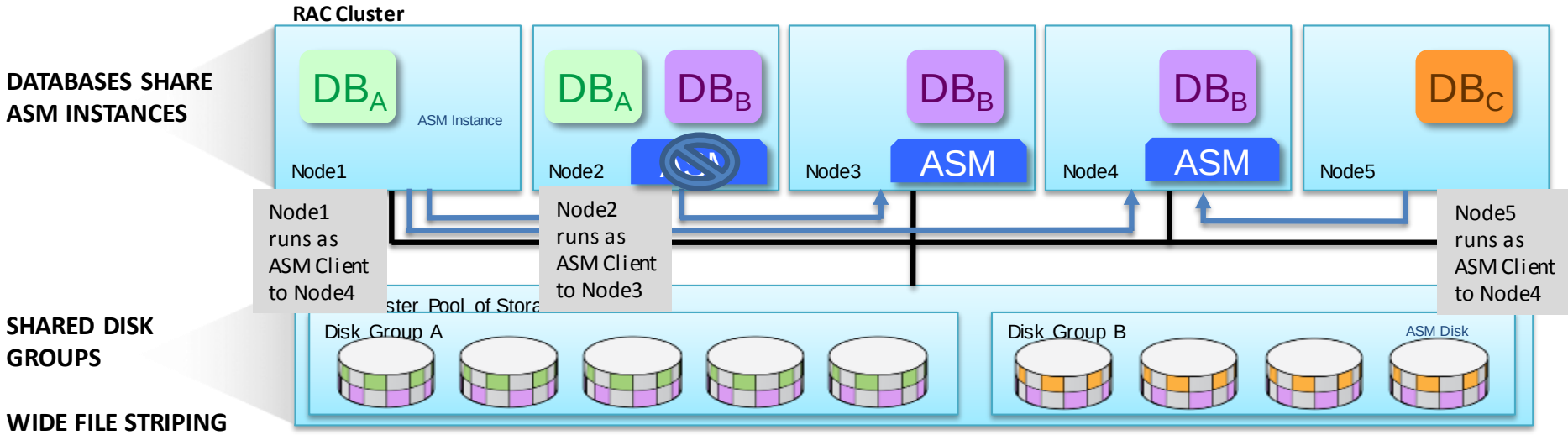
SUMMARY

- The database instance is strongly linked to the ASM instance
- If an ASM instance fails ***so will the database instance*** on the same node

```
[oracle@rac1 ~]$srvctl stop asm -n rac1 -o abort -f
[oracle@rac1 ~]$srvctl status asm
ASM is running on rac2
[oracle@rac1 ~]$ps -ef | grep pmon
oracle   7885  5795 0 06:20 pts/0   00:00:00 grep pmon
```

FLEX ASM: ELIMINATE 1:1 SERVER MAPPING

New: ASM Storage Consolidation in Oracle Database 12c



Oracle Database 12c*R1* with FLEX ASM


```
[oracle@oel6-112-rac1 Desktop]$ hostname
oel6-112-rac1.localdomain

[oracle@oel6-112-rac1 Desktop]$ps -ef | grep pmon
oracle   3325   1   0 17:39 ?   00:00:00 asm_pmon_+ASM1
oracle   3813   1   0 17:40 ?   00:00:00 mdb_pmon_-MGMTDB
oracle   5806   1   0 17:42 ?   00:00:00 ora_pmon_orcl1
oracle   6193   1   0 17:42 ?   00:00:00 apx_pmon_+APX1

[oracle@oel6-112-rac1 Desktop]$ srvctl status asm
ASM is running on oel6-112-rac2,oel6-112-rac1

[oracle@oel6-112-rac1 Desktop]$ crsctl check cluster
CRS-4537: Cluster Ready Services is online
CRS-4529: Cluster Synchronization Services is online
CRS-4533: Event Manager is online
```

LOG INTO RAC DATABASE INSTANCE 1 (RAC1)

CHECK THE STATUS OF ASM & RAC DATABASE INSTANCES

CHECK THE STATUS OF ASM INSTANCE IN RAC DATABASE INSTANCE FROM INSTANCE 1 (RAC 1)

CHECK THE STATUS OF CLUSTER IN INSTANCE 1 (RAC 1)

```
[oracle@oel6-112-rac1 Desktop]$ asmcmd
ASMCMD> showclustermode
ASM cluster : Flex mode enabled
ASMCMD> showclusterstate
Normal
ASMCMD> exit
```

CHECK IF ORACLE FLEX ASM IS ENABLED OR NOT (RAC1)

```
[oracle@oel6-112-rac2 Desktop]$asmcmd
ASMCMD> showclustermode
ASM cluster : Flex mode enabled
ASMCMD> showclusterstate
Normal
ASMCMD> exit
```

CHECK IF ORACLE FLEX ASM IS ENABLED OR NOT (RAC2)

```
[oracle@oel6-112-rac1 Desktop]$ srvctl stop asm -node oel6-112-rac1 -stopoption
abort -force
```

BRING DOWN THE ASM INSTANCE IN RAC DATABASE INSTANCE 1 (RAC 1)

```
[oracle@oel6-112-rac1 Desktop]$srvctl status asm
PRCR-1070 : Failed to check if resource ora.asm is registered Cannot communicate
with crsd
```

CHECK STATUS OF ASM INSTANCE IN RAC DATABASE INSTANCE1 (RAC1)

```
[oracle@oel6-112-rac1 Desktop]$crsctl check cluster
CRS-4535: Cannot communicate with Cluster Ready Services
CRS-4529: Cluster Synchronization Services is online
CRS-4533: Event Manager is online

[oracle@oel6-112-rac1 Desktop]$ps -ef | grep pmon
oracle    3813     1  0 17:40 ?        00:00:00 mdb_pmon_-MGMTDB
oracle    5806     1  0 17:42 ?        00:00:00 ora_pmon_orcl1
oracle    6193     1  0 17:42 ?        00:00:00 apx_pmon_+APX1

[oracle@oel6-112-rac1 Desktop]$
```

CHECK STATUS OF CLUSTER SERVICES IN RAC DATABASE INSTANCE1 (RAC1)

CHECK STATUS OF ASM & RAC

NOTE

Here a database instance is associated with the specific ASM instance running in the specific node. If in case due to some reason if the ASM instance was unable to be brought up/services goes down, still the database instance can be brought up as the database instance will look for ASM instance running in the same cluster.

Oracle Database 12c*R*1 with FLEX ASM

```
[oracle@oel6-112-rac2 Desktop]$. oraenv
ORACLE_SID = [orcl1] ? orcl1
ORACLE_HOME = [/home/oracle] ? /u01/app/orac    /product/12.1.0/db_1
The Oracle base remains unchanged with value /u    pp/oracle
```

CHECK STATUS OF RAC DATABASE INSTANCE RUNNING WITHOUT ASM INTANCE IN RAC DATABASE INSTANCE1 (RAC1)

```
[oracle@oel6-112-rac1 Desktop]$sqlplus /nolog
SQL*Plus: Release 12.1.0.1.0 Production on Wed Sep 25 18:24:36 2013 Copyright
SQL>connect sys/oracle@orcl as sysdba
Connected.
SQL>select instance_name, instance_number from gv$instance;
INSTANCE_NAME            INSTANCE_NUMBER
----------------------------------------
orcl2                               2
orcl1                               1
SQL>select instance_name, instance_number from v$instance;
INSTANCE_NAME            INSTANCE_NUMBER
----------------------------------------
orcl2                               2
SQL>connect sys/oracle@orcl as sysdba
Connected.
SQL>
```

LOG INTO DATABASE INSTANCE FROM RAC DATABASE INSTANCE (RAC1)

```
SQL>select instance_name, instance_number from gv$instance;
INSTANCE_NAME            INSTANCE_NUMBER
----------------------------------------
orcl1                               1

[oracle@oel6-112-rac1 Desktop]$. oraenv
ORACLE_SID = [orcl1] ? +ASM2
ORACLE_HOME = [/home/oracle] ? /u01/app/12.1.0/grid
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@oel6-112-rac1 Desktop]$ asmcmd --privilege sysasm --inst +ASM2
```

CONNECTING TO ASM INSTANCE OF RAC DATABASE INSTANCE2 (RAC2) FROM RAC DATABASE INSTANCE1 (RAC1)

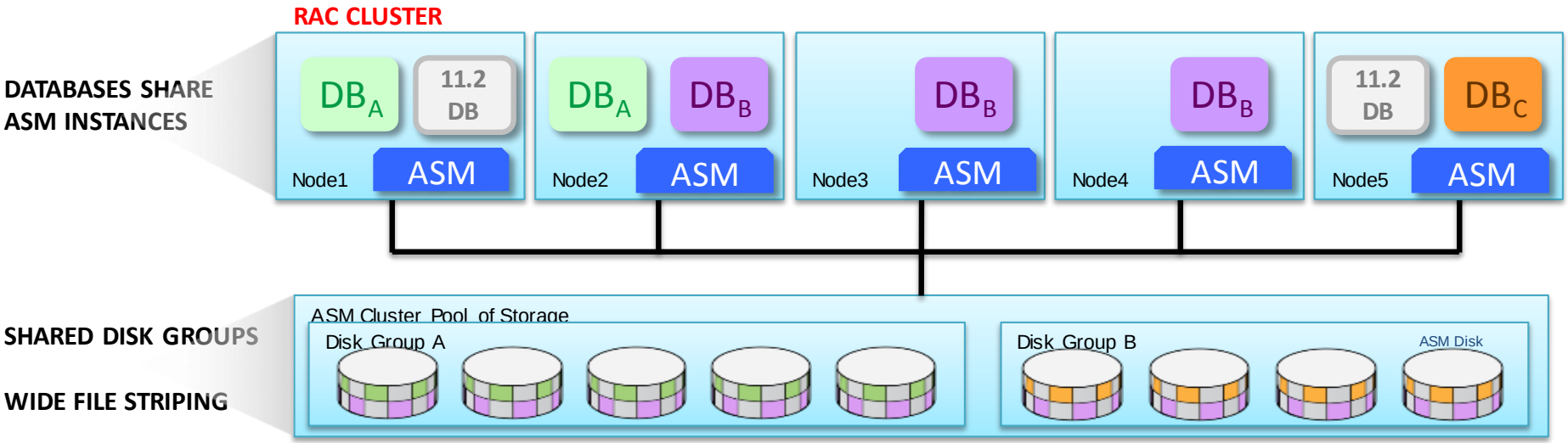
```
ASMCMD> lsdg
State    Type    Rebal  Sector  Block       AU  Total_MB  Free_MB
Req_mir_free_MB  Usable_file_MB  Offline_disks  Voting_files  Name
MOUNTED  EXTERN  N          512   4096  1048576     15342     4782
0             4782                0             Y  DATA/
ASMCMD>
```

SUMMARY

The database instance was using a dedicated ASM instance and that ASM instance was forced to stop working simulating a failure, so the database instance reconnected to an existent ASM instance on another node, for this example node 2 (rac2).

FLEX ASM: SUPPORTING ORACLE DATABASE 11g

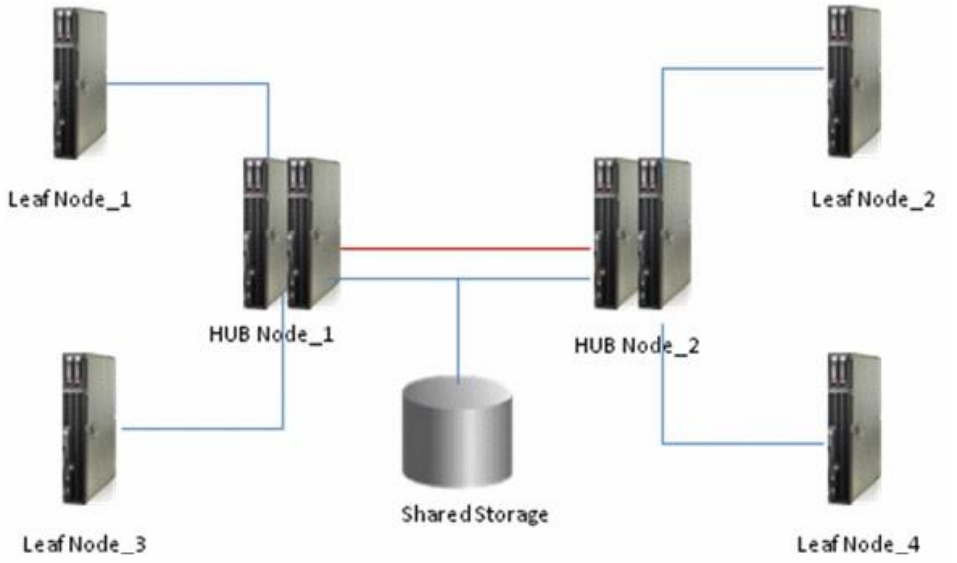
Previous Database versions will host Local ASM Instance



Oracle FLEX CLUSTER

- Comprises of a Hub and Leaf architecture where in only the Hub nodes will only have direct access to Oracle Cluster Registry (OCR) and Voting Disk (VD)
- However application can access the database via Leaf nodes without ASM instance NOT running on Leaf nodes
- The connection to the database is through Hub making it transparent for the application

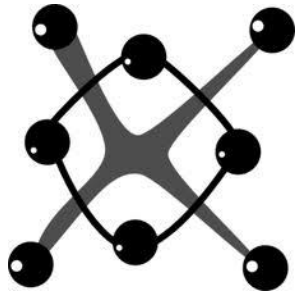
Depicts a typical Oracle flex cluster with four Leaf nodes and two Hub nodes. In a nutshell Oracle Flex Cluster requires Oracle Flex ASM.



HUB NODES & LEAF NODES

Hub Nodes

They are connected among them via private network and have direct access to the shared storage just like previous versions. These nodes are the ones that access the ***Oracle Cluster Registry (OCR)*** and ***Voting Disk (VD)*** directly.



Leaf Nodes

These nodes are lighter and are not connected among them, neither access the shared storage like the Hub Nodes. Each Leaf Node communicates with the Hub Node that is attached to, and its connected to the cluster via the Hub Node that is linked to.

FLEX ASM & FLEX CLUSTER

Flex ASM

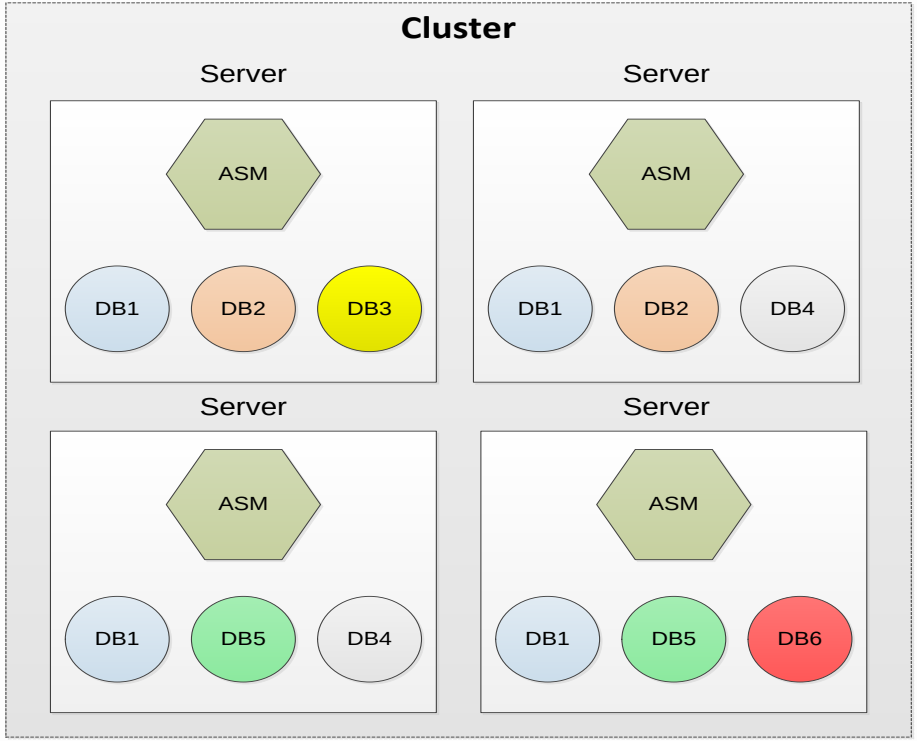
- ✓ Higher Availability (DB instances can use remote ASM instances)
  - *Planned or Unplanned downtime*
- ✓ Reduces per-node ASM instance overhead
  - *ASM only needs to run on 3 nodes in the cluster*
- ✓ Facilitates DB, Cluster & server consolidation
- ✓ Multiple DB's & applications in a cluster

Flex CLUSTER

- ✓ Less complex configuration and management for non-database nodes
- ✓ Less complex configuration for Non-Database nodes, such as Processing Nodes, Application / Web Server Nodes etc.

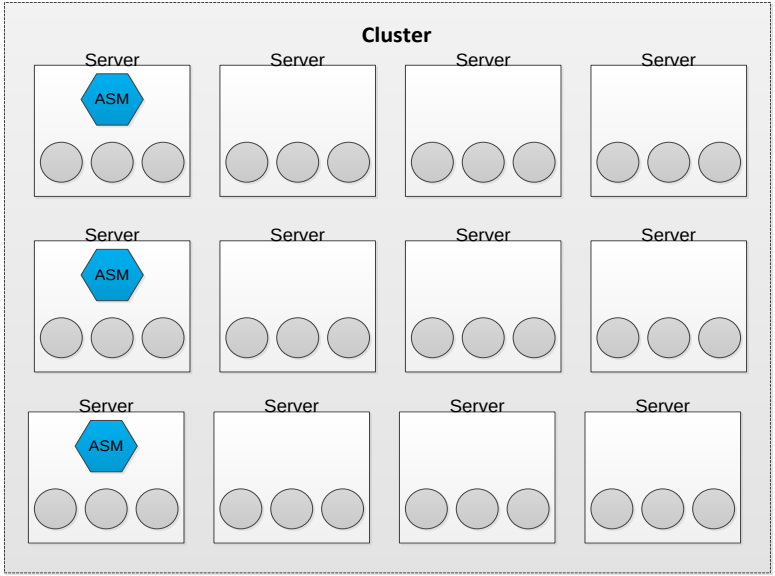
PREVIOUS ASM CLUSTER

- ASM architecture utilized an ASM instance on every server
- Database instances dependent on node-specific ASM instance
- ASM overhead scaled with size of cluster



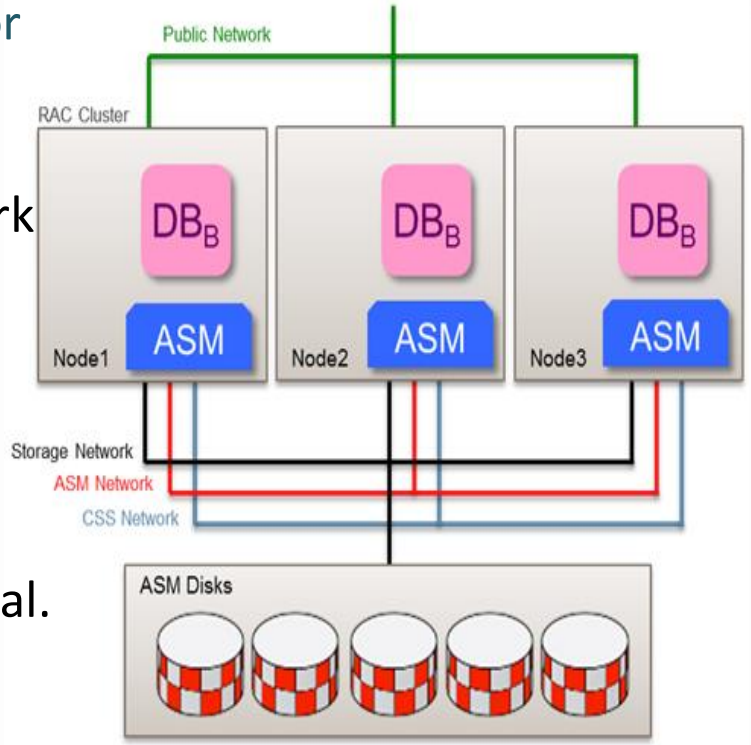
NEW ASM CLUSTER

- Eliminates requirement for an ASM instance on every cluster server
- Database instances connects to any ASM instance in the cluster
- Database instances can failover to a secondary ASM instance
- Administrators specify the cardinality of ASM instances (default is 3)
- *Clusterware* ensures ASM cardinality is maintained



FLEX ASM NETWORK

- Flex ASM adds the ASM network, which is used for communication between ASM and its clients
- Oracle 12c, you can now create a separate network dedicated for ASM communication.
- Need to mention the network address during the installation
- This dedicated ASM network is completely optional. The default is the pre-12c behavior of using the Clusterware interconnect for ASM communication



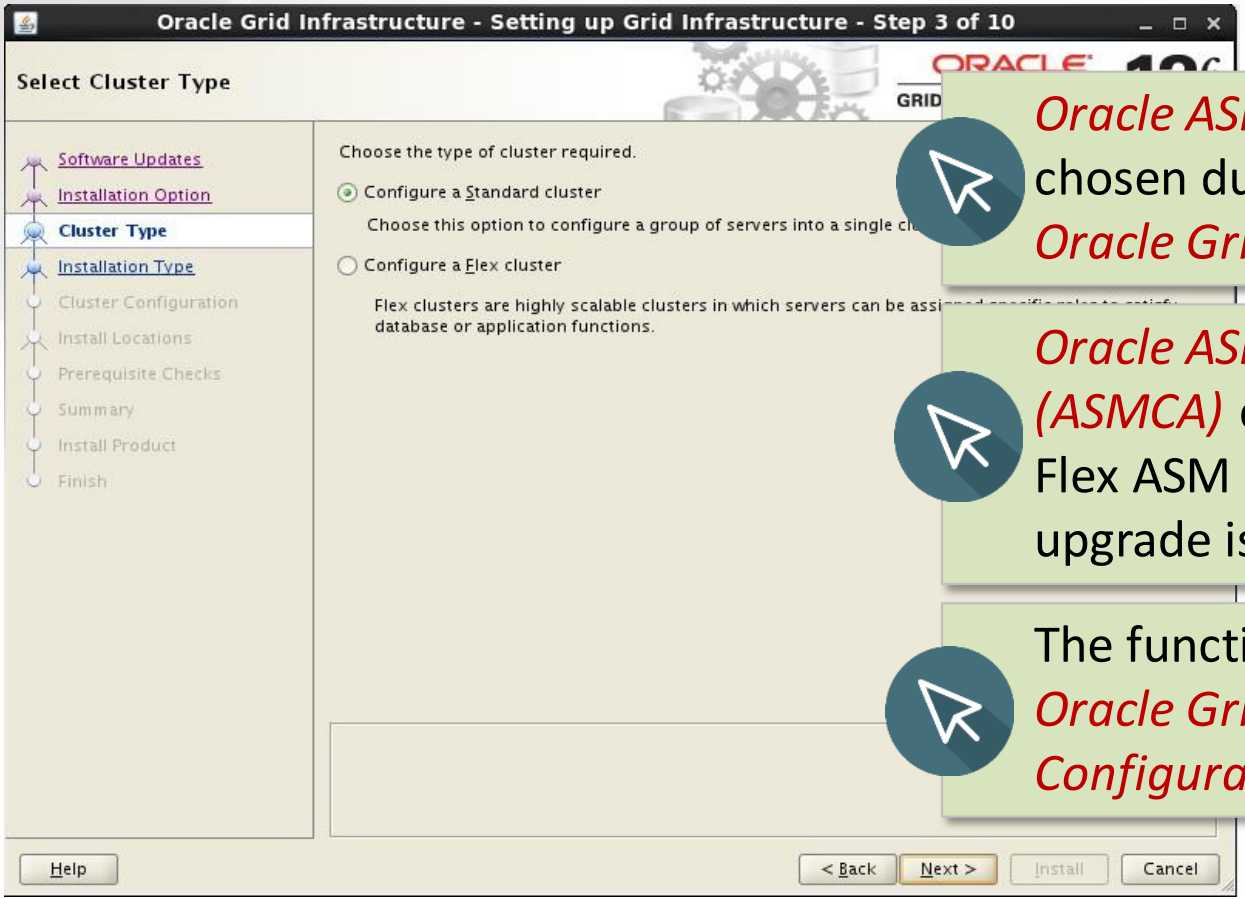
Managing Flex ASM

- Flex ASM requires minimal monitoring and ongoing management
- Primary objective is that instances are up and running
- **SRVCTL Command** for:
  - Checking ASM instance status
  - Setting cardinality
  - Starting – Stopping - and - Relocating ASM instances
- No Flex ASM-specific instance parameters are required
- Default settings will effectively support most situations
- ASM server instances use automatic memory management
- **Flex ASM** is managed by **ASMCA, CRSCTL, SQL*Plus** and **SRVCTL**

Flex Features

- Increase maximum number of Disk Groups to 511 ***(Previous limit was 63)***
- Command for renaming ASM Disk
- **ASM Relocate Command**
  - Clients are automatically relocated to another instance if an Oracle ASM instance fails
  - When necessary, Clients can be manually relocated using the ALTER SYSTEM RELOCATE CLIENT command

New Option in Grid Infrastructure



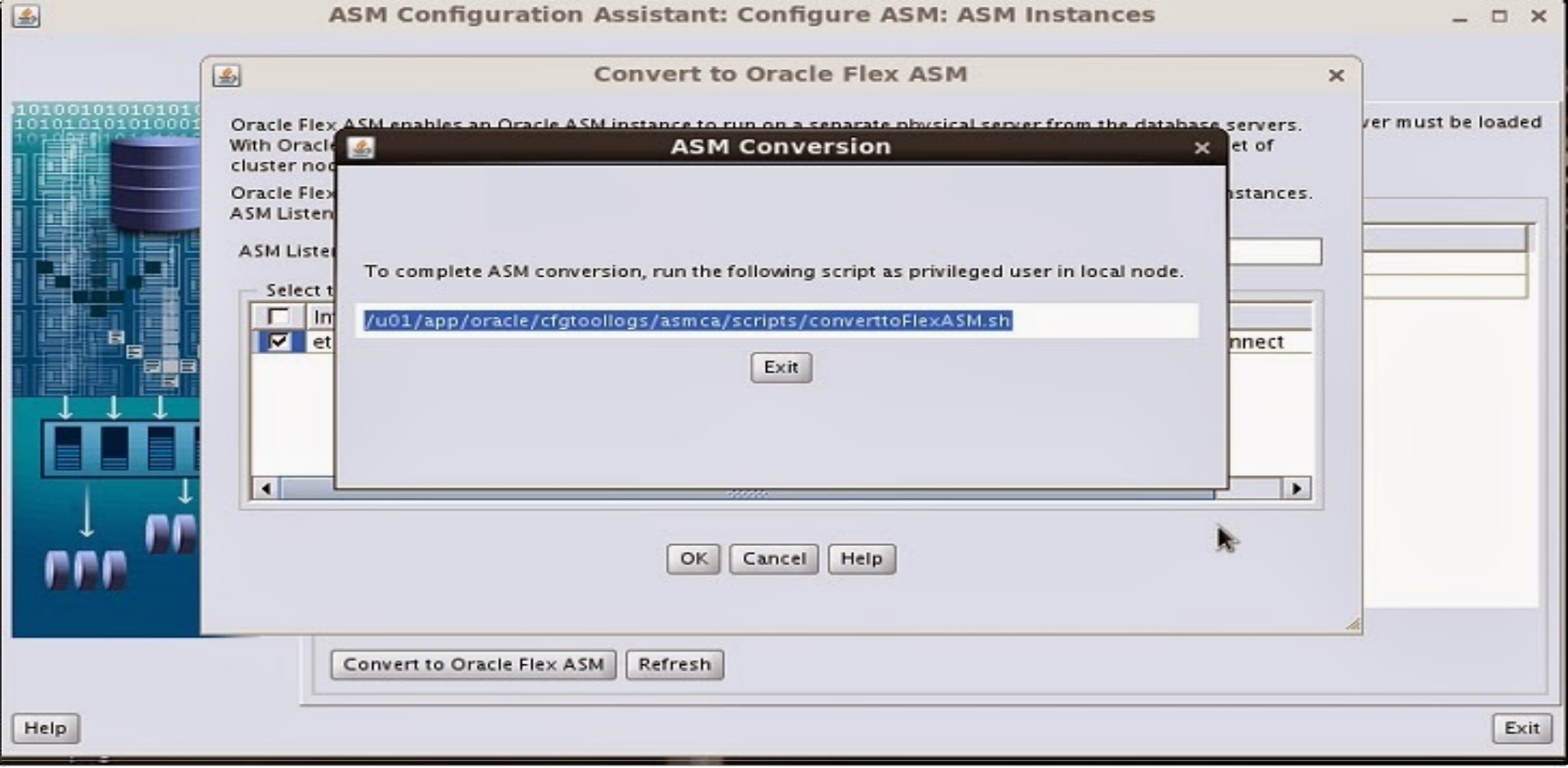
Oracle ASM Deployment Model can be chosen during the installation of *Oracle Grid Infrastructure*

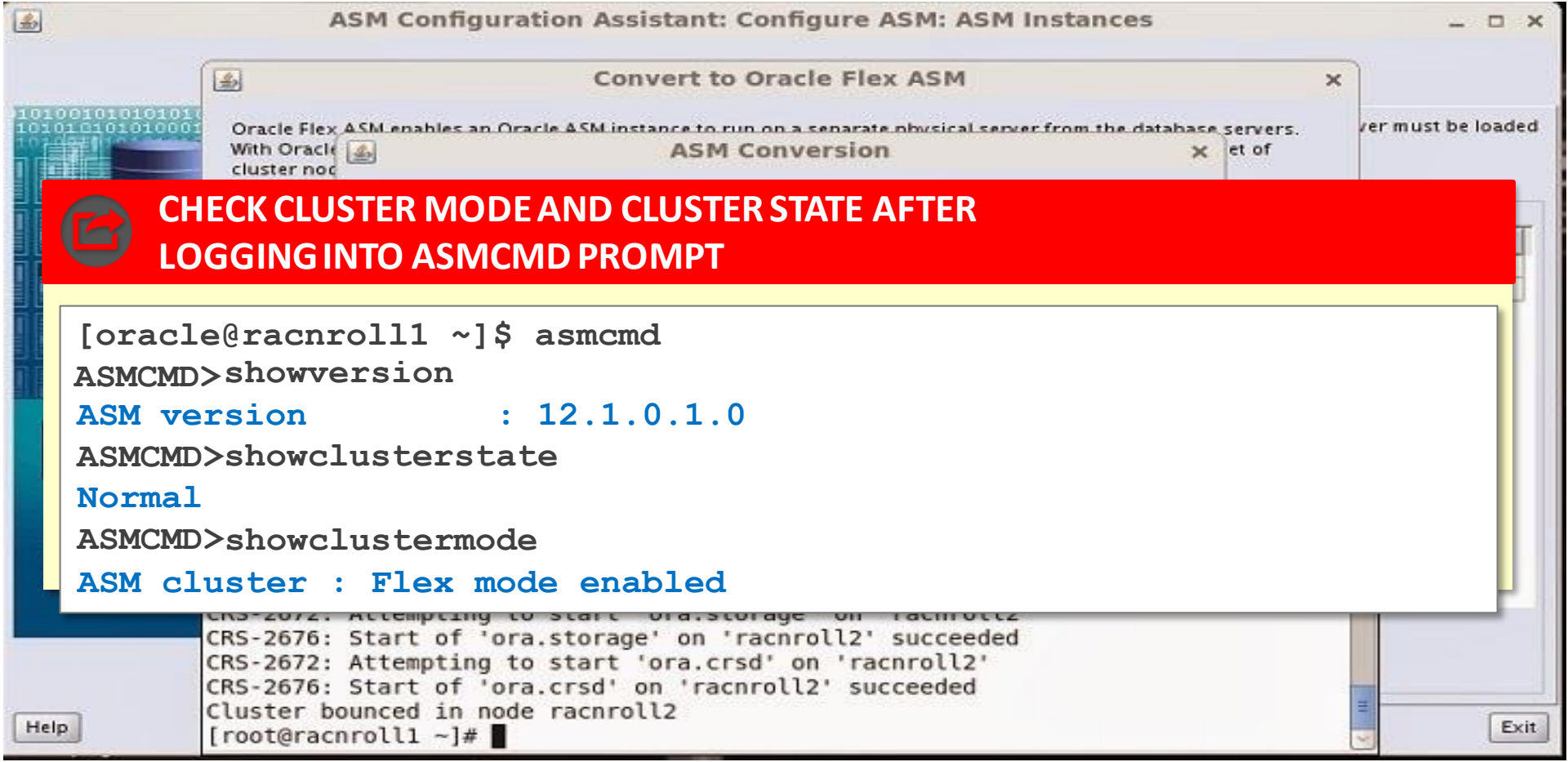
Oracle ASM Configuration Assistant (ASMCA) can be used to enable Oracle Flex ASM after the installation / upgrade is performed

The functionality is available only in an *Oracle Grid Infrastructure Configuration*

Conversion of Standard Cluster to

Oracle Flex ASM Cluster


ASM Configuration Assistant: Configure ASM: ASM Instances
Convert to Oracle Flex ASM
ASM Conversion
To complete ASM conversion, run the following script as privileged user in local node.
/u01/app/oracle/cfgtoollogs/asmca/scripts/converttoFlexASM.sh
Exit
OK
Cancel
Help
Convert to Oracle Flex ASM
Refresh
Help
Exit


ASM Configuration Assistant: Configure ASM: ASM Instances
Convert to Oracle Flex ASM
ASM Conversion
CHECK CLUSTER MODE AND CLUSTER STATE AFTER LOGGING INTO ASMCMD PROMPT
[oracle@racnroll1 ~]$ asmcmd
ASMCMD>showversion
ASM version : 12.1.0.1.0
ASMCMD>showclusterstate
Normal
ASMCMD>showclustermode
ASM cluster : Flex mode enabled
CRS-2676: Start of 'ora.storage' on 'racnroll2' succeeded
CRS-2672: Attempting to start 'ora.crsd' on 'racnroll2'
CRS-2676: Start of 'ora.crsd' on 'racnroll2' succeeded
Cluster bounced in node racnroll2
[root@racnroll1 ~]#
Help
Exit

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Thanks for your Time