ED-WP-0037-01LE

Best Practices White Paper

Using Oracle Database 11g R2 Automatic Storage Management with FUJITSU Storage (Linux version)

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Contents

1. Introduction

This document describes the most efficient database environment that provides the combined benefits and advantages of the new Oracle Database 11g Release 2 feature, Automatic Storage Management (ASM), and Fujitsu ETERNUS DX storage systems.

Automatic Storage Management is a new feature in Oracle Database 11g Release 2 that provides data management features within the database that simplifies the management of database systems and storage environments. ASM is the combination of a clustered file system and logical volume manager that is tightly integrated and embedded within the Oracle database 11g Release 2.

ASM was specifically designed to operate with Oracle database files. ASM is a standard Oracle Database 11g Release 2 feature that is included at no additional cost with the database system. ASM is designed to optimize the operation of Oracle databases and simplify storage management by virtualizing storage hardware, automating tasks, and optimizing performance and thereby reducing operational overhead, administrator intervention – and human error – and overall management costs.

ASM is Oracle's collection of intelligence and best practices learned over many years. The ASM disk group virtualization interface allows DBAs to easily and dynamically add or remove disks for a particular disk group without interrupting the database operation. ASM will automatically begin to use a new disk as soon as it is added to the disk group, and will automatically rebalance data between old and new disks to continuously optimize I/O performance. ASM also eliminates disk fragmentation and hotspots thereby reducing management overhead.

ASM provides up to 3-way mirroring for higher availability and is an alternative to mirroring provided by the hardware RAID in storage arrays. The Oracle DBA simply defines a failure group within a disk group and ASM will automatically mirror the data across two or more failure groups, which can help to avoid downtime in the event of component failures, such as a disk controller or even entire disk array. This powerful redundancy feature increases availability without any additional management overhead. Since failure groups are automatically managed by failover or failback activities are fully managed - without the intervention of an operator - by ASM when the failed component is replaced.

Fujitsu's ETERNUS storage systems meet the requirements of a mission-critical-environment. ETERNUS DX8000 S2 series is a highly scalable, large capacity disk array, ETERNUS DX400 S2 series is a mid range disk array; and DX60 S2/DX80 S2/DX90 S2 are entry-level disk arrays. In any ETERNUS model, all major components are redundantly equipped and are hot-swappable to ensure business continuity with high reliability and high availability. ETERNUS storage systems provide an online volume-replication feature that enables non-disruptive database backup operations.

This white paper describes the most efficient method to configure a high-performance, high-availability Oracle database environment by the combination of ASM and ETERNUS.

* In this verification, the PRIMERGY RX350 S7 was used as the industry standard server.
Database operations require not only high reliability and management features but also scalability.
The PRIMERGY RX350 S7 is a dual CPU rack mount server with both high performance and high scalability, and therefore suitable for this task.
For details of this server, see the following web site.
http://www.fujitsu.com/fts/products/computing/servers/primergy/rack/rx350/

2. Fujitsu's ETERNUS DX Storage Systems

2-1. High Availability

The Fujitsu ETERNUS DX storage system provides high availability that guarantees secure operation in mission critical environments.

All major components are redundantly equipped. In the event of a component failure, the ETERNUS DX storage system automatically reallocates the remaining active components for non-disruptive operation. Plus, all major components are hot-swappable.

Disk drives are configured in RAID groups. In the event of a disk-drive failure, the data is quickly rebuilt in a hot-spare disk to maintain the data redundancy. Plus, the ETERNUS DX storage system constantly monitors each disk drive for pre-failure detection. If one of the disk drives is likely to fail, the ETERNUS proactively copies the data to the hot-spare disk. This enables disk-drive replacement while maintaining the data redundancy.

The interfaces between servers and ETERNUS DX storage systems also deliver a high availability mechanism. This mechanism is provided by the ETERNUS Multipath Driver or GR Multipath Driver that manages multiple Fibre Channel paths. Even if one path fails, operations of a database and/or other applications can continue by automatically rerouting data through the remaining active paths. Such a highly available mechanism guarantees continuous operations even in the event of a server-side HBA failure or switch failure.

Cache in a storage system is a temporary storage of the data written from servers, dependant on a power source – typically a battery – to preserve the data in case of a power failure at the customer site. However, the ETERNUS DX storage system reliably protects the cached data by backing up the data into non-volatile memory in the event of a power failure.

2-2. Performance Tuning

The Fujitsu ETERNUS DX storage system provides features to replace drives or to change RAID configurations without disrupting accesses to the volumes. With these features, it is possible to optimize access performance without stopping operations.

RAID Migration provides two features to reorganize disk drives. One is a feature to include the currently-used RAID drives into the destination RAID group. This feature is useful when reconfiguring the same-specification drives into a different RAID-level group. The other feature is useful when moving the data from the source RAID drives to a different type of target RAID drives, for example, from a 15K rpm-drive RAID group to a 7.2K rpm-drive RAID group. Both features can be used without interrupting accesses to the RAID group, and the switching from the source to destination is automatically performed by the ETERNUS DX storage system.

The QoS（Quality of Service) feature enables storage systems to maintain stable performance without any influence of load change on other applications. This feature can set priority on processing requests from servers and set upper limits on the performance required for each process. Even if processing operations occur simultaneously in each server, storage performance is applied to high-priority processing operations to maintain stable storage performance.

The Automated Storage Tiering feature enables reduction in data management man-hour and management costs by use with the ETERNUS SF Storage Cruiser software. This feature controls data placement in the environment where different types of drives are installed, and optimizes performance and costs. In particular, this feature detects data access frequency and then automatically relocates data between drives according to the set policy.

2-3. Point-in-time Copy Feature

The Fujitsu ETERNUS DX storage system provides a point-in-time copy feature that creates a copy of the source volume data at a certain point in time within the storage system without stopping the operations of a database or other applications.

Demand for system requirements supporting 24 x 365 continuous operations is growing. System administrators must make backups without disrupting business operations, such as database operation, and without putting heavy loads on the servers. ETERNUS DX storage systems provide four types of replication features: Equivalent Copy (EC), One Point Copy (OPC), QuickOPC and SnapOPC+. With EC, a copy volume is created always in synchronization with the update of a business volume. With OPC, all data in a business volume can be copied on demand. With QuickOPC, all data in a business volume is copied once, and then only updated data is copied to a replicated volume. With SnapOPC+, only the data before update is copied at the time of update, enabling generation managements. These features can be used according to the business requirements.

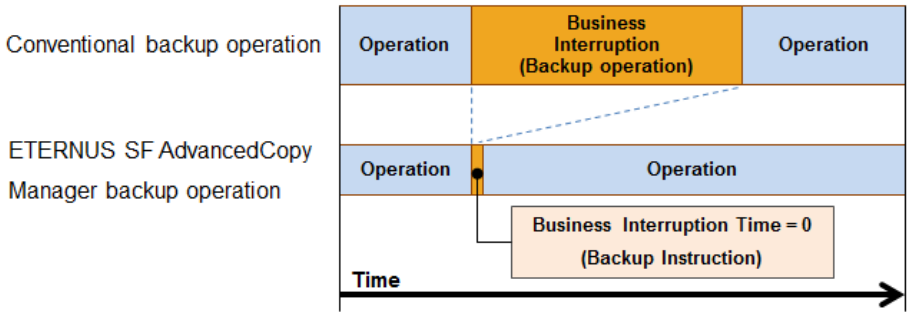
3. Fujitsu Storage Management software

3-1. ETERNUS SF AdvancedCopy Manager

Fujitsu offers the ETERNUS SF AdvancedCopy Manager, an application to control the EC, OPC, Quick OPC and SnapOPC+ features of the ETERNUS DX storage system. The ETERNUS SF AdvancedCopy Manager enables users to perform backup operations using a uniform operation even in a wide variety of OS environments. It is possible to manage replicated spaces, and to non-disruptively create a consistent database copy synchronizing with the original database operation. It also provides the following features.

- Backup operation without impact to normal operations

The AdvancedCopy features of the ETERNUS DX Disk storage system can perform backup operations without impacting running business applications. Thanks to the high-speed backup, and independent of the size, business data and system volumes can be backed up without the need to interrupt operations. System volumes can be backed up easily before or after applying a patch or changing an application.

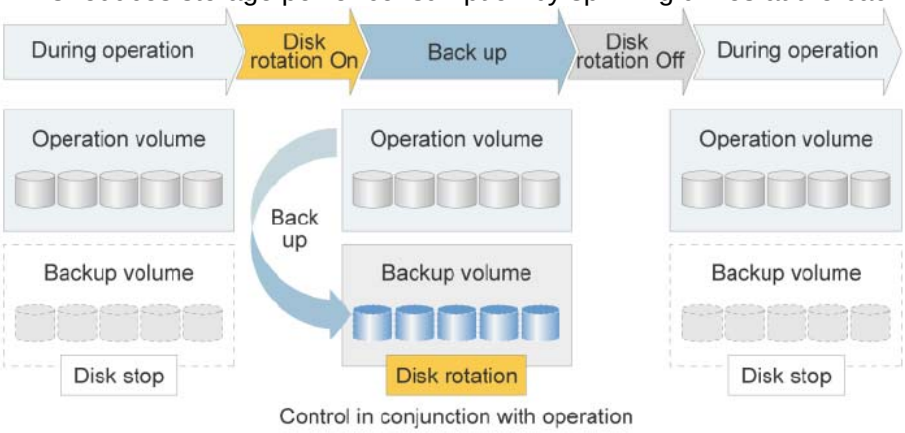


- Backup operation without interrupting the database system

In combination with Oracle's backup feature, this enables backup without interrupting database operations, thereby achieving 24 x 365 continuous operation.

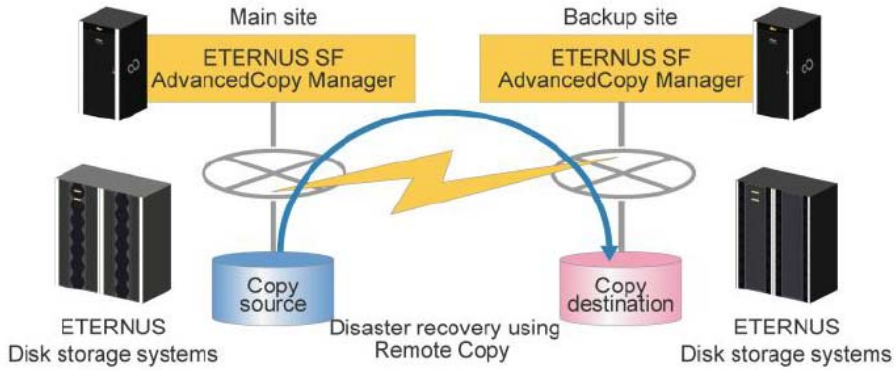
- Power-saving backup

This reduces storage power consumption by spinning drives at the backup site only at the time of backup.



- Implement a disaster recovery solution

Remote copy is available by connecting the ETERNUS DX Disk storage systems via a WAN. For example, a disaster recovery solution can be implemented by installing our disk storage system for storing backup data into a facility where earthquake-resistant measures are taken.



4. Oracle Technologies

4-1. Integration of Grid Infrastructure and Automatic Storage Management

With Oracle Database11g Release2, ASM is integrated with Grid Infrastructure. Whereas ASM was a component of Oracle Database in previous releases, it now is a component of Grid Infrastructure in the Oracle Database11g Release 2. Therefore, it is necessary to install Grid Infrastructure when configuring an ASM instance.

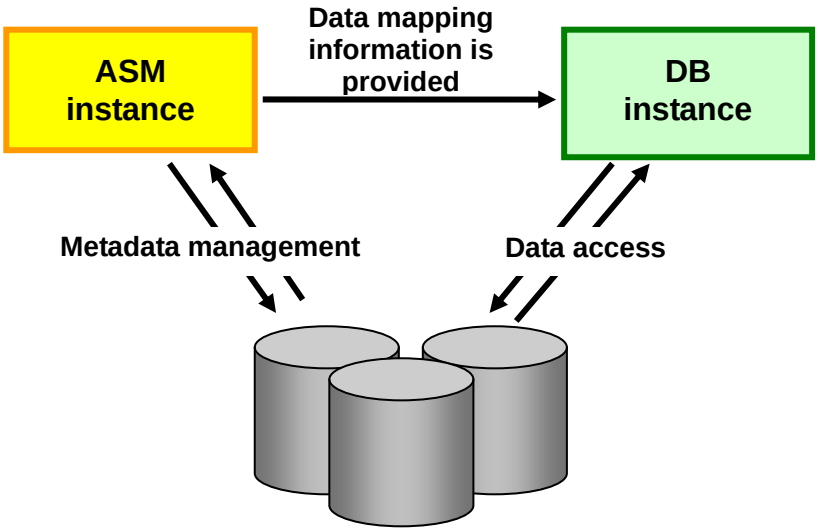
4-2. Automatic Storage Management

ASM enables a disk group to be designated as storage for Oracle database files[*1], OCR, Voting disk, SPFILE for ASM instance and backup files. A disk group consists of multiple disk drives and is managed as a unit by ASM. Any file stored in a disk group is automatically striped over all the disk drives in the group. ASM provides clustering capabilities and is available not only for single SMP machine but across multiple nodes of Oracle Real Application Clusters.

[*1] Control file, data file, SPFILE for database instance, online redo log, archive log, flashback log, changed tracking bitmap, data pump dump set, etc.

4-3. ASM Architecture

The ASM feature is activated by using the ‘ASM instance’ which is different from the ‘DB instance’. The ASM instance manages data mapping information in a disk group by using metadata describing the layout of ASM files.



The DB instance provides for access to data files by using the data mapping information from the ASM instance.

4-4. I/O Distribution

A file (an ASM file) created on a disk group is divided evenly and stored among all the disk drives in the disk group. This prevents I/O concentration on a single disk drive. There are two stripe widths: COARSE (1MB chunks) and FINE (128KB chunks). The default setting for the control file is FINE and for all others the default setting is COARSE.

4-5. Dynamic Reconfiguration of a Disk Group

When a disk drive is added to or removed from a disk group or if a disk drive fails, ASM automatically redistributes data among all the disk drives. This operation can be performed without interrupting database operations.

4-6. Rebalancing

When a disk group is reconfigured, the data is reallocated so that the load on each disk in the disk group is balanced. This operation is called ‘rebalancing’. Rebalancing has some performance impacts on online transactions because it generates internal accesses for moving data. Rebalancing does not relocate data based on I/O statistics nor is it started as a result of statistics. It is completely driven by the size of the disks in the disk group and is automatically started when the storage configuration changes.

4-7. ASM Mirroring

ASM has three disk group types that support different types of mirroring: (1) normal redundancy, (2) high redundancy, and (3) external redundancy. Normal redundancy disk groups support two-way mirroring. High redundancy disk groups support three-way mirroring. External redundancy disk groups do not provide mirroring. When RAID storage is used, we recommend using the external redundancy disk group.

4-8. ASM Recovery

If the ASM instance shuts down or ends abnormally, the DB instance depending on the ASM instance also ends abnormally. This, however, will not crash the operating system and therefore can be recovered and restarted quickly and efficiently.

With an RAC configuration database, an ASM instance is distributed to each node. This ensures that even if an ASM instance on a certain node ends abnormally, the ASM instances on the other nodes automatically recover and maintain their operations.

4-9. Backup and Restoration of Metadata

With Oracle Database 11g, a feature to back up and restore the metadata of ASM disk groups was added. In the event of a ASM disk group failure, this enables the ASM disk group to be recovered（It can be restored with the same disk path, disk name, failure group, attribution, template and arias directory structure as those at the time of backup）.

Both the backup and restoration features are executed with the ASMCMD utility.

5. Best Practices

5-1. High Reliability and High Availability

The ASM in Oracle Database11g provides a mirroring feature that further enhances Oracle database availability. However, to further enhance availability, ETERNUS DX storage system's high-availability features including its RAID mechanism can be used to provide the optimum solution. The ETERNUS DX storage system can perform maintenance operations including failure detection, retry by switching and replacement of failed parts concurrently when database operations are running.

5-2. Database Acceleration

Database performance can be enhanced by the combination of the ASM striping feature and the RAID mechanism. The ASM striping feature allocates data across all the disks in the disk group to enhance the entire throughput. Moreover, with the disk group volume configured as RAID0+1 or RAID5, the performance is enhanced by striping within the ETERNUS DX.

Database operations sometimes require performance tuning after the operations have started. ASM optimizes file accesses by distributing file extents to all the disks in a disk group. This means manual tuning is not required.

Moreover, the ETERNUS DX storage system provides RAID migration feature that enables performance tuning from another aspect. With RAID migration, it is possible to change disk drives comprising the RAID group, for example, from 10K rpm drives to 15K rpm drives and to change RAID levels, for example, from RAID5 to RAID0+1, without stopping operations..

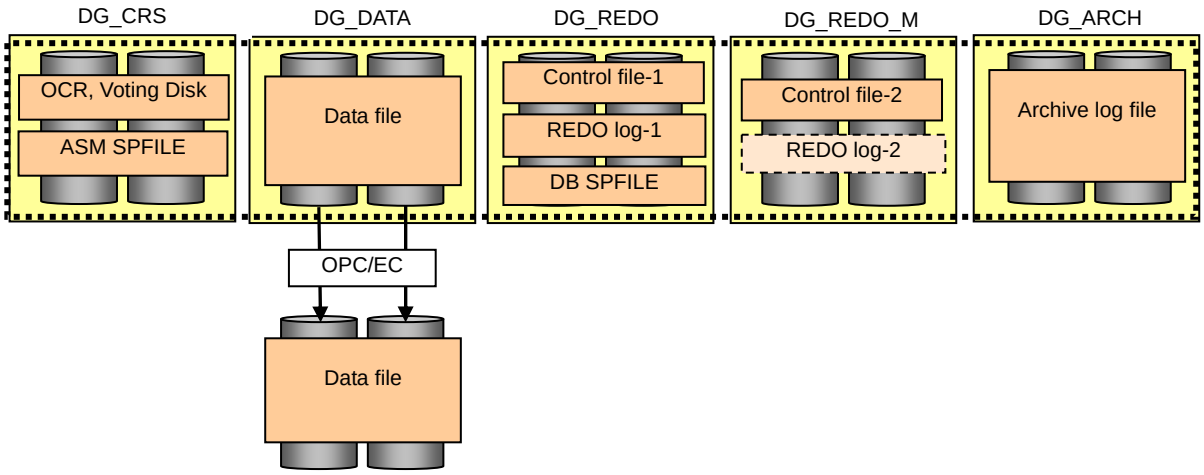
5-3. ASM Disk Group Configuration Guideline

The datafile is huge in size, and does require concurrent backup and rapid recovery - so it is best to use Advanced Copy for the backup of the datafile. It is also best to allocate each file in separate disk group for ease of operation at the time of restoration If Advanced Copy is used for the datafile backup, then the redo log file should never be placed in the same disk group as the datafile. Otherwise, Advanced Copy will overwrite all the data of the disk group at the time of restore.

In order to maximize the benefits of the ETERNUS DX Advanced Copy feature, we recommend configuring ASM disk groups as described in the figure below.

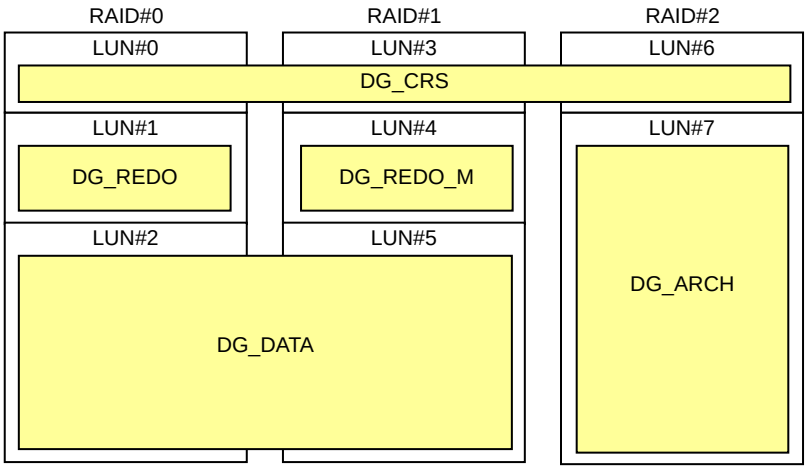
(1) Create five disk groups.
   ① For OCR, Voting disk and SPFILE for ASM（DG_CRS）
   ② For data file (DG_DATA)
   ③ For redo log file (DG_REDO)
   ④ For mirror of control file (DG_REDO_M)
   ⑤ For archive log file（DG_ARCH）
(2) Set 11.2.0.0.0 as compatible.asm attribute and compatible.rdbms attribute of all disk groups
   * Unless the above setting is performed when metadata is backed up with the ASMCMD utility, the metadata cannot be restored properly due to the failure of 11.2.0.1.0.
(3) Allocate only data files to DG_DATA. Data files are backed up with the ETERNUS DX Advanced Copy features（OPC/EC）. For details of the backup for other files, see "7-2. Backup/Recovery Procedures and Usage Example".
(4) Allocate all redo log files and control files to DG_REDO
(5) Allocate all mirrors of control files to DG_REDO_M
(6) Allocate archive log files to DG_ARCH
(7) Allocate OCR, Voting disk, SPFILE for ASM instance to DG_CRS

* Note: If you want to maximize the availability of redo log files, then you can place a mirror of all redo log file logs in the mirror disk group（DG_REDO_M).



Regarding RAID configurations for the ETERNUS DX storage system, RAID0+1 is recommended for online volumes to provide performance and reliability, and RAID5 is recommended for backup volumes for cost-effectiveness. To maximize performance, it is recommended that each disk group is placed in different RAID groups. However, because of advancements in disk capacities, it is unrealistic that all the disk groups can be placed in different RAID groups. Therefore, it is necessary to place a small number of disk groups per RAID group, e.g., placing infrequently accessed disk groups to the same RAID group.

RAID placement of disk group (Example)



5-4. Backup of AdvancedCopy Manager Operational Information

The ETERNUS SF Manager and AdvancedCopy Manager contain various repositories and management information as operational information. The operational information is important information that is required to operate the ETERNUS SF Manager and AdvancedCopy Manager. In the event of an unexpected accident and a shortage of repository capacity due to a long-term operation, a significant change in operational status may occur. Therefore it is recommended to back up the operational information periodically.
For details of the backup methods of the ETERNUS SF Manager and AdvancedCopy Manager operational information, see “9.1 Maintenance of Database” and “Maintenance method of ETERNUS SF Manager Database” in “ETERNUS SF Advanced Copy Manager Operator's Guide (Linux)”.

6. Conclusion

To configure a high-performance, high-availability and high-operability database environment with a combination of the Oracle 11g ASM feature and the Fujitsu ETERNUS DX storage system, the following points must be considered.

(1) For disk groups where OCR, Voting disk or SPFILE for ASM instance is stored, configure disk groups with high redundancy or normal redundancy. For the others, configure disk groups with external redundancy.
(2) Set 11.2.0.0.0 as compatible.asm attribute and compatible.rdbms attribute of all disk groups
*Unless the above setting is made when metadata is backed up with the ASMCMD utility, the metadata cannot be restored properly due to a failure of 11.2.0.1.0.
(3) Employ RAID0+1 or RAID5 for volumes to be registered in a disk group.
(4) Create five disk groups: DG_CRS, DG_DATA, DG_REDO, DG_REDO_M and DG_ARCH. Allocate OCR, Voting disk and ASM SPFILE to DG_CRS. Allocate only data files to DG_DATA. Allocate redo log files and control files to DG_REDO. Allocate mirrors of control files to DG_REDO_M. Allocate archive log files to DG_ARCH.
(5) For maximum availability of redo log files, it is recommended to place mirrors of redo log files in control file mirror disk group（DG_REDO_M）.
(6) RAID Migration feature enables performance tuning by changing the rotational speed of disk drive and/or the RAID levels concurrently with online operations.
(7) For data files, execute backup and recovery of the ASM file system using the Advanced Copy feature of ETERNUS DX storage system
(8) Back up and recover archive logs, control files and SPFILE for database instance using RMAN
(9) Back up and recover metadata of disk groups with the ASMCMD utility
(10) Back up and recover SPFILE for ASM instance using SQL*Plus
(11) Back up and recover OLR, OCR and Voting disk using ocrconfig

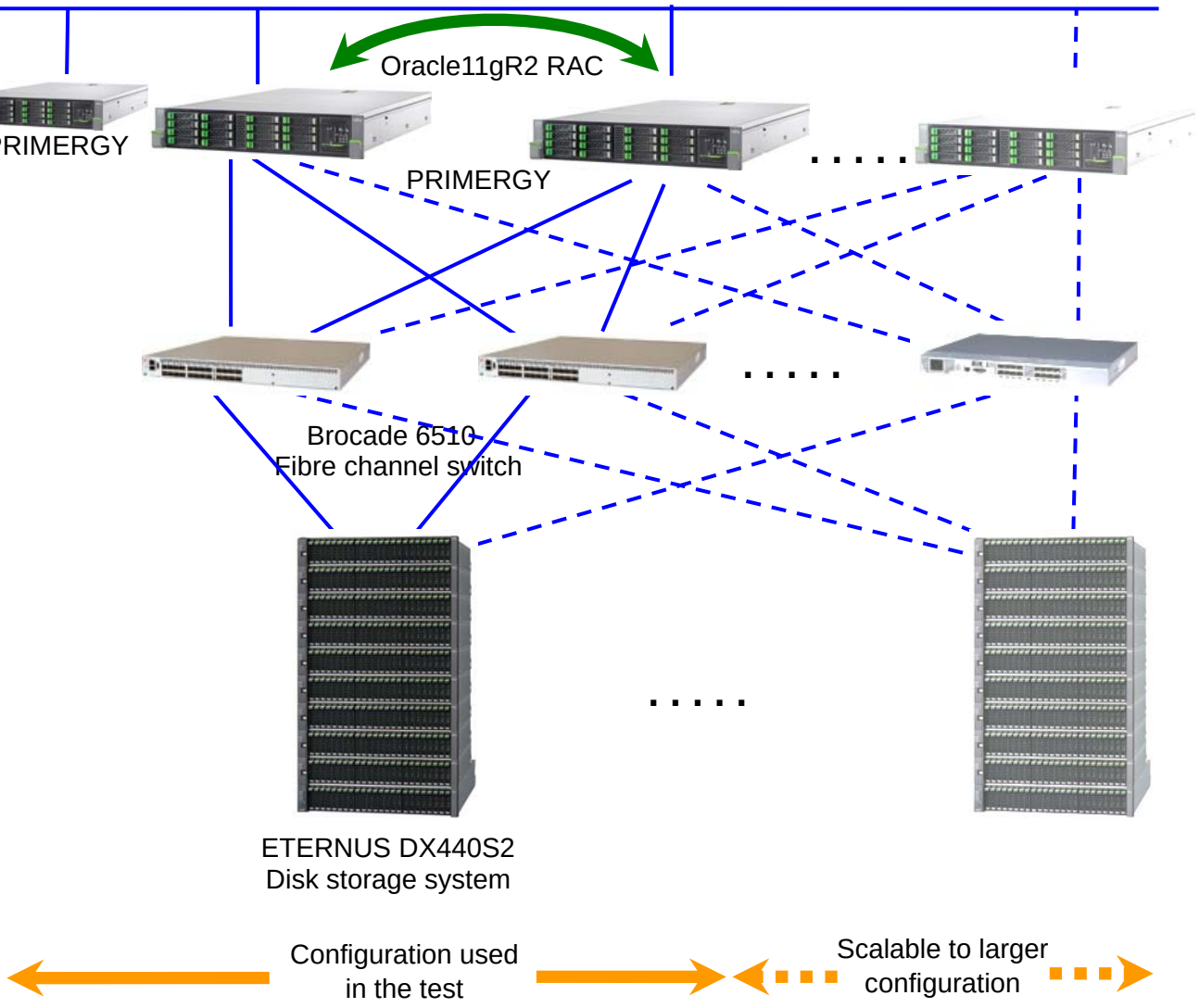
7. Appendix

As described above, this Best Practices document explains the basic features available through the combination of Oracle 11g ASM, ETERNUS DX and ETERNUS SF AdvancedCopy Manager.

【Note】
Screen shots of Oracle Enterprise Manager used in this chapter are that of Oracle Database Product (11gR2). Oracle Corporation has the proprietary rights of them.

7-1. Cluster System by the Combination of Oracle RAC and Oracle Clusterware

Oracle Clusterware enables simple application control. This section describes a procedure for building a cluster environment to operate ETERNUS SF AdvancedCopy Manager in Oracle Clusterware（cluster system）.



7-1-1. Hardware and software requirements

Here is a listing of the equipment and components you will need:

- ETERNUS SF AdvancedCopy Manager 15.1 or later
- Red Hat Enterprise Linux 6 (64bit)
- Oracle Database 11g Release 2
- Oracle Real Application Clusters 11g Release 2
- Oracle Grid Infrastructure 11g Release 2

Prerequisites: Before starting this procedure, it is required that you have a storage management server available, with agent installed.

7-1-2. Required Resources

For cluster operations using AdvancedCopy Manager in Oracle Clusterware, the following resources are needed. The following resources are needed for each HA flame work where AdvancedCopy Manager is installed.

✓ Handover virtual IP (VIP) for AdvancedCopy Manager
Allocate a new IP address that is unique in the network for use in clustered system operations.
IP address is required for each AdvancedCopy Manager transaction.
When a new VIP is assigned, confirm that there is no problem with transaction even if it is added.
When an existing VIP is used, confirm that there is no problem (limit) with the existing products (especially where the VIP is used) even if the VIP is shared with AdvancedCopy Manager.

✓ Shared disk for shared data for AdvancedCopy Manager
Prepare a partition to store shared data for AdvancedCopy Manager on a shared disk. The required number of partitions is one. IP address is required for each AdvancedCopy Manager transaction.
For the shared disk capacity for shared data for AdvancedCopy Manager, see in “3.2 Capacity of a shared disk” in ETERNUS SF Advanced Copy Manager 14.2 Operator's Guide for Cluster Environment.
Note)

- Allocate disks where backup and replication are not executed with AdvancedCopy Manager to the shared disk for shared data for AdvancedCopy Manager.
- Shared disk for shared data for AdvancedCopy Manager is used for a file system. Mount the shared disk for shared data for AdvancedCopy Manager with ActionScript of Oracle Clusterware.

✓ Logical node name
It is the name of logical server in a cluster system. It can be set optionally using only a 8-byte alphameric character.
Commands of AdvancedCopy Manager in cluster operations operate using this logical name as a key.
E.g.: When a command is executed, if this node name is set for the environmental variable SWSTGNODE, the command operates as a cluster operation.

✓ Port number of the communication service for transaction
Prepare the port number assigned to the communication service for transaction. It should be an integral value between 5001 and 65535 which is not used as another port number. In addition, it is necessary to use the same port number for primary and secondary since it is a cluster operation.
Note)

- The port number of the communication service for transaction should be different from that of local the communication service for transaction. To use the port number of local the communication service for transaction for that of the communication service for transaction, register a new port number for the port number for local the communication service for transaction.

✓ ActionScript of AdvancedCopy Manager
Prepare an ActionsScript for transaction that starts and stops the AdvancedCopy Manager service. Specify the prepared ActionScript in the application profile of Oracle Clusterware.

7-1-3. Procedures to Create a Cluster Environment

[Procedure flow]
To create a cluster environment, the following operations are required.

1. Edit the configuration file of AdvancedCopy Manager for each node
2. Create a directory on a shared disk for shared data
3. Create a configuration file of AdvancedCopy Manager on the shared disk for shared data
4. Execute the command to create a cluster environment of AdvancedCopy Manager
5. Register to the HA framework
   (Command/ Oracle Enterprise Manager)

[Procedures to set AdvancedCopy Manager]
Execute the following operation as root user.

In the setting examples described in setting procedures, the following conditions are used.
For the actual setting, set them according to the environment.

Setting example:

AdvancedCopy Manager version		15.1
Cluster	Logical node name	linux
	Business name	acmagt
	Mount point of shared disk for shared data for AdvancedCopy Manager	/acmdata
	Disk device of shared disk for shared data for AdvancedCopy Manager	/dev/disk/by-id/scsi-3600000e00d10000000 1001a200150000-part1
	Primary node name	node1
	Port number of the communication service for transaction	1227

<Operations in a primary node>

1. Make a setting so that a shared disk for shared data for AdvancedCopy Manager can be used
   Setting example

```
[root@node1]#  /bin/mount  /dev/disk/by-id/scsi-3600000e00d100000001001a200150000-part1
/acmdata
```

2. Edit /etc/services to register the port number of the communication service for transaction
   File settings
   The mark "★" indicates the item that should be added according to the environment.

```
# /etc/services:
# $Id: services,v 1.48 2009/11/11 14:32:31 ovasik Exp $
#
# Network services, Internet style
# IANA services version: last updated 2009-11-10
#
# Note that it is presently the policy of IANA to assign a single well-known
# port number for both TCP and UDP; hence, most entries here have two entries
# even if the protocol doesn't support UDP operations.
# Updated from RFC 1700, ``Assigned Numbers'' (October 1994).  Not all ports
# are included, only the more common ones.
#
# The latest IANA port assignments can be gotten from
#      http://www.iana.org/assignments/port-numbers
# The Well Known Ports are those from 0 through 1023.
# The Registered Ports are those from 1024 through 49151
# The Dynamic and/or Private Ports are those from 49152 through 65535
#
# Each line describes one service, and is of the form:
#
# service-name  port/protocol  [aliases ...]   [# comment]

tcpmux        1/tcp                 # TCP port service multiplexer
tcpmux        1/udp                 # TCP port service multiplexer
(snip)
```

```
      stgxfws       1226/tcp
★     stgxfws_<Logical node name>  <Port number of the communication service for transaction
      >/tcp
```

Setting example

```
# /etc/services:
# $Id: services,v 1.48 2009/11/11 14:32:31 ovasik Exp $
#
# Network services, Internet style
# IANA services version: last updated 2009-11-10
#
# Note that it is presently the policy of IANA to assign a single well-known
# port number for both TCP and UDP; hence, most entries here have two entries
# even if the protocol doesn't support UDP operations.
# Updated from RFC 1700, ``Assigned Numbers'' (October 1994).  Not all ports
# are included, only the more common ones.
#
# The latest IANA port assignments can be gotten from
#     http://www.iana.org/assignments/port-numbers
# The Well Known Ports are those from 0 through 1023.
# The Registered Ports are those from 1024 through 49151
# The Dynamic and/or Private Ports are those from 49152 through 65535
#
# Each line describes one service, and is of the form:
#
# service-name  port/protocol  [aliases ...]   [# comment]

tcpmux        1/tcp                       # TCP port service multiplexer
tcpmux        1/udp                       # TCP port service multiplexer
(snip)
stgxfws       1226/tcp
stgxfws_linux       1227/tcp
```

3. Edit the configuration file (swcluster.ini) of AdvancedCopy Manager

File name	swcluster.ini
Storage location	/opt/FJSVswstf/cluster

File settings

The mark "★" indicates the item that should be added according to the environment.

```
      [ClusterCommon]
      Cluster=ON
      Max=20
      StartTimeOut=300
      StopTimeOut=300
      System=SAFE
★     Env_1=<Logical node name>
★     [<Logical node name>]
      Type=Primary
      BusiType=2
★     Business=<Business name>
★     ShareEtc=<Mount point of shared disk for shared data>/etc/opt
★     ShareVar=<Mount point of shared disk for shared data>/var/opt
★     MountPoint=<Mount point of shared disk for shared data>
★     IPAddr=
      IPUseType=0
      IPRscName=
      Hostname=
      NodeName=<Primary node name (Host name of primary node)>
★     ClusterName=
      DiskName=
      GroupName=
      SubNetMask=
      MSCSNetName=
      Date=00/00/00 00:00:00
      Setup=YES
      ResourceType=Procedure
```

Setting example

```
[ClusterCommon]
Cluster=ON
Max=20
StartTimeOut=300
StopTimeOut=300
System=SAFE
Env_1=linux
[linux]
Type=Primary
BusiType=2
Business=acmagt
ShareEtc=/acmdata/etc/opt
ShareVar=/acmdata/var/opt
MountPoint=/acmdata
IPAddr=
IPUseType=0
IPRscName=
Hostname=
NodeName=node1
ClusterName=
DiskName=
GroupName=
SubNetMask=
MSCSNetName=
Date=00/00/00 00:00:00
Setup=YES
ResourceType=Procedure
```

4. Create a directory on a shared disk for shared data for AdvancedCopy Manager

```
Mount point of shared disk for shared data for AdvancedCopy Manager
+---/etc
|   ---/opt
|      ---/swstorage
+---/var
    ---/opt
       ---/swstorage
```

Setting example

```
[root@node1]# /bin/mkdir -p /acmdata/etc/opt/swstorage
[root@node1]# /bin/chmod -R 755 /acmdata/etc
[root@node1]# /bin/chown -R root:root /acmdata/etc
[root@node1]# /bin/mkdir -p /acmdata/var/opt/swstorage
[root@node1]# /bin/chmod -R 755 /acmdata/var
[root@node1]# /bin/chown -R root:root /acmdata/var
```

5. Create a configuration file (clsetup.ini) of AdvancedCopy Manager

File name	clsetup.ini
Storage location	<Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage
Storage location example	/acmdata/etc/opt/swstorage
Language used in AdvancedCopy Manager	Set the following value - Japan version: JAPANESE - International version: ENGLISH

File settings

The mark "★" indicates the item that should be added according to the environment.

```
      [Cluster]
      System=SAFE
★     Swstgnode=<Logical node name>
★     Business=<Business name>
★     ShareEtc=<Mount point of shared disk for shared data>/etc/opt
★     ShareVar=<Mount point of shared disk for shared data>/var/opt
★     MountPoint=<Mount point of shared disk for shared data>
      IPAddr=
      IPUseType=0
```

```
      IPRscName=
      Hostname=
      NodeName=<Primary node name (Host name of primary node)>
★     ClusterName=
      DiskName=
      GroupName=
      SubNetMask=
      MSCSNetName=
      BusiType=2
      ResourceType=Procedure
      [StorageMGR]
      Version=<AdvancedCopy Manager version>
★     Edition=EE
      Type=2
      AFSType=1
      Language=<Language used in AdvancedCopy Manager>
★     Code=
      [Secondary]
      Setup=YES
      Date=00/00/00 00:00:00
      [Primary]
      Date=00/00/00 00:00:00
      Setup=YES
```

Setting example

```
[Cluster]
System=SAFE
Swstgnode=linux
Business=acmagt
ShareEtc=/acmdata/etc/opt
ShareVar=/acmdata/var/opt
MountPoint=/acmdata
IPAddr=
IPUseType=0
IPRscName=
Hostname=
NodeName=node1
ClusterName=
DiskName=
GroupName=
SubNetMask=
MSCSNetName=
BusiType=2
ResourceType=Procedure
[StorageMGR]
Version=V15.1
Edition=EE
Type=2
AFSType=1
Language=ENGLISH
Code=
[Secondary]
Setup=YES
Date=00/00/00 00:00:00
[Primary]
Date=00/00/00 00:00:00
Setup=YES
```

6. Copy the configuration file (swstg.ini) of AdvancedCopy Manager

Copy source file name	/etc/opt/swstorage/swstg.ini
Copy destination	<Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage

Setting example

```
[root@node1]# /bin/cp -p /etc/opt/swstorage/swstg.ini /acmdata/etc/opt/swstorage
```

7. Execute the following commands from the command prompt.

1	clset_FJSVswstf	/opt/FJSVswstf/bin/clset_FJSVswstf -f <Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Primary
2	clset_FJSVswsts	/opt/FJSVswsts/bin/clset_FJSVswsts -f <Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Primary
3	clset_FJSVswsrp	/opt/FJSVswsrp/bin/clset_FJSVswsrp -f <Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Primary

Setting example

```
[root@node1]# /opt/FJSVswstf/bin/clset_FJSVswstf -f /acmdata/etc/opt/swstorage/clsetup.ini -t Primary
clset_FJSVswstf completed
[root@node1]# /opt/FJSVswsts/bin/clset_FJSVswsts -f /acmdata/etc/opt/swstorage/clsetup.ini -t Primary
clset_FJSVswsts completed
[root@node1]# /opt/FJSVswsrp/bin/clset_FJSVswsrp -f /acmdata/etc/opt/swstorage/clsetup.ini -t Primary
clset_FJSVswsrp completed
```

8. Create a symbolic link to the shared disk for shared data for AdvancedCopy Manager

1	Data in etc area	Link source	/etc/opt/swstorage/<Logical node name>
		Link destination	<Mount point of shared disk for shared data for dvancedCopy Manager>/etc/opt/swstorage
2	Data in var area	Link source	/var/opt/swstorage/<Logical node name>
		Link destination	<Mount point of shared disk for shared data for dvancedCopy Manager>/var/opt/swstorage

Setting example

```
[root@node1]# /bin/ln -s /acmdata/etc/opt/swstorage /etc/opt/swstorage/linux
[root@node1]# /bin/ln -s /acmdata/var/opt/swstorage /var/opt/swstorage/linux
```

9. Unmount the shared disk for shared data for AdvancedCopy Manager

Setting example

```
[root@node1]# cd /
[root@node1]# /bin/umount /acmdata
```

<Operations in a secondary node>

10. Make a setting so that a shared disk for shared data for AdvancedCopy Manager can be used

Setting example

```
[root@node2]# /bin/mount /dev/disk/by-id/scsi-3600000e00d100000001001a200150000-part1
/acmdata
```

11. Edit /etc/services to register the port number of the communication service for transaction

File settings

The mark "★" indicates the items that should be added according to the environment.

```
# /etc/services:
# $Id: services,v 1.48 2009/11/11 14:32:31 ovasik Exp $
#
# Network services, Internet style
# IANA services version: last updated 2009-11-10
#
# Note that it is presently the policy of IANA to assign a single well-known
# port number for both TCP and UDP; hence, most entries here have two entries
# even if the protocol doesn't support UDP operations.
# Updated from RFC 1700, ``Assigned Numbers'' (October 1994).  Not all ports
# are included, only the more common ones.
#
# The latest IANA port assignments can be gotten from
#      http://www.iana.org/assignments/port-numbers
# The Well Known Ports are those from 0 through 1023.
# The Registered Ports are those from 1024 through 49151
# The Dynamic and/or Private Ports are those from 49152 through 65535
#
# Each line describes one service, and is of the form:
#
# service-name  port/protocol  [aliases ...]   [# comment]
```

```
      tcpmux        1/tcp                        # TCP port service multiplexer
      tcpmux        1/udp                        # TCP port service multiplexer
      (snip)
      stgxfws       1226/tcp
★     stgxfws_<Logical node name>  <Port number of the communication service for transaction
      >/tcp
```

Setting example

```
# /etc/services:
# $Id: services,v 1.48 2009/11/11 14:32:31 ovasik Exp $
#
# Network services, Internet style
# IANA services version: last updated 2009-11-10
#
# Note that it is presently the policy of IANA to assign a single well-known
# port number for both TCP and UDP; hence, most entries here have two entries
# even if the protocol doesn't support UDP operations.
# Updated from RFC 1700, ``Assigned Numbers'' (October 1994).  Not all ports
# are included, only the more common ones.
#
# The latest IANA port assignments can be gotten from
#     http://www.iana.org/assignments/port-numbers
# The Well Known Ports are those from 0 through 1023.
# The Registered Ports are those from 1024 through 49151
# The Dynamic and/or Private Ports are those from 49152 through 65535
#
# Each line describes one service, and is of the form:
#
# service-name  port/protocol  [aliases ...]   [# comment]

tcpmux        1/tcp                        # TCP port service multiplexer
tcpmux        1/udp                        # TCP port service multiplexer
(snip)
stgxfws       1226/tcp
stgxfws_linux       1227/tcp
```

12. Edit the configuration file (swcluster.ini) of AdvancedCopy Manager

File name	swcluster.ini
Storage location	/opt/FJSVswstf/cluster

File settings

The mark "★" indicates the item that should be added according to the environment.

```
      [ClusterCommon]
      Cluster=ON
      Max=20
      StartTimeOut=300
      StopTimeOut=300
      System=SAFE
★     Env_1=<Logical node name>
★     [<Logical node name>]
      Type=Secondary
      BusiType=2
★     Business=<Business name>
★     ShareEtc=<Mount point of shared disk for shared data>/etc/opt
★     ShareVar=<Mount point of shared disk for shared data>/var/opt
★     MountPoint=<Mount point of shared disk for shared data>
★     IPAddr=
      IPUseType=0
      IPRscName=
      Hostname=
      NodeName=<Primary node name (Host name of primary node)>
★     ClusterName=
      DiskName=
      GroupName=
      SubNetMask=
      MSCSNetName=
      Date=00/00/00 00:00:00
```

```
Setup=YES
ResourceType=Procedure
```

Setting example

```
[ClusterCommon]
Cluster=ON
Max=20
StartTimeOut=300
StopTimeOut=300
System=SAFE
Env_1=linux
[linux]
Type=Secondary
BusiType=2
Business=acmagt
ShareEtc=/acmdata/etc/opt
ShareVar=/acmdata/var/opt
MountPoint=/acmdata
IPAddr=
IPUseType=0
IPRscName=
Hostname=
NodeName=node1
ClusterName=
DiskName=
GroupName=
SubNetMask=
MSCSNetName=
Date=00/00/00 00:00:00
Setup=YES
ResourceType=Procedure
```

13. Execute the following commands from the command prompt.

1	clset_FJSVswstf	/opt/FJSVswstf/bin/clset_FJSVswstf -f <Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Secondary
2	clset_FJSVswsts	/opt/FJSVswsts/bin/clset_FJSVswsts -f <Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Secondary
3	clset_FJSVswsrp	/opt/FJSVswsrp/bin/clset_FJSVswsrp -f < Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Secondary

Execution example

```
[root@node2]# /opt/FJSVswstf/bin/clset_FJSVswstf -f
/acmdata/etc/opt/swstorage/clsetup.ini -t Secondary
clset_FJSVswstf completed
[root@node2]# /opt/FJSVswsts/bin/clset_FJSVswsts -f
/acmdata/etc/opt/swstorage/clsetup.ini -t Secondary
clset_FJSVswsts completed
[root@node2]# /opt/FJSVswsrp/bin/clset_FJSVswsrp -f
/acmdata/etc/opt/swstorage/clsetup.ini -t Secondary
clset_FJSVswsrp completed
```

14. Create a symbolic link to the shared disk for AdvancedCopy Manager data

1	Data in etc area	Link source	/etc/opt/swstorage/<Logical node name>
		Link destination	<Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage
2	Data in var area	Link source	/var/opt/swstorage/<Logical node name>
		Link destination	<Mount point of shared disk for shared data for AdvancedCopy Manager>/var/opt/swstorage

Setting example

```
[root@node2]# /bin/ln -s /acmdata/etc/opt/swstorage /etc/opt/swstorage/linux
[root@node2]# /bin/ln -s /acmdata/var/opt/swstorage /var/opt/swstorage/linux
```

15. Unmount the shared disk for shared data for AdvancedCopy Manager

Setting example

```
[root@node2]# cd /
[root@node2]# /bin/umount /acmdata
```

[Setting procedure of Oracle Clusterware]

Register resources to HA frame work using Oracle Clusterware. The following registration method of HA frame work is described by reference to the Oracle Database manual “Oracle® Clusterware Administration and Deployment Guide 11g Release 2 (11.2)”. For the procedures and setting method, see each version of the Oracle Database manuals.

Grid Infrastructure(GI) installation destination		/u01/app/11.2.0/grid
Grid user name		grid
Oracle installation destination		/u01/app/oracle/11.2.0/dbhome_1
Oracle user name		oracle
Server pool name (for policy management)		acmpool
Storage directory of ActionScript		/u01/app/11.2.0/grid/crs/public
File name of ActionScript		acmagt.scr
Cluster operation (VIP)	VIP name	acmvip
	VIP interface name	eth1
	VIP IP address	192.168.100.100
	VIP netmask	255.255.255.0
Cluster operation (ACM application)	ACM application name	acmagent
	The number of seconds for interval to check ACM application	60
	The number of restarts of ACM application	0

<Resource registration using a command>

1. Start Oracle Clusterware in all nodes.
   Execute it as root user.

```
# {GI installation destination}/bin/crsctl start crs
```

Setting example

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl start crs
CRS-4123: Oracle High Availability Services have been started
```

2. Create ActionScript for AdvancedCopy Manager in all nodes
   Create ActionScript in a primary node, and then transfer the ActionScript created in the primary node to other nodes.
   For details of ActionScript, see “7-2-5. ActionScript”.
   Set the executable access right with the chmod command for the created ActionScript.

3. Create a VIP resource in the primary node
   Execute it as root user.

   *When a VIP resource is created with the {GI installation destination}/bin/appvipcfg command, The error “usage: tail-“ may be displayed. To avoid this error, see KROWN#140076.

```
# {GI installation destination}/bin/appvipcfg create –network={Network number} –ip={VIP IP address} –vipname={VIP name} –user={User name}
```

Setting example

```
[root@node1]# /u01/app/11.2.0/grid/bin/appvipcfg create -network=1 -ip =192.168.100.100 -vipname=ac mvip -user =root
Production Copyright 2007, 2008, Oracle.All rights reserved
2012-11-20 17:39:29: Creating Resource Type
2012-11-20 17:39:29: Executing /u01/app/11.2.0/grid/bin/crsctl add type
app.appvip_net1.type -basetype ora.cluster_vip_net1.type -file
/u01/app/11.2.0/grid/crs/template/appvip.type
2012-11-20 17:39:29: Executing cmd: /u01/app/11.2.0/grid/bin/crsctl add type
app.appvip_net1.type -basetype ora.cluster_vip_net1.type -file
/u01/app/11.2.0/grid/crs/template/appvip.type
2012-11-20 17:39:30: Create the Resource
2012-11-20 17:39:30: Executing /u01/app/11.2.0/grid/bin/crsctl add resource acmvip –type
app.appvip_net1.type -attr
"USR_ORA_VIP=192.168.100.100,START_DEPENDENCIES=hard(ora.net1.network)
pullup(ora.net1.network),STOP_DEPENDENCIES=hard(ora.net1.network),ACL='owner:root:rwx,p
grp:root:
r-x,other::r--,user:root:r-x',HOSTING_MEMBERS=node1.localdomain,APPSVIP_FAILBACK="
```

4. Change the authority of the VIP resource in the primary node
   Execute it as root user.

```
# {GI installation destination}/bin/crsctl setperm resource {VIP name} –o root
# {GI installation destination}/bin/crsctl setperm resource {VIP name} –u user:{Grid user name}:r-x
```

Setting example

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl setperm resource acmvip –o root
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl setperm resource acmvip –u user:grid:r-x
```

5. Start the VIP resource in the primary node
   Execute it as grid user.

```
$ {GI installation destination}/bin/crsctl start resource {VIP name}
```

Setting example

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl start resource acmvip
CRS-2672: Attempting to start ‘acmvip’(on ‘node1’)
CRS-2676: Start of ‘acmvip’ (on ‘node1’) succeeded
```

6. Create an action profile for AdvancedCopy Manager in the primary node
   Execute it as grid user.

[Administrator management]

```
$ {GI installation destination}/bin/crsctl add resource {ACM application name} ¥
   –type cluster_resource –attr “ACTION_SCRIPT={ActionScript of ACM},¥
   CHECK_INTERVAL={No. of seconds for check interval},RESTART_ATTEMPTS={No. of restarts},¥
   START_DEPENDENCIES=hard({VIP name}) pullup(VIP name),¥
   STOP_DEPENDENCIES=hard({VIP name})”
```

Setting example

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl add resource acmagent –type cluster_resource
–attr “ACTION_SCRIPT=/u01/app/11.2.0/grid/crs/public/acmagt.scr,
CHECK_INTERVAL=60,RESTART_ATTEMPTS=0,START_DEPENDENCIES=hard(acmvip)
pullup(acmvip),STOP_DEPENDENCIES=hard(acmvip)”
```

[Policy management]

```
$ {GI installation destination}/bin/crsctl add resource {ACM application name} –type ¥
   cluster_resource  –attr “ACTION_SCRIPT={ActionScript of ACM},¥
   CHECK_INTERVAL={No. of seconds for check interval},RESTART_ATTEMPTS={No. of restarts},¥
   START_DEPENDENCIES=hard({VIP name}) pullup(VIP name),¥
   STOP_DEPENDENCIES=hard({VIP name}),PLACEMENT=restricted,SERVER_POOLS={Server pool
name}”
```

*Set “restricted” for PLACEMENT, and specify SERVER_POOLS

Setting example

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl add resource acmagent –type cluster_resource
–attr “ACTION_SCRIPT=/u01/app/11.2.0/grid/crs/public/acmagt.scr,
CHECK_INTERVAL=60,RESTART_ATTEMPTS=0,START_DEPENDENCIES=hard(acmvip)
pullup(acmvip),STOP_DEPENDENCIES=hard(acmvip),PLACEMENT=restricted,SERVER_POOLS=ora.acm
pool”
```

7. Change the authority of AdvancedCopy Manager in the primary node
   Execute it as root user

```
# {GI installation destination}/bin/crsctl setperm resource {ACM application name} –o root
# {GI installation destination}/bin/crsctl setperm resource {ACM application name} ¥
–u user:{Grid user name}:r-x
```

Setting example

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl setperm resource acmagent –o root
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl setperm resource acmagent –u user:grid:r-x
```

8. Start the AdvancedCopy Manager resource in the primary node
   Execute it as grid user

```
$ {GI installation destination}/bin/crsctl start resource {ACM application name}
```

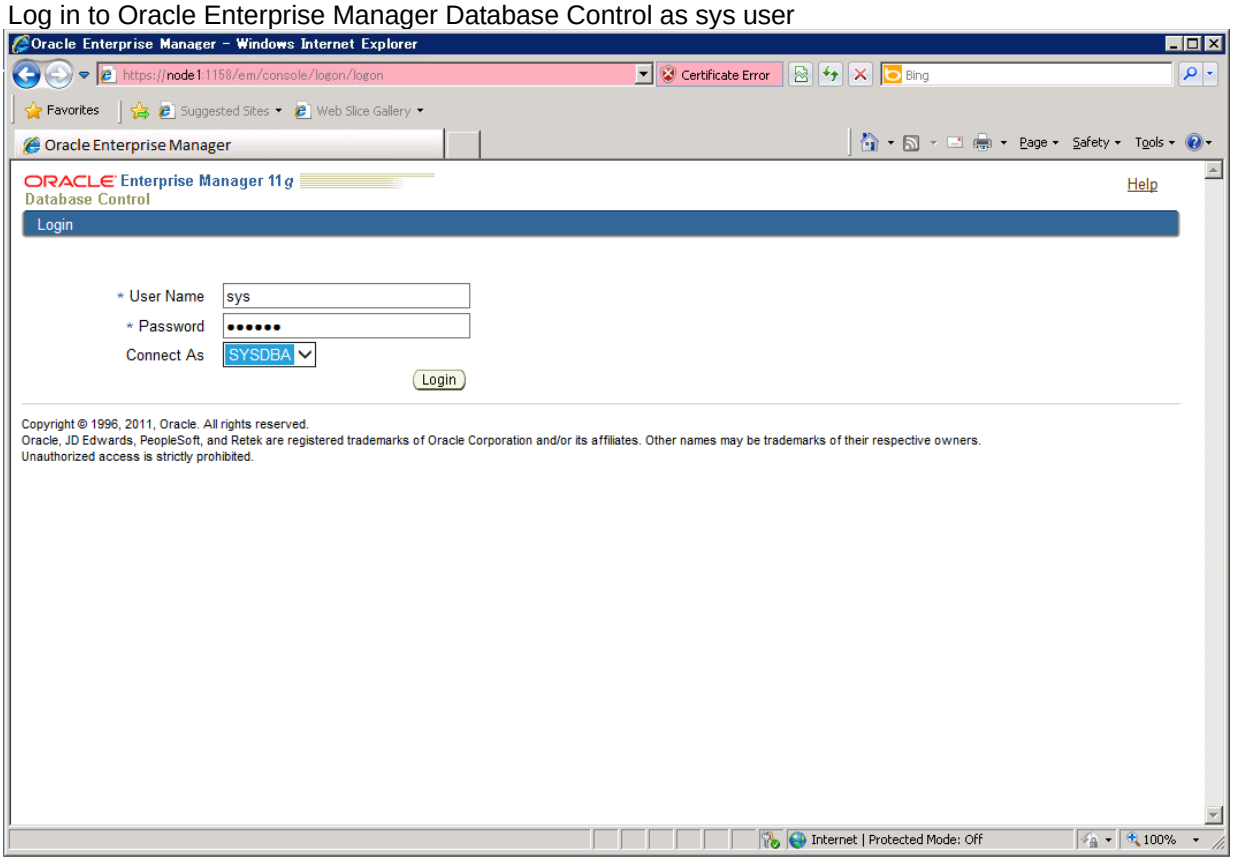
Setting example

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl start resource acmagent
CRS-2672: Attempting to start 'acmagent' (on 'node1')
CRS-2676: Start of 'acmagent' (on 'node1') succeeded
```

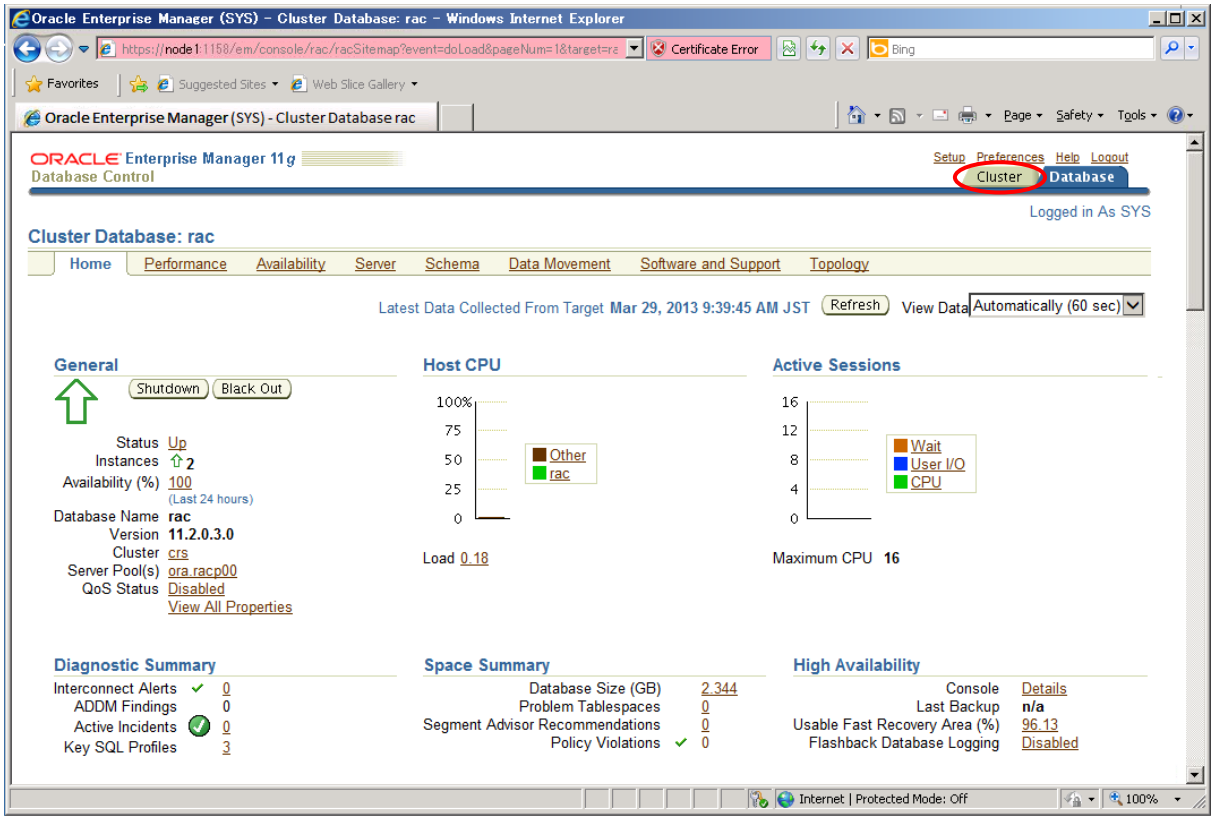
<Resource registration using Oracle Enterprise Manager>

To register resources to Oracle Clusterware using Oracle Enterprise Manager, execute the following procedures.

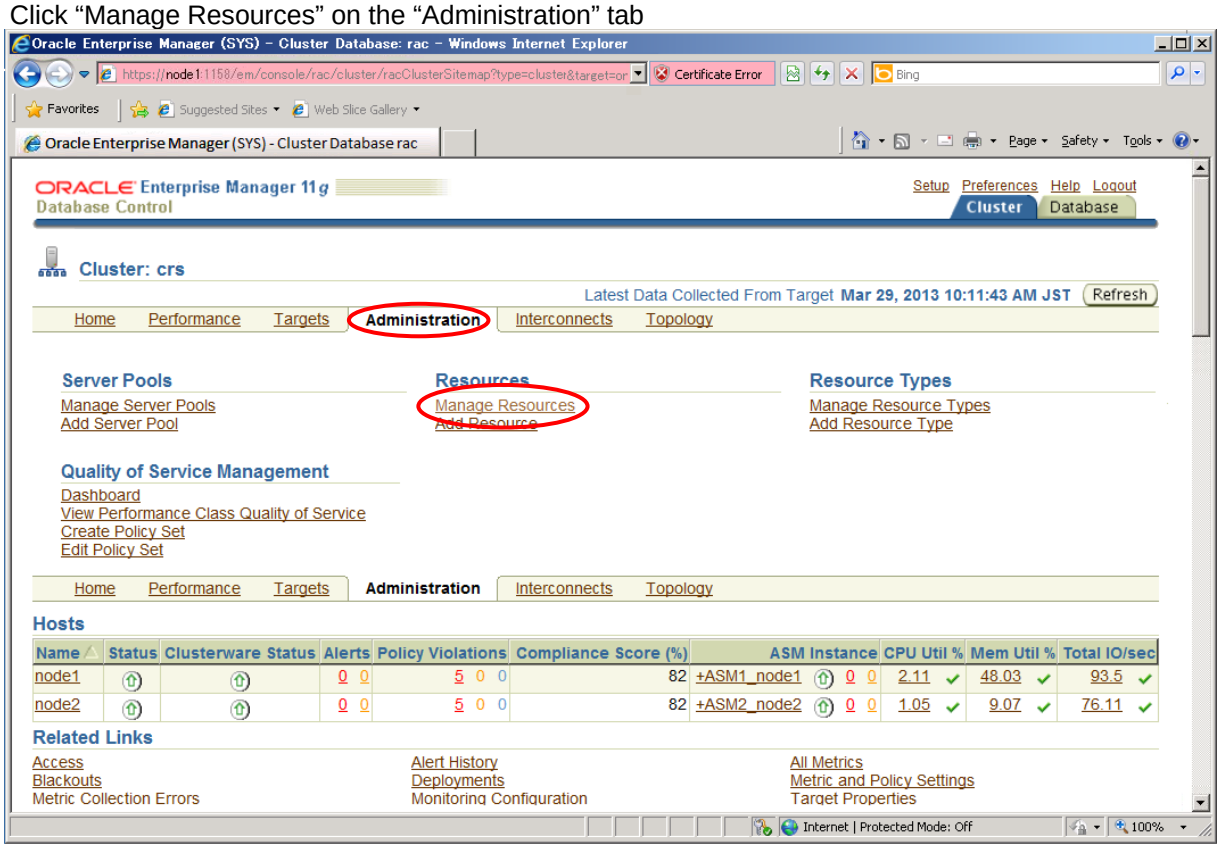
1. Log in to Oracle Enterprise Manager Database Control as sys user



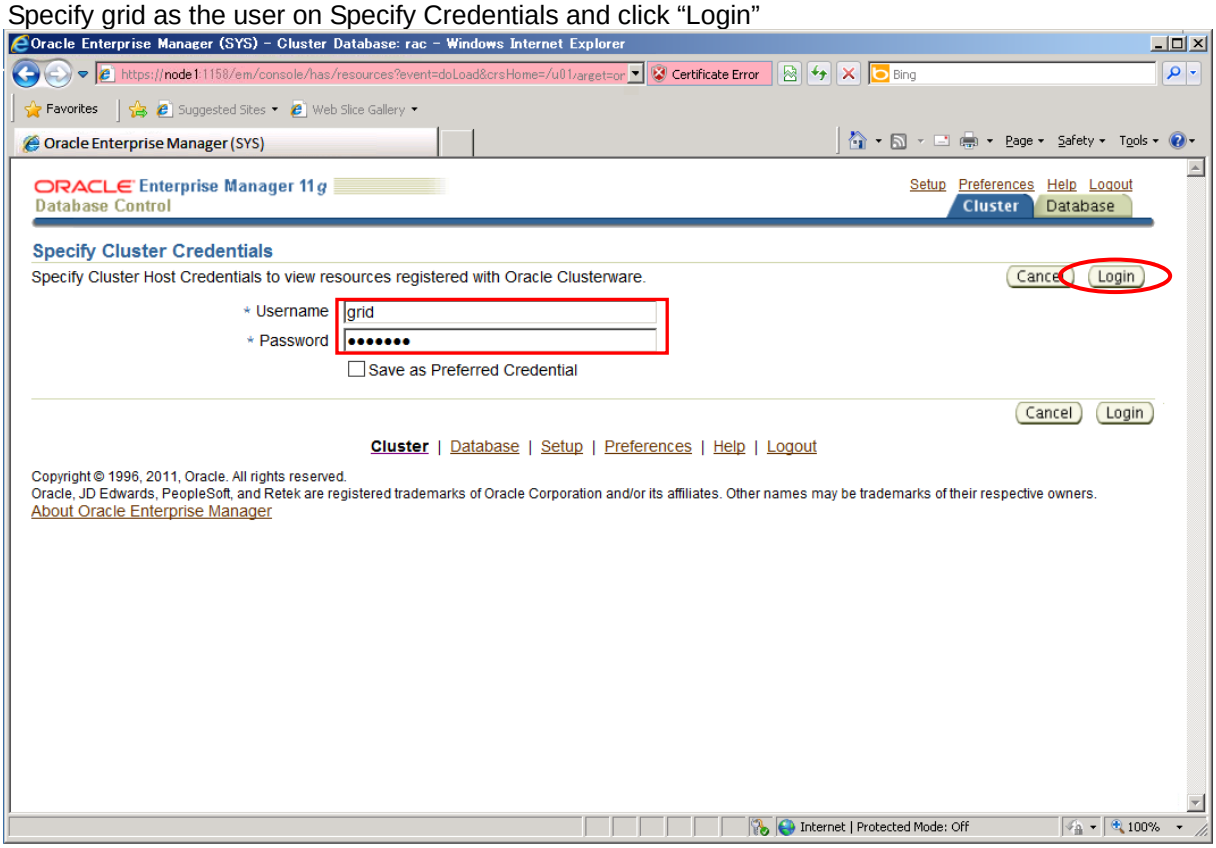
2. Click the “Cluster” tab



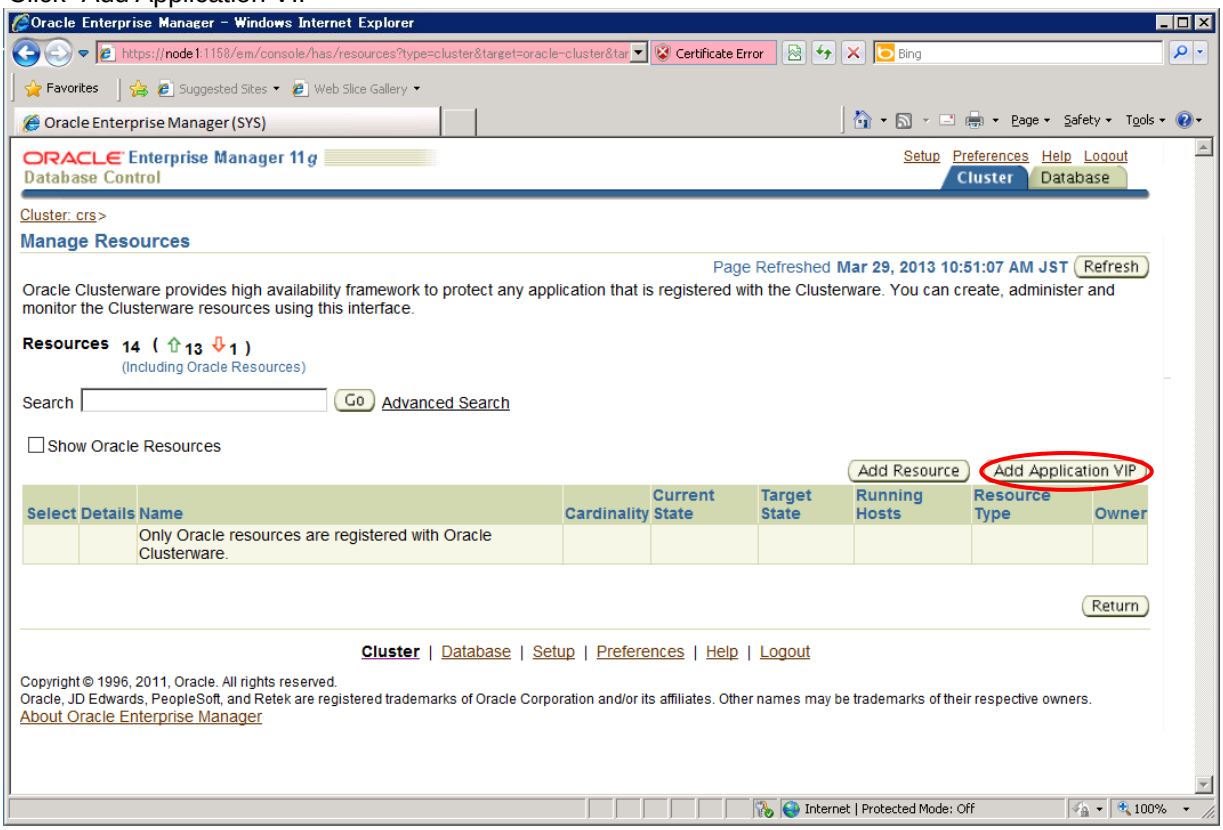
3. Click “Manage Resources” on the “Administration” tab



4. Specify grid as the user on Specify Credentials and click “Login”

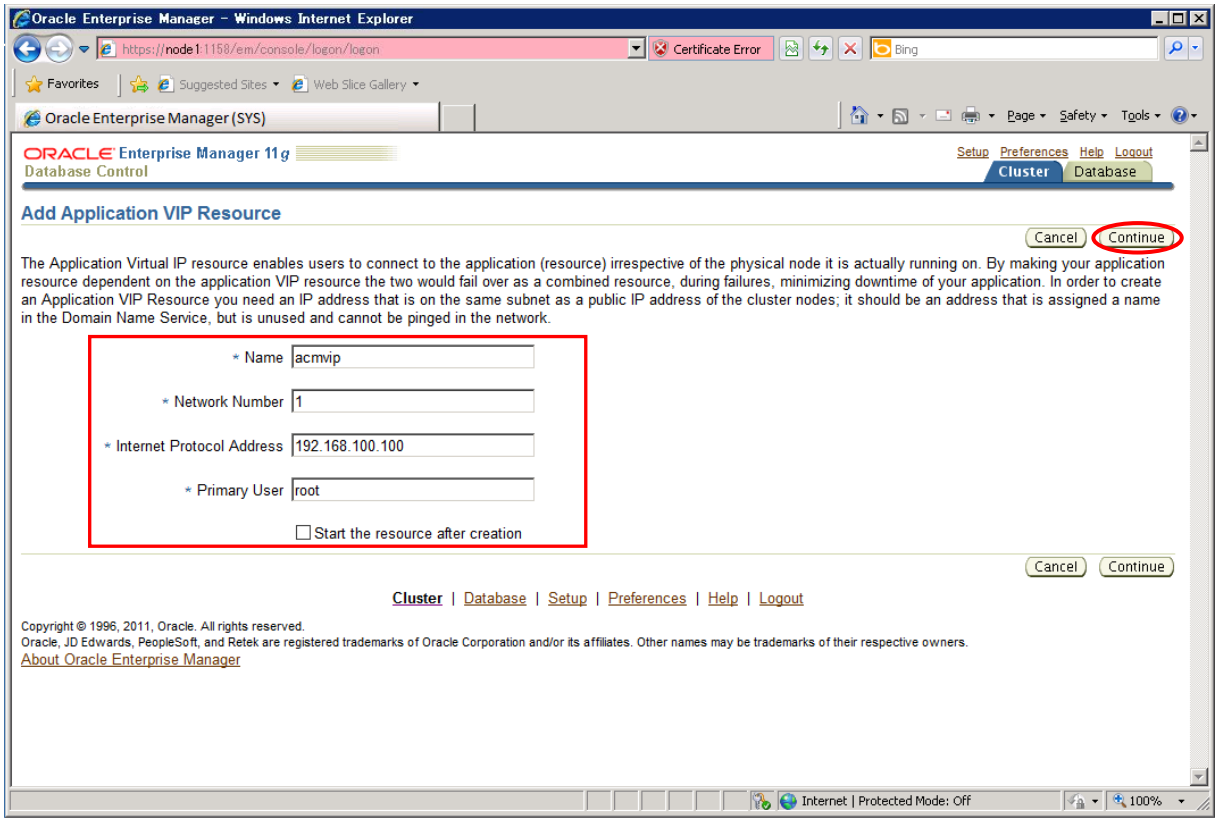


5. Click “Add Application VIP”

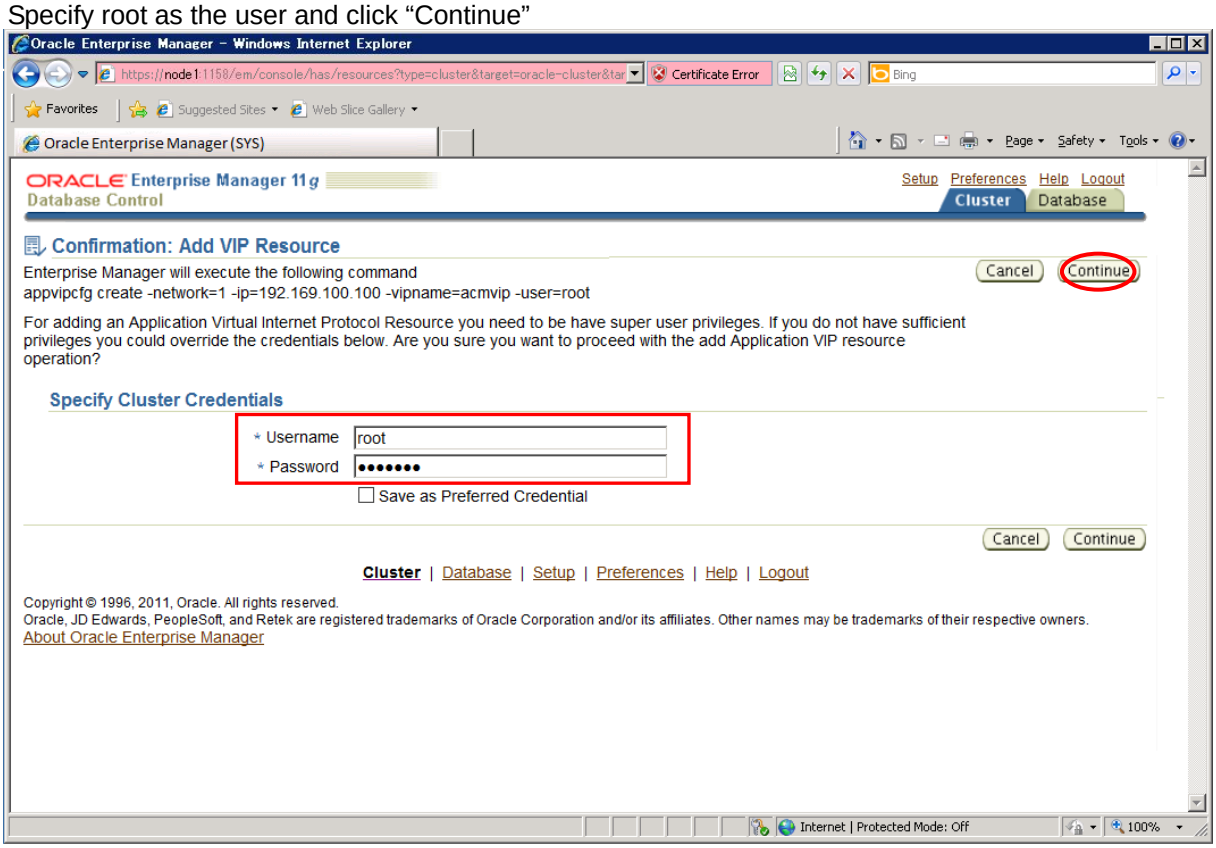


6. Set each item and click “Continue”
The details of each item are described below.

Item name	Descriptions
Name	Specify a name of the application VIP to be created
Network number	Specify the number of <integer> shown in the ora.vip network resource（ora.net<*integer*>.network）(Default value: 1)
Internet Protocol Address	Specify an IP address used for the application VIP to be created
Primary user	Specify root as the user because root authority is required for VIP-related operations



7. Specify root as the user and click “Continue”



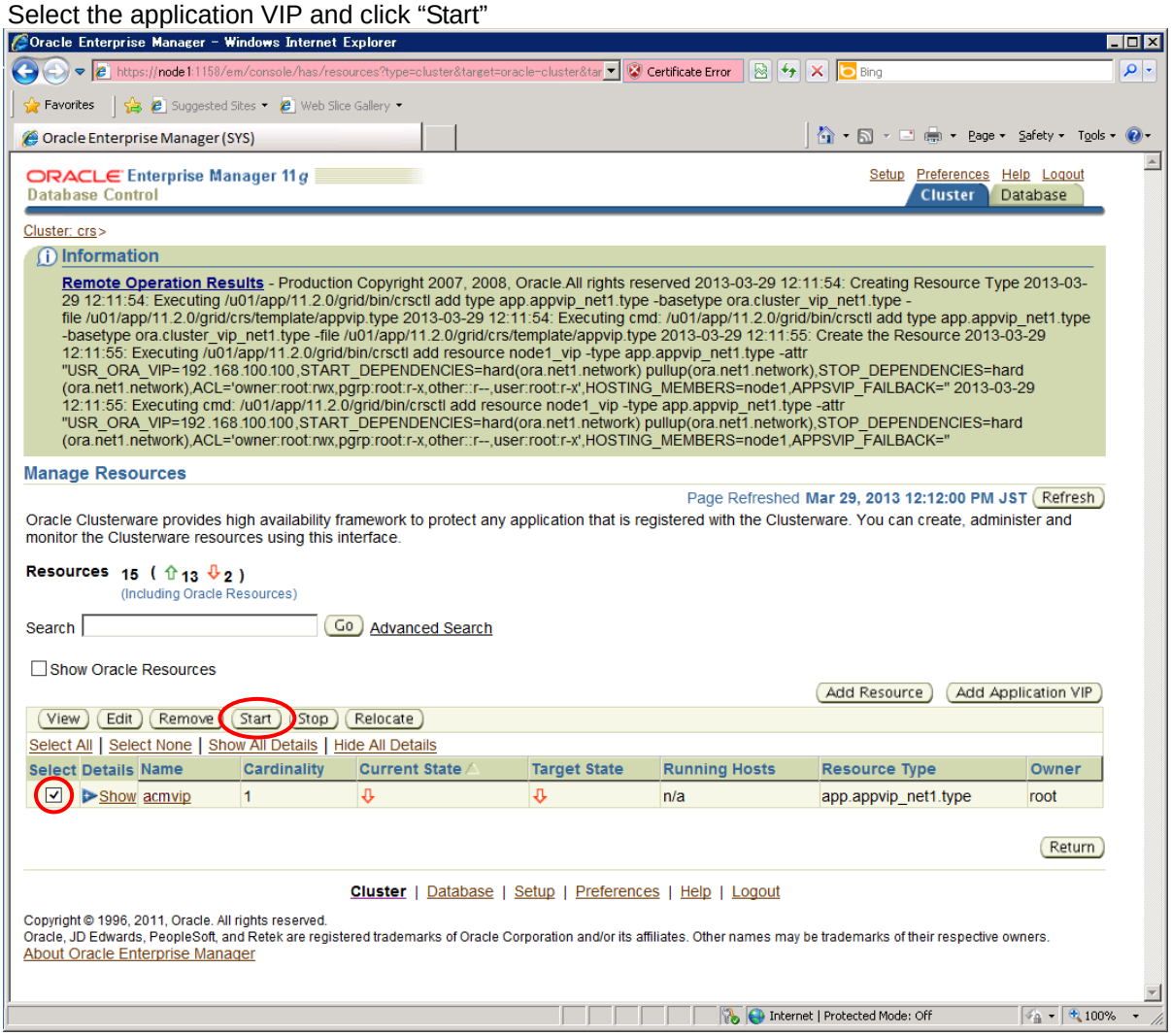
8. Change the authority of the resource
Execute it as root user.

```
# {GI installation destination}/bin/crsctl setperm resource {VIP name} –o root
# {GI installation destination}/bin/crsctl setperm resource {VIP name} –u user:{Grid user name}:r-x
```

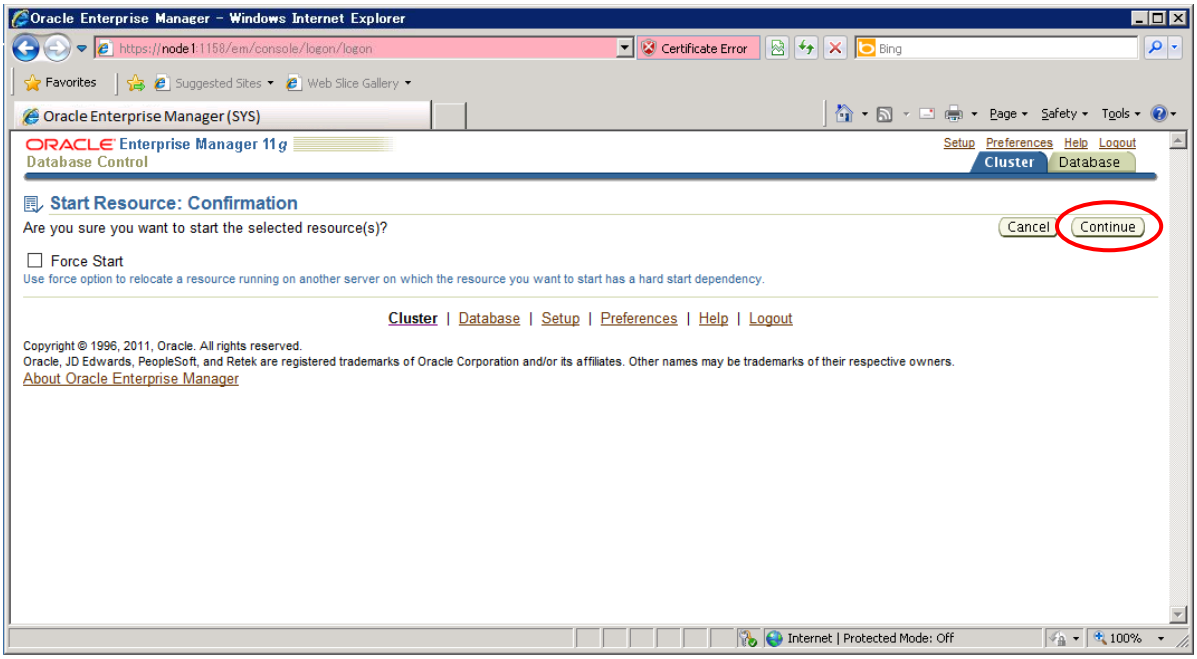
Setting example

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl setperm resource acmvip –o root
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl setperm resource acmvip –u user:grid:r-x
```

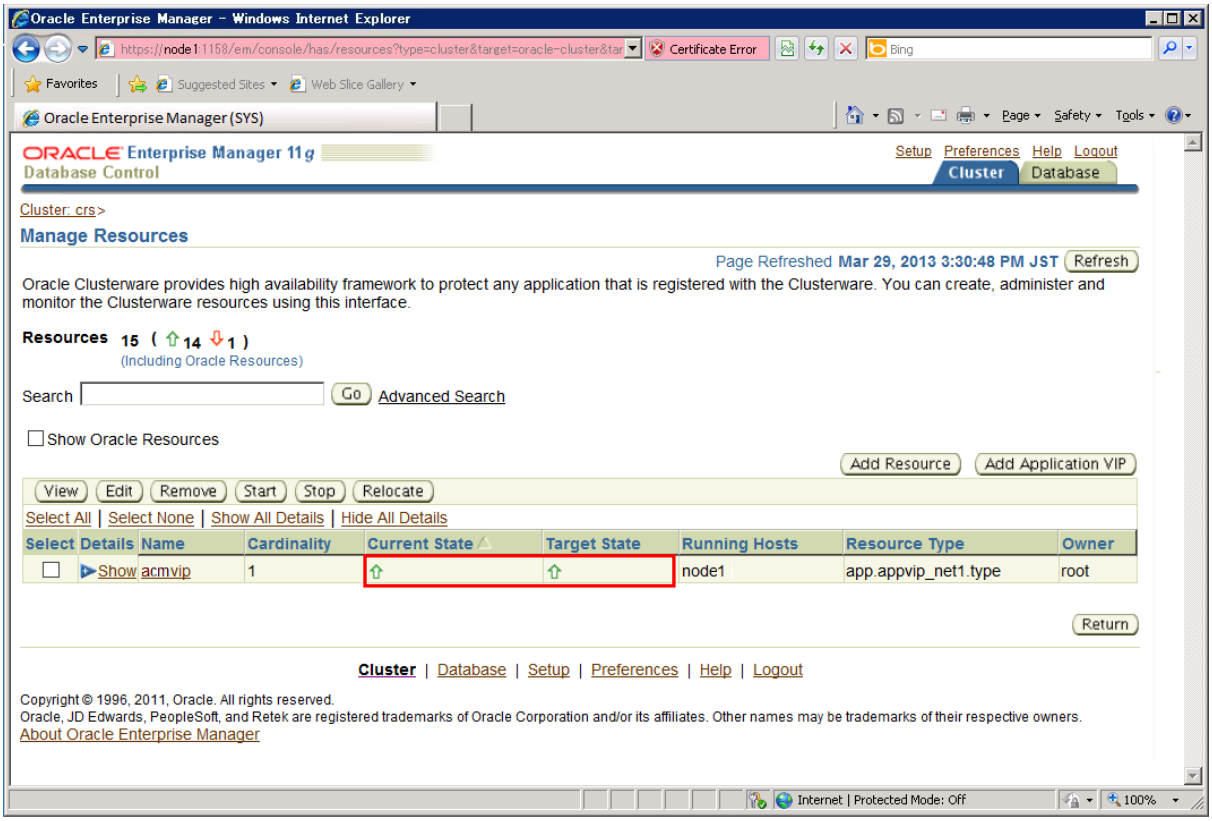
9. Select the application VIP and click “Start”



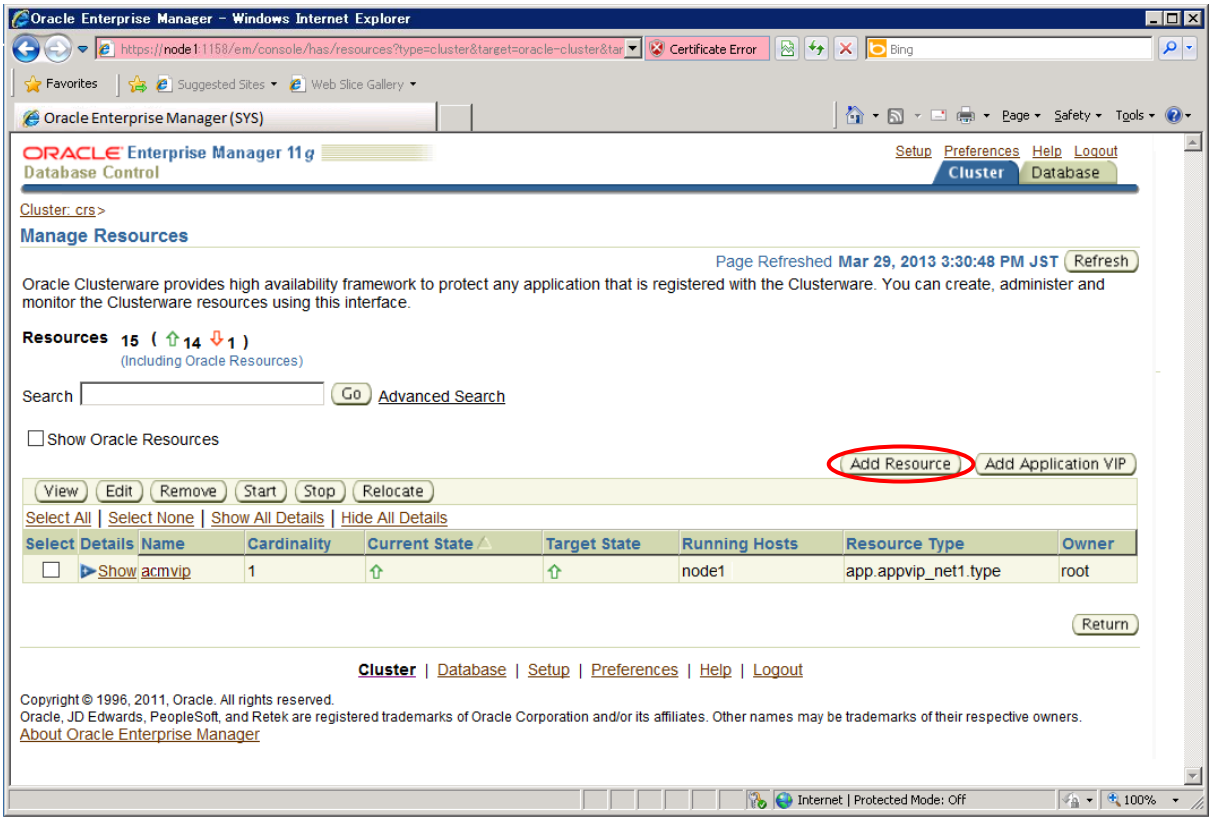
10. Click “Continue”



11. Confirm that the VIP resource has started



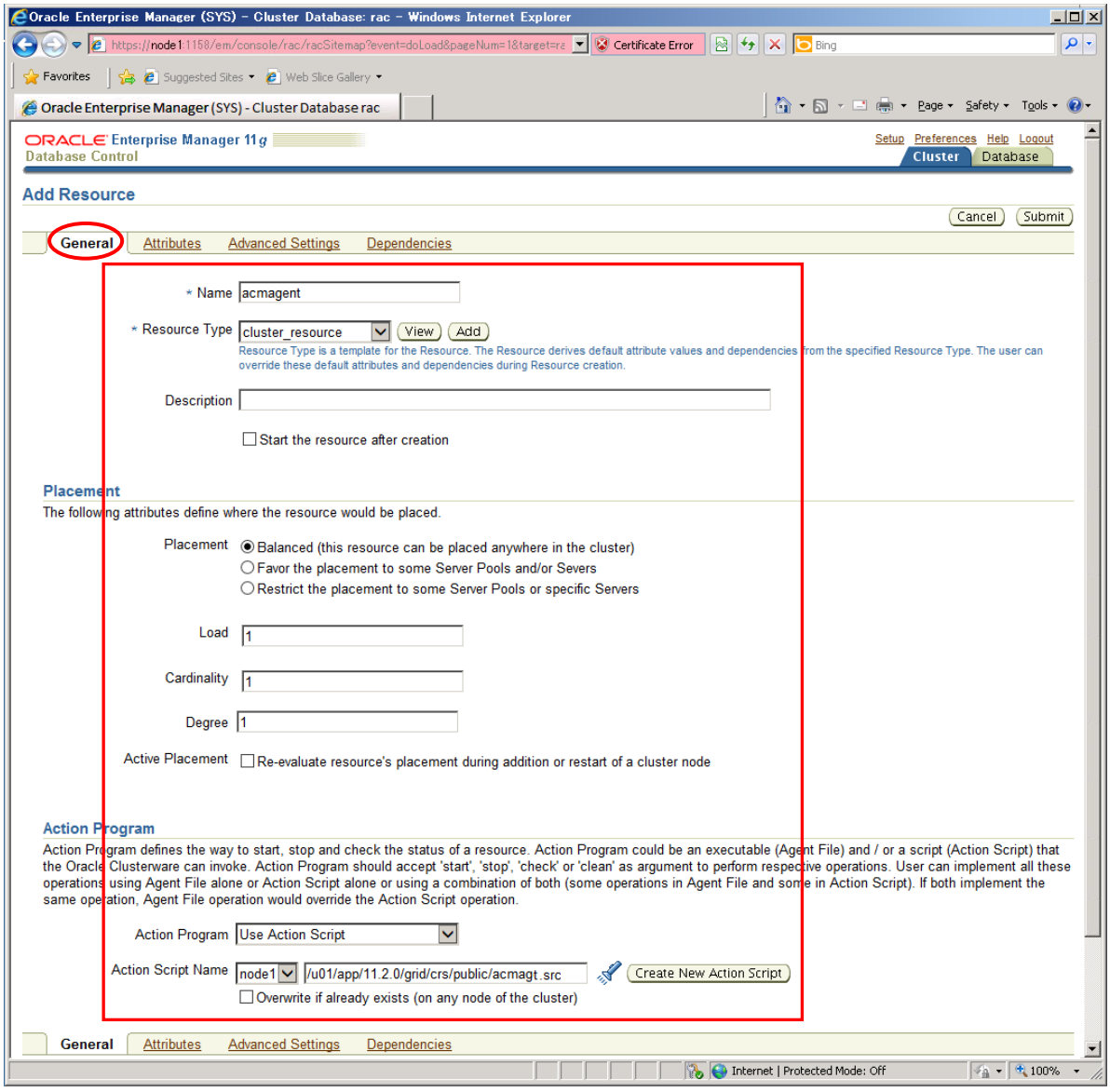
12. Click “Add Resource”



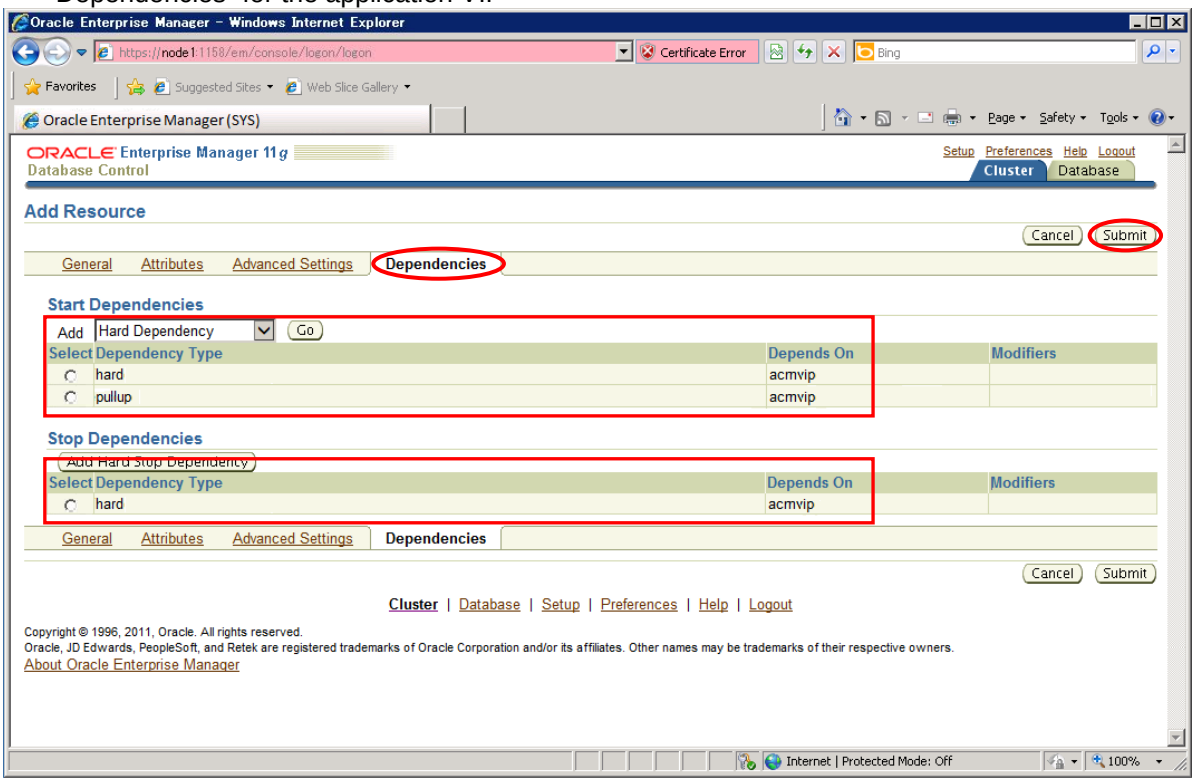
13. Set an applicable value for each item and click “Submit”

① The items in the “General” tab are as follows.

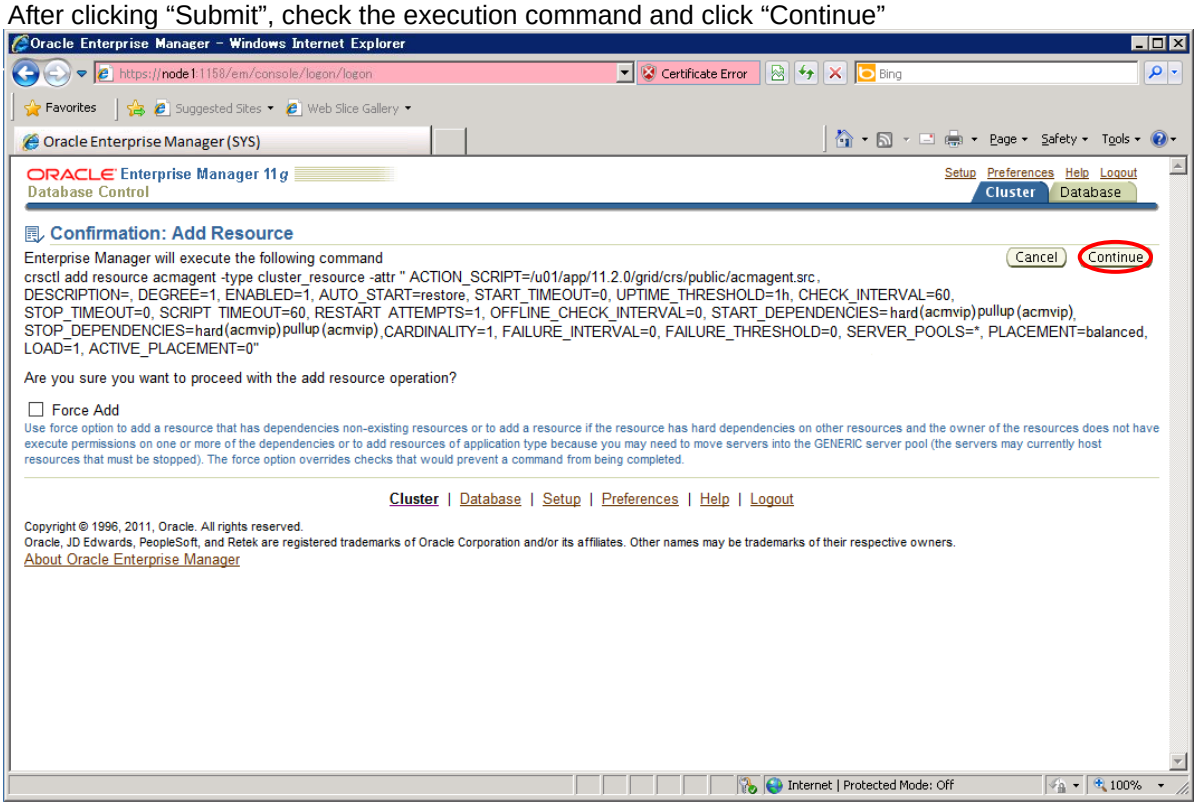
Item name	Descriptions
Name	Specify the application resource name to be created
Resource type	Select a resource template Confirm that “cluster_resource” is selected
Placement	For Administrator-Managed, select “Balanced (this resource can be placed anywhere in the cluster)” For Policy-Managed, “Favor the placement to some Server Pools and/or Servers” or “Restrict the placement to some Server Pools or specific Servers.” and enter a server pool name
Cardinality	Specify the number of nodes where the application resource runs
Action Program	Select a program that is used for resource management Select “Use Action Script”
Action Script Name	Specify a node name and a script path When the application resource is added, ActionScript is also placed on other nodes. If it is placed on all nodes, check “Overwrite if already exists (on any node of the cluster)”



② In the “Dependencies” tab, specify “hard” or “pullup” for “Start Dependencies”, and “hard” for “Stop Dependencies” for the application VIP



14. After clicking “Submit”, check the execution command and click “Continue”



15. Change the authority of the resource.
Execute it as root user

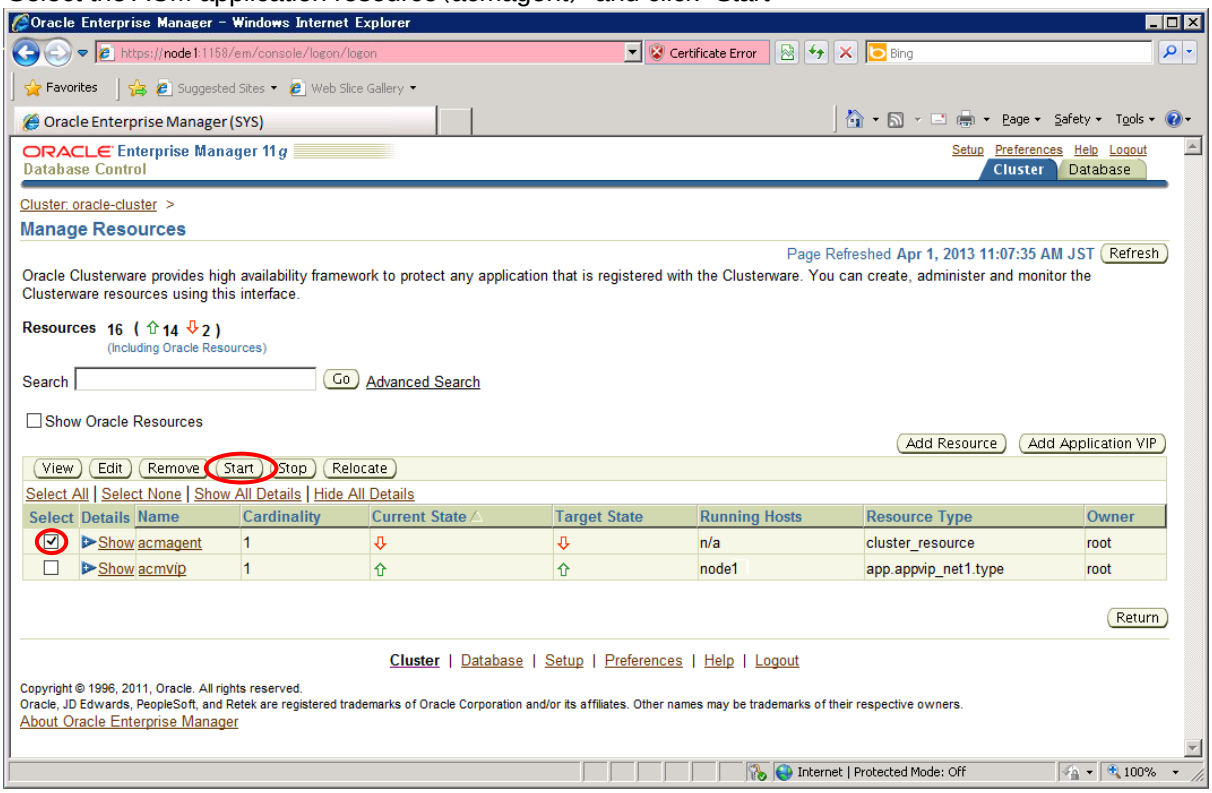
```
# {GI installation destination}/bin/crsctl setperm resource {ACM application name} -o
root
# {GI installation destination}/bin/crsctl setperm resource {ACM application name}
   -u user:{Grid user name}:r-x
```

Setting example

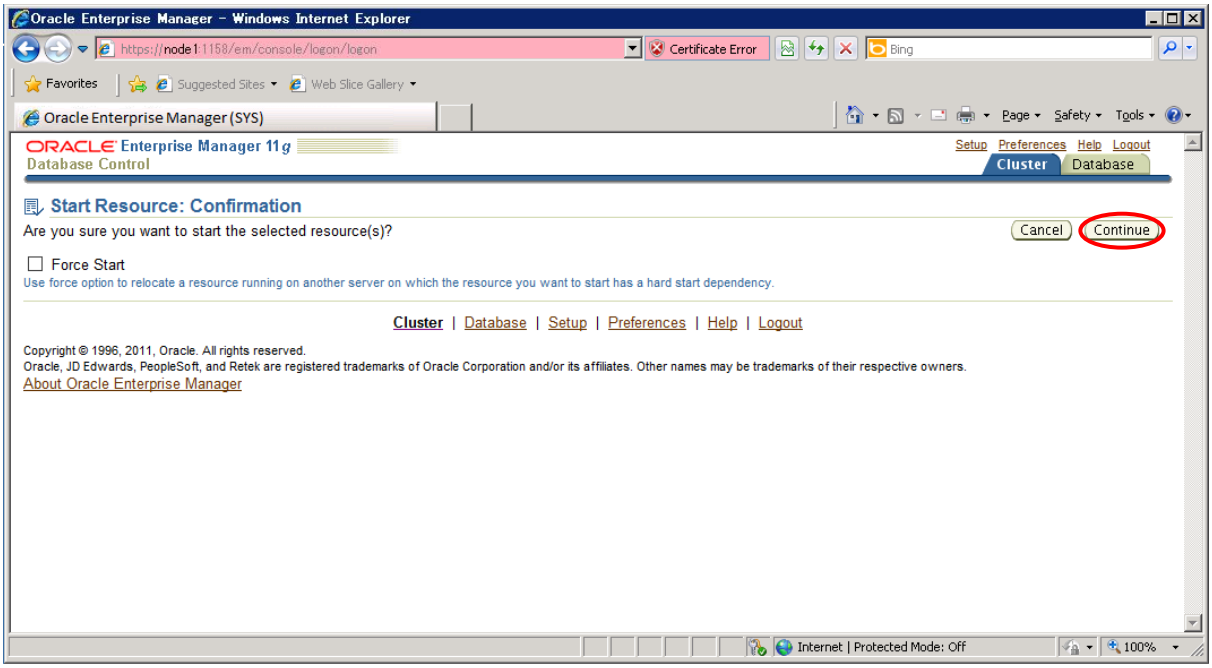
```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl setperm resource acmagent -o root
```

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl setperm resource acmagent –u
user:grid:r-x
```

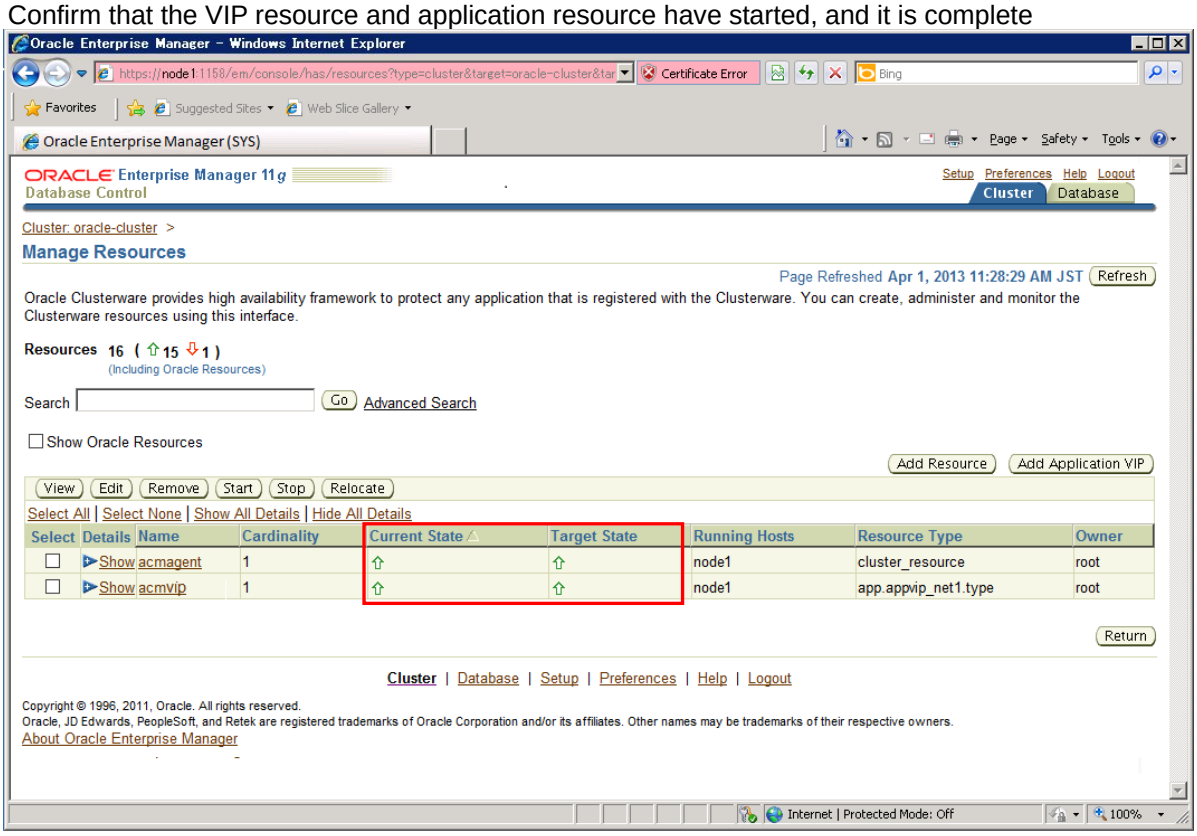
16. Select the ACM application resource（acmagent） and click “Start”



17. Click “Continue”



18. Confirm that the VIP resource and application resource have started, and it is complete



After setting, check the following items to confirm that the settings are correct.

- Resource can be displayed correctly by {GI installation destination}/bin/crsctl status resource
- Shared disk for shared data for AdvancedCopy Manager is mounted
- The daemon configuring AdvancedCopy Manager is activated

For the daemon configuring AdvancedCopy Manager, see “ETERNUS SF AdvancedCopy Manager V15.1 - Operation Guide (Linux)”

After that, execute settings required for AdvancedCopy features (OPC/EC)

7-1-4. Procedures to Delete a Cluster Environment

[Procedure flow]

To delete a cluster environment, the following operations are required.

1. Delete the registration information on AdvancedCopy Manager
2. Delete the resource registered to the HA framework
   (Command / Oracle Enterprise Manager)
3. Delete the cluster operation

[Procedures to delete Oracle Clusterware]

In the setting examples described in deletion procedures, the following conditions are used.
For the actual setting, set them according to the environment.

Setting example:

Cluster operation	Logical node name	linux
	Mount point of shared disk for shared data for AdvancedCopy Manager	/acmdata
	Port number of the communication service for transaction	1227
HA framework resource	VIP name	acmvip
	ACM application name	acmagent

1. Delete the device information registered for backup management and replication management
   For the deletion method, see “ETERNUS SF AdvancedCopy Manager V15.1 - Operation Guide (Linux)”

2. Delete the registration information on the storage server registered to the storage management server
   For the deletion method, see “ETERNUS SF AdvancedCopy Manager V15.1 – Operation Guide (Linux)”

<Resource deletion using a command>

1. Delete the resource registered to the HA framework
   Stop the VIP resource. This procedure should be executed as grid user.

```
$ {GI installation destination}/bin/crsctl stop resource {ACM application name}
$ {GI installation destination}/bin/crsctl stop resource {VIP name}
```

Setting example

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl stop resource acmagent
CRS-2673: Attempting to stop 'acmagent’ (on ‘node1’)
CRS-2677: Stop of 'acmagent’ (on ‘node1’) succeeded
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl stop resource acmvip
CRS-2673: Attempting to stop 'acmvip’ (on ‘node1’)
CRS-2677: Stop of 'acmvip’ (on ‘node1’) succeeded
```

2. Delete the resource. Execute this procedure as root user

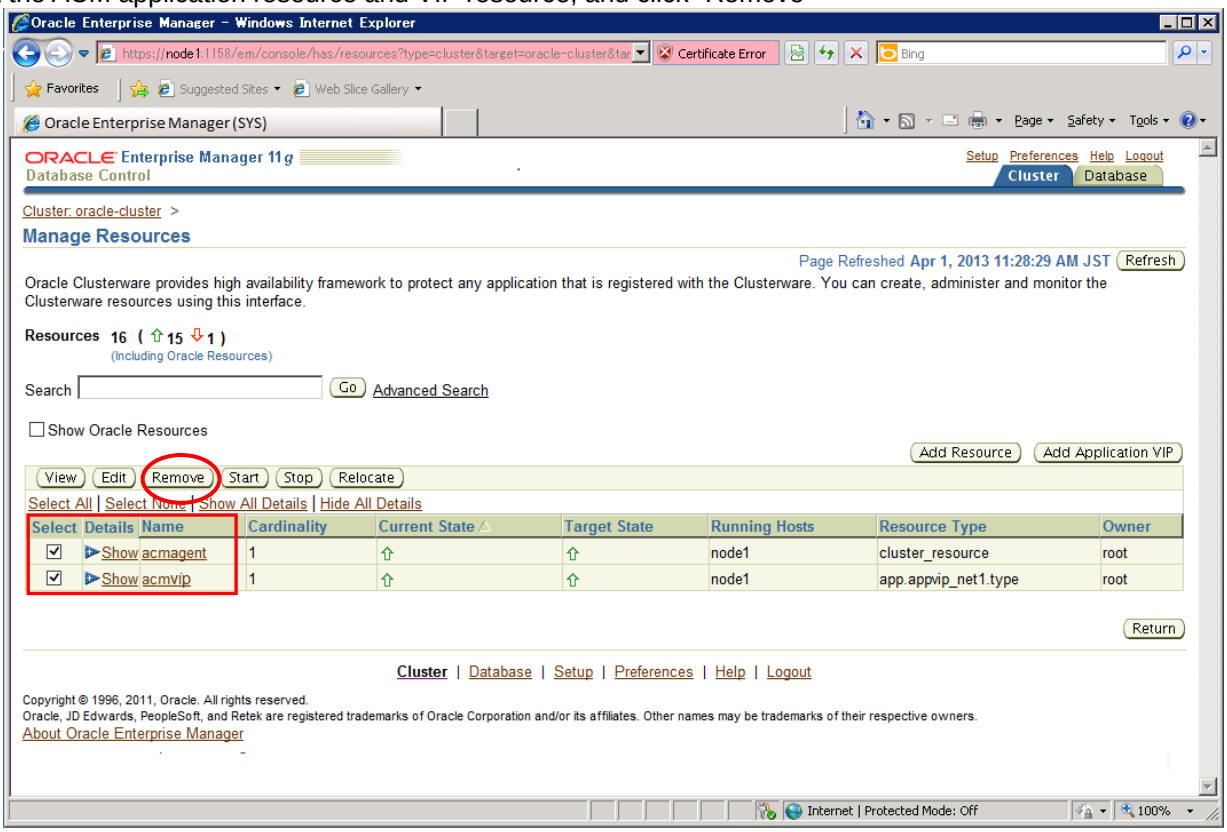
```
# {GI installation destination}/bin/crsctl delete resource {ACM application name}
# {GI installation destination}/bin/appvipcfg delete -vipname={VIP name}
```

Setting example

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl delete resource acmagent
[root@node1]# /u01/app/11.2.0/grid/bin/appvipcfg delete –vipname=acmvip
Production Copyright 2007, 2008, Oracle.All rights reserved
2012-12-01 13:19:42: Deleting the resource
2012-12-01 13:19:42: Executing cmd: /u01/app/11.2.0/grid/bin/crsctl delete res acmvip
2012-12-01 13:19:42: Removing the type
2012-12-01 13:19:42: Executing cmd: /u01/app/11.2.0/grid/bin/crsctl delete type
app.appvip.type
```

<Resource deletion using Oracle Enterprise Manager>

Select the ACM application resource and VIP resource, and click “Remove”



For details of the procedures, see the Oracle Database manual, “Oracle® Clusterware Administration and Deployment Guide 11g Release 2 (11.2)”

Execute the following procedures as root user.

[Procedures to delete AdvancedCopy Manager]

<Operations in a secondary node>

1. Make a setting so that a shared disk for shared data for AdvancedCopy Manager can be used

Setting example

```
[root@node2]# /bin/mount /dev/disk/by-id/scsi-3600000e00d100000001001a200150000-part1
/acmdata
```

2. Execute the following commands from the command prompt.

1	clset_FJSVswstf	/opt/FJSVswstf/bin/clset_FJSVswstf -u -f < Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Secondary
2	clset_FJSVswsts	/opt/FJSVswsts/bin/clset_FJSVswsts -u -f < Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Secondary
3	clset_FJSVswsrp	/opt/FJSVswsrp/bin/clset_FJSVswsrp -u -f < Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Secondary

Setting example

```
[root@node2]# /opt/FJSVswstf/bin/clset_FJSVswstf –u -f
/acmdata/etc/opt/swstorage/clsetup.ini -t Secondary
clset_FJSVswstf completed
[root@node2]# /opt/FJSVswsts/bin/clset_FJSVswsts –u -f
/acmdata/etc/opt/swstorage/clsetup.ini -t Secondary
clset_FJSVswsts completed
[root@node2]# /opt/FJSVswsrp/bin/clset_FJSVswsrp –u -f
/acmdata/etc/opt/swstorage/clsetup.ini -t Secondary
```

```
clset_FJSVswsrp completed
```

3. Delete the symbolic link to the shared disk for the shared data for AdvancedCopy Manager

1	Data in etc area	Link	/etc/opt/swstorage/<Logical node name>
2	Data in var area	Link source	/var/opt/swstorage/<Logical node name>

Setting example

```
[root@node2]# /bin/rm /etc/opt/swstorage/linux
[root@node2]# /bin/rm /var/opt/swstorage/linux
```

4. Restore the edited configuration file (swcluster.ini) settings of AdvancedCopy Manager

File name	swcluster.ini
Storage location	/opt/FJSVswstf/cluster

File settings

```
[ClusterCommon]
Cluster=OFF
Max=20
StartTimeOut=300
StopTimeOut=300
```

5. Edit /etc/services to delete the port number of the communication service for transaction

6. Unmount the shared disk for AdvancedCopy Manager shared disk

Setting example

```
[root@node2]# cd /
[root@node2]# /bin/umount /acmdata
```

<Operations in a primary node>

7. Make a setting so that a shared disk for shared data for AdvancedCopy Manager can be used

Setting example

```
[root@node1]# /bin/mount /dev/disk/by-id/scsi-3600000e00d100000001001a200150000-part1
/acmdata
```

8. Execute the following commands from the command prompt.

1	clset_FJSVswstf	/opt/FJSVswstf/bin/clset_FJSVswstf -u -f < Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Primary
2	clset_FJSVswsts	/opt/FJSVswsts/bin/clset_FJSVswsts -u -f < Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Primary
3	clset_FJSVswsrp	/opt/FJSVswsrp/bin/clset_FJSVswsrp -u -f < Mount point of shared disk for shared data for AdvancedCopy Manager>/etc/opt/swstorage/clsetup.ini -t Primary

Execution example

```
[root@node1]# /opt/FJSVswstf/bin/clset_FJSVswstf –u -f
/acmdata/etc/opt/swstorage/clsetup.ini -t Primary
clset_FJSVswstf completed
[root@node1]# /opt/FJSVswsts/bin/clset_FJSVswsts –u -f
/acmdata/etc/opt/swstorage/clsetup.ini -t Primary
clset_FJSVswsts completed
[root@node1]# /opt/FJSVswsrp/bin/clset_FJSVswsrp –u -f
/acmdata/etc/opt/swstorage/clsetup.ini -t Primary
clset_FJSVswsrp completed
```

9. Delete the symbolic link to the shared disk for the shared data for AdvancedCopy Manager

1	Data in etc area	Link	/etc/opt/swstorage/<Logical node name>
2	Data in var area	Link source	/var/opt/swstorage/<Logical node name>

Setting example

```
[root@node1]# /bin/rm /etc/opt/swstorage/linux
[root@node1]# /bin/rm /var/opt/swstorage/linux
```

10. Restore the edited configuration file (swcluster.ini) of AdvancedCopy Manager

File name	swcluster.ini
Storage location	/opt/FJSVswstf/cluster

File settings

```
[ClusterCommon]
Cluster=OFF
Max=20
StartTimeOut=300
StopTimeOut=300
```

11. Delete the directory created on the shared disk for shared data for AdvancedCopy Manager

```
Mount point of shared disk for shared data for AdvancedCopy Manager
+---/etc
|   ---/opt
|      ---/swstorage
+---/var
    ---/opt
       ---/swstorage
```

Setting example

```
[root@node1]# cd /acmdata
[root@node1]# /bin/rm –r /acmdata/etc
[root@node1]# /bin/rm –r /acmdata/var
```

12. Edit /etc/services to delete the port number of the communication service for transaction

13. Unmount the shared disk for AdvancedCopy Manager shared disk

Setting example

```
[root@node1]# cd /
[root@node1]# /bin/umount /acmdata
```

7-1-5. ActionScript

This section describes a sample of ActionScript. Create an ActionScript according to the environment by reference to this sample.

* From 11g R2, the behavior of check action processing changed as follows:
  - The resource status is normal: Return 0
  - The resource status is abnormal: Return 1

For details, see the Oracle Database manual, “Oracle® Clusterware Administration and Deployment Guide 11g Release 2 (11.2)”.

Sample

```
#!/bin/sh

#############################################################################
#
# Action Script for AdvancedCopy Manager Agent
#
#############################################################################

SCRIPT=$0
ACTION=$1 # Action (start, stop or check)

# ACM Logical Node Name
SWSTGNODE=linux
export SWSTGNODE

# Mount Point for ACM Data
SWSMOUNTPOINT=/acmdata; export SWSMOUNTPOINT
BACKUPMOUNTPOINT=/backup; export BACKUPMOUNTPOINT

# Disk Slice for ACM Data
SWSDATADISK=/dev/disk/by-id/scsi-3600000e00d100000001001a200150000-part1; export
SWSDATADISK
BACKUPDISK=/dev/disk/by-id/scsi-3600000e00d100000001001a2001b0000-part1; export
BACKUPDISK

TOOLDIR=/u01/app/11.2.0/grid/crs/public
LOGFILE=$TOOLDIR/acmagt.log
TEMPFILE=$TOOLDIR/acmagt.tmp

#############################################################################
#
# Main section of Action Script - starts, stops, checks or clean an application
#
# This script is invoked by CRS when managing the application associated
# with this script.
#
# Argument: $1 - start | stop | check | clean
#
# Returns: 0 - successful start, stop, check or
# 1 - error
#
#############################################################################

#
# Start section - start the process and report results
#

case $ACTION in
'start')
  SWSMOUNTCHECK="^$SWSMOUNTPOINT on $SWSDATADISK "
  /bin/mount | /bin/grep "$SWSMOUNTCHECK" > /dev/null
  if [ $? != 0 ]; then
    /bin/mount $SWSDATADISK $SWSMOUNTPOINT
    if [ $? != 0 ]; then
      echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent COULD NOT START,BECAUSE MOUNT
ERROR($SWSMOUNTPOINT)" | tee -a $LOGFILE
      exit 1
    fi
  fi
  BACKUPMOUNTCHECK="^$BACKUPMOUNTPOINT on $BACKUPDATADISK "
  /bin/mount | /bin/grep "$BACKUPMOUNTCHECK" > /dev/null
  if [ $? != 0 ]; then
    /bin/mount $BACKUPDISK $BACKUPMOUNTPOINT
    if [ $? != 0 ]; then
      echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent COULD NOT START,BECAUSE MOUNT
ERROR($BACKUPMOUNTPOINT)" | tee -a $LOGFILE
      exit 1
    fi
  fi
  /opt/FJSVswstf/cluster/AgtStart
  if [ $? != 0 ]; then
```

```
    echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent COULD NOT START:1" | tee -a $LOGFILE
    exit 1
  fi
  echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent STARTED:0" | tee -a $LOGFILE
  exit 0
  ;;

#
# Stop section - stop the process and report results
#

'stop')
  /opt/FJSVswstf/cluster/AgtStop
  /bin/umount $SWSMOUNTPOINT
  if [ $? != 0 ]; then
    /bin/umount -f $SWSMOUNTPOINT
  fi
  /bin/umount $BACKUPMOUNTPOINT
  if [ $? != 0 ]; then
    /bin/umount -f $BACKUPMOUNTPOINT
  fi
  echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent STOPPED:0" | tee -a $LOGFILE
  exit 0
  ;;

#
# Check section - check the process and report results
#

'check')
  /bin/ps -ef > $TEMPFILE
  CNT=`cat $TEMPFILE | grep stgxfws | grep $SWSTGNODE | wc -l`
  if [ $CNT -eq 0 ]; then
    echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent CHECKED:1" | tee -a $LOGFILE
    /bin/umount $SWSMOUNTPOINT
    if [ $? != 0 ]; then
      /bin/umount -f $SWSMOUNTPOINT
    fi
    exit 1
  fi
  CNT=`/bin/mount | grep $SWSMOUNTPOINT | wc -l`
  if [ $CNT -eq 0 ]; then
    echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent CHECKED:1" | tee -a $LOGFILE
    exit 1
  fi
  CNT=`/bin/mount | grep $BACKUPMOUNTPOINT | wc -l`
  if [ $CNT -eq 0 ]; then
    echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent CHECKED:1" | tee -a $LOGFILE
    exit 1
  fi
  echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent CHECKED:$RET" | tee -a $LOGFILE
  exit $RET
  ;;

#
# Clean section - clean the process and report results
#

'clean')
  /opt/FJSVswstf/cluster/AgtStop
  /bin/umount $SWSMOUNTPOINT
  if [ $? != 0 ]; then
    /bin/umount -f $SWSMOUNTPOINT
  fi
  /bin/umount $BACKUPMOUNTPOINT
  if [ $? != 0 ]; then
    /bin/umount -f $BACKUPMOUNTPOINT
  fi
  echo "`date '+%y/%m/%d_%H:%M:%S'` - ACM Agent CLEANED:0" | tee -a $LOGFILE
  exit 0
  ;;
```

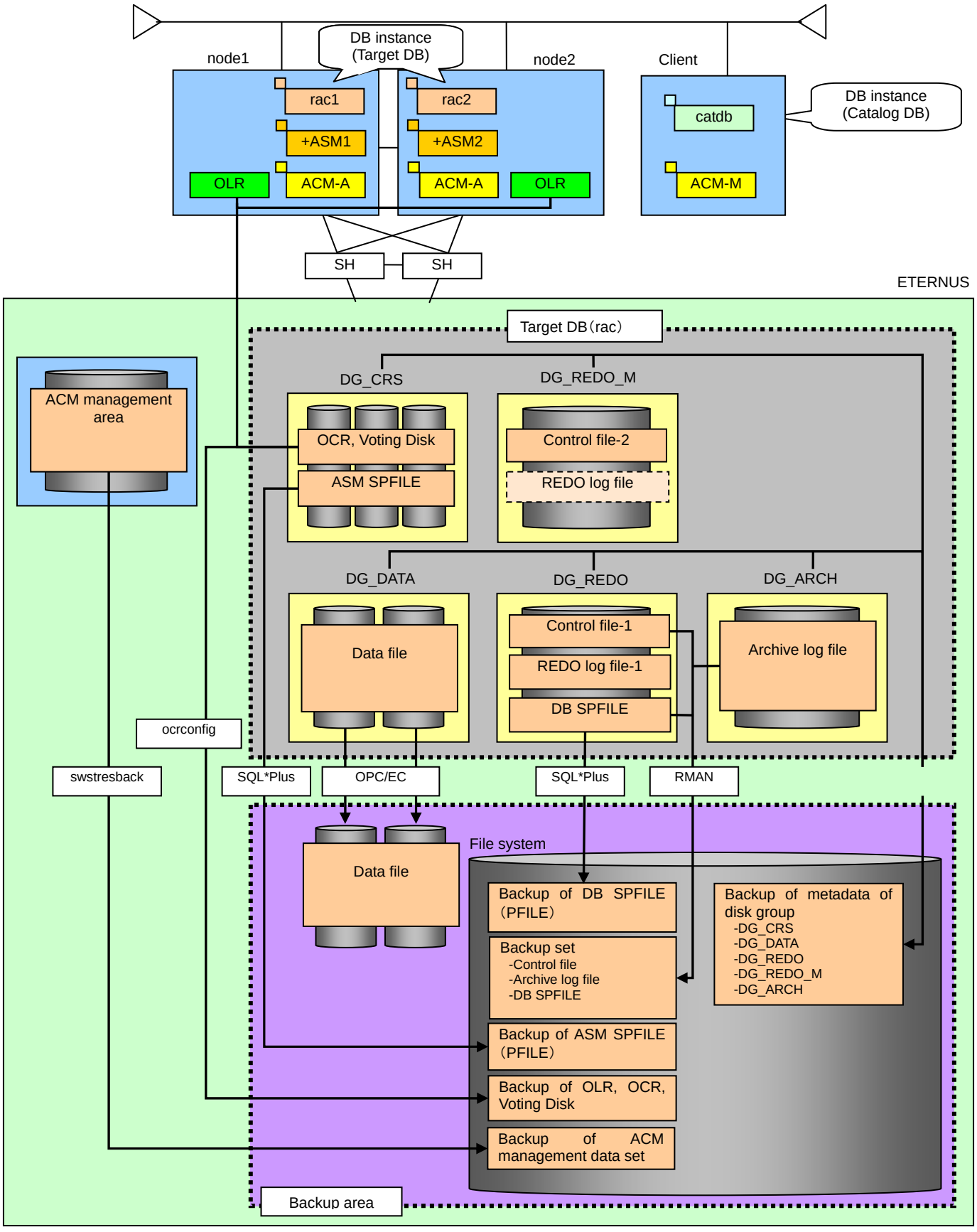
```
*)
  echo "usage: $SCRIPT {start stop check}"
  ;;

esac

exit 0
```

7-2. Backup/Recovery Procedures and Usage Example

This section describes the step-by-step procedure to back up and recover the ASM file system using AdvancedCopy Manager.



7-2-1. Backup/Recovery Procedures and Usage Example

Backup of database

1. Archive the current redo log file
   Execute it on the database instance in node1

```
SQL> alter system archive log current;
```

2. Srart the backup mode for the database
   Execute it on the database instance in node1

```
SQL> alter database begin backup;
```

3. Confirm that rebalance of ASM is not in execution
   Execute it on the ASM instance in node1

```
SQL> select * from v$asm_operation;
```

   There is no problem when 0 rows returned. If the other rows returned, stop rebalance as follows

```
SQL> alter diskgroup DG_DATA rebalance power 0;
```

   Check v$asm_operation again

```
SQL> select * from v$asm_operation;
```

4. With the AdvancedCopy feature, back up all the partitions that belong to the disk group of the data file
   Reference: <7-2-3 Usage Example of Backup Procedure>

5. Release the backup mode for the database
   Execute it on the database instance in node1

```
SQL> alter database end backup;
```

6. Back up the archive log. The current control file and SPFILE of database instance are backed up by the automatic backup feature.
   Execute it on the recovery manager in node1

```
RMAN> backup archivelog all;
```

7. With the ASMCMD utility, back up the metadata of all disk groups
   Execute it on the ASM instance in node1
   *Before backup, confirm that 11.2.0.0.0 is set for compatible.asm attribute and compatible.rdbms attibute of all disk groups. Unless the above setting is made when metadata is backed up with the ASMCMD utility, the metadata cannot be restored properly due to a failure of 11.2.0.1.0.

```
ASMCMD> md_backup /backup/meta/md_bk
```

8. Back up SPFILE of database instance and ASM instance as a text-based file
   Execute it on the database instance and the ASM instance in node1, respectively

```
<Database instance>
SQL> create pfile='/backup/pfile_db/initrac.ora' from spfile;

<ASM instance>
SQL> create pfile='/backup/pfile_asm/initasm.ora' from spfile;
```

*When adding a data file to the database, it is necessary to back up the entire database immediately

Backup of OCR, Voting disk

1. With ocrconfig, back up OCR
   Execute it as root user in node1
   * When using Oracle Clusterware 11g Release 2(11.2), Voting disk is backed up in OCR. Therefore, it is ok to back up only OCR.

```
[root@node1]# /u01/app/11.2.0/grid/bin/ocrconfig –manualbackup
```

Backup of Oracle Local Registry (OLR)

1. With ocrconfig, back up OLR in all nodes
   Execute it as root user in node1 and node2, respectively

```
[root@node1]# /u01/app/11.2.0/grid/bin/ocrconfig –local –manualbackup
```

7-2-2. Recovery Procedure

In case of a disk group failure of a data file

1. Stop the database instance with the ABORT option
   Execute it as orable user in node1

```
[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl stop database –d
rac –o abort
```

2. Delete the disk group of a data file. In the case of RAC, it is necessary to dismount the disk group in all the nodes (node2) other than the node of RAC (node1) where the deletion command is executed before deletion.
   Execute it on the ASM instance in node1
   *If the target disk group in the node where the deletion command is executed is dismounted, use the force option to delete it.

```
SQL> drop diskgroup DG_DATA [force] including contents;
```

3. With the AdvancedCopy feature, restore all the partitions that belong to the disk group of the data file. Execute it as root user in node1
   Reference: <7-2-4 Usage Example of Recovery Procedure>

4. Mount the disk group of the data file
   Execute it on the ASM instance in node1

```
SQL> alter diskgroup DG_DATA mount;
```

5. Start the database instance with the Mount option
   Execute it on the database instance in node1

```
RMAN> startup mount;
```

6. Execute complete recovery
   Execute it on the recovery manager in node1

```
RMAN> recover database;
```

7. Open the database
   Execute it on the recovery manager in node1

```
RMAN> alter database open;
```

8. In the case of RAC, mount the disk group of the data file in all the nodes (node2) other than the node (node1) where the step 4 is executed
   Execute it on the ASM instance in node2

```
SQL> alter diskgroup DG_DATA mount;
```

9. In the case of RAC, start the database instance in all the nodes (node2) other than the node (node1) where the step 7 is executed
   Execute it as orable user in node1

```
[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl start instance
–d rac –n node2
```

In case of a failure of all the disk groups other than DG_CRS

1. Stop the database instance with the ABORT option
   Execute it as orable user in node1

```
[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl stop database –d
rac -o abort
```

2. Delete all the disk groups other than DG_CRS. In the case of RAC, it is necessary to dismount the disk group in all the nodes (node2) other than the node of RAC (node1) where the deletion command is executed before deleting the disk group
   Execute it on the ASM instance in node1
   *If the target disk group in the node where the deletion command is executed is dismounted, use the force option to delete it.

```
SQL> drop diskgroup DG_DATA [force] including contents;
SQL> drop diskgroup DG_REDO [force] including contents;
SQL> drop diskgroup DG_REDO_M [force] including contents;
SQL> drop diskgroup DG_ARCH [force] including contents;
```

3. Restore the metadata of DG_REDO, DG_REDO_M, DG_ARCH disk groups form the backup metadata
   Execute it on the ASMCMD utility in node1

```
ASMCMD > md_restore /backup/meta/md_bk --full –G 'DG_REDO'
ASMCMD > md_restore /backup/meta/md_bk --full –G 'DG_REDO_M'
ASMCMD > md_restore /backup/meta/md_bk --full –G 'DG_ARCH'
```

4. With the AdvancedCopy feature, restore all the partitions that belong to the disk group of the data file. Execute it as root user in node1
   Reference: <7-2-4 Usage Example of Recovery Procedure>

5. Mount the disk group of the data file
   Execute it on the ASM instance in node1

```
SQL> alter diskgroup DG_DATA mount;
```

6. Specify the initialization parameter for backup, and start the database instance in nomount mode
   Execute it on the recovery manager in node1

```
RMAN> startup nomount pfile='/backup/pfile_db/initrac.ora';
```

7. Restore the control file that is automatically backed up
   Execute it on the recovery manager in node1

```
RMAN> restore controlfile from autobackup;
```

8. Mount the database
   Execute it on the recovery manager in node1

```
RMAN> alter database mount;
```

9. Restore the backed up server parameter file
   Execute it on the recovery manager in node1

```
RMAN> restore spfile;
```

10. Execute incomplete recovery
    Execute it on the recovery manager in node1

```
RMAN> recover database until sequence 28 thread 1;
```

11. Open the database with the RESETLOGS option
    Execute it on the recovery manager in node1

```
RMAN> alter database open resetlogs;
```

12. In the case of RAC, mount all the disk groups other than DG_CRS in all the nodes (node2) other than the node (node1) where the step 5 is executed
    Execute it on the database instance in node2

```
SQL> alter diskgroup DG_DATA, DG_REDO, DG_REDO_M, DG_ARCH mount;
```

13. To restart the database instace from the server parameter file, stop the database instance

Execute it as orable user in node1

```
[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl stop database –d
rac
```

14. Start all the database instances
    Execute it as orable user in node1

```
[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl start database
–d rac
```

15. Delete the invalid entry of archive log files
    Execute it on the recovery manager in node1

```
RMAN> crosscheck archivelog all;
RMAN> delete expired archivelog all;
```

In case of a disk group failure of DG_CRS

1. Stop CRS in all nodes
   Execute it as root user in node1 and node2, respectively

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl stop crs –f
```

2. Clear all disk headers of DG_CRS with the dd command
   Execute it as grid user in node1

```
[grid@node1]$ dd if=/dev/zero of=/dev/sde1 bs=1024k count=10
[grid@node1]$ dd if=/dev/zero of=/dev/sdf1 bs=1024k count=10
[grid@node1]$ dd if=/dev/zero of=/dev/sdj1 bs=1024k count=10
```

3. Start CRS in exclusive mode
   Execute it as root user in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl start crs –excl
```

4. Stop crsd
   Execute it as root user in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl stop resource ora.crsd –init
```

5. Restore the metadata in DG_CRS disk group
   Execute it on the ASMCMD utility in node1

```
ASMCMD> md_restore /backup/meta/md_bk --full  -G 'DG_CRS'
```

6. Shut down the ASM instance
   Execute it on the ASM instance in node1

```
SQL> shutdown immediate
```

7. Start the ASM instance using the backed up pfile
   Execute it on the ASM instance in node1

```
SQL> startup pfile='/backup/pfile_asm/initasm.ora';
```

8. Recreate the server parameter file of the ASM instance
   Execute it on the ASM instance in node1

```
SQL> create spfile='+DG_CRS' from pfile='/backup/pfile_asm/initasm.ora';
```

9. Restore OCR
   Execute it as root user in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/ocrconfig -restore ¥
  /backup/ocr/backup_20121130_151838.ocr
```

10. Recreate Voting disk into DG_CRS disk group
    Execute it as root user in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl replace votedisk +DG_CRS
```

11. Stop the CRS running in exclusive mode
    Execute it as root user in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl stop crs -f
```

12. Start CRS in all nodes
    Execute it as root user in node1 and node2, respectively

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl start crs
```

In case of an OLR failure

1. Stop CRS in the target node (node1)
   Execute it as root user in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl stop crs
```

2. Restore OLR from backup
   Execute it as root user in node1
   *If there is no <host name.olr> file under {GI installation destination}/cdata, it is necessary to create an empty file with the same name

```
[root@node1]# /u01/app/11.2.0/grid/bin/ocrconfig -local –restore ¥
  /backup/olr/node1/backup_20121130_130937.olr
```

3. Start CRS in the target node (node1)
   Execute it as root user in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl start crs
```

7-2-3. Usage Example of Backup Procedure

Backup of database

Archive the current redo log file
Execute this command on the database instance in node1

```
SQL> alter system archive log current;

The system has changed
```

Srart the backup mode for the database
Execute this command on the database instance in node1

```
SQL> alter database begin backup;

The database has changed
```

Confirm if rebalance of ASM is in execution
Execute this command on the ASM instance in node1

```
SQL> select * from v$asm_operation;

No record has been selected
```

With the AdvancedCopy feature, back up all the partitions that belong to the disk group of the data file
Execute this command on the OS command line in node1

```
[root@node1 ~]# /opt/FJSVswsts/bin/swstbackup -T
/dev/disk/by-id/scsi-3600000e00d100000001001a200010000-part1 -Xdevmap
/acmdata/map/map-data
/dev/disk/by-id/scsi-3600000e00d100000001001a200010000-part1 swstbackup
completed

[root@node1 ~]# /opt/FJSVswsts/bin/swstbackup -T
/dev/disk/by-id/scsi-3600000e00d100000001001a200020000-part1 -Xdevmap
```

```
/acmdata/map/map-data
/dev/disk/by-id/scsi-3600000e00d100000001001a200020000-part1 swstbackup
completed

[root@node1 ~]# /opt/FJSVswsts/bin/swstbackup -T
/dev/disk/by-id/scsi-3600000e00d100000001001a200080000-part1 -Xdevmap
/acmdata/map/map-data
/dev/disk/by-id/scsi-3600000e00d100000001001a200080000-part1 swstbackup
completed

[root@node1 ~]# /opt/FJSVswsts/bin/swstbackup -T
/dev/disk/by-id/scsi-3600000e00d100000001001a200090000-part1 -Xdevmap
/acmdata/map/map-data
/dev/disk/by-id/scsi-3600000e00d100000001001a200090000-part1 swstbackup
completed
```

Release the backup mode for the database
Execute this command on the database instance in node1

```
SQL> alter database end backup;

The database has changed
```

Back up all the archive log files. It is backed up with the current control file and SPFILE automatic backup feature of database instance
Execute this command on RMAN in node1

```
RMAN>  backup archivelog all;

Backup has started (Start time: 2012/12/01 15:03:33)
The current log has been archived
Channel: ORA_DISK_1 has been assigned
Channel ORA_DISK_1: SID=180 Instance=rac1 Device type=DISK
Channel ORA_DISK_1: Starting archive log backup set
Channel ORA_DISK_1: Specifying archive log for the backup set
Input archive log thread=2 Order=13 Record ID=25 Stamp=800751678
Input archive log thread=1 Order=30 Record ID=24 Stamp=800751676
Channel ORA_DISK_1: Start piece1(2012/12/01 15:03:38)
Channel ORA_DISK_1: Piece1(2012/12/01 15:03:41) has been completed
Piece handle=/backup/rman/0hnrpcqa_1_1 Tag=TAG20121201T150337 Comment=NONE
Channel ORA_DISK_1: Backup set has been completed. Elapsed time: 00:00:03
Channel ORA_DISK_1: Starting archive log backup set
Channel ORA_DISK_1: Specifying archive log for the backup set
Input archive log thread=1 Order=1 Record ID=27 Stamp=800892464
Input archive log thread=2 Order=1 Record ID=26 Stamp=800752291
Input archive log thread=2 Order=2 Record ID=28 Stamp=800892467
Input archive log thread=1 Order=2 Record ID=29 Stamp=800892712
Input archive log thread=2 Order=3 Record ID=31 Stamp=800892994
Input archive log thread=1 Order=3 Record ID=30 Stamp=800892937
Input archive log thread=1 Order=4 Record ID=32 Stamp=800892996
Channel ORA_DISK_1: Start piece1(2012/12/01 15:03:41)
Channel ORA_DISK_1: Piece1(2012/12/01 15:03:56) has been completed
Piece handle=/backup/rman/0inrpcqd_1_1 Tag=TAG20121201T150337 Comment=NONE
Channel ORA_DISK_1: Backup set has been completed. Elapsed time: 00:00:15
Channel ORA_DISK_1: Starting archive log backup set
Channel ORA_DISK_1: Specifying archive log for the backup set
Input archive log thread=1 Order=1 Record ID=34 Stamp=800894088
Input archive log thread=2 Order=1 Record ID=33 Stamp=800893909
Input archive log thread=2 Order=2 Record ID=37 Stamp=800895579
Input archive log thread=1 Order=2 Record ID=35 Stamp=800894090
Input archive log thread=1 Order=3 Record ID=36 Stamp=800895579
Input archive log thread=1 Order=4 Record ID=38 Stamp=800895813
Input archive log thread=2 Order=3 Record ID=39 Stamp=800895814
Channel ORA_DISK_1: Start piece1(2012/12/01 15:03:56)
```

```
Channel ORA_DISK_1: Piece1(2012/12/01 15:03:59) has been completed
Piece handle=/backup/rman/0jnrpcqs_1_1 Tag=TAG20121201T150337 Comment=NONE
Channel ORA_DISK_1: Backup set has been completed. Elapsed time: 00:00:03
Backup has been completed (Completion time: 2012/12/01 15:03:59)

Control File and SPFILE Autobackup have started (Start time: 2012/12/01 15:03:59)
Piece handle=/backup/rman/c-2388723407-20121201-02 Comment=NONE
Control File and SPFILE Autobackup has been completed (Completion time: 2012/12/01
15:04:01)
```

Back up the metadata of all disk groups with the ASMCMD utility
***Before backup, confirm that 11.2.0.0.0 is set for compatible.asm attribute and compatible.rdbms attribute of all disk groups. Unless the above setting is made when metadata is backed up with the ASMCMD utility, the metadata cannot be restored properly due to a failure of 11.2.0.1.0.**

Execute this command on the ASMCMD utility and the ASM instance in node1

```
SQL> SELECT dg.name AS diskgroup, SUBSTR(a.name,1,24) AS name,
  2  SUBSTR(a.value,1,24) AS value FROM V$ASM_DISKGROUP dg, V$ASM_ATTRIBUTE a
  3  WHERE  dg.group_number = a.group_number
  4  and a.name in ('compatible.rdbms','compatible.asm');

DISKGROUP      NAME                     VALUE
-------------- ------------------------ --------------------
DG_CRS         compatible.asm           11.2.0.0.0
DG_CRS         compatible.rdbms         11.2.0.0.0
DG_REDO        compatible.asm           11.2.0.0.0
DG_REDO        compatible.rdbms         11.2.0.0.0
DG_DATA        compatible.asm           11.2.0.0.0
DG_DATA        compatible.rdbms         11.2.0.0.0
DG_REDO_M      compatible.asm           11.2.0.0.0
DG_REDO_M      compatible.rdbms         11.2.0.0.0
DG_ARCH        compatible.asm           11.2.0.0.0
DG_ARCH        compatible.rdbms         11.2.0.0.0

ASMCMD [+] > md_backup /backup/meta/md_bk
Disk group metadata to be backed up: DG_ACM
Disk group metadata to be backed up: DG_REDO
Disk group metadata to be backed up: DG_CRS
Disk group metadata to be backed up: DG_REDO_M
Disk group metadata to be backed up: DG_ARCH
Disk group metadata to be backed up: DG_DATA
Current alias directory path: RAC
Current alias directory path: RAC/PARAMETERFILE
Current alias directory path: RAC/CONTROLFILE
Current alias directory path: RAC/ONLINELOG
Current alias directory path: crs/ASMPARAMETERFILE
Current alias directory path: crs
Current alias directory path: crs/OCRFILE
Current alias directory path: RAC
Current alias directory path: RAC/CONTROLFILE
Current alias directory path: RAC/ONLINELOG
Current alias directory path: RAC/ARCHIVELOG/2012_11_30
Current alias directory path: RAC/ARCHIVELOG
Current alias directory path: RAC/arch
Current alias directory path: RAC/snapcf
Current alias directory path: RAC
Current alias directory path: RAC/CONTROLFILE
Current alias directory path: RAC/ARCHIVELOG/2012_12_01
Current alias directory path: RAC
Current alias directory path: RAC/DATAFILE
Current alias directory path: RAC/TEMPFILE
```

Back up the server parameter files of database instance and ASM instance as a text-based file
Execute this command on the database instance and the ASM instance in node1, respectively

```
<Database instance>
SQL> create pfile='/backup/pfile_db/initrac.ora' from spfile;

A file has been created

<ASM instance>
SQL> create pfile='/backup/pfile_asm/initasm.ora' from spfile;

File created.
```

Backup of OCR, Voting disk

With the ocrconfig command, back up OCR
Execute this command on the OS command line in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/ocrconfig -manualbackup

node1     2012/11/30 22:06:14
/u01/app/11.2.0/grid/cdata/crs/backup_20121130_220614.ocr
```

Backup of Oracle Local Registry(OLR)

With the ocrconfig command, back up OLR
Execute this command on the OS command lines in all nodes (node1, node2)

```
[root@node1]# /u01/app/11.2.0/grid/bin/ocrconfig –local –manualbackup

node1     2012/11/30 22:06:24
/u01/app/11.2.0/grid/cdata/node1/backup_20121130_220624.olr

node1     2012/11/19 09:35:05
/u01/app/11.2.0/grid/cdata/node1/backup_20121119_093505.olr
```

7-2-4. Usage Example of Recovery Procedure

In case of a disk group failure of a data file

With the ABORT option, stop the database instance
Execute this command on the OS command line in node1

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status res -t
--------------------------------------------------------------------------------
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_CRS.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_DATA.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.LISTENER.lsnr
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.asm
               ONLINE  ONLINE       node1                    Started
               ONLINE  ONLINE       node2                    Started
ora.gsd
               OFFLINE OFFLINE      node1
               OFFLINE OFFLINE      node2
ora.net1.network
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.ons
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.registry.acfs
               ONLINE  ONLINE       node1
               ONLINE  OFFLINE      node2
```

```
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
     1       ONLINE  ONLINE      node1
acmvip
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN1.lsnr
     1       ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
     1       ONLINE  ONLINE      node1
ora.cvu
     1       OFFLINE OFFLINE
ora.node1.vip
     1       ONLINE  ONLINE      node1
ora.node2.vip
     1       ONLINE  ONLINE      node2
ora.oc4j
     1       ONLINE  ONLINE      node2
ora.rac.db
     1       ONLINE  ONLINE      node1                 Open
     2       ONLINE  ONLINE      node2                 Open
ora.scan1.vip
     1       ONLINE  ONLINE      node2
ora.scan2.vip
     1       ONLINE  ONLINE      node1
ora.scan3.vip
     1       ONLINE  ONLINE      node1

[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl stop database –d rac -o
abort

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status res -t

--------------------------------------------------------------------------------
NAME          TARGET  STATE       SERVER                  STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.DG_CRS.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.DG_DATA.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.DG_REDO.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.DG_REDO_M.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.LISTENER.lsnr
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.asm
              ONLINE  ONLINE      node1                 Started
              ONLINE  ONLINE      node2                 Started
ora.gsd
              OFFLINE OFFLINE     node1
              OFFLINE OFFLINE     node2
```

```
ora.net1.network
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.ons
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.registry.acfs
               ONLINE  ONLINE      node1
               ONLINE  OFFLINE     node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
      1        ONLINE  ONLINE      node1
acmvip
      1        ONLINE  ONLINE      node1
ora.LISTENER_SCAN1.lsnr
      1        ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
      1        ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
      1        ONLINE  ONLINE      node1
ora.cvu
      1        OFFLINE OFFLINE
ora.node1.vip
      1        ONLINE  ONLINE      node1
ora.node2.vip
      1        ONLINE  ONLINE      node2
ora.oc4j
      1        ONLINE  ONLINE      node2
ora.rac.db
      1        OFFLINE OFFLINE                           Instance Shutdown
      2        OFFLINE OFFLINE                           Instance Shutdown
ora.scan1.vip
      1        ONLINE  ONLINE      node2
ora.scan2.vip
      1        ONLINE  ONLINE      node1
ora.scan3.vip
      1        ONLINE  ONLINE      node1
```

Dismount the disk group of a data file
Execute this command on the ASM instance in node2

```
SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME   MOUNT_S   HEADER_STATU  PATH
------------ --------- ------------ ----------------------------------------
DG_ARCH      CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a2000b0000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200030000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200040000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a2000a0000-part1
DG_DATA      CACHED    CANDIDATE    /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200010000-part1
DG_DATA      CACHED    CANDIDATE    /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200020000-part1
DG_DATA      CACHED    CANDIDATE    /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200080000-part1
DG_DATA      CACHED    CANDIDATE    /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200090000-part1
```

```
DG_REDO       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200000000-part1
DG_REDO_M     CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER NAME           STATE       TYPE
------------ -------------- ----------- ---------
           1 DG_CRS         MOUNTED     NORMAL
           2 DG_ARCH        MOUNTED     EXTERN
           3 DG_DATA        MOUNTED     EXTERN
           4 DG_REDO        MOUNTED     EXTERN
           5 DG_REDO_M      MOUNTED     EXTERN

SQL> alter diskgroup DG_DATA dismount;

Diskgroup altered.

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER NAME           STATE       TYPE
------------ -------------- ----------- ---------
           1 DG_CRS         MOUNTED     NORMAL
           2 DG_ARCH        MOUNTED     EXTERN
           4 DG_REDO        MOUNTED     EXTERN
           5 DG_REDO_M      MOUNTED     EXTERN

SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME   MOUNT_S   HEADER_STATU   PATH
------------ --------- ------------- ----------------------------------------
DG_ARCH      CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a2000b0000-part1
DG_CRS       CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200030000-part1
DG_CRS       CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200040000-part1
DG_CRS       CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a2000a0000-part1
             CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200010000-part1
             CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200020000-part1
             CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200080000-part1
             CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200090000-part1
DG_REDO      CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200000000-part1
DG_REDO_M    CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200070000-part1
```

Delete the disk group of the data file
Execute this command on the ASM instance in node1

```
SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER NAME           STATE       TYPE
------------ -------------- ----------- ---------
           1 DG_CRS         MOUNTED     NORMAL
           2 DG_ARCH        MOUNTED     EXTERN
```

```
           3  DG_DATA         MOUNTED     EXTERN
           4  DG_REDO         MOUNTED     EXTERN
           5  DG_REDO_M       MOUNTED     EXTERN

SQL> drop diskgroup DG_DATA  including contents;

Diskgroup dropped.

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER  NAME           STATE       TYPE
------------ ------------- ----------- ---------
           1  DG_CRS         MOUNTED     NORMAL
           2  DG_ARCH        MOUNTED     EXTERN
           4  DG_REDO        MOUNTED     EXTERN
           5  DG_REDO_M      MOUNTED     EXTERN

SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME   MOUNT_S   HEADER_STATU   PATH
------------ --------- ------------- ----------------------------------------
DG_ARCH      CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a2000b0000-part1
DG_CRS       CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200030000-part1
DG_CRS       CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200040000-part1
DG_CRS       CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a2000a0000-part1
             CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200010000-part1
             CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200020000-part1
             CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200080000-part1
             CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200090000-part1
DG_REDO      CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200000000-part1
DG_REDO_M    CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200070000-part1
```

With the AdvancedCopy feature, restore all the partitions that belong to the disk group of the data file.
Execute this command on the OS command line in node1

```
[root@node1]# /opt/FJSVswsts/bin/swstrestore
/dev/disk/by-id/scsi-3600000e00d100000001001a200010000-part1
/dev/disk/by-id/scsi-3600000e00d100000001001a200010000-part1 swstrestore
completed

[root@node1 ~]# /opt/FJSVswsts/bin/swstrestore
/dev/disk/by-id/scsi-3600000e00d100000001001a200020000-part1
/dev/disk/by-id/scsi-3600000e00d100000001001a200020000-part1 swstrestore
completed

[root@node1 ~]# /opt/FJSVswsts/bin/swstrestore
/dev/disk/by-id/scsi-3600000e00d100000001001a200080000-part1
/dev/disk/by-id/scsi-3600000e00d100000001001a200080000-part1 swstrestore
completed

[root@node1 ~]# /opt/FJSVswsts/bin/swstrestore
/dev/disk/by-id/scsi-3600000e00d100000001001a200090000-part1
```

```
/dev/disk/by-id/scsi-3600000e00d100000001001a200090000-part1 swstrestore
completed
```

Mount the disk group of the data file
Execute this command on the ASM instance in node1

```
SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME   MOUNT_S   HEADER_STATU  PATH
------------ --------- ------------ ----------------------------------------
DG_ARCH      CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a2000b0000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200030000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200040000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a2000a0000-part1
             CLOSED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200010000-part1
             CLOSED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200020000-part1
             CLOSED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200080000-part1
             CLOSED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200090000-part1
DG_REDO      CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200000000-part1
DG_REDO_M    CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER NAME           STATE       TYPE
------------ -------------- ----------- ---------
           1 DG_CRS         MOUNTED     NORMAL
           2 DG_ARCH        MOUNTED     EXTERN
           0 DG_DATA        DISMOUNTED  EXTERN
           4 DG_REDO        MOUNTED     EXTERN
           5 DG_REDO_M      MOUNTED     EXTERN

SQL> alter diskgroup DG_DATA mount;

Diskgroup altered.

SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME   MOUNT_S   HEADER_STATU  PATH
------------ --------- ------------ ----------------------------------------
DG_ARCH      CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a2000b0000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200030000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200040000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a2000a0000-part1
DG_DATA      CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200010000-part1
DG_DATA      CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200020000-part1
```

```
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200080000-part1
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200090000-part1
DG_REDO       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200000000-part1
DG_REDO_M     CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER  NAME           STATE       TYPE
------------ ------------- ----------- ---------
           1  DG_CRS        MOUNTED     NORMAL
           2  DG_ARCH       MOUNTED     EXTERN
           3  DG_DATA       MOUNTED     EXTERN
           4  DG_REDO       MOUNTED     EXTERN
           5  DG_REDO_M     MOUNTED     EXTERN
```

Start the database instance with the Mount option
Execute this command on the recovery manager in node1

```
RMAN> startup mount

The Oracle instance has started
The database has been mounted

The total size of the system global area is 5027385344 bytes

Fixed Size                  2237008 bytes
Variable Size            1006636464 bytes
Database Buffers         4009754624 bytes
Redo Buffers               8757248 bytes
```

Execute complete recovery
Execute this command on the recovery manager in node1

```
RMAN> recover database;

Recovery has started Start time: 12-11-30)
Channel: ORA_DISK_1 has been assigned
Channel ORA_DISK_1: SID=146 Instance=rac1 Device type=DISK

Starting media recovery

The archive log of the thread 1 (Order 27) exists in the disk as the file
+DG_ARCH/rac/arch/1_27_800741391.dbf
The archive log of the thread 2 (Order 8) exists in the disk as the file
+DG_ARCH/rac/arch/2_8_800741391.dbf
The archive log of the thread 2 (Order 9) exists in the disk as the file
+DG_ARCH/rac/arch/2_9_800741391.dbf
Archive log file name=+DG_ARCH/rac/arch/2_8_800741391.dbf Thread=2 Order=8
Media recovery has been completed. Elapsed time: 00:00:35
Recovery has been completed (Completion time:12-11-30)
```

Open the database
Execute this command on the recovery manager in node1

```
RMAN> alter database open;

The database has opened
Starting a full resynchronization of the recovery catalog
The full resynchronization has been completed
```

For all the ASM instances, mount the disk group of the data file
Execute this command on the ASM instance in node2

```
SQL> alter diskgroup DG_DATA mount;

Diskgroup altered.

SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME    MOUNT_S   HEADER_STATU   PATH
------------ --------- ------------ --------------------------
DG_ARCH       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a2000b0000-part1
DG_CRS        CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200030000-part1
DG_CRS        CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200040000-part1
DG_CRS        CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a2000a0000-part1
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200010000-part1
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200020000-part1
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200080000-part1
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200090000-part1
DG_REDO       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200000000-part1
DG_REDO_M     CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER NAME           STATE       TYPE
------------ -------------- ----------- ---------
           1 DG_CRS         MOUNTED     NORMAL
           2 DG_ARCH        MOUNTED     EXTERN
           3 DG_DATA        MOUNTED     EXTERN
           4 DG_REDO        MOUNTED     EXTERN
           5 DG_REDO_M      MOUNTED     EXTERN
```

Start all the database instances
Execute this command on the OS command line in node1

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status res -t
--------------------------------------------------------------------------------
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_CRS.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_DATA.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO.dg
```

```
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.DG_REDO_M.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.LISTENER.lsnr
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.asm
              ONLINE  ONLINE      node1                Started
              ONLINE  ONLINE      node2                Started
ora.gsd
              OFFLINE OFFLINE     node1
              OFFLINE OFFLINE     node2
ora.net1.network
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.ons
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.registry.acfs
              ONLINE  ONLINE      node1
              ONLINE  OFFLINE     node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
     1       ONLINE  ONLINE      node1
acmvip
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN1.lsnr
     1       ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
     1       ONLINE  ONLINE      node1
ora.cvu
     1       OFFLINE OFFLINE
ora.node1.vip
     1       ONLINE  ONLINE      node1
ora.node2.vip
     1       ONLINE  ONLINE      node2
ora.oc4j
     1       ONLINE  ONLINE      node2
ora.rac.db
     1       ONLINE  ONLINE      node1                Open
     2       OFFLINE OFFLINE                          Instance Shutdown
ora.scan1.vip
     1       ONLINE  ONLINE      node2
ora.scan2.vip
     1       ONLINE  ONLINE      node1
ora.scan3.vip
     1       ONLINE  ONLINE      node1

[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl start instance -d rac -n
node2

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status res -t
--------------------------------------------------------------------------------
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
              ONLINE  ONLINE      node1
```

```
              ONLINE  ONLINE      node2
ora.DG_CRS.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.DG_DATA.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.DG_REDO.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.DG_REDO_M.dg
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.LISTENER.lsnr
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.asm
              ONLINE  ONLINE      node1                    Started
              ONLINE  ONLINE      node2                    Started
ora.gsd
              OFFLINE OFFLINE     node1
              OFFLINE OFFLINE     node2
ora.net1.network
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.ons
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.registry.acfs
              ONLINE  ONLINE      node1
              ONLINE  OFFLINE     node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
      1       ONLINE  ONLINE      node1
acmvip
      1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN1.lsnr
      1       ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
      1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
      1       ONLINE  ONLINE      node1
ora.cvu
      1       OFFLINE OFFLINE
ora.node1.vip
      1       ONLINE  ONLINE      node1
ora.node2.vip
      1       ONLINE  ONLINE      node2
ora.oc4j
      1       ONLINE  ONLINE      node2
ora.rac.db
      1       ONLINE  ONLINE      node1                    Open
      2       ONLINE  ONLINE      node2                    Open
ora.scan1.vip
      1       ONLINE  ONLINE      node2
ora.scan2.vip
      1       ONLINE  ONLINE      node1
ora.scan3.vip
      1       ONLINE  ONLINE      node1
```

In case of a failure of a disk group other than DG_CRS

With the ABORT option , shut down the database instance
Execute this command on the OS command line in node1

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status res -t
--------------------------------------------------------------------------------
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_CRS.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_DATA.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.LISTENER.lsnr
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.asm
               ONLINE  ONLINE       node1                    Started
               ONLINE  ONLINE       node2                    Started
ora.gsd
               OFFLINE OFFLINE      node1
               OFFLINE OFFLINE      node2
ora.net1.network
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.ons
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.registry.acfs
               ONLINE  ONLINE       node1
               ONLINE  OFFLINE      node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
      1        ONLINE  ONLINE       node1
acmvip
      1        ONLINE  ONLINE       node1
ora.LISTENER_SCAN1.lsnr
      1        ONLINE  ONLINE       node2
ora.LISTENER_SCAN2.lsnr
      1        ONLINE  ONLINE       node1
ora.LISTENER_SCAN3.lsnr
      1        ONLINE  ONLINE       node1
ora.cvu
      1        OFFLINE OFFLINE
ora.node1.vip
      1        ONLINE  ONLINE       node1
ora.node2.vip
      1        ONLINE  ONLINE       node2
ora.oc4j
```

```
     1       ONLINE  ONLINE      node2
ora.rac.db
     1       ONLINE  ONLINE      node1                  Open
     2       ONLINE  ONLINE      node2                  Open
ora.scan1.vip
     1       ONLINE  ONLINE      node2
ora.scan2.vip
     1       ONLINE  ONLINE      node1
ora.scan3.vip
     1       ONLINE  ONLINE      node1

[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl stop database -d rac -o
abort

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status res -t
--------------------------------------------------------------------------------
NAME           TARGET  STATE       SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_CRS.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_DATA.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_REDO.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.LISTENER.lsnr
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.asm
               ONLINE  ONLINE      node1                  Started
               ONLINE  ONLINE      node2                  Started
ora.gsd
               OFFLINE OFFLINE     node1
               OFFLINE OFFLINE     node2
ora.net1.network
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.ons
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.registry.acfs
               ONLINE  ONLINE      node1
               ONLINE  OFFLINE     node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
     1       ONLINE  ONLINE      node1
acmvip
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN1.lsnr
     1       ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
```

```
     1       ONLINE  ONLINE       node1
ora.cvu
     1       OFFLINE OFFLINE
ora.node1.vip
     1       ONLINE  ONLINE       node1
ora.node2.vip
     1       ONLINE  ONLINE       node2
ora.oc4j
     1       ONLINE  ONLINE       node2
ora.rac.db
     1       OFFLINE OFFLINE                           Instance Shutdown
     2       OFFLINE OFFLINE                           Instance Shutdown
ora.scan1.vip
     1       ONLINE  ONLINE       node2
ora.scan2.vip
     1       ONLINE  ONLINE       node1
ora.scan3.vip
     1       ONLINE  ONLINE       node1
```

Dismount all the disk groups other than DG_CRS
Execute this command on the ASM instance in node2

```
SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME    MOUNT_S   HEADER_STATU   PATH
------------ --------- ------------- --------------------------
DG_ARCH       CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a2000b0000-part1
DG_CRS        CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200030000-part1
DG_CRS        CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200040000-part1
DG_CRS        CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a2000a0000-part1
DG_DATA       CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200010000-part1
DG_DATA       CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200020000-part1
DG_DATA       CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200080000-part1
DG_DATA       CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200090000-part1
DG_REDO       CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200000000-part1
DG_REDO_M     CACHED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER  NAME          STATE       TYPE
------------ ------------- ----------- ---------
           1  DG_CRS        MOUNTED     NORMAL
           2  DG_ARCH       MOUNTED     EXTERN
           3  DG_DATA       MOUNTED     EXTERN
           4  DG_REDO       MOUNTED     EXTERN
           5  DG_REDO_M     MOUNTED     EXTERN

SQL> alter diskgroup DG_DATA, DG_REDO, DG_REDO_M, DG_ARCH dismount;

Diskgroup altered.

SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
```

```
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME    MOUNT_S   HEADER_STATU   PATH
------------ --------- ------------- ----------------------------------------
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a2000b0000-part1
DG_CRS        CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200030000-part1
DG_CRS        CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200040000-part1
DG_CRS        CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a2000a0000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200010000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200020000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200080000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200090000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200000000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER  NAME           STATE       TYPE
------------ ------------- ----------- ---------
           1  DG_CRS         MOUNTED       NORMAL
```

Delete all the disk groups other than DG_CRS
Execute this command on the ASM instance in node1

```
SQL> drop diskgroup DG_DATA including contents;

Diskgroup dropped.

SQL> drop diskgroup DG_REDO including contents;

Diskgroup dropped.

SQL> drop diskgroup DG_REDO_M including contents;

Diskgroup dropped.

SQL> drop diskgroup DG_ARCH including contents;

Diskgroup dropped.

SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME    MOUNT_S   HEADER_STATU   PATH
------------ --------- ------------- ----------------------------------------
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a2000b0000-part1
DG_CRS        CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200030000-part1
DG_CRS        CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200040000-part1
DG_CRS        CACHED    MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a2000a0000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
```

```
                                    1001a200010000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200020000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200080000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200090000-part1
              CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200000000-part1
             CLOSED    CANDIDATE     /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER  NAME           STATE       TYPE
------------  -------------  ----------- ---------
             1  DG_CRS         MOUNTED       NORMAL
```

From the backup of the metadata acquiured with the ASMCMD utility, restore the metadata of DG_REDO, DG_REDO_M and DG_ARCH
Execute this command on the ASMCMD utility in node1

```
ASMCMD >  md_restore /backup/meta/md_bk --full -G 'DG_REDO'
Current Diskgroup metadata being restored: DG_REDO
Diskgroup DG_REDO created!
System template PARAMETERFILE modified!
System template CHANGETRACKING modified!
System template CONTROLFILE modified!
System template DATAFILE modified!
System template DATAGUARDCONFIG modified!
System template FLASHFILE modified!
System template XTRANSPORT modified!
System template TEMPFILE modified!
System template BACKUPSET modified!
System template OCRFILE modified!
System template ARCHIVELOG modified!
System template DUMPSET modified!
System template ONLINELOG modified!
System template AUTOBACKUP modified!
System template FLASHBACK modified!
System template ASMPARAMETERFILE modified!
Directory +DG_REDO/RAC re-created!
Directory +DG_REDO/RAC/CONTROLFILE re-created!
Directory +DG_REDO/RAC/ONLINELOG re-created!
Directory +DG_REDO/RAC/PARAMETERFILE re-created!

ASMCMD >  md_restore /backup/meta/md_bk --full -G 'DG_REDO_M'
Current Diskgroup metadata being restored: DG_REDO_M
Diskgroup DG_REDO_M created!
System template ONLINELOG modified!
System template XTRANSPORT modified!
System template CONTROLFILE modified!
System template DATAFILE modified!
System template BACKUPSET modified!
System template DUMPSET modified!
System template CHANGETRACKING modified!
System template OCRFILE modified!
System template DATAGUARDCONFIG modified!
System template TEMPFILE modified!
System template ASMPARAMETERFILE modified!
System template FLASHFILE modified!
System template PARAMETERFILE modified!
System template FLASHBACK modified!
System template AUTOBACKUP modified!
System template ARCHIVELOG modified!
```

```
Directory +DG_REDO_M/RAC re-created!
Directory +DG_REDO_M/RAC/CONTROLFILE re-created!
Directory +DG_REDO_M/RAC/ONLINELOG re-created!

ASMCMD >  md_restore /backup/meta/md_bk --full -G 'DG_ARCH'
Current Diskgroup metadata being restored: DG_ARCH
Diskgroup DG_ARCH created!
System template XTRANSPORT modified!
System template ONLINELOG modified!
System template DATAGUARDCONFIG modified!
System template AUTOBACKUP modified!
System template TEMPFILE modified!
System template OCRFILE modified!
System template ARCHIVELOG modified!
System template DUMPSET modified!
System template CONTROLFILE modified!
System template BACKUPSET modified!
System template ASMPARAMETERFILE modified!
System template FLASHBACK modified!
System template PARAMETERFILE modified!
System template FLASHFILE modified!
System template DATAFILE modified!
System template CHANGETRACKING modified!
Directory +DG_ARCH/RAC re-created!
Directory +DG_ARCH/RAC/arch re-created!
Directory +DG_ARCH/RAC/CONTROLFILE re-created!
Directory +DG_ARCH/RAC/snapcf re-created!
Directory +DG_ARCH/RAC/ARCHIVELOG re-created!
Directory +DG_ARCH/RAC/ARCHIVELOG/2012_12_01 re-created!
Directory +DG_ARCH/RAC/ARCHIVELOG/2012_11_30 re-created!

SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME   MOUNT_S   HEADER_STATU  PATH
------------ --------- ------------ ---------------------------
DG_ARCH      CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a2000b0000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200030000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200040000-part1
DG_CRS       CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a2000a0000-part1
             CLOSED    CANDIDATE    /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200010000-part1
             CLOSED    CANDIDATE    /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200020000-part1
             CLOSED    CANDIDATE    /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200080000-part1
             CLOSED    CANDIDATE    /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200090000-part1
DG_REDO      CACHED    MEMBER       /dev/disk/by-id/scsi-3600000e00d10000000
                                    1001a200000000-part1
DG_REDO_M     CACHED MEMBER        /dev/disk/by-id/scsi-3600000e00d10000000
                                   1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER NAME           STATE       TYPE
------------ -------------- ----------- ---------
           1 DG_CRS         MOUNTED     NORMAL
           2 DG_REDO        MOUNTED     EXTERN
           3 DG_REDO_M      MOUNTED     EXTERN
```

```
           4  DG_ARCH         MOUNTED      EXTERN
```

With the AdvancedCopy feature, restore all the partitions that belong to the disk group of the data file.
Execute this command on the OS command line in node1

```
[root@node1]# /opt/FJSVswsts/bin/swstrestore
/dev/disk/by-id/scsi-3600000e00d100000001001a200010000-part1
/dev/disk/by-id/scsi-3600000e00d100000001001a200010000-part1 swstrestore
completed

[root@node1 ~]# /opt/FJSVswsts/bin/swstrestore
/dev/disk/by-id/scsi-3600000e00d100000001001a200020000-part1
/dev/disk/by-id/scsi-3600000e00d100000001001a200020000-part1 swstrestore
completed

[root@node1 ~]# /opt/FJSVswsts/bin/swstrestore
/dev/disk/by-id/scsi-3600000e00d100000001001a200080000-part1
/dev/disk/by-id/scsi-3600000e00d100000001001a200080000-part1 swstrestore
completed

[root@node1 ~]# /opt/FJSVswsts/bin/swstrestore
/dev/disk/by-id/scsi-3600000e00d100000001001a200090000-part1
/dev/disk/by-id/scsi-3600000e00d100000001001a200090000-part1 swstrestore
completed
```

Mount the disk group of the data file
Execute this command on the ASM instance in node1

```
SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME    MOUNT_S   HEADER_STATU   PATH
------------ --------- ------------ --------------------------
DG_ARCH       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a2000b0000-part1
DG_CRS        CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200030000-part1
DG_CRS        CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200040000-part1
DG_CRS        CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a2000a0000-part1
              CLOSED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200010000-part1
              CLOSED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200020000-part1
              CLOSED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200080000-part1
              CLOSED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200090000-part1
DG_REDO       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200000000-part1
DG_REDO_M     CACHED MEMBER           /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER  NAME           STATE       TYPE
------------ ------------- ----------- ---------
           1  DG_CRS         MOUNTED     NORMAL
           2  DG_REDO        MOUNTED     EXTERN
           3  DG_REDO_M      MOUNTED     EXTERN
           4  DG_ARCH        MOUNTED     EXTERN
```

```
           0 DG_DATA        DISMOUNTED

SQL> alter diskgroup DG_DATA mount;

Diskgroup altered.

SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME   MOUNT_S   HEADER_STATU   PATH
------------ --------- ------------ --------------------------
DG_ARCH      CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a2000b0000-part1
DG_CRS       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200030000-part1
DG_CRS       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200040000-part1
DG_CRS       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a2000a0000-part1
DG_DATA      CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200010000-part1
DG_DATA      CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200020000-part1
DG_DATA      CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200080000-part1
DG_DATA      CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200090000-part1
DG_REDO      CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200000000-part1
DG_REDO_M     CACHED MEMBER          /dev/disk/by-id/scsi-3600000e00d10000000
                                     1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER NAME           STATE       TYPE
------------ -------------- ----------- ---------
           1 DG_CRS         MOUNTED     NORMAL
           2 DG_REDO        MOUNTED     EXTERN
           3 DG_REDO_M      MOUNTED     EXTERN
           4 DG_ARCH        MOUNTED     EXTERN
           5 DG_DATA        MOUNTED     EXTERN
```

Specify the initialization parameter of backup and start the database instance in NOMOUNT mode
Execute this command on the recovery manager in node1

```
RMAN> startup nomount pfile='/backup/pfile_db/initrac.ora';

The Oracle instance has started

The total size of the system global area is 5027385344 bytes

Fixed Size                     2237008 bytes
Variable Size               1040190896 bytes
Database Buffers            3976200192 bytes
Redo Buffers                   8757248 bytes
```

Restore the automatic backup control file
Execute this command on the recovery manager in node1

```
RMAN> restore controlfile from autobackup;

Restoration has started (Start time: 2012/12/01 16:12:31)
Channel: ORA_DISK_1 has been assigned
```

```
Channel ORA_DISK_1: SID=146 Instance=rac1 Device type=DISK

Channel ORA_DISK_1: Looking for automatic backup of a day of the week: 20121201
Channel ORA_DISK_1: The automatic backup has been found:
/backup/rman/c-2388723407-20121201-05
Channel ORA_DISK_1: Restoring the control file form automatic
backup/backup/rman/c-2388723407-20121201-05
Channel ORA_DISK_1: Restoration of the control file from automatic backup has been
completed
Output fine name=+DG_REDO/rac/control01.ctl
Output fine name=+DG_REDO_M/rac/control02.ctl
Restoration has been completed (Completion time: 2012/12/01 16:12:33)
```

Mount the database
Execute this command on the recovery manager in node1

```
RMAN> alter database mount;

The database has been mounted
Channel: ORA_DISK_1 has been released
```

Restore the backed up server parameter file
Execute this command on the recovery manager in node1

```
RMAN > restore spfile;

Restoration has started (Start time: 2012/12/01 16:12:47)
Channel: ORA_DISK_1 has been assigned
Channel ORA_DISK_1: SID=123 Instance=rac1 Device type=DISK

Channel ORA_DISK_1: Starting restoration of the data file backup set
Channel ORA_DISK_1: SPFILE is being restored
Output fine name=+DG_REDO/rac/spfilerac.ora
Channel ORA_DISK_1: Reading from backup piece/backup/rman/c-2388723407-20121201-05
Channel ORA_DISK_1: Piece handle=/backup/rman/c-2388723407-20121201-05
Tag=TAG20121201T160402
Channel ORA_DISK_1: The backup piece 1 has been restored
Channel ORA_DISK_1: The restoration has been completed. Elapsed time: 00:00:01
Restoration has been completed (Completion time: 2012/12/01 16:12:49)
```

Execute incomplete recovery
Execute this command on the recovery manager in node1

```
RMAN> recover database until sequence 17 thread 1;

Recover has started (Start time: 2012/12/01 16:19:56)
Using channel ORA_DISK_1

Starting media recovery

Channel ORA_DISK_1: Starting restoration of archive log to the default destination
Channel ORA_DISK_1: Restoring archive log
Archive log thread=1 Order=15
Channel ORA_DISK_1: Restoring archive log
Archive log thread=2 Order=12
Channel ORA_DISK_1: Restoring archive log
Archive log thread=2 Order=13
Channel ORA_DISK_1: Restoring archive log
Archive log thread=2 Order=14
Channel ORA_DISK_1: Restoring archive log
Archive log thread=1 Order=16
Channel ORA_DISK_1: Reading from backup piece/backup/rman/0vnrpga4_1_1
Channel ORA_DISK_1: Piece handle=/backup/rman/0vnrpga4_1_1 Tag=TAG20121201T160256
Channel ORA_DISK_1: The backup piece 1 has been restored
```

```
Channel ORA_DISK_1: The restoration has been completed. Elapsed time: 00:00:07
Archive log file name=+DG_ARCH/rac/arch/1_15_800893891.dbf Thread=1 Order=15
Archive log file name=+DG_ARCH/rac/arch/2_12_800893891.dbf Thread=2 Order=12
Archive log file name=+DG_ARCH/rac/arch/2_13_800893891.dbf Thread=2 Order=13
Archive log file name=+DG_ARCH/rac/arch/2_14_800893891.dbf Thread=2 Order=14
Archive log file name=+DG_ARCH/rac/arch/1_16_800893891.dbf Thread=1 Order=16
Media recovery has been completed. Elapsed time: 00:00:34
Recovery has been completed (Completion time:2012/12/01 16:20:39)
```

Open the database with the RESETLOGS option
Execute this command on the recovery manager in node1

```
RMAN> alter database open resetlogs;

The database has opened
New incarnation of database has been registered in recovery catalog
Starting a full resynchronization of the recovery catalog
The full resynchronization has been completed
```

For all the ASM instances, mount all the disk groups other than DG_CRS
Execute this command on the ASM instance in node2

```
SQL> alter diskgroup DG_DATA, DG_REDO, DG_REDO_M, DG_ARCH mount;

Diskgroup altered.

SQL> select ag.name "GROUP_NAME", ad.mount_status, ad.header_status, ad.path
  2  from v$asm_disk ad, v$asm_diskgroup ag
  3  where ad.group_number != 0 and ad.group_number = ag.group_number;

GROUP_NAME    MOUNT_S   HEADER_STATU   PATH
------------ --------- ------------- --------------------------
DG_ARCH       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a2000b0000-part1
DG_CRS        CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200030000-part1
DG_CRS        CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200040000-part1
DG_CRS        CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a2000a0000-part1
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200010000-part1
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200020000-part1
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200080000-part1
DG_DATA       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200090000-part1
DG_REDO       CACHED    MEMBER         /dev/disk/by-id/scsi-3600000e00d10000000
                                       1001a200000000-part1
DG_REDO_M     CACHED MEMBER           /dev/disk/by-id/scsi-3600000e00d10000000
                                      1001a200070000-part1

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER  NAME           STATE       TYPE
------------ ------------- ----------- ---------
           1  DG_CRS        MOUNTED     NORMAL
           2  DG_ARCH       MOUNTED     EXTERN
           3  DG_DATA       MOUNTED     EXTERN
           4  DG_REDO       MOUNTED     EXTERN
           5  DG_REDO_M     MOUNTED     EXTERN
```

To restart the database instace from the server parameter file, stop the database

instance
Execute this command on the OS command line in node1

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status res –t
--------------------------------------------------------------------------------
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_CRS.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_DATA.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.LISTENER.lsnr
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.asm
               ONLINE  ONLINE       node1                    Started
               ONLINE  ONLINE       node2                    Started
ora.gsd
               OFFLINE OFFLINE      node1
               OFFLINE OFFLINE      node2
ora.net1.network
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.ons
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.registry.acfs
               ONLINE  ONLINE       node1
               ONLINE  OFFLINE      node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
      1        ONLINE  ONLINE       node1
acmvip
      1        ONLINE  ONLINE       node1
ora.LISTENER_SCAN1.lsnr
      1        ONLINE  ONLINE       node2
ora.LISTENER_SCAN2.lsnr
      1        ONLINE  ONLINE       node1
ora.LISTENER_SCAN3.lsnr
      1        ONLINE  ONLINE       node1
ora.cvu
      1        OFFLINE OFFLINE
ora.node1.vip
      1        ONLINE  ONLINE       node1
ora.node2.vip
      1        ONLINE  ONLINE       node2
ora.oc4j
      1        ONLINE  ONLINE       node2
ora.rac.db
      1        ONLINE  ONLINE       node1                    Open
```

```
     2       OFFLINE OFFLINE                               Instance Shutdown
ora.scan1.vip
     1       ONLINE  ONLINE      node2
ora.scan2.vip
     1       ONLINE  ONLINE      node1
ora.scan3.vip
     1       ONLINE  ONLINE      node1

[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl stop instance -d rac -n
node1 –o immediate

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status res –t
--------------------------------------------------------------------------------
NAME           TARGET  STATE       SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_CRS.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_DATA.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_REDO.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.LISTENER.lsnr
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.asm
               ONLINE  ONLINE      node1                    Started
               ONLINE  ONLINE      node2                    Started
ora.gsd
               OFFLINE OFFLINE     node1
               OFFLINE OFFLINE     node2
ora.net1.network
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.ons
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.registry.acfs
               ONLINE  ONLINE      node1
               ONLINE  OFFLINE     node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
     1       ONLINE  ONLINE      node1
acmvip
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN1.lsnr
     1       ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
     1       ONLINE  ONLINE      node1
ora.cvu
     1       OFFLINE OFFLINE
```

```
ora.node1.vip
     1       ONLINE  ONLINE      node1
ora.node2.vip
     1       ONLINE  ONLINE      node2
ora.oc4j
     1       ONLINE  ONLINE      node2
ora.rac.db
     1       OFFLINE OFFLINE                           Instance Shutdown
     2       OFFLINE OFFLINE                           Instance Shutdown
ora.scan1.vip
     1       ONLINE  ONLINE      node2
ora.scan2.vip
     1       ONLINE  ONLINE      node1
ora.scan3.vip
     1       ONLINE  ONLINE      node1
```

Start all the database instances
Execute this command on the OS command line in node1

```
[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl start database -d rac

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status res –t
--------------------------------------------------------------------------------
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_CRS.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_DATA.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_REDO.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.LISTENER.lsnr
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.asm
               ONLINE  ONLINE      node1                    Started
               ONLINE  ONLINE      node2                    Started
ora.gsd
               OFFLINE OFFLINE     node1
               OFFLINE OFFLINE     node2
ora.net1.network
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.ons
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.registry.acfs
               ONLINE  ONLINE      node1
               ONLINE  OFFLINE     node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
     1       ONLINE  ONLINE      node1
```

```
acmvip
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN1.lsnr
     1       ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
     1       ONLINE  ONLINE      node1
ora.cvu
     1       OFFLINE OFFLINE
ora.node1.vip
     1       ONLINE  ONLINE      node1
ora.node2.vip
     1       ONLINE  ONLINE      node2
ora.oc4j
     1       ONLINE  ONLINE      node2
ora.rac.db
     1       ONLINE  ONLINE      node1                  Open
     2       ONLINE  ONLINE      node2                  Open
ora.scan1.vip
     1       ONLINE  ONLINE      node2
ora.scan2.vip
     1       ONLINE  ONLINE      node1
ora.scan3.vip
     1       ONLINE  ONLINE      node1
```

Delete the invalid entry of archive log files
Execute this command on the recovery manager in node1

```
RMAN> crosscheck archivelog all;

Starting a full resynchronization of the recovery catalog
The full resynchronization has been completed
Channel: ORA_DISK_1 has been assigned
Channel ORA_DISK_1: SID=135 Instance=rac1 Device type=DISK
Verification of archive log has failed
Archive log file name=+DG_ARCH/rac/arch/1_30_800741391.dbf Record ID=24
Stamp=800751676
Verification of archive log has failed
Archive log file name=+DG_ARCH/rac/arch/2_13_800741391.dbf Record ID=25
Stamp=800751678
Verification of archive log has failed
Archive log file name=+DG_ARCH/rac/arch/1_1_800752274.dbf Record ID=27
Stamp=800892464

         :

Verification of archive log has been successfully completed
Archive log file name=+DG_ARCH/rac/arch/2_1_800900597.dbf Record ID=68
Stamp=800900613
40 objects have been cross-checked

RMAN> list archivelog all;

The list of archive log copies of the database, db_unique_name RAC
=====================================================================

Key     Thrd Seq     S Low time
------- ---- ------- - -------------------
445     1    30      X 2012/11/30 22:28:27
       Name: +DG_ARCH/rac/arch/1_30_800741391.dbf

446     2    13      X 2012/11/30 22:28:27
       Name: +DG_ARCH/rac/arch/2_13_800741391.dbf
```

```
       :

1315    2    14      A 2012/12/01 16:01:46
       Name: +DG_ARCH/rac/arch/2_14_800893891.dbf

1441    2    1       A 2012/12/01 16:23:17
       Name: +DG_ARCH/rac/arch/2_1_800900597.dbf

RMAN> delete expired archivelog all;

Channel: ORA_DISK_1 has been released
Channel: ORA_DISK_1 has been assigned
Channel ORA_DISK_1: SID=135 Instance=rac1 Device type=DISK
The list of archive log copies of the database, db_unique_name RAC
=====================================================================

Key     Thrd Seq     S Low time
------- ---- ------- - -------------------
445     1    30      X 2012/11/30 22:28:27
       Name: +DG_ARCH/rac/arch/1_30_800741391.dbf

446     2    13      X 2012/11/30 22:28:27
                Name: +DG_ARCH/rac/arch/2_13_800741391.dbf

         :

1120    2    10      X 2012/12/01 15:33:47
       Name: +DG_ARCH/rac/arch/2_10_800893891.dbf

1156    2    11      X 2012/12/01 15:42:19
       Name: +DG_ARCH/rac/arch/2_11_800893891.dbf


Do you want to delete this object (enter YES or NO)? yes
The archive log has been deleted
Archive log file name=+DG_ARCH/rac/arch/1_30_800741391.dbf Record ID=24
Stamp=800751676
The archive log has been deleted

        :

The archive log has been deleted
Archive log file name=+DG_ARCH/rac/arch/2_10_800893891.dbf Record ID=53
Stamp=800898139
The archive log has been deleted
Archive log file name=+DG_ARCH/rac/arch/2_11_800893891.dbf Record ID=57
Stamp=800898817
34EXPIRED objects have been deleted

RMAN> list archivelog all;

The list of archive log copies of the database, db_unique_name RAC
=====================================================================

Key     Thrd Seq     S Low time
------- ---- ------- - -------------------
1316    1    15      A 2012/12/01 15:53:34
       Name: +DG_ARCH/rac/arch/1_15_800893891.dbf

1317    1    16      A 2012/12/01 16:01:48
       Name: +DG_ARCH/rac/arch/1_16_800893891.dbf

1319    2    12      A 2012/12/01 15:53:37
```

```
       Name: +DG_ARCH/rac/arch/2_12_800893891.dbf

1318    2    13     A 2012/12/01 15:57:55
       Name: +DG_ARCH/rac/arch/2_13_800893891.dbf

1315    2    14     A 2012/12/01 16:01:46
       Name: +DG_ARCH/rac/arch/2_14_800893891.dbf

1441    2    1      A 2012/12/01 16:23:17
       Name: +DG_ARCH/rac/arch/2_1_800900597.dbf
```

In case of a disk group failure of DG_CRS

Stop CRS in node1
Execute this command on the OS command line in node1

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status resource -t
--------------------------------------------------------------------------------
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_CRS.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_DATA.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.LISTENER.lsnr
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.asm
               ONLINE  ONLINE       node1                    Started
               ONLINE  ONLINE       node2                    Started
ora.gsd
               OFFLINE OFFLINE      node1
               OFFLINE OFFLINE      node2
ora.net1.network
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.ons
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.registry.acfs
               ONLINE  ONLINE       node1
               ONLINE  OFFLINE      node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
      1        ONLINE  ONLINE       node1
acmvip
      1        ONLINE  ONLINE       node1
```

```
ora.LISTENER_SCAN1.lsnr
     1       ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
     1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
     1       ONLINE  ONLINE      node1
ora.cvu
     1       OFFLINE OFFLINE
ora.node1.vip
     1       ONLINE  ONLINE      node1
ora.node2.vip
     1       ONLINE  ONLINE      node2
ora.oc4j
     1       ONLINE  ONLINE      node2
ora.rac.db
     1       ONLINE  ONLINE      node1                 Open
     2       ONLINE  ONLINE      node2                 Open
ora.scan1.vip
     1       ONLINE  ONLINE      node2
ora.scan2.vip
     1       ONLINE  ONLINE      node1
ora.scan3.vip
     1       ONLINE  ONLINE      node1

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl stop resource acmagent
CRS-2673: Attempting to stop 'acmagent' on 'node1'
CRS-2677: Stop of 'acmagent' on 'node1' succeeded

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl stop resource acmvip
CRS-2673: Attempting to stop 'acmvip' on 'node1'
CRS-2677: Stop of 'acmvip' on 'node1' succeeded

[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl stop database –d rac

[grid@node1]$ /u01/app/11.2.0/grid/bin/srvctl stop listener
[grid@node1]$ /u01/app/11.2.0/grid/bin/srvctl stop scan_listener
[grid@node1]$ /u01/app/11.2.0/grid/bin/srvctl stop scan
[grid@node1]$ /u01/app/11.2.0/grid/bin/srvctl stop nodeapps

[root@node1]# /u01/app/11.2.0/grid/bin/crsctl stop crs -f
CRS-2791: Starting shutdown of Oracle High Availability Services-managed resources
on 'node1'
CRS-2673: Attempting to stop 'ora.crsd' on 'node1'
CRS-2790: Starting shutdown of Cluster Ready Services-managed resources on 'node1'
CRS-2673: Attempting to stop 'ora.DG_CRS.dg' on 'node1'
CRS-2673: Attempting to stop 'ora.DG_ARCH.dg' on 'node1'
CRS-2673: Attempting to stop 'ora.DG_DATA.dg' on 'node1'
CRS-2673: Attempting to stop 'ora.DG_REDO.dg' on 'node1'
CRS-2673: Attempting to stop 'ora.DG_REDO_M.dg' on 'node1'
CRS-2677: Stop of 'ora.DG_CRS.dg' on 'node1' succeeded
CRS-2677: Stop of 'ora.DG_ARCH.dg' on 'node1' succeeded
CRS-2677: Stop of 'ora.DG_DATA.dg' on 'node1' succeeded
CRS-2677: Stop of 'ora.DG_REDO.dg' on 'node1' succeeded
CRS-2677: Stop of 'ora.DG_REDO_M.dg' on 'node1' succeeded
CRS-2673: Attempting to stop 'ora.asm' on 'node1'
CRS-2677: Stop of 'ora.asm' on 'node1' succeeded
CRS-2792: Shutdown of Cluster Ready Services-managed resources on 'node1' has been
completed
CRS-2677: Stop of 'ora.crsd' on 'node1' succeeded
CRS-2673: Attempting to stop 'ora.gpnpd' on 'node1'
CRS-2673: 'ora.cssdmonitor' on 'node1'
CRS-2673: Attempting to stop 'ora.ctssd' on 'node1'
CRS-2673: Attempting to stop 'ora.evmd' on 'node1'
CRS-2673: Attempting to stop 'ora.asm' on 'node1'
CRS-2673: Attempting to stop 'ora.mdnsd' on 'node1'
```

```
CRS-2677: Stop of 'ora.cssdmonitor' on 'node1' succeeded
CRS-2677: Stop of 'ora.gpnpd' on 'node1' succeeded
CRS-2677: Stop of 'ora.mdnsd' on 'node1' succeeded
CRS-2677: Stop of 'ora.evmd' on 'node1' succeeded
CRS-2677: Stop of 'ora.ctssd' on 'node1' succeeded
```

Stop CRS in node2
Execute this command on the OS command line in node2

```
[root@node2]# /u01/app/11.2.0/grid/bin/crsctl stop crs -f
CRS-2791: Starting shutdown of Oracle High Availability Services-managed resources
on 'node2'
CRS-2673: Attempting to stop 'ora.cssdmonitor' on 'node2'
CRS-2673: Attempting to stop 'ora.ctssd' on 'node2'
CRS-2673: Attempting to stop 'ora.evmd' on 'node2'
CRS-2673: Attempting to stop 'ora.asm' on 'node2'
CRS-2673: Attempting to stop 'ora.mdnsd' on 'node2'
CRS-2677: Stop of 'ora.cssdmonitor' on 'node2' succeeded
CRS-2677: Stop of 'ora.mdnsd' on 'node2' succeeded
CRS-2677: Stop of 'ora.evmd' on 'node2' succeeded
CRS-2677: Stop of 'ora.ctssd' on 'node2' succeeded
```

Start CRS in exclusive mode
Execute this command on the OS command line in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl start crs –excl
CRS-4123: Oracle High Availability Services has been started.
CRS-2672: Attempting to start 'ora.gipcd' on 'node1'
CRS-2672: Attempting to start 'ora.mdnsd' on 'node1'
CRS-2676: Start of 'ora.gipcd' on 'node1' succeeded
CRS-2676: Start of 'ora.mdnsd' on 'node1'succeeded
CRS-2672: Attempting to start 'ora.gpnpd' on 'node1'
CRS-2676: Start of 'ora.gpnpd' on 'node1' succeeded
CRS-2672: Attempting to start 'ora.cssdmonitor' on 'node1'
CRS-2676: Start of 'ora.cssdmonitor' on 'node1' succeeded
CRS-2672: Attempting to start 'ora.cssd' on 'node1'
CRS-2679: Attempting to clean 'ora.diskmon' on 'node1'
CRS-2681: Clean of 'ora.diskmon' on 'node1' succeeded
CRS-2672: Attempting to start 'ora.diskmon' on 'node1'
CRS-2676: Start of 'ora.diskmon' on 'node1' succeeded
CRS-2676: Start of 'ora.cssd' on 'node1' succeeded
CRS-2672: Attempting to start 'ora.ctssd' on 'node1'
CRS-2676: Start of 'ora.ctssd' on 'node1' succeeded
CRS-2672: Attempting to start 'ora.asm' on 'node1'
CRS-2676: Start of 'ora.asm' on 'node1' succeeded
CRS-2672: Attempting to start 'ora.crsd' on 'node1'
CRS-2676: Start of 'ora.crsd' on 'node1' succeeded
```

Stop crsd
Execute this command on the OS command line in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl stop resource ora.crsd –init
```

With the dd command, clear the disk header of DG_CRS
Execute this command on the OS command line in node1

```
[grid@node1]$ dd if=/dev/zero of=/dev/sde1 bs=1024k count=10
10+0 records in
10+0 records out
[grid@node1]$ dd if=/dev/zero of=/dev/sdf1 bs=1024k count=10
10+0 records in
10+0 records out
```

```
[grid@node1]$ dd if=/dev/zero of=/dev/sdj1 bs=1024k count=10
10+0 records in
10+0 records out
```

Restore the metadata of DG_CRS
Execute this command on the ASM instance and the ASMCMD utility in node1

```
SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER  NAME           STATE       TYPE
------------ ------------- ----------- ---------
           0  DG_ARCH       DISMOUNTED
           0  DG_DATA       DISMOUNTED
           0  DG_REDO       DISMOUNTED
           0  DG_REDO_M     DISMOUNTED

ASMCMD> md_restore /backup/meta/md_bk --full  -G 'DG_CRS'
Current Diskgroup metadata being restored: DG_CRS
Diskgroup DG_CRS created!
System template TEMPFILE modified!
System template CHANGETRACKING modified!
System template DUMPSET modified!
System template ASM_STALE modified!
System template ASMPARAMETERFILE modified!
System template ASMPARAMETERBAKFILE modified!
System template PARAMETERFILE modified!
System template CONTROLFILE modified!
System template ONLINELOG modified!
System template FLASHBACK modified!
System template OCRBACKUP modified!
System template AUTOBACKUP modified!
System template DATAFILE modified!
System template ARCHIVELOG modified!
System template FLASHFILE modified!
System template XTRANSPORT modified!
System template OCRFILE modified!
System template BACKUPSET modified!
System template DATAGUARDCONFIG modified!
Directory +DG_CRS/crs re-created!
Directory +DG_CRS/crs/ASMPARAMETERFILE re-created!
Directory +DG_CRS/crs/OCRFILE re-created!

SQL> select group_number, name, state, type from v$asm_diskgroup;

GROUP_NUMBER  NAME           STATE       TYPE
------------ ------------- ----------- ---------
           0  DG_ARCH       DISMOUNTED
           0  DG_DATA       DISMOUNTED
           0  DG_REDO       DISMOUNTED
           0  DG_REDO_M     DISMOUNTED
           1  DG_CRS        MOUNTED      NORMAL
```

Shut down the ASM instance
Execute this command on the ASM instance in node1

```
SQL> shutdown immediate
ASM diskgroups dismounted
ASM instance shutdown
```

Specify the initialization parameter of backup and start the ASM instance
Execute this command on the ASM instance in node1

```
SQL> startup pfile='/backup/pfile_asm/initasm.ora'
ASM instance started
```

```
Total System Global Area  284008448 bytes
Fixed Size                  2147392 bytes
Variable Size             256695232 bytes
ASM Cache                 25165824 bytes
ASM diskgroups mounted
```

Recreate the server parameter file of the ASM instance
Execute this command on the ASM instance in node1

```
SQL> create spfile='+DG_CRS' from pfile' ='/backup/pfile_asm/initasm.ora';
File created.
```

Restore OCR
Execute this command on the OS command line in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/ocrconfig -restore
/backup/ocr/backup_20121130_151838.ocr
```

Verify the integrity of OCR
Execute this command on the OS command line in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/ocrcheck
Status of Oracle Cluster Registry is as follows :
        Version                  :          3
        Total space (kbytes)     :     262120
        Used space (kbytes)      :       2856
        Available space (kbytes) :     259264
        ID                       : 1114258316
        Device/File Name         :    +DG_CRS
                                    Device/File integrity check succeeded

                                    Device/File not configured

                                    Device/File not configured

                                    Device/File not configured

                                    Device/File not configured

        Cluster registry integrity check succeeded

        Logical corruption check succeeded
```

Execute restoration of Voting disk
Execute this command on the OS command line in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl replace votedisk +DG_CRS
Successful addition of voting disk 9c6593fbe6dc4f27bf1ace7317f3c2d6.
Successful addition of voting disk a544bbc4b6ef4ff4bf826fa196f2f505.
Successful addition of voting disk 6f52872289464f9cbf96355735a89b2d.
Successfully replaced voting disk group with +DG_CRS.
CRS-4266: Voting file(s) successfully replaced
```

Stop the CRS running in exclusive mode
Execute this command on the OS command line in node1

```
[root@node1]# /u01/app/11.2.0/grid/bin /crsctl stop crs -f
CRS-2791: Starting shutdown of Oracle High Availability Services-managed resources
on ‘node1’
CRS-2673: Attempting to stop 'ora.crsd’ on ‘node1’
CRS-2677: Stop of 'ora.crsd’ on ‘node1’ succeeded
CRS-2673: Attempting to stop 'ora.gpnpd’ on ‘node1’
CRS-2673: Attempting to stop 'ora.cssdmonitor’ on ‘node1’
```

```
CRS-2673: Attempting to stop 'ora.ctssd' on 'node1'
CRS-2673: Attempting to stop 'ora.asm' on 'node1'
CRS-2673: Attempting to stop 'ora.mdnsd' on 'node1'
CRS-2677: Stop of 'ora.cssdmonitor' on 'node1' succeeded
CRS-2677: Stop of 'ora.gpnpd' on 'node1' succeeded
CRS-2677: Stop of 'ora.mdnsd' on 'node1' succeeded
CRS-2677: Stop of 'ora.ctssd' on 'node1' succeeded
CRS-2677: Stop of 'ora.asm' on 'node1' succeeded
CRS-2673: Attempting to stop 'ora.cssd' on 'node1'
CRS-2677: Stop of 'ora.cssd' on 'node1' succeeded
CRS-2673: Attempting to stop 'ora.diskmon' on 'node1'
CRS-2673: Attempting to stop 'ora.gipcd' on 'node1'
CRS-2677: Stop of 'ora.gipcd' on 'node1' succeeded
CRS-2677: Stop of 'ora.diskmon' on 'node1' succeeded
CRS-2793: Shutdown of Oracle High Availability Services-managed resources on 'node1'
has been completed
CRS-4133: Oracle High Availability Services has been stopped.
```

Start CRS
Execute this command on the OS command lines in all nodes (node1, node2)

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl start crs
CRS-4123: Oracle High Availability Services has been started.

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status resource -t
--------------------------------------------------------------------------------
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_CRS.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_DATA.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.LISTENER.lsnr
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.asm
               ONLINE  ONLINE       node1                    Started
               ONLINE  ONLINE       node2                    Started
ora.gsd
               OFFLINE OFFLINE      node1
               OFFLINE OFFLINE      node2
ora.net1.network
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.ons
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.registry.acfs
               ONLINE  ONLINE       node1
               ONLINE  OFFLINE      node2
--------------------------------------------------------------------------------
Cluster Resources
```

```
--------------------------------------------------------------------------------
acmagent
      1       ONLINE  ONLINE      node1
acmvip
      1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN1.lsnr
      1       ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
      1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
      1       ONLINE  ONLINE      node1
ora.cvu
      1       OFFLINE OFFLINE
ora.node1.vip
      1       ONLINE  ONLINE      node1
ora.node2.vip
      1       ONLINE  ONLINE      node2
ora.oc4j
      1       ONLINE  ONLINE      node2
ora.rac.db
      1       ONLINE  ONLINE      node1                Open
      2       ONLINE  ONLINE      node2                Open
ora.scan1.vip
      1       ONLINE  ONLINE      node2
ora.scan2.vip
      1       ONLINE  ONLINE      node1
ora.scan3.vip
      1       ONLINE  ONLINE      node1
```

In case of an OLR failure

*For the recovery of OLR, it is only necessary to recover the node where the OLR failed. However, below explains the procedure for OLR failures in all nodes.

Stop CRS in node1
Execute this command on the OS command line in node1

```
[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status resource -t
--------------------------------------------------------------------------------
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_CRS.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_DATA.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_REDO.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.LISTENER.lsnr
               ONLINE  ONLINE      node1
               ONLINE  ONLINE      node2
ora.asm
               ONLINE  ONLINE      node1                    Started
```

```
              ONLINE  ONLINE      node2                    Started
ora.gsd
              OFFLINE OFFLINE     node1
              OFFLINE OFFLINE     node2
ora.net1.network
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.ons
              ONLINE  ONLINE      node1
              ONLINE  ONLINE      node2
ora.registry.acfs
              ONLINE  ONLINE      node1
              ONLINE  OFFLINE     node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
      1       ONLINE  ONLINE      node1
acmvip
      1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN1.lsnr
      1       ONLINE  ONLINE      node2
ora.LISTENER_SCAN2.lsnr
      1       ONLINE  ONLINE      node1
ora.LISTENER_SCAN3.lsnr
      1       ONLINE  ONLINE      node1
ora.cvu
      1       OFFLINE OFFLINE
ora.node1.vip
      1       ONLINE  ONLINE      node1
ora.node2.vip
      1       ONLINE  ONLINE      node2
ora.oc4j
      1       ONLINE  ONLINE      node2
ora.rac.db
      1       ONLINE  ONLINE      node1                    Open
      2       ONLINE  ONLINE      node2                    Open
ora.scan1.vip
      1       ONLINE  ONLINE      node2
ora.scan2.vip
      1       ONLINE  ONLINE      node1
ora.scan3.vip
      1       ONLINE  ONLINE      node1

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl stop resource acmagent
CRS-2673: Attempting to stop 'acmagent' on 'node1'
CRS-2677: Stop of 'acmagent' on 'node1' succeeded

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl stop resource acmvip
CRS-2673: Attempting to stop 'acmvip' on 'node1'
CRS-2677: Stop of 'acmvip' on 'node1' succeeded

[oracle@node1]$ /u01/app/oracle/11.2.0/dbhome_1/bin/srvctl stop database –d rac

[grid@node1]$ /u01/app/11.2.0/grid/bin/srvctl stop listener
[grid@node1]$ /u01/app/11.2.0/grid/bin/srvctl stop scan_listener
[grid@node1]$ /u01/app/11.2.0/grid/bin/srvctl stop scan
[grid@node1]$ /u01/app/11.2.0/grid/bin/srvctl stop nodeapps

[root@node1]# /u01/app/11.2.0/grid/bin/crsctl stop crs
CRS-2791: Starting shutdown of Oracle High Availability Services-managed resources
on 'node1'
CRS-2673: Attempting to stop 'ora.crsd' on 'node1'
CRS-2790: Starting shutdown of Cluster Ready Services-managed resources on 'node1'
CRS-2673: Attempting to stop 'ora.DG_CRS.dg' on 'node1'
```

```
CRS-2673: Attempting to stop 'ora.DG_ARCH.dg' on 'node1'
CRS-2673: Attempting to stop 'ora.DG_DATA.dg' on 'node1'
CRS-2673: Attempting to stop 'ora.DG_REDO.dg' on 'node1'
CRS-2673: Attempting to stop 'ora.DG_REDO_M.dg' on 'node1'
CRS-2677: Stop of 'ora.DG_CRS.dg' on 'node1' succeeded
CRS-2677: Stop of 'ora.DG_ARCH.dg' on 'node1' succeeded
CRS-2677: Stop of 'ora.DG_DATA.dg' on 'node1' succeeded
CRS-2677: Stop of 'ora.DG_REDO.dg' on 'node1' succeeded
CRS-2677: Stop of 'ora.DG_REDO_M.dg' on 'node1' succeeded
CRS-2673: Attempting to stop 'ora.asm' on 'node1'
CRS-2677: Stop of 'ora.asm' on 'node1' succeeded
CRS-2792: Shutdown of Cluster Ready Services-managed resources on 'node1' has been
completed
CRS-2677: Stop of 'ora.crsd' on 'node1' succeeded
CRS-2673: Attempting to stop 'ora.mdnsd' on 'node1'
CRS-2673: Attempting to stop 'ora.gpnpd' on 'node1'
CRS-2673: Attempting to stop 'ora.cssdmonitor' on 'node1'
CRS-2673: Attempting to stop 'ora.ctssd' on 'node1'
CRS-2673: Attempting to stop 'ora.evmd' on 'node1'
CRS-2673: Attempting to stop 'ora.asm' on 'node1'
CRS-2677: Stop of 'ora.cssdmonitor' on 'node1' succeeded
CRS-2677: Stop of 'ora.mdnsd' on 'node1' succeeded
CRS-2677: Stop of 'ora.gpnpd' on 'node1' succeeded
CRS-2677: Stop of 'ora.evmd' on 'node1' succeeded
CRS-2677: Stop of 'ora.ctssd' on 'node1' succeeded
CRS-2677: Stop of 'ora.asm' on 'node1' succeeded
CRS-2673: Attempting to stop 'ora.cssd' on 'node1'
CRS-2677: Stop of 'ora.cssd' on 'node1' succeeded
CRS-2673: Attempting to stop 'ora.diskmon' on 'node1'
CRS-2673: Attempting to stop 'ora.gipcd' on 'node1'
CRS-2677: Stop of 'ora.gipcd' on 'node1' succeeded
CRS-2677: Stop of 'ora.diskmon' on 'node1' succeeded
CRS-2793: Shutdown of Oracle High Availability Services-managed resources on 'node1'
has been completed
CRS-4133: Oracle High Availability Services has been stopped.
```

Stop CRS in node2
Execute this command on the OS command line in node2

```
[root@node2]# /u01/app/11.2.0/grid/bin/crsctl stop crs
CRS-2791: Starting shutdown of Oracle High Availability Services-managed resources
on 'node2'
CRS-2673: Attempting to stop 'ora.crsd' on 'node2'
CRS-2790: Starting shutdown of Cluster Ready Services-managed resources on 'node2'

CRS-2673: Attempting to stop 'ora.DG_CRS.dg' on 'node2'
CRS-2673: Attempting to stop 'ora.DG_ARCH.dg' on 'node2'
CRS-2673: Attempting to stop 'ora.DG_DATA.dg' on 'node2'
CRS-2673: Attempting to stop 'ora.DG_REDO.dg' on 'node2'
CRS-2673: Attempting to stop 'ora.DG_REDO_M.dg' on 'node2'
CRS-2677: Stop of 'ora.DG_CRS.dg' on 'node2' succeeded
CRS-2677: Stop of 'ora.DG_ARCH.dg' on 'node2' succeeded
CRS-2677: Stop of 'ora.DG_DATA.dg' on 'node2' succeeded
CRS-2677: Stop of 'ora.DG_REDO.dg' on 'node2' succeeded
CRS-2677: Stop of 'ora.DG_REDO_M.dg' on 'node2' succeeded
CRS-2673: Attempting to stop 'ora.asm' on 'node2'
CRS-2677: Stop of 'ora.asm' on 'node2' succeeded
CRS-2792: Shutdown of Cluster Ready Services-managed resources on 'node2' has been
completed
CRS-2677: Stop of 'ora.crsd' on 'node2' succeeded
CRS-2673: Attempting to stop 'ora.mdnsd' on 'node2'
CRS-2673: Attempting to stop 'ora.gpnpd' on 'node2'
CRS-2673: Attempting to stop 'ora.cssdmonitor' on 'node2'
CRS-2673: Attempting to stop 'ora.ctssd' on 'node2'
CRS-2673: Attempting to stop 'ora.evmd' on 'node2'
```

```
CRS-2673: Attempting to stop 'ora.asm' on 'node2'
CRS-2677: Stop of 'ora.cssdmonitor' on 'node2' succeeded
CRS-2677: Stop of 'ora.mdnsd' on 'node2' succeeded
CRS-2677: Stop of 'ora.gpnpd' on 'node2' succeeded
CRS-2677: Stop of 'ora.evmd' on 'node2' succeeded
CRS-2677: Stop of 'ora.ctssd' on 'node2' succeeded
CRS-2677: Stop of 'ora.asm' on 'node2' succeeded
CRS-2673: Attempting to stop 'ora.cssd' on 'node2'
CRS-2677: Stop of 'ora.cssd' on 'node2' succeeded
CRS-2673: Attempting to stop 'ora.diskmon' on 'node2'
CRS-2673: Attempting to stop 'ora.gipcd' on 'node2'
CRS-2677: Stop of 'ora.gipcd' on 'node2' succeeded
CRS-2677: Stop of 'ora.diskmon' on 'node2' succeeded
CRS-2793: Shutdown of Cluster Ready Services-managed resources on ‘node2’ has been
completed
CRS-4133: Oracle High Availability Services has been stopped.
```

With the ocrconfig command, restore OLR
***When OLR is removed, it is necessary to create an empty file in（{GI installation destination}/cdata/host name.olr）**

Execute this command on the OS command lines in all nodes (node1, node2)

```
[root@node1]# ls –l /u01/app/11.2.0/grid/cdata
total 12822
drwxr-xr-x   2 grid    oinstall    512 Feb 23 19:24 localhost
drwxrwxr-x   2 grid    oinstall    512 Mar  3 15:18 crs
drwxr-xr-x   2 grid    oinstall    512 Mar  3 13:09 node1

[root@node1]# touch /u01/app/11.2.0/grid/cdata/node1.olr
[root@node1]# chown root:oinstall /u01/app/11.2.0/grid/cdata/node1.olr
[root@node1]# chmod 600 /u01/app/11.2.0/grid/cdata/node1.olr
[root@node1]# ls –l /u01/app/11.2.0/grid/cdata
total 12822
drwxr-xr-x   2 grid    oinstall    512 Feb 23 19:24 localhost
drwxrwxr-x   2 grid    oinstall    512 Mar  3 15:18 crs
drwxr-xr-x   2 grid    oinstall    512 Mar  3 13:09 node1
-rw-------   1 root    oinstall      0 Mar  3 17:41 node1.olr

[root@node1]# /u01/app/11.2.0/grid/bin/ocrconfig -local -restore
/backup/olr/node1/backup_20121130_130937.olr

[root@node1]# /u01/app/11.2.0/grid/bin /ocrcheck -local
 Status of Oracle Local Registry is as follows :
        Version                  :          3
        Total space (kbytes)     :     262120
        Used space (kbytes)      :       2212
        Available space (kbytes) :     259908
        ID                       : 1828220526
        Device/File Name         : /u01/app/11.2.0/grid/cdata/node1.olr
                                   Device/File integrity check succeeded

        Local registry integrity check succeeded

        Logical corruption check succeeded
```

Start CRS
Execute this command on the OS command lines in all nodes (node1, node2)

```
[root@node1]# /u01/app/11.2.0/grid/bin/crsctl start crs
 CRS-4123: Oracle High Availability Services has been started.

[grid@node1]$ /u01/app/11.2.0/grid/bin/crsctl status resource -t
--------------------------------------------------------------------------------
```

```
NAME           TARGET  STATE        SERVER                   STATE_DETAILS
--------------------------------------------------------------------------------
Local Resources
--------------------------------------------------------------------------------
ora.DG_ARCH.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_CRS.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_DATA.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.DG_REDO_M.dg
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.LISTENER.lsnr
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.asm
               ONLINE  ONLINE       node1                    Started
               ONLINE  ONLINE       node2                    Started
ora.gsd
               OFFLINE OFFLINE      node1
               OFFLINE OFFLINE      node2
ora.net1.network
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.ons
               ONLINE  ONLINE       node1
               ONLINE  ONLINE       node2
ora.registry.acfs
               ONLINE  ONLINE       node1
               ONLINE  OFFLINE      node2
--------------------------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------------------------
acmagent
      1        ONLINE  ONLINE       node1
acmvip
      1        ONLINE  ONLINE       node1
ora.LISTENER_SCAN1.lsnr
      1        ONLINE  ONLINE       node2
ora.LISTENER_SCAN2.lsnr
      1        ONLINE  ONLINE       node1
ora.LISTENER_SCAN3.lsnr
      1        ONLINE  ONLINE       node1
ora.cvu
      1        OFFLINE OFFLINE
ora.node1.vip
      1        ONLINE  ONLINE       node1
ora.node2.vip
      1        ONLINE  ONLINE       node2
ora.oc4j
      1        ONLINE  ONLINE       node2
ora.rac.db
      1        ONLINE  ONLINE       node1                    Open
      2        ONLINE  ONLINE       node2                    Open
ora.scan1.vip
      1        ONLINE  ONLINE       node2
ora.scan2.vip
      1        ONLINE  ONLINE       node1
```

```
ora.scan3.vip
     1       ONLINE  ONLINE      node1
```

7-3. Additional Technical References

Oracle web site

(1) Oracle Real Application Clusters
http://www.oracle.com/technology/products/database/clustering/index.html

Fujitsu's storage management software web site

(1) ETERNUS SF AdvancedCopy Manager
http://www.fujitsu.com/global/services/computing/storage/eternus/products/eternus-sf/advance/

Fujitsu's ETERNUS storage system web site

(1) FUJITSU Disk Storage Systems
http://www.fujitsu.com/global/services/computing/storage/eternus/products/diskstorage/

(2) FUJITSU ETERNUS DX series Enterprise disk array
http://www.fujitsu.com/global/services/computing/storage/eternus/products/diskstorage/dx-enterprise/

(3) FUJITSU ETERNUS DX series Midrange disk array
http://www.fujitsu.com/global/services/computing/storage/eternus/products/diskstorage/dx-mid/

(4) FUJITSU ETERNUS DX series Entry disk array
http://www.fujitsu.com/global/services/computing/storage/eternus/products/diskstorage/dx-entry/

(5) White Paper:「MAID for Green Energy Conservation with Fujitsu ETERNUS Storage Systems
http://www.fujitsu.com/downloads/STRSYS/system/eternus_MAID_whitepaper.pdf

About This White Paper
This white paper is intended to provide technical information and an overview of Oracle Database 11g R2 Automatic Storage Management feature and Fujitsu ETERNUS DX storage systems.

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