

Oracle® Grid Infrastructure

Installation Guide

11g Release 2 (11.2) for Microsoft Windows x64 (64-Bit)

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Oracle Grid Infrastructure Installation Guide, 11g Release 2 (11.2) for Microsoft Windows x64 (64-Bit)

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Preface

Oracle Grid Infrastructure Installation Guide for Microsoft Windows x64 (64-Bit) explains how to configure a server in preparation for installing and configuring an Oracle Grid Infrastructure installation (Oracle Clusterware and Oracle Automatic Storage Management). It also explains how to configure a server and storage in preparation for an Oracle Real Application Clusters (Oracle RAC) installation.

Intended Audience

Oracle Grid Infrastructure Installation Guide for Microsoft Windows x64 (64-Bit) provides configuration information for network and system administrators, and database installation information for database administrators (DBAs) who install and configure Oracle Clusterware and Oracle Automatic Storage Management in an Oracle Grid Infrastructure for a cluster installation.

For customers with specialized system roles who intend to install Oracle RAC, this book is intended to be used by system administrators, network administrators, or storage administrators to configure a system in preparation for an Oracle Grid Infrastructure for a cluster installation, and complete all configuration tasks that require Administrator user privileges. When the Oracle Grid Infrastructure installation and configuration is successfully completed, a system administrator should only provide configuration information and grant access to the database administrator to run scripts that require Administrator user privileges during an Oracle RAC installation.

This guide assumes that you are familiar with Oracle Database concepts. For additional information, refer to books in the Related Documents list.

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Related Documents

For more information, refer to the following Oracle resources.

Oracle Clusterware and Oracle Real Application Clusters Documentation

This installation guide reviews steps required to complete an Oracle Clusterware and Oracle Automatic Storage Management installation, and to perform preinstallation steps for Oracle RAC.

If you intend to install Oracle Database or Oracle RAC, then complete the preinstallation tasks as described in this installation guide. Next, complete the Oracle Grid Infrastructure installation, and review the Oracle Database and Oracle RAC installation guides for additional information. You can install either Oracle databases for a standalone server on an Oracle Grid Infrastructure installation, or install an Oracle RAC database. To install an Oracle Restart deployment of Oracle Grid Infrastructure, see *Oracle Database Installation Guide for Microsoft Windows x64 (64-Bit)*.

Most Oracle error message documentation is only available in HTML format. If you only have access to the Oracle Documentation media, then browse the error messages by range. When you find the correct range of error messages, use your browser's Find feature to locate a specific message. When connected to the Internet, you can search for a specific error message using the error message search feature of the Oracle online documentation.

Installation Guides

- *Oracle Diagnostics Pack Installation Guide*
- *Oracle Database Installation Guide for Microsoft Windows x64 (64-Bit)*
- *Oracle Real Application Clusters Installation Guide for Microsoft Windows x64 (64-Bit)*

Operating System-Specific Administrative Guides

- *Oracle Database Platform Guide for Microsoft Windows*

Oracle Clusterware and Oracle Automatic Storage Management Administrative Guides

- *Oracle Clusterware Administration and Deployment Guide*
- *Oracle Automatic Storage Management Administrator's Guide*

Oracle Real Application Clusters Administrative Guides

- *Oracle Real Application Clusters Administration and Deployment Guide*
- *Oracle Database 2 Day + Real Application Clusters Guide*

Generic Documentation

- *Getting Started with the Oracle Diagnostics Pack*
- *Oracle Database 2 Day DBA*
- *Oracle Database Administrator's Guide*
- *Oracle Database Concepts*
- *Oracle Database New Features Guide*
- *Oracle Database Net Services Administrator's Guide*
- *Oracle Database Reference*

To download free release notes, installation documentation, white papers, or other collateral, visit the Oracle Technology Network (OTN). You must register online before using OTN; registration is free and can be done at the following web site:

<http://www.oracle.com/technetwork/community/join/overview/>

If you have a username and password for OTN, then you can go directly to the documentation section of the OTN web site at the following web site:

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Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
monospace	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

What's New in Oracle Grid Infrastructure Installation and Configuration?

This section describes new features as they pertain to the installation and configuration of Oracle Grid Infrastructure (Oracle Clusterware and Oracle Automatic Storage Management) on Microsoft Windows platforms. This guide replaces *Oracle Clusterware Installation Guide*. The topics in this section are:

- [Desupported Options](#)
- [New Features for Oracle Grid Infrastructure 11g Release 2 \(11.2.0.4\)](#)
- [New Features for Oracle Grid Infrastructure 11g Release 2 \(11.2.0.3\)](#)
- [New Features for Oracle Grid Infrastructure 11g Release 2 \(11.2.0.2\)](#)
- [New Features for Oracle Grid Infrastructure 11g Release 2 \(11.2\)](#)
- [New Features for Oracle Clusterware 11g Release 1 \(11.1\)](#)

Desupported Options

Note the following:

- **Raw Devices Not Supported with OUI**

Starting with Oracle Database 11g Release 2, Oracle Universal Installer (OUI) no longer supports installation of Oracle Clusterware files on raw devices. Install Oracle Clusterware files either on Oracle Automatic Storage Management (Oracle ASM) disk groups, or in a supported shared file system.

- **Deinstallation Tool No Longer Supports the -cleanupOBase Option**

Starting with Oracle Database 11g Release 2 (11.2.0.4), the -cleanupOBase option for the deinstall executable file is desupported. There is no replacement for this flag.

New Features for Oracle Grid Infrastructure 11g Release 2 (11.2.0.4)

The following is a list of new features that are available starting with Oracle Grid Infrastructure 11g Release 2 (11.2.0.4):

Windows Server 2012 and Windows Server 2012 R2 Support

Starting with Oracle Database 11g Release 2 (11.2.0.4), Oracle Database server, client, and Oracle RAC are supported on Windows Server 2012 (64-bit only) and Windows Server 2012 R2 (64-bit only).

Note: Windows Database Bundle Patch 11.2.0.4.11 is required for Windows Server 2012 R2 support.

New Features for Oracle Grid Infrastructure 11g Release 2 (11.2.0.3)

The following is a list of new features that are available starting with Oracle Grid Infrastructure 11g Release 2 (11.2.0.3):

Cluster Health Monitor Included with Oracle Clusterware

Cluster Health Monitor gathers operating system metrics in real time, and stores them in its repository for later analysis, so that it can determine the root cause of many Oracle Clusterware and Oracle RAC issues with the assistance of Oracle Support.

Cluster Health Monitor also works in conjunction with Oracle Database Quality of Service Management (QoS) by providing metrics to detect memory over-commitment on a node. QoS Management can shut down services on overloaded nodes to relieve stress and preserve existing workloads.

To support QoS Management, Oracle Database Resource Manager and metrics have been enhanced to support fine-grained performance metrics, and also can manage workloads with user-defined performance classes.

Oracle Database Quality of Service Management

The Database Quality of Service (QoS) Management Server allows system administrators to manage application service levels hosted in Oracle Database clusters by correlating accurate run-time performance and resource metrics and analyzing with an expert system to produce recommended resource adjustments to meet policy-based performance objectives.

See Also: *Oracle Database Quality of Service Management User's Guide*

New Features for Oracle Grid Infrastructure 11g Release 2 (11.2.0.2)

The following is a list of new features that are available starting with Oracle Grid Infrastructure 11g Release 2 (11.2.0.2):

Enhanced Patch Set Installation

Oracle Grid Infrastructure patch sets are full installations of the Oracle Grid Infrastructure software. Note the following changes with the new patch set packaging:

- Direct upgrades from previous releases (11.x, 10.2.x) to the most recent patch set are supported.
- Out-of-place patch set upgrades only are supported. An out-of-place upgrade is one in which you install the patch set into a new, separate home.
- New installations consist of installing the most recent patch set, rather than installing a base release and then upgrading to a patch release.

See Also: My Oracle Support Doc ID 1189783.1, "Important Changes to Oracle Database Patch Sets Starting With 11.2.0.2", available from the following URL:

<https://support.oracle.com>

New Software Updates Option

Use the Software Updates feature to dynamically download and apply software updates as part of the Oracle Database installation. You can also download the updates separately using the `downloadUpdates` option and later apply them during the installation by providing the location where the updates are present.

Standalone Configuration Wizard for Post-Installation Cluster Configuration

The installation of Oracle Grid Infrastructure for a Cluster with Oracle Database 11g Release 2 includes a software-only option. The Configuration wizard assists the administrator with completing the cluster configuration independently of the software installation. You no longer have to manually edit the `config_params` configuration file as this wizard takes you through the process, step by step.

New Features for Oracle Grid Infrastructure 11g Release 2 (11.2)

The following is a list of new features for installation of Oracle Clusterware and Oracle ASM 11g Release 2 (11.2):

Oracle Automatic Storage Management and Oracle Clusterware Installation

With Oracle Grid Infrastructure 11g Release 2 (11.2), Oracle ASM and Oracle Clusterware are installed into a single home directory, which is referred to as the Grid home. Configuration assistants start after the installer interview process that configures Oracle ASM and Oracle Clusterware.

The installation of the combined products is called Oracle Grid Infrastructure. However, Oracle Clusterware and Oracle ASM remain separate products.

Oracle Automatic Storage Management and Oracle Clusterware Files

With this release, Oracle Cluster Registry (OCR) and voting disks can be placed on Oracle ASM.

This feature enables Oracle ASM to provide a unified storage solution, storing all the data for the clusterware and the database, without the need for third-party volume managers or cluster filesystems.

For new installations, OCR and voting disk files can be placed either on Oracle ASM, or on a cluster file system. You cannot install Oracle Clusterware files using raw devices for storage, except when upgrading a system that currently uses raw devices.

Oracle Automatic Storage Management Cluster File System (Oracle ACFS)

Oracle Automatic Storage Management Cluster File System (Oracle ACFS) is a new multi-platform, scalable file system and storage management design that extends Oracle ASM technology to support all application data. Oracle ACFS provides dynamic file system resizing, and improved performance using the distribution, balancing and striping technology across all available disks, and provides storage reliability through the mirroring and parity protection Oracle ASM provides.

Note: For Oracle ASM 11g Release 2 (11.2.0.1), Oracle ACFS is supported on only:

- Windows Server 2003 64-bit
- Windows Server 2003 R2 64-bit

Starting with Oracle Database 11g Release 2 (11.2.0.2), Oracle ACFS is also supported on:

- Windows Server 2008, 64-bit
- Windows Server 2008 R2 64-bit

Starting with Oracle Database 11g Release 2 (11.2.0.4), Oracle ACFS is also supported on:

- Windows Server 2012, 64-bit
 - Windows Server 2012 R2 64-bit
-
-

Cluster Time Synchronization Service

Cluster node times should be synchronized. With this release, Oracle Clusterware provides Cluster Time Synchronization Service (CTSS), which ensures that there is a synchronization service in the cluster. If Network Time Protocol (NTP) or Windows Time Service is not found during cluster configuration, then CTSS is configured to ensure time synchronization.

Oracle Enterprise Manager Database Control Provisioning

Oracle Enterprise Manager Database Control 11g provides the capability to automatically provision Oracle Grid Infrastructure and Oracle RAC installations on new nodes, and then extend the existing Oracle Grid Infrastructure and Oracle RAC database to these provisioned nodes. This provisioning procedure requires a successful Oracle RAC installation before you can use this feature.

See Also: *Oracle Real Application Clusters Administration and Deployment Guide* for information about this feature

Grid Plug and Play

In the past, adding or removing servers in a cluster required extensive manual preparation. With this release, you can continue to configure server nodes manually, or use Grid Plug and Play to configure them dynamically as nodes are added or removed from the cluster.

Grid Plug and Play reduces the costs of installing, configuring, and managing server nodes by starting a grid naming service within the cluster to allow each node to perform the following tasks dynamically:

- Negotiating appropriate network identities for itself
- Acquiring additional information it needs to operate from a configuration profile
- Configuring or reconfiguring itself using profile data, making host names and addresses resolvable on the network

Because servers perform these tasks dynamically, the number of steps required to add or delete nodes is minimized.

Intelligent Platform Management Interface (IPMI) Integration

Intelligent Platform Management Interface (IPMI) is an industry standard management protocol that is included with many servers today. IPMI operates independently of the operating system, and can operate even if the system is not powered on. Servers with IPMI contain a baseboard management controller (BMC) which is used to communicate to the server.

If IPMI is configured, then Oracle Clusterware uses IPMI when node fencing is required and the server is not responding.

Oracle Clusterware Out-of-place Upgrade

With this release, you can install a new version of Oracle Clusterware into a separate home from an existing Oracle Clusterware installation. This feature reduces the downtime required to upgrade a node in the cluster. When performing an out-of-place upgrade, the old and new version of the software are present on the nodes at the same time, each in a different home location, but only one version of the software is active.

Oracle Clusterware Administration with Oracle Enterprise Manager

With this release, you can use the Oracle Enterprise Manager Cluster Home page to perform full administrative and monitoring support for both standalone database and Oracle RAC environments, using High Availability Application and Oracle Cluster Resource Management.

When Oracle Enterprise Manager is installed with Oracle Clusterware, it can provide a set of users that have the Oracle Clusterware Administrator role in Oracle Enterprise Manager, and provide full administrative and monitoring support for High Availability application and Oracle Clusterware resource management. After you have completed the installation and deployed Oracle Enterprise Manager, you can provision nodes added to the cluster using Oracle Enterprise Manager.

SCAN for Simplified Client Access

With this release, the Single Client Access Name (SCAN) is the host name to provide for all clients connecting to the cluster. SCAN is a domain name registered to at least one and up to three IP addresses, either in the domain name service (DNS) or the Grid Naming Service (GNS). SCAN eliminates the need to change clients when nodes are added to or removed from the cluster. Clients using SCAN can also access the cluster using the Easy Connect Naming Method.

SRVCTL Command Enhancements for Patching

With this release, you can use the Server Control utility (SRVCTL) to shut down all Oracle software running within an Oracle home, in preparation for patching. Oracle Grid Infrastructure patching is automated across all nodes, and patches can be applied in a multi-node, multi-patch fashion.

Typical Installation Option

To streamline cluster installations, especially for those customers who are new to clustering, Oracle introduces the Typical Installation path. Typical installation defaults as many options as possible to those recommended as best practices.

Deinstallation Tool

OUI no longer removes Oracle software. Use the new Deinstallation tool (deinstall.bat) available on the installation media before installation and in the

Oracle home directory after installation. The Deinstallation tool can also be downloaded from Oracle Technology Network.

See Also: [Chapter 6, "How to Modify or Deinstall Oracle Grid Infrastructure"](#) for more information

Voting Disk Backup Procedure Change

In prior releases, backing up the voting disks was a required postinstallation task. With Oracle Clusterware release 11.2 and later, backing up and restoring a voting disk is not supported.

Backing up voting disks manually is no longer required, because voting disks are backed up automatically in the OCR as part of any configuration change. Voting disk data is automatically restored to any added voting disks.

See Also: *Oracle Clusterware Administration and Deployment Guide*

New Features for Oracle Clusterware 11g Release 1 (11.1)

The following is a list of new features for Oracle Clusterware 11g Release 1 (11.1)

Changes in Installation Documentation

With Oracle Database 11g Release 1, Oracle Clusterware can be installed or configured as an independent product, and additional documentation is provided on storage administration. For installation planning, note the following documentation:

Oracle Database 2 Day + Real Application Clusters Guide

This book provides an overview and examples of the procedures to install and configure a two-node Oracle Clusterware and Oracle RAC environment.

Oracle Clusterware Installation Guide

This book (the guide that you are reading) provides procedures either to install Oracle Clusterware as a standalone product, or to install Oracle Clusterware with either Oracle Database, or Oracle RAC. It contains system configuration instructions that require system administrator privileges.

Oracle Real Application Clusters Installation Guide

This platform-specific book provides procedures to install Oracle RAC after you have completed an Oracle Clusterware installation. It contains database configuration instructions for database administrators.

Oracle Automatic Storage Management Administrator's Guide

This book provides information for database and storage administrators who administer and manage storage, or who configure and administer Oracle ASM.

Oracle Clusterware Administration and Deployment Guide

This is the administrator's reference for Oracle Clusterware. It contains information about administrative tasks, including those that involve changes to operating system configurations and cloning Oracle Clusterware.

Oracle Real Application Clusters Administration and Deployment Guide

This is the administrator's reference for Oracle RAC. It contains information about administrative tasks. These tasks include database cloning, node addition and

deletion, Oracle Cluster Registry (OCR) administration, use of SRVCTL and other database administration utilities, and tuning changes to operating system configurations.

Oracle Database Release 1 (11.1) Enhancements and New Features for Installation

The following is a list of enhancements and new features for Oracle Database 11g Release 1 (11.1):

New SYSASM Privilege for Oracle ASM Administration

This feature introduces a new SYSASM privilege that is specifically intended for performing Oracle ASM administration tasks. Using the SYSASM privilege when connecting to Oracle ASM instead of the SYSDBA privilege provides a clearer division of responsibility between Oracle ASM administration and database administration.

Typical Installation for Oracle Grid Infrastructure for a Cluster

This chapter describes the differences between a Typical and Advanced installation for Oracle Grid Infrastructure for a cluster, and describes the steps required to complete a Typical installation.

This chapter contains the following sections:

- [Typical and Advanced Installation](#)
- [Preinstallation Steps Requiring Manual Tasks](#)
- [Install Oracle Grid Infrastructure Software](#)

1.1 Typical and Advanced Installation

There are two installation options for Oracle Grid Infrastructure installations:

- **Typical Installation:** The Typical installation option is a simplified installation with a minimal number of manual configuration choices. Oracle recommends that you select this installation type for most cluster implementations.
- **Advanced Installation:** The Advanced Installation option is an advanced procedure that requires more advanced system knowledge. It enables you to select particular configuration choices, including additional storage and network choices, integration with Intelligent Platform Management Interface (IPMI), or more granularity in specifying Oracle Automatic Storage Management (Oracle ASM) roles.

1.2 Preinstallation Steps Requiring Manual Tasks

Complete the following manual configuration tasks

- [Verify System Requirements](#)
- [Check Network Requirements](#)
- [Install Operating System Patches and Other Required Software](#)
- [Configure Operating System Users](#)
- [Configure the Directories Used During Installation](#)
- [Check Shared Storage](#)
- [Prepare Disk Partitions](#)

See Also: [Chapter 2, "Advanced Installation Oracle Grid Infrastructure for a Cluster Preinstallation Tasks"](#) and [Chapter 3, "Configuring Storage for Oracle Grid Infrastructure and Oracle RAC"](#) for information about how to complete these tasks

1.2.1 Verify System Requirements

This section provides a summary of the following pre-installation tasks:

- [Memory Requirements](#)
- [Disk Requirements](#)
- [TEMP Space Requirements](#)

See Also: [Section 2.5, "Checking the Hardware Requirements"](#) for more information about these tasks

1.2.1.1 Memory Requirements

Windows should be optimized for Memory Usage of Programs not System Caching. In the Windows Task Manager window, select the **Performance** tab to view the available memory for your system.

To view the Virtual memory settings, from the Control panel, select **System**. In the System Properties window, select the **Advanced** tab, then, under Performance, click **Performance Options**, or **Settings**. In the Performance Options window, the virtual memory, or page file, click the **Advanced** tab and the settings are displayed at the bottom of the window.

The minimum required RAM is 4 gigabyte (GB) for Oracle Grid Infrastructure for a Cluster and Oracle RAC. The minimum required virtual memory space is 8 GB. Oracle recommends that you set the paging file size to at least one and a half times the amount of RAM for systems with 4 to 32 GB of RAM. For systems with greater than 32 GB of RAM, Oracle recommends that you use a paging file of size 32 GB. If the swap space and the Grid home are on the same file system, then add together their respective requirements for the total minimum space required.

1.2.1.2 Disk Requirements

From the Start menu, select **Run...** In the Run window, type in Diskmgmt.msc to open the Disk Management graphical user interface (GUI).

The Disk Management GUI displays the available space on the available file systems. If you use standard redundancy for Oracle Clusterware files, which is 3 Oracle Cluster Registry (OCR) files and 3 voting disk files, then you should have at least 2 GB of disk space available on three separate physical disks reserved for the Oracle Clusterware files.

Note: You cannot install OCR or voting disk files (Oracle Clusterware files) on raw partitions. You can install Oracle Clusterware files only on Oracle ASM, or on a supported storage option. Raw devices can be used as Oracle ASM disks.

If you plan to install the Oracle Clusterware files on Oracle ASM, then to ensure high availability of OCR or voting disk files on Oracle ASM, you need to have at least 2 GB of disk space for Oracle Clusterware files in three separate failure groups, with at least

three physical disks. Each disk must have at least 1 GB of capacity to ensure that there is sufficient space to create Oracle Clusterware files.

Starting with Oracle Grid Infrastructure release 11.2.0.3, the minimum disk space the Oracle Grid Infrastructure for a Cluster home (Grid home) required for installation is 5 GB. This includes space for Oracle Clusterware, Oracle ASM, and Oracle ACFS files and log files, and the Cluster Health Monitor repository.

For Oracle Grid Infrastructure release 11.2.0.2 or 11.2.0.1, ensure you have at least 3 GB of space for the Oracle Grid Infrastructure for a Cluster home (Grid home). This includes Oracle Clusterware and Oracle ASM files and log files.

If the temp space and the Grid home are on the same file system, then add together their respective requirements for the total minimum space required for that file system.

1.2.1.3 TEMP Space Requirements

Ensure that you have at least 1 GB of disk space in the Windows TEMP directory. If this space is not available, then increase the partition size of the disk, or delete unnecessary files in the directory. Make sure the environment variables `TEMP` and `TMP` both point to the location of the TEMP directory, for example:

```
TEMP=C:\WINDOWS\TEMP
TMP=C:\WINDOWS\TEMP
```

See Also: For more information, see [Section 2.5, "Checking the Hardware Requirements"](#)

1.2.2 Check Network Requirements

Ensure that you have the following available:

- [Single Client Access Name for the Cluster](#)
- [IP Address Requirements](#)
- [Intended Use of Network Adapters](#)
- [Disable the Media Sensing feature for TCP/IP](#)
- [Network Adapter Binding Order and Protocol Priorities](#)
- [Deselect Automatic Registration with DNS for the Public Network Interface](#)
- [Manually Configure Automatic Metric Values](#)
- [Disable IPv6 Components](#)
- [Verify Privileges for Copying Files in the Cluster](#)

1.2.2.1 Single Client Access Name for the Cluster

During Typical installation, you are prompted to confirm the default Single Client Access Name (SCAN), which is used to connect to databases within the cluster irrespective of which nodes the database instances run on. The default value for the SCAN is based on the local node name. If you change the SCAN from the default, then the name that you use must be globally unique throughout your enterprise.

In a Typical installation, SCAN contains the name of the cluster. The SCAN and cluster name must be at least one character long and no more than 15 characters in length, must be alphanumeric, and can contain hyphens (-), for example:

NE-sa89-scan

If you require a SCAN that is longer than 15 characters, then the cluster name defaults to the first 15 characters of the SCAN. See [Section 1.2.2.2, "IP Address Requirements"](#) for information about the SCAN address requirements.

1.2.2.2 IP Address Requirements

Before starting the installation, you must have at least two network interface cards (NICs) configured on each node: One for the private internet protocol (IP) addresses and one for the public IP addresses.

Note: Oracle recommends that you use a static host name for all server node public host names.

1.2.2.2.1 IP Address Requirements for Manual Configuration

The public and virtual IP addresses must be static addresses, configured before installation, and the virtual IP (VIP) addresses for each node must not currently be in use. Public and virtual IP addresses must be on the same subnet. Oracle Clusterware manages private IP addresses in the private subnet on network interfaces you identify as private during the installation interview.

The cluster must have the following addresses configured:

- A public IP address for each node, with the following characteristics:
 - Static IP address
 - Configured before installation for each node, and resolvable to that node before installation
 - On the same subnet as all other public IP addresses, VIP addresses, and SCAN addresses
- A VIP address for each node, with the following characteristics:
 - Static IP address
 - Configured before installation for each node, but not currently in use
 - On the same subnet as all other public IP addresses, VIP addresses, and SCAN addresses
- A single client access name (SCAN) for the cluster, with the following characteristics:
 - Three static IP addresses configured on the domain name server (DNS) before installation so that the three IP addresses are associated with the name provided as the SCAN, and all three addresses are returned in random order by the DNS to the requestor
 - Configured before installation in the DNS to resolve to addresses that are not currently in use
 - Given a name that does not begin with a numeral and conforms with the RFC 952 standard, which allows alphanumeric characters and hyphens ("-"), but does not allow underscores ("_").
 - On the same subnet as all other public IP addresses, VIP addresses, and SCAN addresses
- A private IP address for each node, with the following characteristics:

- Static IP address
- Configured before installation, but on a separate, private network, with its own subnet. The IP address should not be resolvable except by other cluster member nodes.

The SCAN is a name that is used to provide service access for clients to the cluster. Because the SCAN is associated with the cluster as a whole, rather than to a particular node, the SCAN makes it possible to add or remove nodes from the cluster without needing to reconfigure clients. It also adds location independence for the databases, so that client configuration does not have to depend on which nodes are running a particular database instance. Client can continue to access the cluster in the same way as with previous releases, but Oracle recommends that clients accessing the cluster use the SCAN.

Note: In a Typical installation, the SCAN you provide is also the name of the cluster, so the SCAN name must meet the requirements for a cluster name. In an Advanced installation, the SCAN and cluster name are entered in separate fields during installation, so cluster name requirements do not apply to the SCAN name.

You can use the `nslookup` command to confirm that the DNS is correctly associating the SCAN with the addresses. For example:

```
C:\> nslookup mycluster-scan
Server:          dns.example.com
Address:        192.0.2.001

Name:   mycluster-scan.example.com
Address: 192.0.2.201
Name:   mycluster-scan.example.com
Address: 192.0.2.202
Name:   mycluster-scan.example.com
Address: 192.0.2.203
```

After installation, when a client sends a request to the cluster, the Oracle Clusterware SCAN listeners redirect client requests to servers in the cluster.

Note: Oracle strongly recommends that you do not configure SCAN VIP addresses in the `hosts` file. Use DNS resolution for SCAN VIPs. If you use the `hosts` file to resolve SCANS, then you will only be able to resolve to one IP address and you will have only one SCAN address.

Configuring SCANS in a DNS or a `hosts` file is the only supported configuration. Configuring SCANS in a Network Information Service (NIS) is not supported.

See Also: [Section C.1.3, "Understanding Network Addresses,"](#) for more information about network addresses.

1.2.2.3 Intended Use of Network Adapters

During installation, you are asked to identify the planned use for each network adapter (or network interface) that Oracle Universal Installer (OUI) detects on your cluster node. You must identify each network adapter as a public or private adapter, or

as "do not use." You must use the same private adapters for both Oracle Clusterware and Oracle RAC. For network adapters that you plan to use for other purposes—for example, an adapter dedicated to a network file system—you must identify those network adapters as "do not use" adapters so that Oracle Clusterware ignores them.

If you require high availability or load balancing for public adapters, then use a third party solution. Typically, bonding, trunking or similar technologies can be used for this purpose.

1.2.2.4 Disable the Media Sensing feature for TCP/IP

Media Sense allows Windows to uncouple an IP address from a network interface card when the link to the local switch is lost. To disable Windows Media Sensing for TCP/IP on Windows Server 2003 with SP1 or higher, you must set the value of the `DisableDHCPMediaSense` parameter to 1 on each node. Because you must modify the Windows registry to disable Media Sensing, you should first backup the registry and confirm that you can restore it, using the methods described in your Windows documentation.

Disable Media Sensing by completing the following steps on each node of your cluster:

1. Backup the Windows registry.
2. Use Registry Editor (`Regedit.exe`) to view the following key in the registry:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters
```

3. Add the following registry entry to the Parameters subkey:

```
Name: DisableDHCPMediaSense  
Data type: REG_DWORD (Boolean)  
Value: 1
```

4. Exit the Registry Editor and restart the computer.

1.2.2.5 Network Adapter Binding Order and Protocol Priorities

Check the network adapter binding order on each node. Ensure that your public network adapter is first in the binding order, and the private network adapter is second. Follow these steps to configure the network adapter binding order:

1. Right-click **My Network Places** and choose **Properties**.
2. In the left-side menu, select **Change adapter settings**.
3. In the Advanced menu, click **Advanced Settings**.
4. If the public adapter name is not the first name listed under the Adapters and Bindings tab, then select it and click the arrow to move it to the top of list.
5. Click **OK** to save the setting and then exit the network setup dialog.

The names used for each class of network adapter (such as public) must be consistent across all nodes. You can use nondefault names for the network adapter, for example, `PublicLAN`, if the same names are used for the same class of network adapters on each node in the network.

1.2.2.6 Deselect Automatic Registration with DNS for the Public Network Interface

If you are using Windows Server 2008 or a later release, then for the Public Network interface, you must deselect **Register this connection's addresses in DNS** to avoid issues with mixed up host, VIP and SCAN IPs when you restart the server.

Disable automatic IP registration for the Public network interface on Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, or Windows Server 2012 R2 servers by performing the following steps:

1. Right-click **My Network Places** and choose **Properties**.
2. In the left-side menu, select **Change adapter settings**.
3. Right-click the public network interface name and select **Properties**.
4. Select the **Networking** tab, then select **Internet Protocol Version 4(TCP/IPv4)**.
5. Click **Properties**.
6. Select the **General** tab, then click **Advanced...**
7. Select the **DNS** tab.
8. Deselect the radio button for **Register this connection's addresses in DNS**.

Repeat this procedure on each node of your cluster.

1.2.2.7 Manually Configure Automatic Metric Values

On Windows 2012, the public and private network interface for IPv4 use the Automatic Metric feature of Windows. Automatic Metric is a new feature in Windows that automatically configures the metric for the local routes that are based on link speed. The Automatic Metric feature is enabled by default, and it can also be manually configured to assign a specific metric.

When the Automatic Metric feature is enabled and using the default values, it can sometimes cause OUI to select the private network interface as the default public host name for the server when installing Oracle Grid Infrastructure.

To prevent OUI from selecting the wrong network interface during installation, perform the following steps:

1. In Control Panel, double-click **Network Connections**.
2. Right-click a network interface, and then click **Properties**.
3. Click **Internet Protocol (TCP/IP)**, and then click **Properties**.
4. On the General tab, click **Advanced**.
5. To specify a metric, on the IP Settings tab, click to clear the Automatic metric check box.
6. In the Interface Metric field, set the public network interface metric to a lower value than the private network interface. For example, you might set the public network interface metric to **100** and the private network interface metric to **300**.

1.2.2.8 Disable IPv6 Components

IPv6 is not supported with Oracle Grid Infrastructure. Before installing the Oracle software, disable IPv6 by modifying the registry on all cluster nodes using the following steps:

1. Start the `regedit` program. Create a backup of the current registry settings.
2. In the Registry Editor, go to the `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip6\Parameters` entry.
3. Double-click the **DisabledComponents** key to modify its value. If the `DisabledComponents` key does not exist, then create this key as follows:
 - a. Open the Edit menu.

- b. Select New > DWORD (32-bit) Value.
 - c. Enter **DisabledComponents**, then press Enter to create the key.
 4. For the DisabledComponents key, add a DWORD value of `ffffffff`.
 5. Exit the Registry Editor and restart the computer.
 6. Repeat these steps on each node on which you plan to install Oracle Grid Infrastructure.

These steps disable all IPv6 components except for the IPv6 loopback interface.

1.2.2.9 Verify Privileges for Copying Files in the Cluster

During installation, OUI copies the software from the local node to the remote nodes in the cluster. Verify that you have Administrator privileges on the other nodes in the cluster by running the following command on each node, where *nodename* is the name of the remote node:

```
net use \\nodename\C$
```

1.2.3 Install Operating System Patches and Other Required Software

Refer to the tables listed in [Section 2.8, "Identifying Software Requirements"](#) on page 2-15 for details.

You must configure sufficient space in the Windows virtual memory, or paging file. Paging files are used to store information that cannot fit in RAM, the main memory for the computer. Paging files are shared by all processes, and a lack of space in the paging files can prevent processes from allocating memory.

If possible, split the paging file into multiple files on multiple physical devices. This configuration encourages parallel access to virtual memory, and improves the software performance. See [Section 1.2.1.1, "Memory Requirements"](#) for information on configuring the Windows paging file.

1.2.4 Configure Operating System Users

To install the Oracle software, you must use an account with Administrator privileges. For more information, refer to the section [Section 2.13, "Configuring User Accounts"](#) on page 2-25.

Note: If you are performing the installation remotely, refer to [Section 2.3, "Logging In To a Remote Windows Server"](#) on page 2-3

1.2.5 Configure the Directories Used During Installation

OUI uses several directories during installation of Oracle Grid Infrastructure:

- [Temporary Directories](#)
- [Grid Home Directory](#)
- [Oracle Base Directory](#)
- [Oracle Inventory Directory](#)

1.2.5.1 Temporary Directories

To install properly across all nodes, OUI uses the temporary folders defined within Microsoft Windows. The TEMP and TMP environment variables should point to the same local directory on all nodes in the cluster. By default, these settings are defined as %USERPROFILE%\Local Settings\Temp and %USERPROFILE%\Local Settings\Tmp in the Environment Settings of My Computer. It is recommended to explicitly redefine these as %WINDIR%\temp and %WINDIR%\tmp, for example, C:\Windows\temp or C:\Windows\tmp for all nodes, if Windows is installed on the C drive.

1.2.5.2 Grid Home Directory

The directory that Oracle Grid Infrastructure is installed in is referred to as the **Grid home**. When installing Oracle Grid Infrastructure, you must determine the location of the Grid home. Oracle ASM is also installed in this home directory.

If you plan to install Oracle RAC, you must choose a different directory in which to install the Oracle Database software. The location of the Oracle RAC installation is referred to as the **Oracle home**.

Note: For installations with Oracle Grid Infrastructure only, Oracle recommends that you let OUI create the Grid home and Oracle Inventory directories.

1.2.5.3 Oracle Base Directory

During installation, you are prompted to specify an Oracle base location, which is owned by the user performing the installation. You can choose a location with an existing Oracle home, or choose another directory location that does not have the structure for an Oracle base directory.

If you install Oracle Database 11g Release 2 (11.2) on a computer with no other Oracle software installed, OUI creates an Oracle base directory for you. If Oracle software is already installed, then one or more Oracle base directories already exist. In the latter case, OUI offers you a choice of Oracle base directories to use during installation.

In a default Windows installation, the Oracle base directory appears as follows, where *X* represents a disk drive and *username* is the name of the currently logged in user:

X: \app*username*

Using the Oracle base directory path helps to facilitate the organization of Oracle installations, and helps to ensure that installations of multiple databases maintain an Optimal Flexible Architecture (OFA) configuration.

1.2.5.4 Oracle Inventory Directory

The **Oracle Inventory directory** is the central inventory location for all Oracle software installed on a server. By default, the location of the Oracle Inventory directory is C:\Program Files\Oracle\Inventory. This directory is created automatically the first time you install Oracle software on a Windows server.

1.2.6 Check Shared Storage

You must have space available on Oracle ASM for Oracle Clusterware files (voting disks and OCRs), and for Oracle Database files, if you install standalone or Oracle RAC databases. Creating Oracle Clusterware files on raw devices is no longer

supported for new installations. You can also use Oracle Cluster File System for Windows (OCFS for Windows) for shared storage.

Note: When using Oracle ASM for either the Oracle Clusterware files or Oracle Database files, Oracle creates one Oracle ASM instance on each node in the cluster, regardless of the number of databases.

1.2.7 Prepare Disk Partitions

The following topics outline the procedures for preparing disk partitions for use with either Oracle Cluster File System for Windows (OCFS for Windows) or Oracle ASM.

- [Create Disk Partitions for Use With OCFS for Windows or Oracle ASM](#)
- [Stamp Disk Partitions for Use With Oracle ASM](#)

See Also:

- [Section 3.6, "Configuring Shared Storage for Oracle ASM"](#) on page 3-20
- [Section 3.7, "Configuring Storage for Oracle Database Files on OCFS for Windows"](#) on page 3-23

1.2.7.1 Create Disk Partitions for Use With OCFS for Windows or Oracle ASM

The following steps outline the procedure for creating disk partitions for use with either OCFS for Windows or Oracle ASM:

1. Use Microsoft Computer Management utility or the command line tool `diskpart` to create an extended partition. Use a basic disk; dynamic disks are not supported.
2. Create at least one logical partition for the Oracle Clusterware files. You do not have to create separate partitions for the OCR and voting disk if you plan to use OCFS for Windows. Oracle Clusterware creates individual files for the OCR and voting disk.
3. If your file system does not use a redundant array of inexpensive disks (RAID), then create an additional extended partition and logical partition for each partition that will be used by Oracle Clusterware files, to provide redundancy.

To create the required partitions, use the Disk Management utilities available with Microsoft Windows. Use a basic disk with a Master Boot Record (MBR) partition style as an extended partition for creating partitions.

1. From an existing node in the cluster, run the Windows disk administration tool as follows:

- a. For Windows Server 2003 and Windows 2003 R2 systems:

Click **Start**, then select **Settings, Control Panel, Administrative Tools**, and then **Computer Management**

Expand the Storage folder to Disk Management. Use a basic disk with a MBR partition style and create an extended partition. Right click inside an unallocated part of a disk and select **Create Extended Partition**. Specify a size for the partition that is at least 520 megabyte (MB) to store both the OCR and voting disk, or 500 MB (the minimum size) to store just the voting disk or OCR.

When specifying options for the logical drive, choose the option "**Do not assign a drive letter or path**" and "**Do not format this partition**". Repeat this steps to create enough logical partitions to store all the required files.

- b. For Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, or Windows Server 2012 R2 systems, see [Section 3.7, "Configuring Storage for Oracle Database Files on OCFS for Windows"](#) for instructions on creating disk partitions using the DISKPART utility.
2. On each node in the cluster, ensure that the partitions are visible and that none of the disk partitions created for shared storage have drive letters assigned. If any partitions have drive letters assigned, then remove them by performing these steps:
 - Right-click the partition in the Windows disk administration tool
 - Select "**Change Drive Letters and Paths...**" from the menu
 - Click **Remove** in the "Change Drive Letter and Paths" window

1.2.7.2 Stamp Disk Partitions for Use With Oracle ASM

If you plan to use Oracle ASM to store the Oracle Clusterware files, then you must perform one additional step. After you have created the disk partitions, the disks must be stamped with a header before they can be used by Oracle ASM. You can stamp the disk partitions by using either `asmtoolg` (GUI version) or using `asmtool` (command-line version).

Note: On Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, or Windows Server 2012 R2, if user account control (UAC) is enabled, then running `asmtoolg` or `asmtool` utility requires administrator-level permissions.

See Also:

- [Section 3.6.2.2, "Using asmtoolg \(Graphical User Interface\) To Mark Disks"](#)
- [Section 3.6.2.4, "Using asmtool \(Command Line\) To Mark Disks"](#)

1.3 Install Oracle Grid Infrastructure Software

This section provides an overview of the installation process for Oracle Grid Infrastructure for a Cluster. For more information, review [Section 4.2, "Installing Oracle Grid Infrastructure"](#).

1. Start OUI from the root level of the installation media. For example, if the installation media is mounted on D: drive, then perform the following at the command prompt:


```
C:\> D:
D:\> setup.exe
```
2. Select **Install and Configure Grid Infrastructure for a Cluster**, then select **Typical Installation**. In the installation screens that follow, enter the configuration information as prompted.
3. After you have installed Oracle Grid Infrastructure, verify Oracle Clusterware and Oracle ASM are started and functioning correctly.

See Also: [Chapter 4, "Installing Oracle Grid Infrastructure for a Cluster"](#)

Advanced Installation Oracle Grid Infrastructure for a Cluster Preinstallation Tasks

This chapter describes the system configuration tasks that you must complete before you start Oracle Universal Installer (OUI) to install Oracle Grid Infrastructure for a Cluster, and that you may need to complete if you intend to install Oracle Real Application Clusters (Oracle RAC) on the cluster.

This chapter contains the following topics:

- [Installation Differences Between Windows and Linux or UNIX](#)
- [Reviewing Upgrade Best Practices](#)
- [Logging In To a Remote Windows Server](#)
- [Checking Hardware and Software Certification on My Oracle Support](#)
- [Checking the Hardware Requirements](#)
- [Checking the Network Requirements](#)
- [Checking the Disk Space Requirements](#)
- [Identifying Software Requirements](#)
- [Checking Individual Component Requirements](#)
- [Supported Web Browsers](#)
- [Configuring Time Synchronization for the Cluster](#)
- [Enabling Intelligent Platform Management Interface \(IPMI\)](#)
- [Configuring User Accounts](#)
- [Verifying User Privileges to Update Remote Nodes](#)

2.1 Installation Differences Between Windows and Linux or UNIX

If you are experienced with installing Oracle components in Linux or UNIX environments, then note that many manual setup tasks required on Linux or UNIX are not required on Windows. The key differences between Windows and Linux or UNIX and installations are:

- Environment variables

On Windows systems, OUI updates the PATH environment variable during installation, and does not require other environment variables to be set, such as

ORACLE_BASE, ORACLE_HOME, and ORACLE_SID. On Linux and UNIX systems, you must manually set these environment variables.

- Operating System Groups

On Windows systems, OUI creates the ORA_DBA group, which is used for operating system authentication for Oracle instances. On Linux and UNIX systems, you must create this and other operating system groups manually, and they are used for granting permission to access various Oracle software resources and for operating system authentication. Windows does not use an Oracle Inventory group.

- Account for running OUI

On Windows systems, you log in as the Administrator user or as a user that is a member of the local Administrators group. You do not need a separate account. On Linux and UNIX systems, you must create and use a software owner user account, and this user must belong to the Oracle Inventory group.

See Also: "Oracle Database Windows/UNIX Differences," in *Oracle Database Platform Guide for Microsoft Windows*

2.2 Reviewing Upgrade Best Practices

Caution: Always create a backup of existing databases before starting any configuration change.

If you have an existing Oracle installation, then record the release numbers, patches, and other configuration information. Before proceeding with installation of Oracle Grid Infrastructure, review the Oracle upgrade documentation to decide the best method of upgrading your current software installation.

Note: To upgrade Oracle Clusterware release 10.2 to Oracle Clusterware Release 11g, you must first apply the 10.2.0.3 or later patch set.

You can upgrade a clustered Oracle Automatic Storage Management (Oracle ASM) installation without shutting down an Oracle Real Application Clusters (Oracle RAC) database by performing a rolling upgrade either of individual nodes, or of a set of nodes in the cluster. However, if you have a standalone database on a cluster that uses Oracle ASM, then you must shut down the standalone database before upgrading.

If you have an existing standalone, or non-clustered, Oracle ASM installation, then review Oracle upgrade documentation. The location of the Oracle ASM home changes in this release, and you may want to consider other configuration changes to simplify or customize storage administration. If you have an existing Oracle ASM home from a previous release, then it should be owned by the same user that you plan to use to upgrade Oracle Clusterware.

During rolling upgrades of the operating system, Oracle supports using different operating system binaries when both versions of the operating system are certified with the Oracle Database release you are using.

Note: Using mixed operating system versions is only supported for the duration of an upgrade, over the period of a few hours. Oracle Clusterware does not support nodes that have processors that use different instruction sets in the same cluster. Each node must be binary compatible with the other nodes in the cluster. For example, you cannot have one node using an Intel 64 processor and another node using an Itanium processor in the same cluster. You could have one node using an Intel 64 processor and another node using an AMD64 processor in the same cluster because the processors use the same x86-64 instruction set and run the same Oracle software executable files.

Your cluster can have nodes with processors of different manufacturers, speeds, or sizes, but this is not recommended.

To find the most recent software updates, and to find best practices recommendations about preupgrade, postupgrade, compatibility, and interoperability, refer to "Oracle Upgrade Companion." "Oracle Upgrade Companion" is available through Note 785351.1 on My Oracle Support:

<https://support.oracle.com>

2.3 Logging In To a Remote Windows Server

During installation, you are required to perform tasks as an Administrator user on the cluster nodes. Complete the following procedure for user accounts that you want to enable for remote display.

This section contains these topics:

- [Windows Telnet Services Support](#)
- [Configuring Remote Desktop Services and Remote Desktop Connections](#)

2.3.1 Windows Telnet Services Support

You can use a Telnet Service to enable users to log on to the operating system of a remote server and run console programs using the command line. Oracle supports the use of database command line utilities such as `sqlplus`, `export`, `import` and `sqlldr` using this feature, but does not support the database graphical user interface (GUI) tools such as OUI, Database Configuration Assistant (DBCA), and Oracle Net Configuration Assistant (NETCA).

Caution: Because of the unencrypted nature of the telnet data stream and the fact that your username and password are also sent unencrypted over the network, using telnet is considered a security vulnerability. You can use Remote Desktop Services instead.

Note: Ensure that the Telnet service is installed and started.

2.3.2 Configuring Remote Desktop Services and Remote Desktop Connections

Microsoft changed the name from Terminal Services to Remote Desktop Services with the release of Windows Server 2008 R2. Microsoft also introduced the Remote Desktop Connections client, which can be used to connect to a Windows server that has Terminal Services installed.

On Windows, Oracle supports installing, configuring, and running Oracle Database software through Remote Desktop Services (formerly known as Terminal Services). If you do not use Terminal Services in console mode, then you might encounter problems with configuration assistants after the installation or with starting Oracle Clusterware components after installation.

Starting Terminal Services on Windows Server 2003 Systems

For Windows Server 2003, to start Terminal Services in console mode, enter the following command:

```
mstsc /v:servername /f /console
```

When you use the `/console` switch, you are connected to the physical console session (also known as session 0) on the remote server.

Connecting with Remote Desktop Connection Client on Windows Server 2003 or Windows Server 2003 R2 Systems

If you use a Remote Desktop Connection client version 6.1 or later with Windows Server 2003 or Windows Server 2003 R2 to connect to a server that is running Terminal Services, then you use the `/admin` switch instead of the `/console` switch. The following example shows how to connect to the remote server `node4` using the Remote Desktop Connection client on a Windows 2003 server:

```
mstsc /v:node4 /f /admin
```

Connecting with Remote Desktop Connection Client on Windows Server 2008, Windows Server 2008 R2, or Windows Server 2012 Systems

Due to changes implemented in Windows Server 2008, you no longer need to connect to session 0 for installation. Use the Remote Desktop Connection client, but do not specify the `/console` switch, as shown in the following example:

```
mstsc /v:servername /f
```

2.4 Checking Hardware and Software Certification on My Oracle Support

The hardware and software requirements included in this installation guide were current at the time this guide was published. However, because new platforms and operating system software versions might be certified after this guide is published, review the certification matrix on the My Oracle Support web site for the most up-to-date list of certified hardware platforms and operating system versions. This web site also provides compatible client and database versions, patches, and workaround information for bugs.

You can view certification on both Oracle Technology Network (OTN) and My Oracle Support.

The OTN certification page can be found on the following web site:

<http://www.oracle.com/technetwork/database/clustering/overview/index.html>

You can view hardware certification details for Microsoft Windows platforms on Oracle Technology Network, at the following URL:

<http://www.oracle.com/technetwork/database/clustering/tech-generic-windows-new-166584.html>

My Oracle Support contains guidance about supported hardware options that can assist you with your purchasing decisions and installation planning. The My Oracle Support certifications page contains more detailed information about certified hardware and has information specific to each release and platform. My Oracle Support is available at the following URL:

<http://support.oracle.com/>

You must register online before using My Oracle Support. To locate the certification information for your platform, click the **Certifications** tab. Select **Microsoft Windows x64 (64-bit)** as the Platform/Version to limit the search results.

Note: Contact your Oracle sales representative if you do not have a My Oracle Support account.

2.5 Checking the Hardware Requirements

When selecting servers to act as nodes in your cluster, select servers that have the same type of processors, or processors that use the same instruction set; running x86 and x64 Oracle software versions in the same cluster stack is not supported. Each server must run the same operating system and Oracle executable files. However, Oracle Grid Infrastructure and Oracle RAC support servers with different hardware in the same cluster. Each system must meet the following minimum hardware requirements:

Table 2–1 Minimum Hardware Requirements for Oracle Grid Infrastructure Installation

Hardware Component	Requirements
Memory (RAM)	Oracle Grid Infrastructure installations: At least 5 gigabyte (GB) of physical RAM for Oracle Grid Infrastructure for a cluster installations, including installations where you plan to install Oracle RAC. This includes additional space for Cluster Health Monitor (CHM) and the Oracle ACFS files.
Virtual memory (swap)	1.5 times the amount of RAM, with a suggested maximum size of 32 GB
Video adapter	256 color and at least 1024 x 768 display resolution, so that OUI displays correctly
Processor	x64: Intel Extended Memory 64 Technology (EM64T) or AMD 64

Note: While Oracle Database for Microsoft Windows can run on supported x86 systems, Oracle Real Application Clusters, Oracle Clusterware, and Oracle Automatic Storage Management are only supported on x64 Windows systems.

To determine the amount of available memory (RAM):

To determine the physical RAM size, open **System** in the control panel and select the **General** tab.

To check the configured virtual memory:

To determine the size of the configured virtual memory (also known as paging file size) perform the following steps:

1. Open the Control Panel and select **System**.
2. Select the **Advanced** tab and then click **Settings** in the Performance section.
3. In the Performance Options window, click the **Advanced** tab to see the virtual memory configuration.

If necessary, refer to your operating system documentation for information about how to configure additional virtual memory.

To determine the operating system and processor type (x86, x64, or Itanium):

To determine whether your computer is running a x64 Windows operating system, perform the following steps:

1. Right-click My Computer and select **Properties**.
2. On the General tab, under the heading of System, view the displayed text.
 - On Windows Server 2003 and Windows Server 2003 R2, you will see text similar to "x64 Edition" if you have the x64 version of the operating system installed.
 - On Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, or Windows Server 2012 R2, you will see text similar to "64-bit Operating System" if you have the x64 version of the operating system installed.

2.6 Checking the Network Requirements

Review the following sections to check that you have the networking hardware and internet protocol (IP) addresses required for an Oracle Grid Infrastructure for a cluster installation:

- [Network Hardware Requirements](#)
- [IP Address Requirements](#)
- [Broadcast Requirements for Networks Used by Oracle Grid Infrastructure](#)
- [Multicast Requirements for Networks Used by Oracle Grid Infrastructure](#)
- [DNS Configuration for Domain Delegation to Grid Naming Service](#)
- [Grid Naming Service Configuration Example](#)
- [Manual IP Address Configuration Example](#)
- [Network Interface Configuration Options](#)

Note: For the most up-to-date information about supported network protocols and hardware for Oracle RAC installations, refer to the Certify pages on the My Oracle Support web site. See [Section 2.4, "Checking Hardware and Software Certification on My Oracle Support"](#) on page 2-4 for instructions.

2.6.1 Network Hardware Requirements

The following is a list of requirements for network configuration:

- The host name of each node must use only the characters a-z, A-Z, 0-9, and the dash or minus sign (-). Host names using underscores (_) are not allowed.

- Each node must have at least two network adapters or network interface cards (NICs): one for the public network interface, and one for the private network interface, or the **interconnect**. Each network adapter is referred to by its network connection name.

To configure multiple public network adapters, use a third-party technology for your platform to aggregate the multiple public network adapters before you start installation, and then select the single network connection name for the combined network adapters as the public interface. Oracle recommends that you do not identify multiple public network connection names during Oracle Grid Infrastructure installation. Note that if you configure two network adapters as public network adapters in the cluster without using an aggregation technology, the failure of one public network adapter on a node does not result in automatic VIP failover to the other public network adapter.

- The private and public network connection names must be different from each other and cannot contain any multibyte language characters. The names are case-sensitive.
- If you use OUI to install Oracle Grid Infrastructure, then the public network connection names associated with the public network adapters for each network must be the same on all nodes, and the private network connection names associated with the private network adapters must be the same on all nodes.

For example, if you have a two-node cluster, you cannot configure network adapters on `node1` with `NIC1` as the public network connection name and on `node2` have `NIC2` as the public network connection name. Public network connection names must be the same, so you must configure `NIC1` as the public network connection name on *both* nodes. You must also use the same network connection name for the private network adapters for each network. If `PrivNIC` is the private network connection name for `node1`, then `PrivNIC` must be the private network connection name for `node2`.

- In Windows Networking Properties, the public network connection on each node must be listed first in the binding order (the order in which network services access the node). The private network connection should be listed second.

To ensure that your public adapter is first in the binding order, follow these steps:

1. Right click **My Network Places** and choose **Properties**.
 2. In the Advanced menu, click **Advanced Settings**.
 3. If the public network connection name is not the first name listed under the Adapters and Bindings tab, then select it and click the arrow to move it to the top of the list.
 4. Click **OK** to save the settings and then exit the network setup dialog.
- For the public network, each network adapter must support transmission control protocol and internet protocol (TCP/IP).
 - Oracle Grid Infrastructure does not support the IPv6 protocol, so the IPv6 components must be disabled prior to installation. See ["Disable IPv6 Components"](#) on page 1-7 for details.
 - For the private network, the network adapters must support the user datagram protocol (UDP) using high-speed network adapters and switches that support TCP/IP (minimum requirement is 1 Gigabit Ethernet).

Note: UDP is the default interconnect protocol for Oracle RAC, and TCP is the interconnect protocol for Oracle Clusterware. You must use a switch for the interconnect. Oracle recommends that you use a dedicated switch.

Oracle does not support token-rings or crossover cables for the interconnect.

- Windows Media Sensing must be disabled for the private network adapters.

To disable Windows Media Sensing for TCP/IP, you must set the value of the `DisableDHCPMediaSense` parameter to 1 on each node. Because you must modify the Windows registry to disable Media Sensing, you should first backup the registry and confirm that you can restore it, using the methods described in your Windows documentation. Disable Media Sensing by completing the following steps on each node of your cluster:

 1. Backup the Windows registry.
 2. Use Registry Editor (`Regedt32.exe`) to view the following key in the registry:
`HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Tcpip\Parameters`
 3. Add the following registry value of type `DWORD`:

```
Value Name: DisableDHCPMediaSense
Data Type: REG_DWORD -Boolean
Value: 1
```
 4. Restart the computer.
- Deselect Automatic Registration with DNS for the Public Network Interface.

If you are using Windows Server 2008 or a later release, then for the Public Network interface, you must deselect **Register this connection's addresses in DNS** to avoid issues with host, VIP and SCAN IP bindings when you restart the server. Refer to [Section 1.2.2.6, "Deselect Automatic Registration with DNS for the Public Network Interface"](#) for instructions. Make sure you perform this procedure on each node of your cluster.
- If you are using Windows Server 2012 or Windows Server 2012 R2, then manually configure the Automatic Metric value for the public and private network interface, as described in [Section 1.2.2.7, "Manually Configure Automatic Metric Values."](#)
- Each node's private interface for interconnects must be on the same subnet, and those subnets must connect to every node of the cluster. For example, if the private interfaces have a subnet mask of 255.255.255.0, then your private network is in the range 192.168.0.0–192.168.0.255, and your private addresses must be in the range of 192.168.0.[0-255]. If the private interfaces have a subnet mask of 255.255.0.0, then your private addresses can be in the range of 192.168.[0-255].[0-255].
- For the private network adapters, the endpoints of all designated network connection names must be completely reachable on the network. There should be no node that is not connected to every other node on the private network. You can test if an interconnect interface is reachable using `ping`.

2.6.2 IP Address Requirements

Before starting the installation, you must have at least two network adapters configured on each node: One for the private IP address and one for the public IP address.

You can configure IP addresses with one of the following options:

- Dynamic IP address assignment using Oracle Grid Naming Service (GNS). If you select this option, then network administrators assign static IP address for the physical host name and dynamically allocated IPs for the Oracle Clusterware managed VIP addresses. In this case, IP addresses for the VIPs are assigned by a DHCP and resolved using a multicast domain name server configured as part of Oracle Clusterware within the cluster. If you plan to use GNS, then you must have the following:
 - A DHCP service running on the public network for the cluster
 - Enough addresses on the DHCP to provide 1 IP address for each node's virtual IP, and 3 IP addresses for the cluster used by the Single Client Access Name (SCAN) for the cluster
- Static IP address assignment. If you select this option, then network administrators assign a fixed IP address for each physical host name in the cluster and for IPs for the Oracle Clusterware managed VIPs. In addition, domain name system (DNS) based static name resolution is used for each node. Selecting this option requires that you request network administration updates when you modify the cluster.

Note: Oracle recommends that you use a static host name for all server node public host names.

Public IP addresses and virtual IP addresses must be in the same subnet.

2.6.2.1 IP Address Requirements with Grid Naming Service

If you enable GNS, then name resolution requests to the cluster are delegated to the GNS, which listens on the GNS VIP address. You define this address in the DNS domain before installation. The DNS must be configured to delegate resolution requests for cluster names (any names in the subdomain delegated to the cluster) to the GNS. When a request comes to the domain, GNS processes the requests and responds with the appropriate addresses for the name requested.

To use GNS, before installation the DNS administrator must establish DNS Lookup to direct DNS resolution of a subdomain to the cluster. If you enable GNS, then you must have a DHCP server on the public network that allows the cluster to dynamically allocate the VIP addresses as required by the cluster.

See Also: ["DNS Configuration for Domain Delegation to Grid Naming Service"](#) on page 2-11 for information on how to configure DNS delegation

2.6.2.2 IP Address Requirements for Manual Configuration

If you do not enable GNS, then the public and VIP addresses for each node must be static IP addresses, configured before installation for each node, but not currently in use. Public and VIP addresses must be on the same subnet.

IP addresses on the subnet you identify as private are assigned as private IP addresses for cluster member nodes. Oracle Clusterware manages private IP addresses in the private subnet. You do not have to configure these addresses manually in a `hosts` file.

The cluster must have the following addresses configured:

- A public IP address for each node
- A VIP address for each node
- A Single Client Access Name (SCAN) configured on the DNS for Round Robin resolution to three addresses (recommended) or at least one address.

The SCAN is a name used to provide service access for clients to the cluster. Because the SCAN is associated with the cluster as a whole, rather than to a particular node, the SCAN makes it possible to add or remove nodes from the cluster without needing to reconfigure clients. It also adds location independence for the databases, so that client configuration does not have to depend on which nodes are running a particular database. Clients can continue to access the cluster in the same way as with previous releases, but Oracle recommends that clients access the cluster using the SCAN.

The SCAN addresses must be on the same subnet as VIP addresses and public IP addresses. For high availability and scalability, Oracle recommends that you configure the SCAN to use Round Robin resolution to three addresses. The name for the SCAN cannot begin with a numeral. For installation to succeed, the SCAN must resolve to at least one address.

Note: Oracle strongly recommends that you do not configure SCAN VIP addresses in the system `hosts` file. Use DNS resolution for SCAN VIPs. If you use the system `hosts` file to resolve the SCAN, then you will only be able to resolve to one IP address and you will have only one SCAN address.

See Also: [Section C.1.3, "Understanding Network Addresses"](#) for more information about network addresses

2.6.3 Broadcast Requirements for Networks Used by Oracle Grid Infrastructure

Starting with Oracle Database 11g Release 2 (11.2.0.2), broadcast communications (address resolution protocol (ARP) and UDP) must work properly across all the public and private interfaces configured for use by Oracle Grid Infrastructure. The broadcast communications must work across any configured virtual local area networks (VLANs) that are used by the public or private network interfaces.

2.6.4 Multicast Requirements for Networks Used by Oracle Grid Infrastructure

With Oracle Grid Infrastructure 11g Release 2 (11.2), the Oracle multicast DNS (mDNS) daemon uses multicasting on a network interface to communicate with other nodes in the cluster.

Starting with Oracle Database 11g Release 2 (11.2.0.2), multicasting is required for mDNS. You must enable multicasting for a network interface on each node that is:

- Used for either the public or private interconnect
- The same type of network interface (public or private) configured for multicasting on other nodes in the cluster
- On the IP address subnet ranges 224.0.0.0/24

You do not need to enable multicast communications across routers.

2.6.5 DNS Configuration for Domain Delegation to Grid Naming Service

If you plan to use GNS, then before installing Oracle Grid Infrastructure, you must configure DNS to send to GNS any name resolution requests for the subdomain served by GNS. The subdomain that GNS serves represents the cluster member nodes.

You must configure the DNS to send GNS name resolution requests using DNS forwarders. If the DNS server is running on Windows server that you administer, then the following steps must be performed to configure DNS:

1. Click **Start**, then select **Programs**. Select **Administrative Tools** and then click **DNS manager**. The DNS server configuration wizard starts automatically.
2. Use the wizard to create an entry for the GNS virtual IP address, where the address uses the form *gns-server.CLUSTERNAME.DOMAINNAME*. For example, if the cluster name is *mycluster*, and the domain name is *example.com*, and the IP address is *192.0.2.1*, create an entry similar to the following:

```
mycluster-gns.example.com: 192.0.2.1
```

The address you provide must be static and routable.

3. To configure DNS forwarders, click **Start**, select **Administrative Tools**, and then select **DNS**.
4. Right-click *ServerName*, where *ServerName* is the name of the server, and then click the **Forwarders** tab.
5. Click **New**, then type the name of the DNS domain for which you want to forward queries in the DNS domain box, for example, *clusterdomain.example.com*. Click **OK**.
6. In the selected domain's forwarder IP address box, type the GNS VIP address, and then click **Add**.
7. Click **OK** to exit.

If the DNS server is running on a different operating system, then refer to the *Oracle Grid Infrastructure Installation Guide* for that platform, or your operating system documentation.

Note: Experienced DNS administrators may want to create a reverse lookup zone to enable resolution of reverse lookups. A **reverse lookup** resolves an IP address to a host name with a Pointer Resource (PTR) record. If you have reverse DNS zones configured, then you can automatically create associated reverse records when you create your original forward record.

2.6.6 Grid Naming Service Configuration Example

If you use GNS, then you must specify a static IP address for the GNS VIP address, and delegate a subdomain to be delegated to that static GNS VIP address.

As nodes are added to the cluster, your organization's DHCP server can provide addresses for these nodes dynamically. These addresses are then registered automatically in GNS, and GNS provides resolution within the subdomain to cluster node addresses registered with GNS.

Because allocation and configuration of addresses is performed automatically with GNS, no further configuration is required. Oracle Clusterware provides dynamic network configuration as nodes are added to or removed from the cluster. The following example is provided only for information.

With a two node cluster where you have defined the GNS VIP, after installation you might have a configuration similar to that shown in [Table 2–2](#), where the cluster name is `mycluster`, the GNS parent domain is `example.com`, the subdomain is `grid.example.com`, the `192.0.2` portion of the IP addresses represents the cluster public IP address network, and `192.168.0` represents the private IP address network.

Table 2–2 Example of a Grid Naming Service Network

Identity	Home Node	Host Node	Given Name	Type	Address	Address Assigned By	Resolved By
GNS VIP	None	Selected by Oracle Clusterware	<code>mycluster-gns.example.com</code>	Virtual	192.0.2.1	Fixed by network administrator	DNS
Node 1 Public	Node 1	<code>node1</code>	<code>node1¹</code>	Public	192.0.2.101	Fixed	GNS
Node 1 VIP	Node 1	Selected by Oracle Clusterware	<code>node1-vip</code>	Virtual	192.0.2.104	DHCP	GNS
Node 1 Private	Node 1	<code>node1</code>	<code>node1-priv</code>	Private	192.168.0.1	Fixed or DHCP	GNS
Node 2 Public	Node 2	<code>node2</code>	<code>node2¹</code>	Public	192.0.2.102	Fixed	GNS
Node 2 VIP	Node 2	Selected by Oracle Clusterware	<code>node2-vip</code>	Virtual	192.0.2.105	DHCP	GNS
Node 2 Private	Node 2	<code>node2</code>	<code>node2-priv</code>	Private	192.168.0.2	Fixed or DHCP	GNS
SCAN VIP 1	none	Selected by Oracle Clusterware	<code>mycluster-scan.grid.example.com</code>	Virtual	192.0.2.201	DHCP	GNS
SCAN VIP 2	none	Selected by Oracle Clusterware	<code>mycluster-scan.grid.example.com</code>	Virtual	192.0.2.202	DHCP	GNS
SCAN VIP 3	none	Selected by Oracle Clusterware	<code>mycluster-scan.grid.example.com</code>	Virtual	192.0.2.203	DHCP	GNS

¹ Node host names may resolve to multiple addresses, including VIP addresses currently running on that host.

2.6.7 Manual IP Address Configuration Example

If you choose not to use GNS, then before installation you must configure public, virtual, and private IP addresses. Also, check that the default gateway can be accessed by a ping command. To find the default gateway, use the `ipconfig` command, as described in your operating system's help utility.

For example, with a two node cluster where the cluster name is `mycluster`, and each node has one public and one private interface, and you have defined a SCAN domain address to resolve on your DNS to one of three IP addresses, you might have the configuration shown in [Table 2–3](#) for your network interfaces.

Table 2–3 Manual Network Configuration Example

Identity	Home Node	Host Node	Given Name	Type	Address	Address Assigned By	Resolved By
Node 1 Public	Node 1	node1	node1 ¹	Public	192.0.2.101	Fixed	DNS
Node 1 VIP	Node 1	Selected by Oracle Clusterware	node1-vip	Virtual	192.0.2.104	Fixed	DNS, hosts file
Node 1 Private	Node 1	node1	node1-priv	Private	192.168.0.1	Fixed	DNS, hosts file, or none
Node 2 Public	Node 2	node2	node2 ¹	Public	192.0.2.102	Fixed	DNS
Node 2 VIP	Node 2	Selected by Oracle Clusterware	node2-vip	Virtual	192.0.2.105	Fixed	DNS, hosts file
Node 2 Private	Node 2	node2	node2-priv	Private	192.168.0.2	Fixed	DNS, hosts file, or none
SCAN VIP 1	none	Selected by Oracle Clusterware	mycluster-scan	Virtual	192.0.2.201	Fixed	DNS
SCAN VIP 2	none	Selected by Oracle Clusterware	mycluster-scan	Virtual	192.0.2.202	Fixed	DNS
SCAN VIP 3	none	Selected by Oracle Clusterware	mycluster-scan	Virtual	192.0.2.203	Fixed	DNS

¹ Node host names may resolve to multiple addresses.

You do not have to provide a private name for the interconnect. If you want name resolution for the interconnect, then you can configure private IP names in the system `hosts` file or DNS. However, Oracle Clusterware assigns interconnect addresses on the interface defined during installation as the private interface (Local Area Connection 2, for example), and to the subnet used for the private subnet.

The addresses to which the SCAN resolves are assigned by Oracle Clusterware, so they are not fixed to a particular node. To enable VIP failover, the configuration shown in the preceding table defines the SCAN addresses and the public and VIP addresses of both nodes on the same subnet, 192.0.2.

Note: All host names must conform to the Internet Engineering Task Force RFC 952 standard, which permits alphanumeric characters. Host names using underscores ("_") are not allowed.

2.6.8 Network Interface Configuration Options

The precise configuration you choose for your network depends on the size and use of the cluster you want to configure, and the level of availability you require.

If certified Network-attached Storage (NAS) is used for Oracle RAC and this storage is connected through Ethernet-based networks, then you must have a third network interface for NAS I/O. Failing to provide three separate interfaces in this case can cause performance and stability problems under heavy system loads.

2.7 Checking the Disk Space Requirements

The requirements for disk space on your server are described in the following sections:

- [Disk Format Requirements](#)
- [Disk Space Requirements for Oracle Home Directories](#)
- [TEMP Disk Space Requirements](#)

2.7.1 Disk Format Requirements

Oracle recommends that you install Oracle software, or binaries, on New Technology File System (NTFS) formatted drives or partitions. Because it is difficult for OUI to estimate NTFS and file allocation table (FAT) disk sizes on Windows, the system requirements documented in this section are likely more accurate than the values reported on the OUI Summary screen.

Note: Oracle Grid Infrastructure software is not supported on Network File System (NFS).

You cannot use NTFS formatted disks or partitions for Oracle Clusterware files or data files because they cannot be shared. Oracle Clusterware shared files and Oracle Database data files can be placed on unformatted basic disks or disk partitions, called **raw partitions**, that are managed by Oracle ASM or Oracle Cluster File System for Windows (Oracle OCFS for Windows).

Oracle ASM is recommended for storing Oracle Clusterware and Oracle Database data files.

2.7.2 Disk Space Requirements for Oracle Home Directories

Starting with Oracle Grid Infrastructure release 11.2.0.3, a minimum of 5 GB of disk space is required for the Oracle Grid Infrastructure home (Grid home). A minimum of 3 GB of disk space is required for the Oracle Grid Infrastructure home (Grid home) for release 11.2.0.2 or earlier. The Grid home includes Oracle Clusterware and Oracle ASM software, configuration files, and log files. In Oracle Grid Infrastructure release 11.2.0.3, additional disk space is required for the ACFS log files and for the Cluster Health Monitor (CHM). In addition to the Grid home, you must configure additional disk space on a cluster file system or shared disks for the Oracle Cluster Registry (OCR) and voting files used by Oracle Clusterware.

To determine the amount of free disk space, open **My Computer**, right-click the drive where the Oracle software is to be installed, and choose **Properties**.

If you are installing Oracle RAC, then you must configure additional disk space for:

- The Oracle RAC software and log files
- The shared data files and, optionally, the shared Fast Recovery Area on either a file system or in an Oracle ASM disk group

See Also:

- [Chapter 3, "Configuring Storage for Oracle Grid Infrastructure and Oracle RAC"](#)
- *Oracle Automatic Storage Management Administrator's Guide*

2.7.3 TEMP Disk Space Requirements

The amount of available disk space in the `TEMP` directory is equivalent to the total amount of free disk space, minus what will be needed for the Oracle software to be installed.

You must have 1 GB of disk space available in the `TEMP` directory. If you do not have sufficient space, then first delete all unnecessary files. If the temp disk space is still less than the required amount, then set the `TEMP` environment variable to point to a different hard drive.

To modify the `TEMP` environment variable open the **System** control panel, select the **Advanced** tab, and click **Environment Variables**.

See Also: [Section 1.2.1.3, "TEMP Space Requirements"](#) for more information

Note: The temporary directory must reside in the same directory path on each node in the cluster.

2.8 Identifying Software Requirements

Depending on the products that you intend to install, verify that the following operating system software listed in [Table 2–4, "Oracle Grid Software Requirements for Windows Systems"](#) is installed on each node of your cluster. [Table 2–4](#) lists the software requirements for Oracle Grid Infrastructure and Oracle RAC 11g Release 2 (11.2).

Requirements listed here are current as of the initial release date. To obtain the most current information about kernel requirements, refer to the online version on the Oracle Technology Network (OTN) at the following URL:

<http://www.oracle.com/technetwork/indexes/documentation/index.html>

OUI performs checks on your system to verify that it meets the listed operating system requirements. To ensure that these checks complete successfully, verify the requirements before you start OUI.

Note: Oracle does not support running different operating system versions on cluster members, unless an operating system is being upgraded. You cannot run different operating system version binaries on members of the same cluster, even if each operating system is supported.

Table 2–4 Oracle Grid Software Requirements for Windows Systems

Requirement	Value
System Architecture	Processor: AMD64, or Intel Extended memory (EM64T) Note: Oracle provides only x64 versions of Oracle Database with Oracle RAC for Windows. The x64 version of Oracle RAC runs on the x64 version of Windows on AMD64 and EM64T hardware. For additional information, visit My Oracle Support, as described in Section 2.4, "Checking Hardware and Software Certification on My Oracle Support" .

Table 2–4 (Cont.) Oracle Grid Software Requirements for Windows Systems

Requirement	Value
Operating system	<p>Oracle Grid Infrastructure and Oracle RAC for x64 Windows:</p> <ul style="list-style-type: none"> ■ Windows Server 2003 x64 with service pack 2 (SP2) - Standard, Enterprise, and Data Center editions ■ Windows Server 2003 R2 x64 with service pack 2 (SP2) - Standard, Enterprise, and Data Center editions. ■ Windows Server 2008 x64 with service pack 2 (SP2) - Standard, Enterprise, DataCenter, and Web editions. ■ Windows Server 2008 R2 x64 - Foundation, Standard, Enterprise, DataCenter, and Web editions. <p>Oracle Database 11g Release 2 (11.2.0.4) for Windows x64 and higher:</p> <ul style="list-style-type: none"> ■ Windows Server 2012 x64 - Foundation, Standard, Essentials, and DataCenter editions ■ Windows Server 2012 R2 x64 - Foundation, Standard, Essentials, and DataCenter editions <p>NOTE: Windows Database Bundle Patch 11.2.0.4.11 is required for Windows Server 2012 R2 support.</p> <p>The Windows Multilingual User Interface Pack and Terminal Services are supported. The Server Core option is not supported.</p> <p>NOTE: Oracle Clusterware, Oracle ASM and Oracle RAC 11g Release 2 are not supported on any x86 Windows operating systems.</p>
Compilers	<p>Pro*Cobol has been tested and is certified with Micro Focus Net Express 5.0. Object Oriented COBOL (OOCOBOL) specifications are not supported.</p> <p>The following components are supported with the Microsoft Visual C++ .NET 2005 9.0 and Intel 10.1 C compilers:</p> <ul style="list-style-type: none"> ■ Oracle Call Interface (OCI) ■ Pro*C/C++ ■ External callouts ■ Oracle XML Developer's Kit (XDK) <p>Oracle C++ Call Interface (OCCI) is supported with:</p> <ul style="list-style-type: none"> ■ Microsoft Visual C++ .NET 2005 8.0 ■ Microsoft Visual C++ .NET 2008 9.0 - OCCI libraries are installed under <code>ORACLE_HOME\oci\lib\msvc\vc9</code>. When developing OCCI applications with MSVC++ 9.0, ensure that the OCCI libraries are correctly selected from this directory for linking and executing. ■ Intel 10.1 C++ compiler with the relevant Microsoft Visual C++ .NET STLs
Java Development Kit (JDK)	JDK 5 x64 - 1.5.0_17 1.5.0_17
Microsoft SDK	<ul style="list-style-type: none"> ■ Microsoft Visual Studio 2005 SDK - Service Pack 1 VS2005-SP1 ■ Windows Driver Kit - 6001.18000 6001.18000 <p>Note: The Windows Driver kit is only needed for building device drivers, for example, for OCFS for Windows or Oracle ACFS.</p>

If you are currently running an operating system version that is not supported by Oracle Database 11g Release 2 (11.2), such as Windows Server 2003 x86, then see *Oracle Database Platform Guide for Microsoft Windows*.

2.8.1 Windows Firewall Feature on Windows Servers

When installing Oracle Grid Infrastructure software or Oracle RAC software on Windows servers, it is mandatory to disable the Windows Firewall feature. If the windows firewall is enabled, then remote copy and configuration assistants such as virtual IP configuration assistant (VIPCA), Network Configuration Assistant (NETCA) and Oracle Database Configuration Assistant (DBCA) will fail during Oracle RAC installation. Thus, the firewall must be disabled on all the nodes of a cluster before performing an Oracle RAC installation.

Note: The Windows Firewall should *never* be enabled on a NIC that is used as a cluster interconnect (private network interface).

After the installation is successful, you can enable the Windows Firewall for the public connections. However, to ensure correct operation of the Oracle software, you must add certain executables and ports to the Firewall exception list on all the nodes of a cluster. See [Section 5.1.2, "Configure Exceptions for the Windows Firewall"](#) for details.

Additionally, the Windows Firewall must be disabled on all the nodes in the cluster before performing any clusterwide configuration changes, such as:

- Adding a node
- Deleting a node
- Upgrading to patch release
- Applying a patch bundle or an emergency patch

If you do not disable the Windows Firewall before performing these actions, then the changes might not be propagated correctly to all the nodes of the cluster.

2.9 Checking Individual Component Requirements

This section contains these topics:

- [Oracle Advanced Security Requirements](#)
- [Oracle Enterprise Manager Requirements](#)

2.9.1 Oracle Advanced Security Requirements

You must meet hardware and software requirements to use authentication support with Oracle components. Some Oracle Advanced Security components can use a Lightweight Directory Access Protocol (LDAP) such as Oracle Internet Directory. These requirements are not listed in this document.

See Also: *Oracle Database Advanced Security Administrator's Guide*

2.9.2 Oracle Enterprise Manager Requirements

All Oracle Enterprise Manager products that you use on your system must be of the same release. Earlier versions of Enterprise Manager are not supported with the current release (Oracle Database 11g Release 2).

Note: All Oracle Enterprise Manager products, except Oracle Enterprise Manager Database Control, are released on the Enterprise Manager Grid Control installation media. Enterprise Manager Database Control is available on the Oracle Database installation media.

See Also: *Oracle Enterprise Manager Grid Control Installation and Basic Configuration* available on the Enterprise Manager Grid Control installation media

2.10 Supported Web Browsers

For a list of supported web browsers for use with Oracle Database 11g Release 2 and Oracle Enterprise Manager Database Control or Oracle Enterprise Manager Grid Control, see the Oracle Enterprise Manager certification matrix on My Oracle Support:

<https://support.oracle.com>

2.11 Configuring Time Synchronization for the Cluster

Oracle Clusterware requires the same time zone setting on all cluster nodes. During installation, the installation process picks up the time zone (TZ) setting of the Grid installation owner on the node where OUI runs, and uses that value on all nodes as the default TZ setting for all processes managed by Oracle Clusterware. This default TZ setting is used for databases, Oracle ASM, and any other managed processes.

You have three options for time synchronization between cluster nodes: the Windows Time service, an operating system configured network time protocol (NTP), or Oracle Cluster Time Synchronization Service. Oracle Cluster Time Synchronization Service is designed for organizations whose cluster servers are unable to access NTP services. If you use NTP, then the Oracle Cluster Time Synchronization daemon (`ctssd`) starts up in observer mode. If neither NTP or the Windows Time service is found, then `ctssd` starts up in active mode and synchronizes time among cluster members without contacting an external time server.

Note: Before starting the installation of Oracle Grid Infrastructure, Oracle recommends that you ensure the clocks on all nodes are set to the same time.

Follow the instructions in one of the following sections to configure time synchronization for your cluster nodes:

- [Configuring the Windows Time Service](#)
- [Configuring Network Time Protocol](#)
- [Configuring Cluster Time Synchronization Service](#)

2.11.1 Configuring the Windows Time Service

The Windows Time service (W32Time) provides network clock synchronization on computers running Microsoft Windows. If you are using Windows Time service, and you prefer to continue using it instead of Cluster Time Synchronization Service, then you must modify the Windows Time service settings to jumps in time and allow the

time to gradually match with the reference time. Restart the Windows Time service after you complete this task.

To configure Windows Time service, use the following command on each node:

```
C:\> W32tm /register
```

To modify the Windows Time service to work in an Oracle RAC environment, perform the following steps:

1. Open the Registry Editor (regedit).
2. Locate the HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Config key.
3. Set the following Windows Time service parameters to these values:
 - MaxPosPhaseCorrection to 600
 - MaxNegPhaseCorrection to 600
 - MaxAllowedPhaseOffset to 600

These parameter settings specify that small time adjustments are allowed when the time difference between the reference and cluster nodes is under 10 minutes.

Note: You should configure the Windows Time service to meet the requirements of your environment, with assistance from Microsoft, if necessary. The recommended settings provided for the three parameters are the settings that Oracle recommends to allow time adjustments to happen through *slewing* (gradually adjusting the clock using small changes) rather than in large *steps* (setting the clock to a new time). Large time adjustments in a single step are not supported.

4. To put the changes into effect, use the following command:

```
C:\>W32tm /config /update
```

See Also: For more information about using and configuring the Windows Time Service, see:

- Microsoft® Support article ID 816042: "How to configure an authoritative time server in Windows Server"
- Microsoft® Support article ID 939322: "Support boundary to configure the Windows Time service for high accuracy environments"
- "The NTP FAQ and HOWTO" at <http://www.ntp.org/ntpfaq/>

2.11.2 Configuring Network Time Protocol

The Network Time Protocol (NTP) is a client/server application. Each server must have NTP client software installed and configured to synchronize its clock to the network time server. The Windows Time service is not an exact implementation of the NTP, but is based on the NTP specifications. You can find more information about NTP and NTP client software at the following web site:

<http://ntp.org>

If you decide to use NTP instead of the Windows Time service, then, after you have installed the NTP client software on each node server, you must start the NTP service with the `-x` option to prevent time from being adjusted backward.

To ensure the NTP service is running with the `-x` option, perform the following steps:

1. Use the registry editor to edit the value for the `ntpd` executable under `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\NTP`
2. Add the `-x` option to the `ImagePath` key value, behind `%INSTALLDIR%\ntpd.exe`.
3. Restart the NTP service using the following commands:

```
net stop NTP
net start NTP
```

2.11.3 Configuring Cluster Time Synchronization Service

To use Cluster Time Synchronization Service to provide synchronization service in the cluster, disable the Windows Time service and stop the NTP service. If you have an NTP service on your server but you cannot use the service to synchronize time with a time server, then you must deactivate and deinstall the NTP to use Cluster Time Synchronization Service.

When OUI discovers that neither the Windows Time service or NTP service are active, the Cluster Time Synchronization Service is installed in active mode and synchronizes the time across the nodes. If the Windows Time service or NTP service is found on the server, then the Cluster Time Synchronization Service is started in observer mode, and no active time synchronization is performed by Oracle Clusterware within the cluster.

To confirm that the Cluster Time Synchronization Service is active after installation, enter the following command as the Oracle Grid Infrastructure installation owner:

```
crsctl check ctss
```

2.12 Enabling Intelligent Platform Management Interface (IPMI)

Intelligent Platform Management Interface (IPMI) provides a set of common interfaces to computer hardware and firmware that system administrators can use to monitor system health and manage the system. With Oracle Database 11g Release 2, Oracle Clusterware can integrate IPMI to provide failure isolation support and to ensure cluster integrity.

You can configure node-termination with IPMI during installation by selecting a node-termination protocol, such as IPMI. You can also configure IPMI after installation with `crsctl` commands.

See Also: *Oracle Clusterware Administration and Deployment Guide* for information about how to configure IPMI after installation

2.12.1 Requirements for Enabling IPMI

You must have the following hardware and software configured to enable cluster nodes to be managed with IPMI:

- Each cluster member node requires a Baseboard Management Controller (BMC) running firmware compatible with IPMI version 1.5 or greater, which supports IPMI over local area networks (LANs), and configured for remote control using LAN.

Note: On servers running Windows 2008, you may have to upgrade the basic I/O system (BIOS), system firmware, and BMC firmware before you can use IPMI. Refer to Microsoft Support Article ID 950257 (<http://support.microsoft.com/kb/950257>) for details.

- Each cluster member node requires an IPMI driver installed on each node.
- The cluster requires a management network for IPMI. This can be a shared network, but Oracle recommends that you configure a dedicated network.
- Each cluster member node's Ethernet port used by BMC must be connected to the IPMI management network.
- Each cluster member must be connected to the management network.
- Some server platforms put their network interfaces into a power saving mode when they are powered off. In this case, they may operate only at a lower link speed (for example, 100 megabyte (MB), instead of 1 GB). For these platforms, the network switch port to which the BMC is connected must be able to auto-negotiate down to the lower speed, or IPMI will not function properly.

2.12.2 Configuring the IPMI Management Network

You can configure the BMC for DHCP, or for static IP addresses. Oracle recommends that you configure the BMC for dynamic IP address assignment using DHCP. To use this option, you must have a DHCP server configured to assign the BMC IP addresses.

Note: If you configure IPMI, and you use GNS, then you still must configure separate addresses for the IPMI interfaces. Because the IPMI adapter is not seen directly by the host, the IPMI adapter is not visible to GNS as an address on the host.

2.12.3 Configuring the IPMI Driver

For Oracle Clusterware to communicate with the BMC, the IPMI driver must be installed permanently on each node, so that it is available on system restarts. On Windows systems, the implementation assumes the Microsoft IPMI driver (`ipmidrv.sys`) is installed, which is included on Windows Server 2008 and later versions of the Windows operating system. The driver is included as part of the Hardware Management feature, which includes the driver and the Windows Management Interface (WMI).

Note:

- The `ipmidrv.sys` driver is not supported by default on Windows Server 2003. It is available for Windows 2003 R2, but is not installed by default.
 - An alternate driver (`imbdrv.sys`) is available from Intel as part of Intel Server Control, but this driver has not been tested with Oracle Clusterware.
-
-

2.12.3.1 Configuring the Hardware Management Component

Hardware Management is not installed and enabled by default on Windows Server 2003 systems. Hardware management is installed using the Add/Remove Windows Components Wizard.

1. Press **Start**, then select **Control Panel**.
2. Select **Add or Remove Programs**.
3. Click **Add/Remove Windows Components**.
4. Select (but do not check) **Management and Monitoring Tools** and click the **Details** button to display the detailed components selection window.
5. Select the **Hardware Management** option.

If a BMC is detected through the system management BIOS (SMBIOS) Table Type 38h, then a dialog box will be displayed instructing you to remove any third party drivers. If no third party IPMI drivers are installed or they have been removed from the system, then click **OK** to continue.

Note: The Microsoft driver is incompatible with other drivers. Any third party drivers must be removed

6. Click **OK** to select the Hardware Management Component, and then click **Next**. Hardware Management (including Windows Remote Management, or WinRM) will be installed.

After the driver and hardware management have been installed, the BMC should be visible in the Windows Device Manager under System devices with the label "Microsoft Generic IPMI Compliant Device". If the BMC is not automatically detected by the plug and play system, then the device must be created manually.

To create the IPMI device, run the following command:

```
rundll32 ipmisetp.dll,AddTheDevice
```

2.12.3.2 Configuring the BMC Using ipmiutil on Windows 2003 R2

For IPMI-based fencing to function properly, the BMC hardware must be configured for remote control through LAN. The BMC configuration may be effected from the boot prompt (BIOS), using a platform specific management utility or one of many publicly available utilities, which can be downloaded from the Internet, such as:

IPMIutil, which is available for Linux and Windows:

<http://ipmiutil.sourceforge.net>

Refer to the documentation for the configuration tool you select for details about using the tool to configure the BMC.

When you configure the BMC on each node, you must complete the following:

- Enable IPMI over LAN, so that the BMC can be controlled over the management network.
- Enable dynamic IP addressing using DHCP or GNS, or configure a static IP address for the BMC.
- Establish an administrator user account and password for the BMC

- Configure the BMC for VLAN tags, if you will use the BMC on a tagged VLAN.

The configuration tool you use does not matter, but these conditions must be met for the BMC to function properly.

Example of BMC Configuration Using ipmiutil on Windows 2003 R2

The following is an example of configuring BMC using `ipmiutil` (version 2.2.3):

1. Open a command window while logged in as a member of the Administrators group.
2. After the driver is loaded and the device special file has been created, verify that `ipmiutil` can communicate with the BMC through the driver:

```
C:\> ipmiutil lan
ipmiutil ver 2.23
<PEFilter parameters displayed> . . .
pefconfig, GetLanEntry for channel 1 . . .
Lan Param(0) Set in progress: 00
. . . <remaining Lan Param info displayed>
```

The following steps establish the required configuration parameters described in this example.

Note: If you use the `-l` option, then `ipmiutil` sets only certain LAN parameters for enabling IPMI over LAN. If a previously established parameter is not specified on the command line, the values of these parameters might be reset to the default values when you use this command. Thus, the order of the following steps could be critical.

3. Establish remote LAN access with Administrator privileges (`-v 4`) and the desired user name and password (`ipmiutil` will find the LAN channel on its own):

```
C:\> ipmiutil lan -l -v 4 -u user_name -p password
```

4. Configure dynamic or static IP address settings for BMC:
 - **Using dynamic IP addressing (DHCP)**

Dynamic IP addressing is the default assumed by OUI. Oracle recommends that you select this option so that nodes can be added or removed from the cluster more easily, as address settings can be assigned automatically.

Note: Use of DHCP requires a DHCP server on the subnet.

Set the channel. For example, if the channel is 1, then enter the following command to enable DHCP:

```
C:\> ipmiutil lan set -l -D
```

- **Using static IP Addressing**

If the BMC shares a network connection with the operating system, then the IP address must be on the same subnet. You must set not only the IP address, but also the proper values for the netmask and default gateway for your network, for example:

```
C:\> ipmiutil lan -l -I 192.168.0.55 (IP address)
```

```
C:\> ipmiutil lan -l -G 192.168.0.1    (gateway IP address)
C:\> ipmiutil lan -l -S 255.255.255.0 (netmask)
```

The specified address (192.168.0.55) will be associated with only the BMC, and will not respond to normal pings.

Note: Enabling IPMI over LAN with the `-l` option will reset the subnet mask to a value obtained from the operating system. Thus, when setting parameters one at a time using the `ipmiutil lan -l` command, the `-S` option should be specified last, as shown in the previous example.

5. Verify the setup.

After the previous configuration steps have been completed, you can verify your settings on the node being configured as follows (the items in **bold** text reflect the settings just made):

```
C:\> ipmiutil lan

ipmiutil ver 2.23
peconfig ver 2.23
-- BMC version 1.40, IPMI version 1.5
peconfig, GetPefEntry ...
PEFilter(01): 04 h : event ... <skipping PEF entries>
...

peconfig, GetLanEntry for channel 1 ...
Lan Param(0) Set in progress: 00
Lan Param(1) Auth type support: 17 : None MD2 MD5 Pswd
Lan Param(2) Auth type enables: 16 16 16 16 00
Lan Param(3) IP address: 192 168 0 55
Lan Param(4) IP address src: 01 : Static
Lan Param(5) MAC addr: 00 11 43 d7 4f bd
Lan Param(6) Subnet mask: 255 255 255 0
Lan Param(7) IPv4 header: 40 40 10
GetLanEntry: completion code=cc
GetLanEntry(10), ret = -1
GetLanEntry: completion code=cc
GetLanEntry(11), ret = -1
Lan Param(12) Def gateway IP: 192 168 0 1
Lan Param(13) Def gateway MAC: 00 00 0c 07 ac dc
...
Get User Access(1): 0a 01 01 0f : No access ()
Get User Access(2): 0a 01 01 14 : IPMI, Admin (user_name)
Get User Access(3): 0a 01 01 0f : No access ()
peconfig, completed successfully
```

6. Finally, you can verify that the BMC is accessible and controllable from a remote node in your cluster:

```
C:\> ipmiutil health -N 192.168.0.55 -U user_name -P password
ipmiutil ver 2.23
bmchealth ver 2.23
Opening connection to node 192.168.0.55 ...
Connected to node racnode1.example.com 192.168.0.31
BMC version 1.23, IPMI version 1.5
BMC manufacturer = 0002a2 (Dell), product = 0000
Chassis Status = 01 (on, restore_policy=stay_off)
```

```
Power State      = 00    (S0: working)
Selftest status = 0055 (OK)
Channel 1 Auth Types: MD2 MD5
                  Status = 14, OEM ID 000000 OEM Aux 00
bmchealth, completed successfully
```

2.13 Configuring User Accounts

To install the Oracle Grid Infrastructure software, you must use a user that is a member of the Administrators group. If you use a local user account for the installation, then the user account must exist on all nodes in the cluster and the user name and password must be the same on all nodes.

If you use a domain account for the installation, then the domain user must be explicitly declared as a member of the local Administrators group on each node in the cluster. It is not sufficient if the domain user has inherited membership from another group. The user performing the installation must be in the same domain on each node. For example, you cannot have a dba1 user on the first node in the DBADMIN domain and a dba1 user on the second node in the RACDBA domain.

For example, assume that you have one Oracle installation owner, and the user name for this Oracle installation owner is `oracle`. The `oracle` user must be either a local Administrator user or a domain user, and the same user must exist (same user name, password, and domain) on each node in the cluster.

Note: Oracle strongly recommends the use of domain users for Oracle RAC installations on Windows platforms.

2.13.1 Configuring Environment Variables for the Software Installation Owner

Before starting the Oracle Grid Infrastructure installation, ensure the `%TEMP%` environment variable is set correctly. See [Section 1.2.1.3, "TEMP Space Requirements"](#).

2.13.2 Verifying User Privileges to Update Remote Nodes

Before running OUI, from the node where you intend to run the installer, verify that the user account you are using for the installation is configured as a member of the Administrators group on each node in the cluster. To do this, enter the following command for each node that is a part of the cluster where `nodename` is the node name:

```
net use \\nodename\C$
```

If you will be using other disk drives in addition to the C: drive, then repeat this command for every node in the cluster, substituting the drive letter for each drive you plan to use.

The installation user must also be able to update the Windows registry on each node in the cluster. To verify the installation user is configured to do this, perform the following steps:

1. Run `regedit` from the Run menu or the command prompt.
2. From the File menu select **Connect Network Registry**.
3. In the 'Enter the object name...' edit box enter the name of a remote node in the cluster, then click **OK**.
4. Wait for the node to appear in the registry tree.

If the remote node does not appear in the registry tree or you are prompted to fill in a username and password, then you must resolve the permissions issue at the operating system level before proceeding with the Oracle Grid Infrastructure installation.

Note: For the installation to be successful, you must use the same user name and password on each node in a cluster or use a domain user. If you use a domain user, then you must have explicitly granted membership in the local Administrators group to the domain user on all of the nodes in your cluster.

2.13.3 Operating System Groups for Oracle RAC

If you intend to install Oracle Database or Oracle RAC, then the user performing the installation must be part of the `ORA_DBA` group. During installation of Oracle Database or Oracle RAC, OUI creates the `ORA_DBA` group on all nodes and the user performing the installation is automatically added to this group. If you use a domain user, then you must make sure the domain user on each node is a member of the `ORA_DBA` group.

Note: Oracle strongly recommends the use of domain users for Oracle RAC installations on Windows platforms.

2.13.4 Managing User Accounts with User Account Control

To ensure that only trusted applications run on your computer, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2 provide User Account Control. If you have enabled this security feature, then depending on how you have configured it, OUI prompts you for either your consent or your credentials when installing Oracle Database. Provide either the consent or your Windows Administrator credentials as appropriate.

You must have Administrator privileges to run some Oracle tools, such as DBCA, NETCA, and OPatch, or to run any tool or application that writes to any directory within the Oracle home. If User Account Control is enabled and you are logged in as the local Administrator, then you can successfully run each of these commands. However, if you are logged in as "a member of the Administrators group," then you must explicitly run these tools with Windows Administrator privileges.

All of the Oracle shortcuts that require Administrator privileges are invoked as "Administrator" automatically when you click the shortcuts. However, if you run the previously mentioned tools from a Windows command prompt, then you must run them from an Administrator command prompt. OPatch does not have a shortcut and has to be run from an Administrator command prompt.

Configuring Storage for Oracle Grid Infrastructure and Oracle RAC

This chapter describes the storage configuration tasks that you must complete before you start the installer to install Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM), and that you must complete before adding an Oracle Real Application Clusters (Oracle RAC) installation to the cluster.

This chapter contains the following topics:

- [Reviewing Oracle Grid Infrastructure Storage Options](#)
- [Supported Storage Options for Oracle Grid Infrastructure and Oracle RAC](#)
- [Storage Requirements for Oracle Clusterware and Oracle RAC](#)
- [After You Have Selected the Shared Storage Options](#)
- [Preliminary Shared Disk Preparation](#)
- [Configuring Shared Storage for Oracle ASM](#)
- [Configuring Storage for Oracle Database Files on OCFS for Windows](#)
- [Configuring Direct NFS Client for Oracle RAC Data Files](#)
- [Upgrading or Migrating Existing Oracle ASM Instances](#)
- [Configuring Oracle Automatic Storage Management Cluster File System](#)
- [Desupport of Block and Raw Devices](#)

3.1 Reviewing Oracle Grid Infrastructure Storage Options

This section describes supported options for storing Oracle Grid Infrastructure for a cluster software and shared files. It contains the following sections:

- [General Storage Considerations for Oracle Grid Infrastructure](#)
- [General Storage Considerations for Oracle RAC](#)

See Also: The Certification page in My Oracle Support for a list of supported vendors for Network Attached Storage options. See [Section 2.4, "Checking Hardware and Software Certification on My Oracle Support"](#) on page 2-4 for instructions on how to access the certification information.

3.1.1 General Storage Considerations for Oracle Grid Infrastructure

Oracle Clusterware voting disks are used to monitor cluster node status, and the Oracle Cluster Registry (OCR) is a file that contains the configuration information and status of the cluster. The installer automatically initializes the OCR during the Oracle Clusterware installation. Oracle Database Configuration Assistant (DBCA) uses the OCR for storing the configurations for the cluster databases that it creates.

You can place voting disks and OCR files either in an Oracle ASM disk group, or on a cluster file system. Storage must be shared; any node that does not have access to an absolute majority of voting disks (more than half) will be restarted.

Note: To store the Oracle Clusterware files in an Oracle ASM disk group, the disk group compatibility must be at least 11.2, which is the default for new installations of Oracle Grid Infrastructure. If you are upgrading an Oracle ASM installation, then see *Oracle Automatic Storage Management Administrator's Guide* for more information about disk group compatibility.

For a storage option to meet high availability requirements, the files stored on the disk must be protected by data redundancy, so that if one or more disks fail, then the data stored on the failed disks can be recovered. This redundancy can be provided externally using Redundant Array of Independent Disks (RAID) devices, or logical volumes on multiple physical devices and implement the stripe-and-mirror-everything methodology, also known as SAME. If you do not have a RAID devices or logical volumes, then you can create additional copies, or **mirrors**, of the files on different file systems. If you choose to mirror the files, then you must provide disk space for additional OCR files and at least two additional voting disk files.

Each OCR location should be placed on a different disk. For voting disk file placement, ensure that each file is configured so that it does not share any hardware device or disk, or other single point of failure with the other voting disks. Any node that does not have available to it an absolute majority of voting disks configured (more than half) will be restarted.

Use the following guidelines when choosing storage options for the Oracle Clusterware files:

- You can choose any combination of the supported storage options for each file type if you satisfy all requirements listed for the chosen storage options.
- You can use Oracle ASM 11g Release 2 (11.2) for shared storage. You cannot use earlier Oracle ASM releases to do this.
- If you do not have a storage option that provides external file redundancy, then you must configure at least three voting disk locations to provide redundancy.
- The Oracle Grid Infrastructure home (Grid home) cannot be stored on a shared file system; it must be installed on a local disk.
- If you choose to store Oracle Clusterware files on Oracle ASM and use redundancy for the disk group, then Oracle ASM automatically maintains the ideal number of voting files based on the redundancy of the diskgroup. The voting files are created within a single disk group and you cannot add extra voting files to this disk group manually.

3.1.2 General Storage Considerations for Oracle RAC

For all Oracle RAC installations, you must choose the shared storage options to use for Oracle Database files. Oracle Database files include data files, control files, redo log files, the server parameter file, and the password file. To enable automated backups during the installation, you must also choose a shared storage option to use for recovery files (the fast recovery area).

- [Guidelines for Choosing a Storage Option](#)
- [Guidelines for Using Oracle ASM Disk Groups for Storage](#)
- [Guidelines for Using Direct Network File System \(NFS\) Client with Oracle RAC](#)
- [Guidelines for Using Oracle ACFS with Oracle RAC](#)
- [Guidelines for Placing Data Files on a File System](#)
- [Guidelines for Placing Recovery Files on a File System](#)

3.1.2.1 Guidelines for Choosing a Storage Option

Use the following guidelines when choosing the storage options to use for the Oracle Database files:

- The shared storage option that you choose for recovery files can be the same as or different from the shared storage option that you choose for the data files. However, you cannot use raw devices to store recovery files.
- Raw devices are supported only when upgrading an existing installation and using the previously configured raw partitions. On new installations, using raw disks or partitions is not supported by Oracle Automatic Storage Management Configuration Assistant (ASMCA) or Oracle Universal Installer (OUI), but is supported by the Oracle RAC if you perform manual configuration of the database.

See Also: *Oracle Database Upgrade Guide* for information about how to prepare for upgrading an existing database

- You can choose any combination of the supported shared storage options for each file type if you satisfy all requirements listed for the chosen storage options.
- Oracle recommends that you choose Oracle ASM as the shared storage option for the database data files and recovery files.
- For Standard Edition Oracle RAC installations, Oracle ASM is the only supported shared storage option for database or recovery files. You must use Oracle ASM for the storage of Oracle RAC data files, online redo logs, archived redo logs, control files, server parameter file (SPFILE), and the fast recovery area.
- If you intend to use Oracle ASM with Oracle RAC, and you are configuring a new Oracle ASM instance, then your system must meet the following conditions:
 - All the nodes in the cluster must have Oracle Clusterware and Oracle ASM 11g Release 2 (11.2) installed as part of an Oracle Grid Infrastructure for a cluster installation.
 - Any existing Oracle ASM instance on any node in the cluster is shut down before installing Oracle RAC or creating the Oracle RAC database.

3.1.2.2 Guidelines for Using Oracle ASM Disk Groups for Storage

During Oracle Grid Infrastructure installation, you can create one disk group. After the Oracle Grid Infrastructure installation, you can create additional disk groups using ASMCA, SQL*Plus, or ASMCMD. Note that with Oracle Database 11g Release 2 (11.2) and later releases, Oracle Database Configuration Assistant (DBCA) does not have the functionality to create disk groups for Oracle ASM.

If you install Oracle Database or Oracle RAC after you install Oracle Grid Infrastructure, then you can either use the same disk group for database files, OCR, and voting disk files, or you can use different disk groups. If you create multiple disk groups before installing Oracle RAC or before creating a database, then you can decide whether you want to:

- Place the data files in the same disk group as the Oracle Clusterware files
- Use the same Oracle ASM disk group for data files and recovery files
- Use different disk groups for each file type

If you create only one disk group for storage, then the OCR and voting disk files, database files, and recovery files are contained in the one disk group. If you create multiple disk groups for storage, then you can choose to place files in different disk groups.

Note: The Oracle ASM instance that manages the existing disk group should be running in the Grid home.

See Also:

- *Oracle Database Installation Guide for Microsoft Windows* for information about configuring a database to use Oracle ASM storage
- *Oracle Automatic Storage Management Administrator's Guide* for information about creating disk groups

3.1.2.3 Guidelines for Using Direct Network File System (NFS) Client with Oracle RAC

Network attached storage (NAS) systems use a network file system (NFS) to access data. You can store Oracle RAC data files and recovery files on supported NAS servers using the Oracle Direct NFS Client.

The NFS file system must be mounted and available before you start the Oracle RAC installation. See your vendor documentation for NFS configuration and mounting information.

Note that the performance of Oracle Database software and the databases that use NFS storage depend on the performance of the network connection between the database server and the NAS device. For this reason, Oracle recommends that you connect the database server (or cluster node) to the NAS device using a private, dedicated, network connection, which should be Gigabit Ethernet or better.

3.1.2.4 Guidelines for Using Oracle ACFS with Oracle RAC

Oracle Automatic Storage Management Cluster File System (Oracle ACFS) provides a general purpose file system. You can place the Oracle home for an Oracle Database 11g Release 2 (11.2) database on Oracle ACFS, but you cannot place Oracle data files or Oracle Clusterware files on Oracle ACFS. Note the following about Oracle ACFS:

- You cannot put Oracle Clusterware executable files or shared files on Oracle ACFS.
- You cannot put Oracle Database data files on Oracle ACFS.
- You can put Oracle Database executable files and administrative files (for example, trace files) on Oracle ACFS.
- Oracle ACFS provides a general purpose file system for file types other than Oracle data files.

Note: For Oracle ASM 11g Release 2 (11.2.0.1), Oracle ACFS and Oracle ASM Dynamic Volume Manager (Oracle ADVM) are supported only in the following environments:

- Windows Server 2003, x64
- Windows Server 2003 R2, x64

Oracle ACFS and Oracle ADVM are supported on Windows Server 2008, x64 and Windows Server 2008 R2, x64 starting with Oracle ASM 11g Release 2 (11.2.0.2).

See Also: *Oracle Automatic Storage Management Administrator's Guide* for more information about using ACFS

3.1.2.5 Guidelines for Placing Data Files on a File System

If you decide to place the Oracle data files on Oracle Cluster File System for Windows (OCFS for Windows), then use the following guidelines when deciding where to place them:

- You can choose either a single cluster file system or multiple cluster file systems to store the data files:

- To use a single cluster file system, choose a cluster file system on a physical device that is dedicated to the database.

For best performance and reliability, choose a RAID device or a logical volume on multiple physical devices and implement the stripe-and-mirror-everything methodology, also known as SAME.

- To use multiple cluster file systems, choose cluster file systems on separate physical devices or partitions that are dedicated to the database.

This method enables you to distribute physical I/O and create separate control files on different devices for increased reliability. It also enables you to fully implement Oracle Optimal Flexible Architecture (OFA) guidelines. To implement this method, you must choose the Advanced database creation option in OUI.

- If you intend to create a preconfigured database during the installation, then the cluster file systems that you choose must have at least 4 gigabyte (GB) of free disk space.

For production databases, you must estimate the disk space requirement based on how you use the database.

- For optimum performance, the cluster file systems that you choose should be on physical devices that are used by only the database.

Note: You must not create a New Technology File System (NTFS) partition on a disk that you are using for OCFS for Windows.

- OCFS for Windows does not support network access through NFS or Windows Network Shares.

3.1.2.6 Guidelines for Placing Recovery Files on a File System

You must choose a location for the Oracle Database recovery files before installation only if you intend to enable automated backups during installation.

If you choose to place the recovery files on a cluster file system, then use the following guidelines when deciding where to place them:

- To prevent disk failure from making the database files and the recovery files unavailable, place the recovery files on a cluster file system that is on a different physical disk from the database files.

Note: Alternatively use an Oracle ASM disk group with a normal or high redundancy level for either or both file types, or use external redundancy.

- The cluster file system that you choose should have at least 3 GB of free disk space.

The disk space requirement is the default disk quota configured for the fast recovery area (specified by the `DB_RECOVERY_FILE_DEST_SIZE` initialization parameter).

If you choose the Advanced database configuration option, then you can specify a different disk quota value. After you create the database, you can also use Oracle Enterprise Manager to specify a different value.

See Also: *Oracle Database Backup and Recovery User's Guide* for more information about sizing the fast recovery area.

3.2 Supported Storage Options for Oracle Grid Infrastructure and Oracle RAC

Both Oracle Clusterware and the Oracle RAC database use files that must be available to all the nodes in the cluster. These files must be placed on a supported type of shared storage.

Review the following topics when deciding which type of shared storage to use during installation of Oracle Grid Infrastructure and Oracle RAC:

- [Supported Storage Options for Oracle Grid Infrastructure](#)
- [Supported Storage Options for Oracle RAC](#)

3.2.1 Supported Storage Options for Oracle Grid Infrastructure

You cannot install the Oracle Grid Infrastructure software on a cluster file system. The Oracle Grid Infrastructure home (Grid home) must be on a local, NTFS formatted disk.

There are two ways of storing the shared Oracle Clusterware files:

- **Oracle ASM:** You can install Oracle Clusterware files (OCR and voting disks) in Oracle ASM disk groups.

Oracle ASM is the required database storage option for Typical installations, and for Standard Edition Oracle RAC installations. It is an integrated, high-performance database file system and disk manager for Oracle Clusterware and Oracle Database files. It performs striping and mirroring of database files automatically.

Note:

- You can no longer use OUI to install Oracle Clusterware or Oracle Database files directly on raw devices.
 - Only one Oracle ASM instance is permitted for each node regardless of the number of database instances on the node.
 - To store the Oracle Clusterware files in an Oracle ASM disk group, the disk group compatibility must be at least 11.2. See *Oracle Automatic Storage Management Administrator's Guide* for more information about disk group compatibility.
-
-

- **OCFS for Windows:** OCFS for Windows is the only other supported cluster file system that you can use for storage of Oracle Clusterware and Oracle RAC files on Microsoft Windows platforms. OCFS for Windows is not the same as OCFS2, which is available on Linux platforms.

OCFS for Windows is included in the installation media for Oracle Grid Infrastructure and Oracle RAC on Microsoft Windows platforms and is installed automatically with Oracle Clusterware. However, for new installations, Oracle recommends that you use Oracle ASM to store the OCR and voting disk files. Oracle does not recommend using OCFS for Windows for Oracle Clusterware files.

Note: You cannot put Oracle Clusterware files on Oracle Automatic Storage Management Cluster File System (Oracle ACFS). You cannot install Oracle Grid Infrastructure on a cluster file system.

See Also: The Certify page on My Oracle Support for supported cluster file systems. See [Section 2.4, "Checking Hardware and Software Certification on My Oracle Support"](#).

[Table 3–1, "Supported Storage Options for Oracle Clusterware and Oracle RAC Files and Home Directories"](#) shows the storage options supported for storing Oracle Clusterware and Oracle RAC files.

Note: For the most up-to-date information about supported storage options for Oracle Clusterware and Oracle RAC installations, refer to the Certify pages on the My Oracle Support web site. See [Section 2.4, "Checking Hardware and Software Certification on My Oracle Support"](#).

3.2.2 Supported Storage Options for Oracle RAC

There are several ways of storing Oracle Database (Oracle RAC) files that must be shared across all the nodes:

- **Oracle ASM:** You can create Oracle RAC data files and recovery files in Oracle ASM disk groups.

Oracle ASM is the required database storage option for Typical installations, and for Standard Edition Oracle RAC installations.

Note: You can no longer use OUI to install Oracle Clusterware or Oracle Database files or binaries directly on raw devices.

Only one Oracle ASM instance is permitted for each node regardless of the number of database instances on the node.

- **A supported shared file system:** Supported file systems include the following:
 - **OCFS for Windows:** OCFS for Windows is a cluster file system used to store Oracle Database binary and data files. If you intend to use OCFS for Windows for your database storage, then you should create partitions large enough for all the database and recovery files when you create the unformatted disk partitions that are used by OCFS for Windows.
 - **Oracle ACFS:** Oracle ACFS provides a general purpose file system that can store administrative files as well as external general purpose data files. You can install the Oracle Database software on Oracle ACFS.

Note: You cannot put Oracle Clusterware or Oracle Database data files on Oracle ACFS.

See Also: The Certify page on My Oracle Support for supported cluster file systems. See [Section 2.4, "Checking Hardware and Software Certification on My Oracle Support"](#).

- **Network File System (NFS) with Oracle Direct NFS Client:** You can configure Oracle RAC to access NFS V3 servers directly using an Oracle internal Direct NFS Client.

Note: You cannot use Direct NFS Client to store Oracle Clusterware files. You can only use Direct NFS Client to store Oracle Database files. To install Oracle RAC on Windows using Direct NFS Client, you must have access to a shared storage method other than NFS for the Oracle Clusterware files.

See Also: [Section 3.8.1, "About Direct NFS Client"](#) for more information on using Direct NFS Client

[Table 3–1](#) shows the storage options supported for storing Oracle Clusterware and Oracle RAC files.

Table 3–1 Supported Storage Options for Oracle Clusterware and Oracle RAC Files and Home Directories

Storage Option	OCR and Voting Disks	Oracle Grid Infrastructure Home	Oracle RAC Home	Oracle RAC Database Files	Oracle Recovery Files
Oracle ASM	Yes	No	No	Yes	Yes
Oracle ACFS	No	No	11.2 or later: Yes 11.1 or earlier: No	No	No
OCFS for Windows	Yes	No	Yes	Yes	Yes
Direct NFS Client access to a certified network attached storage (NAS) filer	No	No	No	Yes	Yes
Note: NFS or Direct NFS Client cannot be used for Oracle Clusterware files.					
Shared disk partitions (raw devices)	Not supported by OUI or ASMCA, but supported by the software. They can be added or removed after installation.	No	No	Not supported by OUI or ASMCA, but supported by the software. They can be added or removed after installation.	No
Local file system	No	Yes	Yes	No	No

Note: For the most up-to-date information about supported storage options for Oracle Clusterware and Oracle RAC installations, refer to the Certify pages on the My Oracle Support web site. See [Section 2.4, "Checking Hardware and Software Certification on My Oracle Support"](#).

3.3 Storage Requirements for Oracle Clusterware and Oracle RAC

Each supported file system type has additional requirements that must be met to support Oracle Clusterware and Oracle RAC. Use the following sections to help you select your storage option:

- [Requirements for Using a Cluster File System for Oracle Clusterware Files](#)
- [Identifying Storage Requirements for Using Oracle ASM for Shared Storage](#)
- [Restrictions for Disk Partitions Used By Oracle ASM](#)
- [Requirements for Using a Shared File System](#)
- [Requirements for Files Managed by Oracle](#)

3.3.1 Requirements for Using a Cluster File System for Oracle Clusterware Files

To use OCFS for Windows for Oracle Clusterware files, you must comply with the following requirements:

- If you choose to place your OCR files on a shared file system, then Oracle recommends that one of the following is true:
 - The disks used for the file system are on a highly available storage device, (for example, a RAID device that implements file redundancy)

- At least two file systems are mounted, and you use the features of Oracle Clusterware 11g release 2 (11.2) to provide redundancy for the OCR and voting disks
- If you use a RAID device to store the Oracle Clusterware files, then you must have a partition that has at least 280 megabyte (MB) of available space for the OCR and 280 MB for each voting disk.
- If you use the redundancy features of Oracle Clusterware to provide high availability for the OCR and voting disk files, then you need a minimum of three file systems, and each one must have 560 MB of available space for the OCR and voting disk.

Note: The smallest partition size that OCFS for Windows can use is 500 MB

For example, to store all OCR and voting disk files on a cluster file system that does not provide redundancy at the hardware level (external redundancy), you should have approximately 2 GB of storage available over a minimum of three volumes (three separate volume locations for the OCR and voting disk files, one on each volume). If you use a file system that provides data redundancy, then you need only one physical disk with 280 MB of available space to store the OCR and 560 MB of available space for each voting disk file.

Note: If you are upgrading from an earlier release of Oracle Clusterware, and your existing cluster uses 100 MB disk partitions for the OCR and 20 MB disk partitions for the voting disk, then you must extend these partitions to at least 300 MB. Oracle recommends that you do not use partitions, but instead place the OCR and voting disks in Oracle ASM disk groups that are marked as QUORUM disk groups.

If the existing OCR and voting disk files are 280 MB or larger, then you do not have to change the size of the OCR or voting disks before performing the upgrade.

All storage products must be supported by both your server and storage vendors.

3.3.2 Identifying Storage Requirements for Using Oracle ASM for Shared Storage

To identify the storage requirements for using Oracle ASM, you must determine how many devices and the amount of free disk space that you require. To complete this task, follow these steps:

Tip: As you progress through the following steps, make a list of the raw device names you intend to use to create the Oracle ASM disk groups and have this information available during the Oracle Grid Infrastructure installation or when creating your Oracle RAC database.

1. Determine whether you want to use Oracle ASM for Oracle Clusterware files (OCR and voting disks), Oracle Database data files, recovery files, or all file types.

Note:

- You do not have to use the same storage mechanism for data files and recovery files. You can store one type of file in a cluster file system while storing the other file type within Oracle ASM. If you plan to use Oracle ASM for both data files and recovery files, then you should create separate Oracle ASM disk groups for the data files and the recovery files.
- There are two types of Oracle Clusterware files: OCR files and voting disk files. Each type of file can be stored on either Oracle ASM or a cluster file system. All the OCR files or all the voting disk files must use the same type of storage. You cannot have some OCR files stored in Oracle ASM and other OCR files in a cluster file system. However, you can use one type of storage for the OCR files and a different type of storage for the voting disk files if all files of each type use the same type of storage.

If you plan to enable automated backups for your Oracle RAC database, then you must place the fast recovery area on shared storage. You can choose Oracle ASM as the shared storage mechanism for recovery files by specifying an Oracle ASM disk group for the fast recovery area. Depending on how you choose to create a database during the installation, you have the following options:

- If you created the Oracle ASM disk groups prior to performing the Oracle Database installation, and then select an installation method that runs DBCA in interactive mode (for example, by choosing the Advanced database configuration option), then you can decide whether you want to use the same Oracle ASM disk group for data files and recovery files. You can also choose to use different disk groups for each file type. Ideally, you should create separate Oracle ASM disk groups for data files and recovery files.

The same choice is available to you if you use DBCA after the installation to create a database.

- If you select an installation type that runs DBCA in non-interactive mode, then you must use the same Oracle ASM disk group for data files and recovery files. The Oracle ASM disk group you select must have been created prior to starting the installation or DBCA.
2. Choose the Oracle ASM redundancy level to use for the Oracle ASM disk group.

The redundancy level that you choose for the Oracle ASM disk group determines how Oracle ASM mirrors files in the disk group, and determines the number of disks and amount of disk space that you require. The redundancy levels are as follows:

- External redundancy

An external redundancy disk group requires a minimum of one disk device. The effective disk space in an external redundancy disk group is the sum of the disk space in all of its devices.

Because Oracle ASM does not mirror data in an external redundancy disk group, Oracle recommends that you use external redundancy with storage devices such as RAID, or other similar devices that provide their own data protection mechanisms.

Even if you select external redundancy, you must have at least three voting disks configured, as each voting disk is an independent entity, and cannot be mirrored.

- Normal redundancy

A normal redundancy disk group requires a minimum of two disk devices (or two failure groups). The effective disk space in a normal redundancy disk group is *half* the sum of the disk space in all of its devices.

For Oracle Clusterware files, a normal redundancy disk group requires a minimum of three disk devices and provides three voting disk files, one OCR, and two OCR copies (one primary and one secondary mirror). When using a normal redundancy disk group, the cluster can survive the loss of one failure group.

For most installations, Oracle recommends that you select normal redundancy disk groups.

- High redundancy

In a high redundancy disk group, Oracle ASM uses three-way mirroring to increase performance and provide the highest level of reliability. A high redundancy disk group requires a minimum of three disk devices (or three failure groups). The effective disk space in a high redundancy disk group is *one-third* the sum of the disk space in all of its devices.

For Oracle Clusterware files, a high redundancy disk group requires a minimum of five disk devices and provides five voting disk files, one OCR, and three copies of the OCR (one primary and two secondary mirrors). With high redundancy, the cluster can survive the loss of two failure groups.

While high redundancy disk groups provide a high level of data protection, you should consider the greater cost of additional storage devices before deciding to use this redundancy level.

Note: After a disk group is created, you cannot alter the redundancy level of the disk group.

3. Determine the total amount of disk space that you require for the Oracle Clusterware files.

Use [Table 3–2](#) to determine the minimum number of disks and the minimum disk space requirements for installing Oracle Clusterware using Oracle ASM for shared storage:

Table 3–2 Oracle Clusterware Disk Space for Oracle ASM by Redundancy Type

File Types Stored	Minimum Number of Disks	Disk or Disk Partition Sizes
OCR and voting disks in an external redundancy disk group	1	At least 300 MB for each voting disk file and 300 MB for each OCR

Table 3–2 (Cont.) Oracle Clusterware Disk Space for Oracle ASM by Redundancy Type

File Types Stored	Minimum Number of Disks	Disk or Disk Partition Sizes
OCR and voting disks in a normal redundancy disk group	3	At least 600 MB for the OCR and its copies, at least 900 MB for the voting disk files, or at least 1.5 GB for both files types in one disk group. Note: If you create a disk group during installation, then it must be at least 2 GB in size.
OCR and voting disks in a high redundancy disk group	5	At least 900 MB for the OCR and its copies, at least 1.5 GB for the voting disk files, or at least 2.4 GB for both files types in one disk group.

Note: If the voting disk files are in a disk group, then note that disk groups that contain Oracle Clusterware files (OCR and voting disk files) have a higher minimum number of failure groups than other disk groups.

If you create a disk group for the OCR and voting disk files as part of the installation, then the installer requires that you create these files on a disk group with at least 2 GB of available space.

A **quorum failure group** is a special type of failure group. Disks in quorum failure groups do not contain user data, but can contain the Oracle Clusterware voting files. The quorum failure group is used to ensure that a quorum of the specified failure groups are available. A quorum failure group is not considered when determining redundancy requirements in respect to storing user data. However, a quorum failure group counts when mounting disk groups.

To ensure high availability of Oracle Clusterware files on Oracle ASM, for a normal redundancy disk group, you must have at least 4 GB of disk space (2 GB of effective disk space) for Oracle Clusterware files in three separate failure groups, with at least three physical disks. Each disk must have at least 1 GB of capacity to ensure that there is sufficient space to create Oracle Clusterware files.

- Determine the total amount of disk space that you require for the Oracle database files and recovery files.

Use the following table to determine the minimum number of disks and the minimum disk space requirements for installing the starter database:

Table 3–3 Total Oracle Database Storage Space Required by Redundancy Type

Redundancy Level	Minimum Number of Disks	Database Files	Recovery Files	Both File Types
External	1	1.5 GB	3 GB	4.5 GB
Normal	2	3 GB	6 GB	9 GB
High	3	4.5 GB	9 GB	13.5 GB

Note: The file sizes listed in the previous table are estimates of minimum requirements for a new installation (or a database without any user data). The file sizes for your database will be larger.

5. Determine if you can use an existing disk group.

If an Oracle ASM instance currently exists on the system, then you can use an existing disk group to meet these storage requirements. If necessary, you can add disks to an existing disk group during the installation. See [Section 3.3.2.1, "Using an Existing Oracle ASM Disk Group"](#) for more information about using an existing disk group.

6. If there is no existing Oracle ASM disk group to use, then create one or more Oracle ASM disk groups, as needed, before installing Oracle RAC. See [Section 3.3.2.2, "Selecting Disks to use with Oracle ASM Disk Groups"](#) for more information about selecting disks to use in a disk group.
7. Optionally, identify failure groups for the Oracle ASM disk group devices.

Note: You only have to complete this step if you plan to use an installation method that includes configuring Oracle ASM disk groups before installing Oracle RAC, or creating an Oracle RAC database.

If you intend to use a normal or high redundancy disk group, then you can further protect your database against hardware failure by associating a set of disk devices in a custom failure group. **Failure groups** define Oracle ASM disks that share a common potential failure mechanism. By default, each device comprises its own failure group. If you choose to define custom failure groups, then note the following:

- You must specify a minimum of two failure groups for normal redundancy disk groups and three failure groups for high redundancy disk groups.
- If the disk group contains data files and Oracle Clusterware files, including the voting disk files, then you must specify a minimum of three failure groups for normal redundancy disk groups and five failure groups for high redundancy disk groups.
- Disk groups containing voting disk files must have at least three failure groups for normal redundancy or at least five failure groups for high redundancy. If the disk group does not contain the voting disk files, then the minimum number of required failure groups is two for normal redundancy and three for high redundancy. The minimum number of failure groups applies whether or not they are custom failure groups.

If two disk devices in a normal redundancy disk group are attached to the same small computer system interface (SCSI) controller, then the disk group becomes unavailable if the controller fails. The SCSI controller in this example is a single point of failure. To protect against failures of this type, you could use two SCSI controllers, each with two disks, and define a failure group for the disks attached to each controller. This configuration enables the disk group to tolerate the failure of one SCSI controller.

Note: You can define custom failure groups after installation of Oracle Grid Infrastructure using the GUI tool ASMCA, the command-line tool `asmcmd`, or SQL*Plus commands.

For more information about Oracle ASM failure groups, refer to *Oracle Automatic Storage Management Administrator's Guide*.

3.3.2.1 Using an Existing Oracle ASM Disk Group

To use Oracle ASM as the storage option for either database or recovery files, you must use an existing Oracle ASM disk group, or use ASMCA to create the necessary disk groups before installing Oracle Database 11g Release 2 and creating an Oracle RAC database.

To determine if an Oracle ASM disk group currently exists, or to determine whether there is sufficient disk space in an existing disk group, you can use Oracle Enterprise Manager, either Grid Control or Database Control. Alternatively, you can use the following procedure:

1. In the **Services** Control Panel, ensure that the `OracleASMSERVICE+ASMn` service, where *n* is the node number, has started.
2. Open a Windows command prompt and temporarily set the `ORACLE_SID` environment variable to specify the appropriate value for the Oracle ASM instance to use.

For example, if the Oracle ASM system identifier (SID) is named `+ASM1`, then enter a setting similar to the following:

```
C:\> set ORACLE_SID=+ASM1
```

3. If the `ORACLE_HOME` environment variable is not set to the Grid home, then temporarily set this variable to the location of the Grid home using a command similar to the following:

```
C:\> set ORACLE_HOME=C:\app\11.2.0\grid
```

4. Use `ASMCMD` to connect to the Oracle ASM instance and start the instance if necessary with a command similar to the following:

```
C:\> %ORACLE_HOME%\bin\asmcmd
ASMCMD> startup
```

5. Enter one of the following commands to view the existing disk groups, their redundancy level, and the amount of free disk space in each disk group:

```
ASMCMD> lsdg
```

or:

```
C:\> %ORACLE_HOME%\bin\asmcmd -p lsdg
```

6. From the output, identify a disk group with the appropriate redundancy level and note the free space that it contains.
7. If necessary, install, or identify the additional disk devices required to meet the storage requirements listed in the previous section.

Note: If you are adding devices to an existing disk group, then Oracle recommends that you use devices that have the same size and performance characteristics as the existing devices in that disk group.

3.3.2.2 Selecting Disks to use with Oracle ASM Disk Groups

If you are sure that a suitable disk group does not exist on the system, then install or identify appropriate disk devices to add to a new disk group. Use the following guidelines when identifying appropriate disk devices:

- All of the devices in an Oracle ASM disk group should be the same size and have the same performance characteristics.
- Do not specify multiple partitions on a single physical disk as a disk group device. Oracle ASM expects each disk group device to be on a separate physical disk.
- Nonshared logical partitions are not supported with Oracle RAC. If you want to use logical partitions for your Oracle RAC database, then you must use shared logical volumes created by a logical volume manager such as `diskpart.msc`.
- Although you can specify a logical volume as a device in an Oracle ASM disk group, Oracle does not recommend their use because it adds a layer of complexity that is unnecessary with Oracle ASM. In addition, Oracle RAC requires a cluster logical volume manager in case you decide to use a logical volume with Oracle ASM and Oracle RAC.

See Also:

- [Section 3.5, "Preliminary Shared Disk Preparation"](#)
- [Section 3.6, "Configuring Shared Storage for Oracle ASM"](#)

3.3.3 Restrictions for Disk Partitions Used By Oracle ASM

Be aware of the following restrictions when configuring disk partitions for use with Oracle ASM:

- You cannot use primary partitions for storing Oracle Clusterware files while running OUI to install Oracle Clusterware as described in [Chapter 4, "Installing Oracle Grid Infrastructure for a Cluster"](#). You must create logical drives inside extended partitions for the disks to be used by Oracle Clusterware files and Oracle ASM.
- With x64 Windows, you can create up to 128 primary partitions for each disk.
- You can create shared directories only on primary partitions and logical drives.
- Oracle recommends that you limit the number of partitions you create on a single disk to prevent disk contention. Therefore, you may prefer to use extended partitions rather than primary partitions.

For these reasons, you might prefer to use extended partitions for storing Oracle software files and not primary partitions.

3.3.4 Requirements for Using a Shared File System

To use a shared file system for Oracle Clusterware, Oracle ASM, and Oracle RAC, the file system must comply with the following requirements:

- To use a cluster file system, it must be a supported cluster file system, as listed in the section [Section 3.2, "Supported Storage Options for Oracle Grid Infrastructure"](#)

and Oracle RAC".

- To use NFS, it must be on a certified network attached storage (NAS) device. Access the My Oracle Support web site as described in [Section 2.4, "Checking Hardware and Software Certification on My Oracle Support"](#) to find a list of certified NAS devices.
- If you choose to place your OCR files on a shared file system, then Oracle recommends that one of the following is true:
 - The disks used for the file system are on a highly available storage device, for example, a RAID device.
 - At least two file systems are mounted, and use the features of Oracle Clusterware 11g Release 2 (11.2) to provide redundancy for the OCR.
- If you choose to place the Oracle RAC data files on a shared file system, then one of the following should be true:
 - The disks used for the file system are on a highly available storage device, (for example, a RAID device).
 - The file systems consist of at least two independent file systems, with the data files on one file system, and the recovery files on a different file system.
- The user account with which you perform the installation (`oracle` or `grid`) must have write permissions to create the files in the path that you specify for the shared storage.

Note:

If you are upgrading Oracle Clusterware, and your existing cluster uses 100 MB OCR and 20 MB voting disk partitions, then you must extend these partitions to at least 300 MB. Oracle recommends that you do not use partitions, but instead place OCR and voting disks in Oracle ASM disk groups marked as QUORUM disk groups.

All storage products must be supported by both your server and storage vendors.

Use [Table 3–4](#) and [Table 3–5](#) to determine the minimum size for shared file systems:

Table 3–4 Oracle Clusterware Shared File System Volume Size Requirements

File Types Stored	Number of Volumes	Volume Size
Voting disks with external redundancy	1	At least 300 MB for each voting disk volume
OCR with external redundancy	1	At least 300 MB for each OCR volume
Oracle Clusterware files (OCR and voting disks) with redundancy provided by Oracle software	1	At least 300 MB for each OCR volume At least 300 MB for each voting disk volume

Table 3–5 Oracle RAC Shared File System Volume Size Requirements

File Types Stored	Number of Volumes	Volume Size
Oracle Database data files	1	At least 1.5 GB for each volume
Recovery files	1	At least 2 GB for each volume
Note: Recovery files must be on a different volume than database files		

In [Table 3–4](#) and [Table 3–5](#), the total required volume size is cumulative. For example, to store all Oracle Clusterware files on the shared file system with normal redundancy, you should have at least 2 GB of storage available over a minimum of three volumes (three separate volume locations for the OCR and two OCR mirrors, and one voting disk on each volume). You should have a minimum of three physical disks, each at least 500 MB, to ensure that voting disks and OCR files are on separate physical disks. If you also use this shared storage for Oracle RAC, using one volume for data files and one volume for recovery files, then you should have at least 3.5 GB available storage over two volumes, and at least 5.5 GB available total for all volumes.

3.3.5 Requirements for Files Managed by Oracle

If you use OCFS for Windows or Oracle ASM for your database files, then your database is created by default with files managed by Oracle Database. When using the Oracle Managed files feature, you need specify only the database object name instead of file names when creating or deleting database files.

Configuration procedures are required to enable Oracle Managed Files.

See Also: "Using Oracle-Managed Files" in *Oracle Database Administrator's Guide*

3.4 After You Have Selected the Shared Storage Options

When you have determined your disk storage options, first perform the steps listed in the section [Section 3.5, "Preliminary Shared Disk Preparation"](#), then configure the shared storage:

- **To use Oracle ASM**, refer to [Section 3.6, "Configuring Shared Storage for Oracle ASM"](#).
- **To use a file system**, refer to [Section 3.7, "Configuring Storage for Oracle Database Files on OCFS for Windows"](#).

3.5 Preliminary Shared Disk Preparation

Complete the following steps to prepare shared disks for storage:

- [Disabling Write Caching](#)
- [Enabling Automounting for Windows](#)

3.5.1 Disabling Write Caching

You must disable write caching on all disks that will be used to share data between the nodes in your cluster. Perform these steps to disable write caching:

1. Click **Start**, then select **Control Panel**, then **Administrative Tools**, then **Computer Management**, then **Device Manager**, and then **Disk drives**
2. Expand the Disk drives and double-click the first drive listed.
3. Under the Policies tab for the selected drive, uncheck the option that enables write caching.
4. Double-click each of the other drives that will be used by Oracle Clusterware and Oracle RAC and disable write caching as described in the previous step.

Caution: Any disks that you use to store files, including database files, that will be shared between nodes, must have write caching disabled.

3.5.2 Enabling Automounting for Windows

If you are using Windows Server 2003 R2 Enterprise Edition or Datacenter Edition, then you must enable disk automounting, as it is disabled by default. For other Windows releases, even though the automount feature is enabled by default, you should verify that automount is enabled.

You must enable automounting when using:

- Raw partitions for Oracle RAC
- OCFS for Windows
- Oracle Clusterware
- Raw partitions for single-node database installations
- Logical drives for Oracle ASM

Note: Raw partitions are supported only when upgrading an existing installation using the configured partitions. On new installations, using raw partitions is not supported by ASMCA or OUI, but is supported by the software if you perform manual configuration

If you upgrade the operating system from one version of Windows to another (for example, Windows Server 2003 to Windows Advanced Server 2003), then you must repeat this procedure after the upgrade is finished.

To determine if automatic mounting of new volumes is enabled, use the following commands:

```
c:\> diskpart
DISKPART> automount
Automatic mounting of new volumes disabled.
```

To enable automounting:

1. Enter the following commands at a command prompt:

```
c:\> diskpart
DISKPART> automount enable
Automatic mounting of new volumes enabled.
```

2. Type `exit` to end the diskpart session

3. Repeat steps 1 and 2 for each node in the cluster.
4. When you have prepared all of the cluster nodes in your Windows Server 2003 R2 system as described in the previous steps, restart all of the nodes.

Note: All nodes in the cluster must have automatic mounting enabled to correctly install Oracle RAC and Oracle Clusterware. Oracle recommends that you enable automatic mounting before creating any logical partitions for use by the database, Oracle ASM, or OCFS for Windows.

You must restart each node after enabling disk automounting. After it is enabled and the node is restarted, automatic mounting remains active until it is disabled.

3.6 Configuring Shared Storage for Oracle ASM

The installer does not suggest a default location for the OCR or the voting disk. If you choose to create these files on Oracle ASM, then you must first create and configure disk partitions to be used in the Oracle ASM disk group.

The following sections describe how to create and configure disk partitions to be used by Oracle ASM for storing Oracle Clusterware files or Oracle Database data files:

- [Creating Disk Partitions for Oracle ASM](#)
- [Marking Disk Partitions for Oracle ASM Before Installation](#)

3.6.1 Creating Disk Partitions for Oracle ASM

To use direct-attached storage (DAS) or storage area network (SAN) disks for Oracle ASM, each disk must have a partition table. Oracle recommends creating exactly one partition for each disk that encompasses the entire disk.

Note: You can use any physical disk for Oracle ASM, if it is partitioned. However, you cannot use NAS or Microsoft dynamic disks.

Use Microsoft Computer Management utility or the command line tool `diskpart` to create the partitions. Ensure that you create the partitions without drive letters. After you have created the partitions, the disks can be configured.

See Also:

- *Oracle Database Installation Guide for Microsoft Windows* for information about creating DAS or SAN disk partitions
- [Section 1.2.7, "Prepare Disk Partitions"](#) for more information about using `diskpart` to create a partition

3.6.2 Marking Disk Partitions for Oracle ASM Before Installation

The only partitions that OUI displays for Windows systems are logical drives that are on disks that do not contain a primary partition, and have been marked (or **stamped**) with `asmtool`. Configure the disks before installation either by using `asmtoolg` (graphical user interface (GUI) version) or using `asmtool` (command line version). You

also have the option of using the `asmtoolg` utility during Oracle Grid Infrastructure for a cluster installation.

The `asmtoolg` and `asmtool` utilities only work on partitioned disks; you cannot use Oracle ASM on unpartitioned disks. You can also use these tools to reconfigure the disks after installation. These utilities are installed automatically as part of Oracle Grid Infrastructure.

Note: On Windows Server 2008 and later releases, if user account control (UAC) is enabled, then running `asmtoolg` or `asmtool` requires administrator-level permissions.

3.6.2.1 Overview of `asmtoolg` and `asmtool`

The `asmtoolg` and `asmtool` tools associate meaningful, persistent names with disks to facilitate using those disks with Oracle ASM. Oracle ASM uses disk strings to operate more easily on groups of disks at the same time. The names that `asmtoolg` or `asmtool` create make this easier than using Windows drive letters.

All disk names created by `asmtoolg` or `asmtool` begin with the prefix `ORCLDISK` followed by a user-defined prefix (the default is `DATA`), and by a disk number for identification purposes. You can use them as raw devices in the Oracle ASM instance by specifying a name `\\.\ORCLDISKprefixn`, where `prefix` either can be `DATA`, or a value you supply, and where `n` represents the disk number.

To configure your disks with `asmtoolg`, see one of the following sections:

- [Section 3.6.2.2, "Using `asmtoolg` \(Graphical User Interface\) To Mark Disks"](#)
- [Section 3.6.2.4, "Using `asmtool` \(Command Line\) To Mark Disks"](#)

3.6.2.2 Using `asmtoolg` (Graphical User Interface) To Mark Disks

Use `asmtoolg` (GUI version) to create device names; use `asmtoolg` to add, change, delete, and examine the devices available for use in Oracle ASM.

To add or change disk stamps:

1. In the installation media for Oracle Grid Infrastructure, go to the `asmtool` folder and double-click `asmtoolg`.

If Oracle Clusterware is installed, then go to the `Grid_home\bin` folder and double-click `asmtoolg.exe`.

On Windows Server 2008 and later releases, if user access control (UAC) is enabled, then you must create a desktop shortcut to a command window. Open the command window using the **Run as Administrator**, right-click the context menu, and launch `asmtoolg`.

2. Select the **Add or change label** option, and then click **Next**.

`asmtoolg` shows the devices available on the system. Unrecognized disks have a status of "Candidate device", stamped disks have a status of "Stamped ASM device," and disks that have had their stamp deleted have a status of "Unstamped ASM device." The tool also shows disks that are recognized by Windows as a file system (such as NTFS). These disks are not available for use as Oracle ASM disks, and cannot be selected. In addition, Microsoft Dynamic disks are not available for use as Oracle ASM disks.

If necessary, follow the steps under [Section 1.2.7, "Prepare Disk Partitions"](#) to create disk partitions for the Oracle ASM instance.

3. On the Stamp Disks window, select the disks to you want to use with Oracle ASM.
 For ease of use, Oracle ASM can generate unique stamps for all of the devices selected for a given prefix. The stamps are generated by concatenating a number with the prefix specified. For example, if the prefix is `DATA`, then the first Oracle ASM link name is `ORCLDISKDATA0`.
 You can also specify the stamps of individual devices.
4. Optionally, select a disk to edit the individual stamp (Oracle ASM link name).
5. Click **Next**.
6. Click **Finish**.

3.6.2.3 Using `asmtoolg` To Remove Disk Stamps

To delete disk stamps:

1. In the installation media for Oracle Grid Infrastructure, go the `asmtool` folder and double-click `asmtoolg`.
 If Oracle Clusterware is installed, then go to the `Grid_home\bin` folder and double-click `asmtoolg.exe`.
 On Windows Server 2008 and later releases, if user access control (UAC) is enabled, then you must create a desktop shortcut to a command window. Open the command window using the **Run as Administrator**, right-click the context menu, and launch `asmtoolg`.
2. Select the **Delete labels** option, then click **Next**.
 The delete option is only available if disks exist with stamps. The delete screen shows all stamped Oracle ASM disks.
3. On the Delete Stamps screen, select the disks to unstamp.
4. Click **Next**.
5. Click **Finish**.

3.6.2.4 Using `asmtool` (Command Line) To Mark Disks

`asmtool` is a command-line interface for marking (or stamping) disks to be used with Oracle ASM. It has the following options:

Option	Description	Example
<code>-add</code>	Adds or changes stamps. You must specify the hard disk, partition, and new stamp name. If the disk is a raw device or has an existing Oracle ASM stamp, then you must specify the <code>-force</code> option. If necessary, follow the steps under Section 1.2.7, "Prepare Disk Partitions" to create disk partitions for the Oracle ASM instance.	<code>asmtool -add [-force] \Device\Harddisk1\Partition1 ORCLDISKASM0 \Device\Harddisk2\Partition1 ORCLDISKASM2...</code>
<code>-addprefix</code>	Adds or changes stamps using a common prefix to generate stamps automatically. The stamps are generated by concatenating a number with the prefix specified. If the disk is a raw device or has an existing Oracle ASM stamp, then you must specify the <code>-force</code> option.	<code>asmtool -addprefix ORCLDISKASM [-force] \Device\Harddisk1\Partition1 \Device\Harddisk2\Partition1...</code>

Option	Description	Example
-create	Creates an Oracle ASM disk device from a file instead of a partition. Note: Usage of this command is not supported for production environments.	asmttool -create \\server\share\file 1000 asmttool -create D:\asm\asmfile02.asm 240
-list	List available disks. The stamp, windows device name, and disk size in MB are shown.	asmttool -list
-delete	Removes existing stamps from disks.	asmttool -delete ORCLDISKASM0 ORCLDISKASM1...

On Windows Server 2008 and later releases, if user access control (UAC) is enabled, then you must create a desktop shortcut to a command window. Open the command window using the **Run as Administrator**, right-click the context menu, and launch asmttool.

Note: If you use -add, -addprefix, or -delete, asmttool notifies the Oracle ASM instance on the local node and on other nodes in the cluster, if available, to rescan the available disks.

3.7 Configuring Storage for Oracle Database Files on OCFS for Windows

To use OCFS for Windows for your Oracle home and data files, the following partitions, at a minimum, must exist before you run OUI to install Oracle Clusterware:

- 5.5 GB or larger partition for the Oracle home, if you want a shared Oracle home
- 3 GB or larger partitions for the Oracle Database data files and recovery files

Log in to Windows using a member of the Administrators group and perform the steps described in this section to set up the shared disk raw partitions for OCFS for Windows. Windows refers to raw partitions as logical drives. If you need more information about creating partitions, then refer to the Windows online help from within the Disk Management utility.

1. Run the Windows Disk Management utility from one node to create an extended partition. Use a basic disk; dynamic disks are not supported.
2. Create a partition for the Oracle Database data files and recovery files, and optionally create a second partition for the Oracle home.

The number of partitions used for OCFS for Windows affects performance. Therefore, you should create the minimum number of partitions needed for the OCFS for Windows option you choose.

Note:

Oracle supports installing the database into multiple Oracle Homes on a single system. This allows flexibility in deployment and maintenance of the database software. For example, it enables different versions of the database to run simultaneously on the same system, or it enables you to upgrade specific database or Oracle Automatic Storage Management instances on a system without affecting other running databases.

However, when you have installed multiple Oracle Homes on a single system, there is also some added complexity introduced that you may have to consider allowing these Oracle Homes to coexist. For more information on this topic, refer to *Oracle Database Platform Guide for Microsoft Windows* and *Oracle Real Application Clusters Installation Guide for Microsoft Windows x64 (64-Bit)*

To create the required partitions, perform the following steps:

1. From an existing node in the cluster, run the DiskPart utility as follows:

```
C:\> diskpart
DISKPART>
```

2. List the available disks. By specifying its disk number (*n*), select the disk on which you want to create a partition.

```
DISKPART> list disk
DISKPART> select disk n
```

3. Create an extended partition:

```
DISKPART> create part ext
```

4. Create a logical drive of the desired size after the extended partition is created using the following syntax:

```
DISKPART> create part log [size=n] [offset=n] [noerr]
```

5. Repeat steps 2 through 4 for the second and any additional partitions. An optimal configuration is one partition for the Oracle home and one partition for Oracle Database files.

6. List the available volumes, and remove any drive letters from the logical drives you plan to use.

```
DISKPART> list volume
DISKPART> select volume n
DISKPART> remove
```

7. If you are preparing drives on a Windows 2003 R2 system, then you should restart all nodes in the cluster after you have created the logical drives.

8. Check all nodes in the cluster to ensure that the partitions are visible on all the nodes and to ensure that none of the Oracle partitions have drive letters assigned. If any partitions have drive letters assigned, then remove them by performing these steps:

- Right-click the partition in the Windows Disk Management utility
- Select "Change Drive Letters and Paths..." from the menu

- Click Remove in the "Change Drive Letter and Paths" window

3.7.1 Formatting Drives to Use OCFS for Windows after Installation

If you want to use OCFS for Windows for storage for Oracle RAC, then you must configure OCFS for Windows and the disks to be used by OCFS for Windows before you can use OCFS for Windows for storing data files.

If you do not select OCFS for Windows as the storage type for the Oracle Clusterware files, then OCFS for Windows is not configured during the Oracle Grid Infrastructure installation. Before you can use OCFS for Windows, you must first install the OCFS for Windows driver.

3.7.1.1 Installing and Configuring OCFS for Windows

To install and start the OCFS for Windows driver, run the following command from the *Grid_home\cfs* directory on each node in your cluster that will use OCFS for Windows:

```
Grid_home\cfs\OcfsInstall /y
```

To create the OracleClusterVolumeService service, run the following command on each node in your cluster:

```
Grid_home\cfs\OcfsFindVol /i:Grid_home\cfs\ocfsfindvol.exe
```

To start the OracleClusterVolumeService service, run the following command on each node in your cluster:

```
net start OracleClusterVolumeService
```

3.7.1.2 Formatting Drives for Use with OCFS for Windows

To use OCFS for Windows to store Oracle data files you must create OCFS volumes on the shared disks.

To format a disk partition or logical drive as an OCFS volume, run the *ocfsformat.exe* command from the *Grid_home\cfs* directory using the following syntax:

```
Grid_home\cfs\OcfsFormat /m link_name /c ClusterSize_in_KB /v volume_label /f /a /d
```

In the previous command syntax example, the following variables were used:

- */m link_name* is the mountpoint for this file system which you want to format with OCFS for Windows. On Windows, provide a drive letter corresponding to the logical drive.
- *ClusterSize_in_KB* is the Cluster size or allocation size for the OCFS for Windows volume (this option must be used with the */a* option or else the default size of 4 kilobytes (KB) is used)

Note: The Cluster size is essentially the block size. Recommended values are 1024 (1 MB) if the OCFS for Windows disk partition is to be used for Oracle datafiles and 4 (4 KB) if the OCFS for Windows disk partition is to be used for the Oracle home.

- *volume_label* is an optional volume label

- The `/f` option forces the format of the specified volume
- The `/a` option, if specified, forces `OcfsFormat` to use the `clustersize` specified with the `/c` option
- The `/d` option forces all future volume operations to use direct IO mode

For example, to create an OCFS for Windows formatted shared disk partition named DATA, mounted as U:, using a shared disk with a nondefault cluster size of 1 MB, you would use the following command:

```
ocfsformat /m U: /c 1024 /v DATA /f /a
```

3.8 Configuring Direct NFS Client for Oracle RAC Data Files

This section contains the following information about Direct NFS Client:

- [About Direct NFS Client](#)
- [About the oranfstab File for Direct NFS Client](#)
- [Mounting NFS Storage Devices with Direct NFS Client](#)
- [Specifying Network Paths for an NFS Server](#)
- [Enabling Direct NFS Client](#)
- [Performing Basic File Operations Using the ORADNFS Utility](#)
- [Disabling Direct NFS Client](#)

3.8.1 About Direct NFS Client

With Oracle Database 11g Release 2 (11.2), instead of using the operating system or third-party NFS client, you can configure Oracle Database to use Direct NFS Client to access NFS V3 servers directly. Direct NFS Client tunes itself to make optimal use of available resources and enables the storage of data files on supported NFS servers.

Note: Use NFS servers supported for Oracle RAC. Check My Oracle Support, as described in [Section 2.4, "Checking Hardware and Software Certification on My Oracle Support"](#) for support information.

To enable Oracle Database to use Direct NFS Client, the NFS file systems must be mounted and available over regular NFS mounts before you start installation. Direct NFS Client manages settings after installation. If Oracle Database cannot open an NFS server using Direct NFS Client, then an informational message is logged into the Oracle alert log. A trace file is also created, indicating that Direct NFS Client could not connect to an NFS server.

Note: Direct NFS does not work if the backend NFS server does not support a write size (`wtmax`) of 32768 or larger.

The Oracle files resident on the NFS server that are accessed by Direct NFS Client can also be accessed through a third party NFS client. Management of Oracle data files created with Direct NFS Client should be done according to the guidelines specified in

the "Managing Datafiles and Tempfiles" chapter of *Oracle Database Administrator's Guide*.

Volumes mounted through Common Internet File System (CIFS) can not be used for storing Oracle database files without configuring Direct NFS Client. The atomic write requirements needed for database writes are not guaranteed through the CIFS protocol, consequently CIFS can only be used for OS level access, for example, for commands such as `copy`.

3.8.2 About the `oranfstab` File for Direct NFS Client

If you use Direct NFS Client, then you must create a configuration file, `oranfstab`, to specify the options, attributes, and parameters that enable Oracle Database to use Direct NFS Client. Direct NFS Client looks for the mount point entries in `Oracle_home\dbs\oranfstab`. It uses the first matched entry as the mount point. You must create the `oranfstab` file in the `Oracle_home\dbs` directory.

When the `oranfstab` file is placed in `Oracle_home\dbs`, the entries in the file are specific to a single database. For Oracle RAC installations in a shared Oracle home, the `oranfstab` file is globally available to all database instances. All instances that use the shared Oracle home use the same `Oracle_home\dbs\oranfstab` file. For a nonshared Oracle home, because all the Oracle RAC instances use the same `oranfstab` file, you must replicate the `oranfstab` file on all of the nodes. Also, you must keep the `oranfstab` file synchronized on all the nodes.

Note: If you remove an NFS path from `oranfstab` that Oracle Database is using, then you must restart the database for the change to be effective. In addition, the mount point that you use for the file system must be identical on each node.

See Also: [Section 3.8.5, "Enabling Direct NFS Client"](#) for more information about creating the `oranfstab` file

3.8.3 Mounting NFS Storage Devices with Direct NFS Client

Direct NFS Client determines mount point settings for NFS storage devices based on the configuration information in `oranfstab`. If Oracle Database cannot open an NFS server using Direct NFS Client, then an error message is written into the Oracle alert and trace files indicating that Direct NFS Client could not establish a connection to the NFS server.

Note: You can have only one active Direct NFS Client implementation for each instance. Using Direct NFS Client on an instance will prevent another Direct NFS Client implementation.

See Also: [Section 3.2.2, "Supported Storage Options for Oracle RAC"](#) for a list of the file types that are supported with Direct NFS Client

3.8.4 Specifying Network Paths for an NFS Server

Direct NFS Client can use up to four network paths defined in the `oranfstab` file for an NFS server. Direct NFS Client performs load balancing across all specified paths. If

a specified path fails, then Direct NFS Client re-issues all outstanding requests over any remaining paths.

Note: You can have only one active Direct NFS Client implementation for each instance. Using Direct NFS Client on an instance prevents the use of another Direct NFS Client implementation.

Use the following global dynamic performance views for managing Direct NFS Client usage with your Oracle RAC database:

- `GV$DNFS_SERVERS`: Lists the servers that are accessed using Direct NFS Client.
- `GV$DNFS_FILES`: Lists the files that are currently open using Direct NFS Client.
- `GV$DNFS_CHANNELS`: Shows the open network paths, or channels, to servers for which Direct NFS Client is providing files.
- `GV$DNFS_STATS`: Lists performance statistics for Direct NFS Client.

3.8.5 Enabling Direct NFS Client

To enable Direct NFS Client, you must add an `oranfstab` file to `Oracle_home\dbs`. When `oranfstab` is placed in this directory, the entries in this file are specific to one particular database. Direct NFS Client searches for the mount point entries as they appear in `oranfstab`. Direct NFS Client uses the first matched entry as the mount point.

Complete the following procedure to enable Direct NFS Client:

1. Create an `oranfstab` file with the following attributes for each NFS server accessed by Direct NFS Client:
 - `server`: The NFS server name.
 - `path`: Up to four network paths to the NFS server, specified either by internet protocol (IP) address, or by name, as displayed using the `ifconfig` command on the NFS server.
 - `local`: Up to 4 network interfaces on the database host, specified by IP address, or by name, as displayed using the `ipconfig` command on the database host.
 - `export`: The exported path from the NFS server. Use a UNIX-style path.
 - `mount`: The corresponding local mount point for the exported volume. Use Windows-style path.
 - `mnt_timeout`: (Optional) Specifies the time (in seconds) for which Direct NFS Client should wait for a successful mount before timing out. The default timeout is 10 minutes (600).
 - `management`: Enables Direct NFS Client to use the management interface for SNMP queries. You can use this parameter if SNMP is running on separate management interfaces on the NFS server. The default value is the `server` parameter value.
 - `community`: Specifies the community string for use in SNMP queries. Default value is `public`.

- `uid`: (Optional) The UNIX user ID to be used by Direct NFS Client to access all NFS servers listed in `oranfstab`. The default value is `uid:65534`, which corresponds to `user:nobody` on the NFS server.
- `gid`: (Optional) The UNIX group ID to be used by Direct NFS Client to access all NFS servers listed in `oranfstab`. The default value is `gid:65534`, which corresponds to `group:nogroup` on the NFS server.

The mount point specified in the `oranfstab` file represents the local path where the database files would reside normally, as if Direct NFS Client was not used. For example, if the location for the data files if the database did not use Direct NFS Client would be `C:\app\oracle\oradata\orcl` directory, then you specify `C:\app\oracle\oradata\orcl` for the NFS virtual mount point in the corresponding `oranfstab` file.

[Example 3–1](#) and [Example 3–2](#) provide examples of how Direct NFS Client attributes can be used in an `oranfstab` file.

Note:

- Direct NFS Client ignores a `uid` or `gid` value of 0.
 - The exported path from the NFS server must be accessible for read/write/execute by the user with the `uid`, `gid` specified in `oranfstab`. If neither `uid` nor `gid` is listed, then the exported path must be accessible by the user with `uid:65534` and `gid:65534`.
-
-

2. Replace the standard Oracle Disk Manager (ODM) library, `oraodm11.dll`, with the ODM NFS library.

Oracle Database uses the ODM library, `oranfsodm11.dll`, to enable Direct NFS Client. To replace the ODM library, complete the following steps:

- a. Change directory to `Oracle_home\bin`.
- b. Shut down the Oracle Database instance on a node using the Server Control Utility (SRVCTL).
- c. Enter the following commands:


```
copy oraodm11.dll oraodm11.dll.orig
copy /Y oranfsodm11.dll oraodm11.dll
```
- d. Restart the Oracle Database instance using SRVCTL.
- e. Repeat Step a to Step d for each node in the cluster.

Example 3–1 `oranfstab` File Using Local and Path NFS Server Entries

The following example of an `oranfstab` file shows an NFS server entry, where the NFS server, `MyDataServer1`, uses 2 network paths specified with IP addresses.

```
server: MyDataServer1
local: 132.34.35.10
path: 132.34.35.12
local: 132.34.55.10
path: 132.34.55.12
export: /vol/oradata1 mount: C:\APP\ORACLE\ORADATA\ORCL
```

Example 3–2 oranfstab File Using Network Connection Names

The following example of an `oranfstab` file shows an NFS server entry, where the NFS server, `MyDataServer2`, uses 4 network paths specified by the network interface to use, or the network connection name. Multiple export paths are also used in this example.

```
server: MyDataServer2
local: LocalInterface1
path: NfsPath1
local: LocalInterface2
path: NfsPath2
local: LocalInterface3
path: NfsPath3
local: LocalInterface4
path: NfsPath4
export: /vol/oradata2 mount: C:\APP\ORACLE\ORADATA\ORCL2
export: /vol/oradata3 mount: C:\APP\ORACLE\ORADATA\ORCL3
```

3.8.6 Performing Basic File Operations Using the ORADNFS Utility

ORADNFS is a utility which enables the database administrators to perform basic file operations over Direct NFS Client on Microsoft Windows platforms.

ORADNFS is a multi-call binary, which is a single binary that acts like many utilities. You must be a member of the local `ORA_DBA` group to use ORADNFS. To execute commands using ORADNFS you issue the command as an argument on the command line.

The following command prints a list of commands available with ORADNFS:

```
C:\> oradnfs help
```

To display the list of files in the NFS directory mounted as `C:\ORACLE\ORADATA`, use the following command:

```
C:\> oradnfs ls C:\ORACLE\ORADATA\ORCL
```

Note: A valid copy of the `oranfstab` configuration file must be present in `Oracle_home\dfs` for ORADNFS to operate.

3.8.7 Disabling Direct NFS Client

Complete the following steps to disable Direct NFS Client:

1. Restore the original `oraodm11.dll` file by reversing the process you completed in [Section 3.8.5, "Enabling Direct NFS Client."](#)
2. Remove the `oranfstab` file.

Note: If you remove an NFS path that Oracle Database is using, then you must restart the database for the change to be effective.

3.9 Upgrading or Migrating Existing Oracle ASM Instances

If you have an Oracle ASM installation from a prior release installed on your server, or in an existing Oracle Clusterware installation, then you can use ASMCA to upgrade the existing Oracle ASM instance to Oracle ASM 11g Release 2 (11.2). You can also use ASMCA to configure failure groups, Oracle ASM volumes and Oracle ACFS.

Note: You must first shut down all database instances and applications on the node with the existing Oracle ASM instance before upgrading it.

During installation, if you chose to use Oracle ASM and ASMCA detects that there is a prior Oracle ASM version installed in another Oracle ASM home, then after installing the Oracle ASM 11g Release 2 (11.2) binaries, you can start ASMCA to upgrade the existing Oracle ASM instance. You can then choose to configure an Oracle ACFS deployment by creating Oracle ASM volumes and using the upgraded Oracle ASM to create the Oracle ACFS.

If you are upgrading from Oracle ASM 11g Release 2 (11.2.0.1) or later, then Oracle ASM is always upgraded with Oracle Grid Infrastructure as part of the rolling upgrade, and ASMCA is started during the upgrade. ASMCA cannot perform a separate upgrade of Oracle ASM from release 11.2.0.1 to 11.2.0.2.

On an existing Oracle Clusterware or Oracle RAC installation, if the prior version of Oracle ASM instances on all nodes is Oracle ASM 11g Release 1, then you are provided with the option to perform a rolling upgrade of Oracle ASM instances. If the prior version of the Oracle ASM instances for an Oracle RAC installation are from a release prior to Oracle ASM 11g Release 1, then rolling upgrades cannot be performed. Oracle ASM on all nodes will be upgraded to Oracle ASM 11g Release 2 (11.2).

3.10 Configuring Oracle Automatic Storage Management Cluster File System

Oracle Grid Infrastructure includes Oracle Clusterware, Oracle ASM, Oracle ACFS, Oracle ADVM, and driver resources and software components, which are installed into the Grid home during installation with OUI. After an Oracle Grid Infrastructure installation, you can use Oracle ASM Configuration Assistant (ASMCA) to start the Oracle ASM instance and create Oracle ASM disk groups, Oracle ADVM volumes, and Oracle ACFS file systems (assuming Oracle Clusterware is operational). Alternatively, Oracle ASM disk groups and Oracle ADVM volumes can be created using SQL*Plus, ASMCMD command line tools, or Oracle Enterprise Manager. File systems can be created in Oracle ACFS using operating system command-line tools or Oracle Enterprise Manager.

Note:

- Oracle ACFS is supported only on Windows Server 2003 x64 and Windows Server 2003 R2 x64 for Oracle Grid Infrastructure release 11.2.0.1.
 - Starting with Oracle Grid Infrastructure 11g Release 2 (11.2.0.2), Oracle ACFS is supported on Windows Server 2008 x64 and Windows Server 2008 R2 x64.
 - The compatibility parameters `COMPATIBLE.ASM` and `COMPATIBLE.ADVM` must be set to 11.2 or higher for the disk group to contain an Oracle ADVM volume.
-

If you want to create the Oracle home for your Oracle RAC database in Oracle ACFS, then perform the following steps:

1. Install Oracle Grid Infrastructure for a cluster (Oracle Clusterware and Oracle ASM).

2. Go to the bin directory in the Grid home, for example:

```
C:\> cd app\11.2.0\grid\bin
```

3. Start ASMCA as the Local Administrator user, for example:

```
C:\..\bin> asmca
```

The Configure ASM: Disk Groups page is displayed.

4. On the Configure ASM: Disk Groups page, right-click the disk group in which you want to create the Oracle ADVM volume, then select **Create ACFS for Database Home**.

5. In the Create ACFS Hosted Database Home window, enter the following information:

- Database Home Volume Name: Enter the name of the database home. The name must be unique in your enterprise, for example: `racdb_01`
- Database Home Mountpoint: Enter the directory path or logical drive letter for the mountpoint. For example: `M:\acfsdisks\racdb_01`

Make a note of this mountpoint for future reference.

- Database Home Size (GB): Enter in gigabytes the size you want the database home to be.
 - Click **OK** when you have entered the required information.
6. If prompted, run any scripts as directed by ASMCA as the Local Administrator user.
 7. During Oracle RAC 11g Release 2 (11.2) installation, ensure that you or the database administrator who installs Oracle RAC selects for the Oracle home the mountpoint you provided in the Database Home Mountpoint field (in the preceding example, this was `M:\acfsdisks\racdb_01`).

Note: You cannot place the Oracle home directory for Oracle Database 11g Release 1 or earlier releases on Oracle ACFS.

See Also: *Oracle Automatic Storage Management Administrator's Guide* for more information about configuring and managing your storage with Oracle ACFS

3.11 Desupport of Block and Raw Devices

Starting with Oracle Database 11g Release 2 (11.2) and Oracle RAC 11g Release 2 (11.2), using DBCA or OUI to store Oracle Clusterware or Oracle Database files on raw devices is not supported.

If you upgrade an existing Oracle RAC database, or an Oracle RAC database with Oracle ASM instances, then you can use an existing raw device partition, and perform a rolling upgrade of your existing installation. Performing a new installation using raw devices is not allowed.

Installing Oracle Grid Infrastructure for a Cluster

This chapter describes the procedures for installing Oracle Grid Infrastructure for a cluster. Oracle Grid Infrastructure consists of Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM). If you plan afterward to install Oracle Database with Oracle Real Application Clusters (Oracle RAC), then this is phase one of a two-phase installation.

This chapter contains the following topics:

- [Preparing to Install Oracle Grid Infrastructure with Oracle Universal Installer](#)
- [Installing Oracle Grid Infrastructure](#)
- [Installing Oracle Grid Infrastructure Using a Software-Only Installation](#)
- [Confirming Oracle Clusterware Function](#)
- [Confirming Oracle ASM Function for Oracle Clusterware Files](#)
- [Understanding Offline Processes in Oracle Grid Infrastructure](#)

Note: The second phase of an Oracle RAC installation, installing Oracle RAC, is described in *Oracle Real Application Clusters Installation Guide for Microsoft Windows x64 (64-Bit)*.

4.1 Preparing to Install Oracle Grid Infrastructure with Oracle Universal Installer

Before you install Oracle Grid Infrastructure with Oracle Universal Installer (OUI), use the following checklist to ensure that you have all the information you will need during installation, and to ensure that you have completed all tasks that must be done before starting your installation. Check off each task in the following list as you complete it, and write down the information needed, so that you can provide it during installation.

❑ Verify Cluster Privileges

Before running OUI, from the node where you intend to run the Installer, verify that you are logged in using a member of the Administrators group, and that this user is a Local Administrator user on the other nodes in the cluster. To do this, enter the following command for each node that is a part of the cluster, where *nodename* is the node name:

```
net use \\nodename\C$
```

Repeat for each node in the cluster.

❑ **Shut Down Running Oracle Processes**

You may have to shut down running Oracle processes:

Installing on a node with a standalone database not using Oracle ASM: You do not have to shut down the database while you install Oracle Grid Infrastructure software.

Installing on a node that already has a standalone Oracle Database 11g Release 2 (11.2) installation running on Oracle ASM: Stop the existing Oracle ASM instances. The Oracle ASM instances are restarted during installation.

Note: If you receive a warning to stop all Oracle services after starting OUI, then, only if your environment is not running Oracle RAC, run the command, where *oracle_home* is the existing Oracle Clusterware home (the Oracle home directory out of which the cluster synchronization service (CSS) is running):

```
oracle_home\bin\localconfig delete
```

Installing on an Oracle RAC database node: This installation requires an upgrade of Oracle Clusterware, because Oracle Clusterware is required to run Oracle RAC. As part of the upgrade, you must shut down the database one node at a time as the rolling upgrade proceeds from node to node.

❑ **Prepare for Oracle ASM and Oracle Clusterware upgrade if you have existing installations**

During the installation of Oracle Grid Infrastructure, existing Oracle Clusterware and clustered Oracle ASM installations are upgraded.

When all member nodes of the cluster are running Oracle Grid Infrastructure 11g Release 2 (11.2), then the new clusterware becomes the active version.

If you intend to install Oracle RAC, then you must first complete the upgrade to Oracle Grid Infrastructure 11g Release 2 (11.2) on all cluster nodes before you install the Oracle Database 11g Release 2 (11.2) version of Oracle RAC.

Note: All Oracle Grid Infrastructure upgrades (upgrades of existing Oracle Clusterware and clustered Oracle ASM installations) are out-of-place upgrades.

❑ **Obtain LOCAL_SYSTEM administrator access**

Oracle Grid Infrastructure must be installed as a Local Administrator user, one with LOCAL_SYSTEM privileges, or a member of the local Administrators group. If you do not have Administrator access to each node in the cluster, then ask your system administrator to create and configure the user account on each node.

❑ **Decide if you want to install other languages**

During an Advanced installation session, you are asked if you want translation of user interface text into languages other than the default, which is English.

Note: If the language set for the operating system is not supported by OUI, then OUI, by default, runs in English.

See Also: *Oracle Database Globalization Support Guide* for detailed information on character sets and language configuration

- ❑ **Determine your cluster name, public node names, single client access name (SCAN), virtual node names, GNS VIP, and planned interface use for each node in the cluster**

During installation, you are prompted to provide the public and virtual host name, unless you use a third party cluster software. In that case, the public host name information will be filled in. You are also prompted to identify which interfaces are public, private, or interfaces in use for another purpose, such as a network file system.

If you use Grid Naming Service (GNS), then OUI displays the public and virtual host name addresses labeled as "AUTO" because they are configured automatically by GNS.

Note: If you configure internet protocol (IP) addresses manually, then avoid changing host names after you complete the Oracle Grid Infrastructure installation, including adding or deleting domain qualifications. A node with a new host name is considered a new host, and must be added to the cluster. A node under the old name will appear to be down until it is removed from the cluster.

When you enter the public node name, use the primary host name of each node. In other words, use the name displayed by the `hostname` command. This node name can be either the permanent or the virtual host name. The node name should contain only single-byte alphanumeric characters (a to z, A to Z, and 0 to 9). Do not use underscores (`_`) or any other characters in the host name.

In addition:

- Provide a cluster name with the following characteristics:
 - * It must be globally unique throughout your host domain.
 - * It must be at least one character long and less than 15 characters long.
 - * It must consist of the same character set used for host names, in accordance with Internet Engineering Task Force RFC 1123: Hyphens (-), and single-byte alphanumeric characters (a to z, A to Z, and 0 to 9).

Note: Windows operating systems allow underscores to be used in host names. However, because underscored names are not legal host names for a domain name system (DNS), they should be avoided.

- If you are not using GNS, then determine a virtual host name for each node. A virtual host name is a public node name that is used to reroute client requests sent to the node if the node is down. Oracle Database uses virtual IP (VIP) addresses for client-to-database connections, so the VIP address must be

publicly accessible. Oracle recommends that you provide a name in the format *hostname-vip*. For example: *myclstr2-vip*.

- Provide SCAN addresses for client access to the cluster. These addresses should be configured as round robin addresses on the domain name service (DNS). Oracle recommends that you supply three SCAN addresses.

Note: The following is a list of additional information about node IP addresses:

- For the local node only, OUI automatically fills in public and VIP fields.
 - Host names and virtual host names are not domain-qualified. If you provide a domain in the host name field during installation, then OUI removes the domain from the name.
 - Interfaces identified as private for private IP addresses should not be accessible as public interfaces. Using public interfaces for Cache Fusion can cause performance problems.
-

- Identify public and private interfaces. OUI configures public interfaces for use by public and virtual IP addresses, and configures private IP addresses on private interfaces.

The private subnet that the private interfaces use must connect all the nodes you intend to have as cluster members.

❑ **Obtain proxy realm authentication information if you have a proxy realm on your network**

During installation, OUI attempts to download updates. You are prompted to provide a proxy realm, and user authentication information to access the Internet through the proxy service. If you have a proxy realm configured, then be prepared to provide this information. If you do not have a proxy realm, then you can leave the proxy authentication fields blank.

❑ **Identify shared storage for Oracle Clusterware files and prepare storage if necessary**

During installation, you are asked to provide paths for the following Oracle Clusterware files. These files must be shared across all nodes of the cluster, either on Oracle ASM, or on a supported cluster file system:

- Voting disks are files that Oracle Clusterware uses to verify cluster node membership and status.
- Oracle Cluster Registry files (OCR) contain cluster and database configuration information for Oracle Clusterware.

If you intend to use Oracle Cluster File System for Windows (OCFS for Windows), then you are prompted to indicate which of the available disks you want to format with OCFS for Windows, what format type you want to use, and to what drive letter the formatted OCFS for Windows disk is mounted.

If your file system does not have external storage redundancy, then Oracle recommends that you provide two additional locations for the OCR disk and voting disks, for a total of at least three partitions. If the OCR and voting disks are not stored together, then you will need at least six partitions (three for the OCR and three for voting disks). Creating redundant storage locations protects the OCR

and voting disk if a failure occurs. To completely protect your cluster, the storage locations given for the copies of the OCR and voting disks should have completely separate paths, controllers, and disks, so that no single point of failure is shared by storage locations.

When you select to store the OCR on Oracle ASM, the default configuration is to create the OCR in one Oracle ASM disk group. If you create the disk group with normal or high redundancy, then the OCR is protected from physical disk failure.

To protect the OCR from logical disk failure, create another Oracle ASM disk group after installation and add the OCR to the second disk group using the `ocrconfig` command.

See Also:

- [Chapter 2, "Advanced Installation Oracle Grid Infrastructure for a Cluster Preinstallation Tasks"](#) and *Oracle Automatic Storage Management Administrator's Guide* for information about adding disks to disk groups
- [Chapter 3, "Configuring Storage for Oracle Grid Infrastructure and Oracle RAC"](#)

❑ **Disconnect all non-persistent drives**

Before starting the Oracle Grid Infrastructure installation on Windows, ensure that you disconnect all nonpersistent drives that are temporarily mounted on all the nodes. Alternatively, to access the shared drive, make the shared drive persistent using the following command:

```
net use * \\servername\sharename /persistent: YES
```

❑ **Disable Anti-Virus software**

Disable any anti-virus software running on cluster nodes before and for the entire duration of the Oracle Grid Infrastructure 11g Release 2 installation. If the system is restarted before the installation is complete, ensure the anti-virus software was not restarted before continuing with the installation. Anti-virus software can be re-enabled when the installation is complete.

❑ **Have intelligent platform management interface (IPMI) configuration completed and have IPMI administrator account information**

If you intend to use IPMI, then ensure baseboard management controller (BMC) interfaces are configured, and have an administration account username and password to provide when prompted during installation.

For nonstandard installations, if you must change the configuration on one or more nodes after installation (for example, if you have different administrator usernames and passwords for BMC interfaces on cluster nodes), then decide if you want to reconfigure the BMC interface, or modify IPMI administrator account information after installation, as described in [Chapter 5, "Oracle Grid Infrastructure Postinstallation Procedures"](#).

❑ **Ensure that the Oracle home path you select for the Grid home uses only American standard code for information interchange (ASCII) characters**

The use of non-ASCII characters in any part of the path for an Oracle Grid Infrastructure home (Grid home) or Oracle Database home is not supported. This restriction includes installation owner user names, which are used as a default for some home paths, as well as other directory names you may select for paths.

- ❑ **Unset Oracle environment variables.** If you have set `ORA_CRS_HOME` as an environment variable, then unset it before starting an installation or upgrade. You should never configure `ORA_CRS_HOME` as a user or system environment variable.

If you have had an existing installation on your system, and you are using the same user account to install this installation, then unset the following environment variables: `ORA_CRS_HOME`; `ORACLE_HOME`; `ORA_NLS10`; `TNS_ADMIN`

- ❑ **Decide if you want to use the Software Updates option.** OUI can install critical patch updates and system requirements updates for supported operating systems, and other significant updates that can help to ensure your installation proceeds smoothly. Oracle recommends that you enable software updates during installation.

If you choose to enable software updates, then during installation you must provide a valid My Oracle Support user name and password, so that OUI can download the latest updates, or you must provide a path to the location of an software updates packages that you have downloaded previously.

If you plan to run the installation in a secured data center, then you can download updates before starting the installation by starting OUI in update download mode on a system that has Internet access. To start OUI to download updates, enter the following command from the base directory of the installation media:

```
X:\> setup.exe -downloadUpdates
```

Provide the My Oracle Support user name and password, and provide proxy settings if needed. After you download the updates, transfer the update file to a directory on the server where you plan to run the installation.

4.2 Installing Oracle Grid Infrastructure

This section provides information about how to use OUI to install Oracle Grid Infrastructure. It contains the following sections:

- [Running OUI to Install Oracle Grid Infrastructure](#)
- [Performing a Silent Installation of Oracle Grid Infrastructure](#)

4.2.1 Running OUI to Install Oracle Grid Infrastructure

Complete the following steps to install Oracle Grid Infrastructure (Oracle Clusterware and Oracle ASM) on your cluster. You can run OUI from a Virtual Network Computing (VNC) session, or Terminal Services in console mode.

At any time during installation, if you have a question about what you are being asked to do, then click the **Help** button on the OUI page.

1. Log in to Windows using a member of the Administrators group and run the `setup.exe` command from the Oracle Database 11g Release 2 (11.2) installation media.

Note: After Oracle Grid Infrastructure is installed, renaming the software owner user account (for example, `oracle`) requires the cluster to be reconfigured, which requires downtime.

2. Provide information as prompted by OUI. If you need assistance during installation, then click **Help**. After the installation interview, you can click **Details** to see the log file.
3. After you have specified all the information needed for installation, OUI installs the software then runs Oracle Net Configuration Assistant (NETCA), Oracle Private Interconnect Configuration Assistant, and Cluster Verification Utility (CVU). These programs run without user intervention.
4. If you selected to Oracle ASM as the storage option for the OCR and voting disk files, then the Oracle Automatic Storage Management Configuration Assistant (ASMCA) configures Oracle ASM as part of the installation process. If you did not select Oracle ASM as the storage option for the Oracle Clusterware files, then you must start ASMCA manually after installation to configure Oracle ASM.

Start ASMCA using the following command, where *Grid_home* is the Grid home:

```
Grid_home\bin\asmca
```

When you have verified that your Oracle Grid Infrastructure installation has completed successfully, you can either use Oracle Clusterware to maintain high availability for other applications, or you can install Oracle Database software.

If you intend to install Oracle Database 11g Release 2 (11.2) with Oracle RAC, then see *Oracle Real Application Clusters Installation Guide for Microsoft Windows x64 (64-Bit)*. If you intend to use Oracle Grid Infrastructure on a standalone server (an Oracle Restart deployment), then refer to *Oracle Database Installation Guide for Microsoft Windows*.

See Also:

- *Oracle Clusterware Administration and Deployment Guide* for cloning Oracle Grid Infrastructure
- *Oracle Real Application Clusters Administration and Deployment Guide* for information about using cloning and node addition procedures for Oracle RAC nodes

4.2.2 Performing a Silent Installation of Oracle Grid Infrastructure

During installation of Oracle Grid Infrastructure, you are given the option either of providing cluster configuration information manually, or of using a cluster configuration file. A cluster configuration file is a text file that you can create before starting OUI, which provides OUI with information about the cluster name and node names that it requires to configure the cluster. When creating the text file, save the file with the extension `.ccf` because the installer only accepts a file of type of Oracle Cluster Configuration File (`.ccf`).

There are two steps involved when installing Oracle Grid Infrastructure using the silent method:

- [Creating a Cluster Configuration File](#)
- [Using a Configuration File to Install Oracle Grid Infrastructure](#)

4.2.2.1 Creating a Cluster Configuration File

The cluster configuration file should have the following syntax, where *node* is the name of the public host name for a node in the cluster, and *vip* is the VIP address for that node:

```
node      vip
```

```
node      vip
...
```

For example, if you have three nodes for your cluster, with host names RACnode1, RACnode2 and RACnode3, you could create a text file named `cluster_config.ccf`, with the following contents:

```
RACnode1  RACnode1-vip
RACnode2  RACnode2-vip
RACnode3  RACnode3-vip
```

Oracle suggests that you consider using a cluster configuration file if you intend to perform repeated installations on a test cluster, or if you intend to perform an installation on many nodes.

To create a cluster configuration file, perform the following steps:

1. On the installation media, and go to the directory `/response`.
2. Using a text editor, open the response file `grid_install.rsp`.
3. Follow the directions in the sections relevant to the type of installation you are performing, and supply values appropriate for your environment.

See Also: [Appendix B, "Installing and Configuring Oracle Grid Infrastructure Using Response Files"](#) for more information about using configuration files

4.2.2.2 Using a Configuration File to Install Oracle Grid Infrastructure

Complete the following procedure to perform a noninteractive (silent) installation:

1. Create a cluster configuration file as described in the previous section, "[Performing a Silent Installation of Oracle Grid Infrastructure](#)".
2. Use the following command syntax to run OUI in silent mode:

```
setup.exe -silent -responseFile path_to_your_response_file
```

For example:

```
E:\ setup.exe -silent -responseFile C:\users\oracle\installGrid.rsp
```

See Also: [Appendix B, "Installing and Configuring Oracle Grid Infrastructure Using Response Files"](#) for more information about performing silent installations using configuration files

4.3 Installing Oracle Grid Infrastructure Using a Software-Only Installation

A software-only installation consists of installing Oracle Grid Infrastructure for a cluster on one node. If you use the Install Grid Infrastructure Software Only option during installation, then the Oracle Grid Infrastructure software is installed on the local node. To complete the installation for your cluster, you must perform the additional steps of configuring Oracle Clusterware and Oracle ASM, creating a clone of the local installation, deploying this clone on other nodes, and then adding the other nodes to the cluster.

Note: Oracle recommends that only advanced users perform the software-only installation, because this installation method provides no validation of the installation and this installation option requires manual postinstallation steps to enable the Oracle Grid Infrastructure software.

If you select a software-only installation, then ensure that the Oracle Grid Infrastructure home path is identical on each cluster member node.

Performing a software-only installation involves the following steps:

1. [Installing Only the Oracle Grid Infrastructure Software](#)
2. Configuring the installed software using one of the following methods:
 - [Configuring the Software Binaries Using Configuration Wizard Mode of OUI](#)
 - [Configuring the Software Binaries Using a Response File](#)

4.3.1 Installing Only the Oracle Grid Infrastructure Software

To perform a software-only installation:

1. Log in to Windows using a member of the Administrators group and run the `setup.exe` command from the Oracle Grid Infrastructure 11g Release 2 (11.2) installation media or download directory.
2. Complete a software-only installation of Oracle Grid Infrastructure for a cluster on the first node, or the local node.
3. If you are using Oracle Grid Infrastructure release 11.2.0.1 or 11.2.0.2, then enable the Oracle RAC option for Oracle Grid infrastructure by renaming the `orac11.dll.dbl` file located in the `Grid_home\bin` directory to `orac11.dll`.
4. Verify that all of the cluster nodes meet the installation requirements using the command `runcluvfy.bat stage -pre crsinst -n node_list`. Ensure that you have completed all storage and server preinstallation requirements.
5. Use OUI as described in steps 1 through 4 to install the Oracle Grid Infrastructure software on every remaining node that you want to include in the cluster, and complete a software-only installation of Oracle Grid Infrastructure on every node.
6. If you installed Oracle Grid Infrastructure release 11.2.0.2 or later, then configure the cluster using the full OUI configuration wizard GUI as described in [Section 4.3.2, "Configuring the Software Binaries Using Configuration Wizard Mode of OUI."](#)

If you installed Oracle Grid Infrastructure release 11.2.0.1, then configure the cluster using a response file as described in [Appendix B, "Installing and Configuring Oracle Grid Infrastructure Using Response Files."](#)

4.3.2 Configuring the Software Binaries Using Configuration Wizard Mode of OUI

Starting with Oracle Grid Infrastructure release 11.2.0.2, you can configure the software binaries by starting Oracle Grid Infrastructure configuration wizard in GUI mode.

1. On one of the nodes, log in as a Local Administrator user, and enter the following command from the `crs\config` directory of the Grid home:

```
C:\..\crs\config> config.bat
```

The configuration script starts OUI in Configuration Wizard mode. Provide information as needed for configuration. Each page shows the same user interface and performs the same validation checks that OUI normally does. However, instead of running an installation, The configuration wizard mode validates inputs and configures the installation on all cluster nodes.

2. When you complete inputs, OUI shows you the Summary page, listing all inputs you have provided for the cluster. Verify that the summary has the correct information for your cluster, and click **Install** to start configuration of the local node.

When configuration of the local node is complete, OUI copies the Oracle Grid Infrastructure configuration file to other cluster member nodes.

3. Run any scripts, if prompted.
4. OUI checks the cluster configuration status, and starts other configuration tools as needed.

4.3.3 Configuring the Software Binaries Using a Response File

When you install or copy Oracle Grid Infrastructure software on any node, you can defer configuration for a later time. This section provides the procedure for completing configuration after the software is installed or copied on nodes, using the configuration wizard utility (`config.bat`), which is available starting with Oracle Grid Infrastructure release 11.2.0.2.

To configure Oracle Grid Infrastructure for a cluster using a response file:

1. As the Oracle Grid Infrastructure installation owner (`grid`), start OUI in Oracle Grid Infrastructure configuration wizard mode from the Oracle Grid Infrastructure software-only home using the following syntax, where `Grid_home` is the Oracle Grid Infrastructure home:

```
Grid_home\crs\config\config.bat [-debug]
```

The configuration script starts OUI in Configuration Wizard mode. Each page shows the same user interface and performs the same validation checks that OUI normally does. However, instead of running an installation, the configuration wizard mode validates inputs and configures the installation on all cluster nodes.

2. When you complete inputs, OUI shows you the Summary page, listing all inputs you have provided for the cluster. Verify that the summary has the correct information for your cluster, and click **Install** to start configuration of the local node.

When configuration of the local node is complete, OUI copies the Oracle Grid Infrastructure configuration file to other cluster member nodes.

3. OUI checks the cluster configuration status, and starts other configuration tools as needed.

To configure and activate a software-only Oracle Grid Infrastructure installation for a standalone server, refer to *Oracle Database Installation Guide for Microsoft Windows*.

4.3.4 Configuring the Software Binaries in Silent Mode Using a Response File

This section provides the procedure for completing configuration after the software is installed or copied on nodes, using the configuration wizard utility (`config.bat`) in

silent (non-response) mode. The configuration wizard utility is available starting with Oracle Grid Infrastructure release 11.2.0.2.

To configure Oracle Grid Infrastructure for a cluster in silent mode using a cluster configuration file:

1. As the Oracle Grid Infrastructure installation owner (*grid*), start OUI in Oracle Grid Infrastructure configuration wizard mode from the Oracle Grid Infrastructure software-only home using the following syntax, where *Grid_home* is the Oracle Grid Infrastructure home, and *filename* is the response file name, as shown in the following example:

```
C:\> cd app\11.2.0\grid\crs\config
C:\> config.bat -responseFile C:\app\11.2.0\grid\response\grid_install.rsp
```

The wizard validates the cluster configuration file and proceeds with the configuration. If any of the inputs in the cluster configuration file are found to be invalid, then the Configuration Wizard displays an error and exits. Run the `configToolAllCommands` scripts as prompted.

2. When configuration of the local node is complete, OUI copies the Oracle Grid Infrastructure configuration file to other cluster member nodes.
3. OUI checks the cluster configuration status, and starts other configuration tools as needed.

4.4 Confirming Oracle Clusterware Function

After installation, log in as a member of the Administrators group, and run the following command from the `bin` directory in the Grid home to confirm that your Oracle Clusterware installation is installed and running correctly:

```
crsctl check cluster -all
```

Example 4-1 Checking the Status of Oracle Clusterware

To check the status of the Oracle Clusterware components on each node of your cluster, run the following command:

```
C:\..\bin> crsctl check cluster -all
```

The output for this command is similar to the following:

```
*****
node1:
CRS-4537: Cluster Ready Services is online
CRS-4529: Cluster Synchronization Services is online
CRS-4533: Event Manager is online
*****
node2:
CRS-4537: Cluster Ready Services is online
CRS-4529: Cluster Synchronization Services is online
CRS-4533: Event Manager is online
*****
```

4.5 Confirming Oracle ASM Function for Oracle Clusterware Files

If you installed the OCR and voting disk files on Oracle ASM, then run the following command from the `Grid_home\bin` directory to confirm that your Oracle ASM software is operational:

```
srvctl status asm
```

Oracle ASM is running only if it is needed for Oracle Clusterware files. If you did not configure Oracle Clusterware storage on Oracle ASM during installation, then the Oracle ASM instance should be down.

Example 4–2 *Checking the Status of Oracle ASM After Installing Oracle Grid Infrastructure*

To verify that your Oracle ASM installation is operational, run the following command, replacing `C:\app\11.2.0\grid` with the location of your Grid home. The text below the command is an example of the output returned by the command.

```
C:\app\11.2.0\grid\BIN> srvctl status asm
ASM is running on node node1
ASM is running on node node2
```

Note: To manage Oracle ASM or Oracle Net Services on Oracle Clusterware 11g Release 2 (11.2) or later installations, use the `srvctl` binary in the Oracle Grid Infrastructure home for a cluster (Grid home). If you have Oracle RAC or Oracle Database installed, then you cannot use the `srvctl` program in the database home (Oracle home) to manage Oracle ASM or Oracle Net Services.

4.6 Understanding Offline Processes in Oracle Grid Infrastructure

Oracle Grid Infrastructure provides required resources for various Oracle products and components. Some of those products and components are optional, so you can install and enable them after installing Oracle Grid Infrastructure. To simplify postinstallation additions, Oracle Grid Infrastructure preconfigures and registers all required resources for all products available for these products and components, but only activates them when you choose to add them. As a result, some components may be listed as OFFLINE after the installation of Oracle Grid Infrastructure.

Resources listed as TARGET:OFFLINE and STATE:OFFLINE do not need to be monitored. They represent components that are registered, but not enabled, so they do not use any system resources. If an Oracle product or component is installed on the system, and it requires a particular resource to be online, then the software will prompt you to activate the required offline resource.

Oracle Grid Infrastructure Postinstallation Procedures

This chapter describes how to complete the postinstallation tasks after you have installed the Oracle Grid Infrastructure software.

This chapter contains the following topics:

- [Required Postinstallation Tasks](#)
- [Recommended Postinstallation Tasks](#)
- [Using Earlier Oracle Database Versions with Grid Infrastructure](#)
- [Modifying Oracle Clusterware Binaries After Installation](#)

5.1 Required Postinstallation Tasks

You must perform the following tasks after completing your installation:

- [Download and Install Patch Updates](#)
- [Configure Exceptions for the Windows Firewall](#)

Note: In prior releases, backing up the voting disks using the `ocopy.exe` command was a required postinstallation task. With Oracle Clusterware 11g Release 2 (11.2) and later releases, backing up a voting disk is no longer required.

5.1.1 Download and Install Patch Updates

Refer to the My Oracle Support web site for required patch updates for your installation.

Note: Browsers require an Adobe Flash plug-in, version 9.0.115 or higher to use My Oracle Support. Check your browser for the correct version of Flash plug-in by going to the Adobe Flash checker page, and installing the latest version of Adobe Flash.

If you do not have Flash installed, then download the latest version of the Flash Player from the Adobe web site:

<http://www.adobe.com/go/getflashplayer>

On a regular basis Oracle provides patch sets that include generic and port specific fixes encountered by customers since the base product was released. Patch sets increment the 4th digit of the version number e.g. 10.2.0.1.0 to 10.2.0.4.0, these patch sets are fully regression tested in the same way that the base release is (i.e. 10.2.0.1.0). Customers are encouraged to apply these fixes.

If a customer encounters a critical problem that requires a fix prior to the next patch set becoming available, they can request that a one off fix is made available on top of the latest patch set. This delivery mechanism is similar to the Microsoft Hot Fixes and is known as an Oracle patch set exception (or interim patch). Unlike Unix platforms these patch set exceptions are delivered in a **patch set exception bundle** (cumulative patch bundle), which includes all fixes since the current patch set. For example, bug 12393432 is a patch set exception bundle, Patch 12, for Oracle Database release 11.2.0.1 for Microsoft Windows (x64). You should always apply the latest patch bundle available for your release.

The patch set exception bundles also include the fixes for the CPU (Critical Patch Update), DST (Daylight Saving Time), PSU (Patch Set Update) and Recommended Patch Bundles. It is not required to have previous security patches applied before applying the patch set exception bundle. However, you must be on the stated patch set level for a given product home before applying the patch set exception bundle for that release.

To download required patch updates:

1. Use a web browser to view the My Oracle Support web site:

<https://support.oracle.com>

2. Log in to My Oracle Support web site.

Note: If you are not a My Oracle Support registered user, then click **Register Here** to register.

3. On the main My Oracle Support page, click **Patches & Updates**.
4. To search for patch sets, perform the following steps:
 - a. Click the **Latest Patch sets** link on the left side of the page, under the heading Oracle Server/Tools.

The Quick Links page appears in a new browser window or tab.
 - b. Click **Simple Search**.
 - c. Set the Search By field to **Product or Family**. Click the flashlight icon next to the adjacent text field. In the popup window, in the text field next to All Products, type "%Oracle Database%", then click **Go**.
 - d. Select **Oracle Database Family** from the list, then click **Select** to return to the Simple Search window.
 - e. Choose a value for Patch set release, for example, **Oracle 11.2.0.2.0**.

Note: The Patch set release is one greater than your current software release. For example, if your current software release is Oracle 10.2.0.3, then the Patch set release would Oracle 10.2.0.4.

- f. For the Patch Type, select **Patch set/Minipack**.

- g. For the Platform or Language, select **Microsoft Windows x64 (64-bit)**.
 - h. Click **Go**. Continue with Step 6.
5. To search for patches, perform the following steps:
 - a. On the right side of the page, in the Patch Search section, select **Product or Family (Advanced Search)**.
 - b. In the Product or Family Search section, select **Oracle Database** for the Product and Oracle 11.2.0.1.0 (Oracle Database) for the Release. If you have applied any of the bundle patches, then used the modified database version, for example 11.2.0.1.3, instead of the base version number (11.2.0.1.0).
 - c. If a search filter for Platform is visible, select **Microsoft Windows x64 (64-bit)** for the Platform. If this search filter is not visible, either add this search filter, or select Platform from the drop-down list for the last search filter line.
 - d. Click **Search**.
A list of all available patches for the specified Oracle Database release on Microsoft Windows x64 platforms is displayed.
 - e. (Optional) To locate patches specific to Oracle RAC or Oracle Grid Infrastructure, click Edit Search. When returned to the Product or Family Search window, add a filter for Patch Target, and set the value to Real Application Clusters.

Note: Because Oracle RAC is an option of the Oracle Database software, patches that apply to Oracle Database also apply to Oracle RAC databases.

6. Click the patch number to view the patch description and access the README file for the patch. You can also download the patch from this page.
7. Click **Read Me** to view the patch instructions. The README page is opened in a separate browser window or tab. The README file contains information about the patch, a list of bugs fixed by this patch, and how to apply the patch to your installation.
Close the tab or window to return to the previous page.
8. Click **Download**, and save the patch file on your system.
9. Use the unzip utility provided with your Oracle software to uncompress the Oracle patch updates that you download from My Oracle Support. The unzip utility is located in the *Grid_home*\BIN directory.
10. Refer to [Appendix D, "How to Upgrade to Oracle Grid Infrastructure 11g Release 2"](#) for information about how to stop database processes in preparation for installing patches.

5.1.2 Configure Exceptions for the Windows Firewall

If the Windows Firewall feature is enabled on one or more of the nodes in your cluster, then virtually all transmission control protocol (TCP) network ports are blocked to incoming connections. As a result, any Oracle product that listens for incoming connections on a TCP port will not receive any of those connection requests and the clients making those connections will report errors.

You must configure exceptions for the Windows Firewall if your system meets all of the following conditions:

- Oracle server-side components are installed on a computer running a supported version of Microsoft Windows. The list of components includes the Oracle Database, Oracle Grid Infrastructure, Oracle Real Application Clusters (Oracle RAC), network listeners, or any web servers or services.
- The Windows computer in question accepts connections from other computers over the network. If no other computers connect to the Windows computer to access the Oracle software, then no post-installation configuration steps are required and the Oracle software functions as expected.
- The Windows computer in question is configured to run the Windows Firewall. If the Windows Firewall is not enabled, then no post-installation configuration steps are required.

If all of the above conditions are met, then the Windows Firewall must be configured to allow successful incoming connections to the Oracle software. To enable Oracle software to accept connection requests, Windows Firewall must be configured by either opening up specific static TCP ports in the firewall or by creating exceptions for specific executables so they can receive connection requests on any ports they choose. This firewall configuration can be done by one of the following methods:

- Start the Windows Firewall application, select the **Exceptions** tab and then click either **Add Program** or **Add Port** to create exceptions for the Oracle software.
- From the command prompt, use the `netsh firewall add...` command.
- When Windows notifies you that a foreground application is attempting to listen on a port, and gives you the opportunity to create an exception for that executable. If you choose the create the exception in this way, the effect is the same as creating an exception for the executable either through Control Panel or from the command line.

The following sections list the Oracle Database 11g Release 2 executables that listen on TCP ports on Windows, along with a brief description of the executable. It is recommended that these executables (if in use and accepting connections from a remote, client computer) be added to the exceptions list for the Windows Firewall to ensure correct operation. In addition, if multiple Oracle homes are in use, firewall exceptions may have to be created for the same executable, for example, `oracle.exe`, multiple times, once for each Oracle home from which that executable loads.

- [Firewall Exceptions for Oracle Database](#)
- [Firewall Exceptions for Oracle Database Examples \(or the Companion CD\)](#)
- [Firewall Exceptions for Oracle Gateways](#)
- [Firewall Exceptions for Oracle Clusterware and Oracle ASM](#)
- [Firewall Exceptions for Oracle RAC Database](#)
- [Firewall Exceptions for Oracle Cluster File System for Windows](#)
- [Firewall Exceptions for Other Oracle Products](#)

See Also: [Section A.12, "Troubleshooting Windows Firewall Exceptions"](#)

5.1.2.1 Firewall Exceptions for Oracle Database

For basic database operation and connectivity from remote clients, such as SQL*Plus, Oracle Call Interface (OCI), Open Database Connectivity (ODBC), Object Linking and Embedding database (OLE DB) applications, and so on, the following executables must be added to the Windows Firewall exception list:

- *Oracle_home\bin\oracle.exe* - Oracle Database executable
- *Oracle_home\bin\tnslsnr.exe* - Oracle Listener

If you use remote monitoring capabilities for your database, the following executables must be added to the Windows Firewall exception list:

- *Oracle_home\bin\emagent.exe* - Oracle Database Control
- *Oracle_home\jdk\bin\java.exe* - Java Virtual Machine (JVM) for Enterprise Manager Database Control

5.1.2.2 Firewall Exceptions for Oracle Database Examples (or the Companion CD)

After installing the Oracle Database Companion CD, the following executables must be added to the Windows Firewall exception list:

- *Oracle_home\opmn\bin\opmn.exe* - Oracle Process Manager
- *Oracle_home\jdk\bin\java.exe* - JVM

5.1.2.3 Firewall Exceptions for Oracle Gateways

If your Oracle database interacts with non-Oracle software through a gateway, then you must add the gateway executable to the Windows Firewall exception list.

[Table 5–1](#) lists the gateway executables used to access non-Oracle software.

Table 5–1 Oracle Executables Used to Access Non-Oracle Software

Executable Name	Description
<i>omtsreco.exe</i>	Oracle Services for Microsoft Transaction Server
<i>dg4sybs.exe</i>	Oracle Database Gateway for Sybase
<i>dg4tera.exe</i>	Oracle Database Gateway for Teradata
<i>dg4msql.exe</i>	Oracle Database Gateway for SQL Server
<i>dg4db2.exe</i>	Oracle Database Gateway for Distributed Relational Database Architecture (DRDA)
<i>pg4arv.exe</i>	Oracle Database Gateway for Advanced Program to Program Communication (APPC)
<i>pg4t4ic.exe</i>	Oracle Database Gateway for APPC
<i>dg4mqs.exe</i>	Oracle Database Gateway for WebSphere MQ
<i>dg4mqc.exe</i>	Oracle Database Gateway for WebSphere MQ
<i>dg4odbc.exe</i>	Oracle Database Gateway for ODBC

5.1.2.4 Firewall Exceptions for Oracle Clusterware and Oracle ASM

If you installed the Oracle Grid Infrastructure software on the nodes in your cluster, then you can enable the Windows Firewall only *after* adding the following executables and ports to the Firewall exception list. The Firewall Exception list must be updated on each node.

- *Grid_home\bin\gpnpd.exe* - Grid Plug and Play daemon

- *Grid_home\bin\oracle.exe* - Oracle Automatic Storage Management (Oracle ASM) executable (if using Oracle ASM for storage)
- *Grid_home\bin\racgvip.exe* - Virtual Internet Protocol Configuration Assistant
- *Grid_home\bin\evmd.exe* - OracleEVMSERVICE
- *Grid_home\bin\crsd.exe* - OracleCRSERVICE
- *Grid_home\bin\ocssd.exe* - OracleCSSERVICE
- *Grid_home\bin\octssd.exe* - Cluster Time Synchronization Service daemon
- *Grid_home\bin\mDNSResponder.exe* - multicast-domain name system (DNS) Responder Daemon
- *Grid_home\bin\gipc.d.exe* - Grid inter-process communication (IPC) daemon
- *Grid_home\bin\gnsd.exe* - Grid Naming Service (GNS) daemon
- *Grid_home\bin\ohasd.exe* - OracleOHSERVICE
- *Grid_home\bin\TNLSNR.EXE* - single client access name (SCAN) listener and local listener for Oracle RAC database and Oracle ASM
- *Grid_home\opmn\bin\ons.exe* - Oracle Notification Service (ONS)
- *Grid_home\jdk\jre\bin\java.exe* - JVM

5.1.2.5 Firewall Exceptions for Oracle RAC Database

For the Oracle RAC database, the executables that require exceptions are:

- *Oracle_home\bin\oracle.exe* - Oracle RAC database instance
- *Oracle_home\bin\emagent.exe* - Oracle Enterprise Manager agent
- *Oracle_home\jdk\bin\java.exe* - For the Oracle Enterprise Manager Database Console

In addition, the following ports should be added to the Windows Firewall exception list:

- Microsoft file sharing system management bus (SMB)
 - User Datagram Protocol (UDP) ports from 135 through 139
 - TCP ports from 135 through 139
- Direct-hosted SMB traffic without a network basic I/O system (NetBIOS)
 - port 445 (TCP and UPD)

5.1.2.6 Firewall Exceptions for Oracle Cluster File System for Windows

If you use Oracle Cluster File System for Windows (OCFS for Windows) to store the Oracle Clusterware files, or Oracle RAC database files, then you must add the following exceptions to the Windows Firewall:

- *Grid_home\cfs\Ocfsfindvol.exe* - OCFS for Windows Volume Service
- *%WINDOWS_HOME%\system32\drivers\Ocfs.sys* - System file for OCFS (if using OCFS for Windows for Oracle Clusterware storage)

5.1.2.7 Firewall Exceptions for Other Oracle Products

In addition to all the previously listed exceptions, if you use any of the Oracle software listed in, then you must create an exception for Windows Firewall for the associated executable.

Table 5–2 Other Oracle Software Products Requiring Windows Firewall Exceptions

Oracle Software Product	Executable Name
Data Guard Manager	dgmgrl.exe
Oracle Internet Directory lightweight directory access protocol (LDAP) Server	oidldapd.exe
External Procedural Calls	extproc.exe

5.2 Recommended Postinstallation Tasks

Oracle recommends that you complete the following tasks as needed after installing Oracle Grid Infrastructure:

- [Install Troubleshooting Tool](#)
- [Optimize Memory Usage for Programs](#)
- [Create a Fast Recovery Area Disk Group](#)

5.2.1 Install Troubleshooting Tool

To address troubleshooting issues, Oracle recommends that you install Instantaneous Problem Detection OS Tool (IPD/OS). This utility is available on Oracle Technology Network (OTN) for Oracle Grid Infrastructure 11.2.0.1 installations.

Note: With the Oracle Grid Infrastructure 11g Release 2 (11.2) release, the IPD/OS utility was updated and renamed to Cluster Health Monitor (CHM). CHM is not available for Windows platforms until Oracle Grid Infrastructure release 11.2.0.3, and IPD/OS is not compatible with the first patch set release of Oracle Grid Infrastructure 11g Release 2 (11.2.0.2).

5.2.1.1 Installing Instantaneous Problem Detection OS Tool (IPD/OS)

On Windows systems running Windows Server 2003 with service pack 2 or higher, you can install IPD/OS. IPD/OS supports both x86 and x64 installations.

Note: If you already have IPD/OS installed on your cluster, then you will have to remove the current version before installing the new version.

The IPD/OS tool is designed to detect and analyze operating system and cluster resource-related degradation and failures. The tool can provide better explanations for many issues that occur in clusters where Oracle Clusterware and Oracle RAC are running, such as node evictions. It tracks the operating system resource consumption at each node, process, and device level continuously. It collects and analyzes clusterwide data. In real time mode, when thresholds are reached, an alert is shown to

the operator. For root cause analysis, historical data can be replayed to understand what was happening at the time of failure.

You can download IPD/OS by clicking the link titled **Cluster Health Monitor - Download** at the following URL:

<http://www.oracle.com/technetwork/database/clustering/overview/index.html>

To prevent performance problems, you cannot run the graphical user interface (GUI) interface for IPD/OS on the Oracle RAC node. You can install the client on any Linux or Windows client that is not a cluster member node. From this client you can view the data.

See Also: The README file for IPD/OS for more information about installing the IPD/OS tool and client

5.2.2 Optimize Memory Usage for Programs

The Windows operating system should be optimized for Memory Usage of 'Programs' instead of 'System Caching'. To modify the memory optimization settings, perform the following steps:

1. From the Start Menu, select **Control Panel**, then **System**.
2. In the System Properties window, click the **Advanced** tab.
3. In the Performance section, click **Settings**.
4. In the Performance Options window, click the **Advanced** tab.
5. In the Memory Usage section, make sure Programs is selected.

5.2.3 Create a Fast Recovery Area Disk Group

During installation of Oracle Grid Infrastructure, if you select Oracle ASM for storage, a single disk group is created to store the Oracle Clusterware files. If you plan to create a single-instance database, an Oracle RAC database, or an Oracle RAC One Node database, then this disk group can also be used to store the data files for the database. However, you should create a separate disk group for the fast recovery area.

5.2.3.1 About the Fast Recovery Area and the Fast Recovery Area Disk Group

The fast recovery area is a unified storage location for all Oracle Database files related to recovery. Database administrators can define the `DB_RECOVERY_FILE_DEST` parameter to the path for the Fast Recovery Area to enable on-disk backups, and rapid recovery of data. Enabling rapid backups for recent data can reduce requests to system administrators to retrieve backup tapes for recovery operations.

When you enable the fast recovery area in the database initialization parameter file, all RMAN backups, archive logs, control file automatic backups, and database copies are written to the fast recovery area. RMAN automatically manages files in the fast recovery area by deleting obsolete backups and archive files that are no longer required for recovery.

To use a fast recovery area in Oracle RAC, you must place it on an Oracle ASM disk group, a cluster file system, or on a shared directory that is configured through Direct network file system (NFS) for each Oracle RAC instance. In other words, the fast recovery area must be shared among all of the instances of an Oracle RAC database. Oracle Clusterware files and Oracle Database files can be placed on the same disk group as fast recovery area files. However, Oracle recommends that you create a separate fast recovery area disk group to reduce storage device contention.

The fast recovery area is enabled by setting the parameter `DB_RECOVERY_FILE_DEST` to the same value on all instances. The size of the fast recovery area is set with the parameter `DB_RECOVERY_FILE_DEST_SIZE`. As a general rule, the larger the fast recovery area, the more useful it becomes. For ease of use, Oracle recommends that you create a fast recovery area disk group on storage devices that can contain at least three days of recovery information. Ideally, the fast recovery area should be large enough to hold a copy of all of your data files and control files, the online redo logs, and the archived redo log files needed to recover your database using the data file backups kept under your retention policy.

Multiple databases can use the same fast recovery area. For example, assume you have created one fast recovery area disk group on disks with 150 gigabyte (GB) of storage, shared by three different databases. You can set the size of the fast recovery area for each database depending on the importance of each database. For example, if `database1` is your least important database, `database2` is of greater importance and `database3` is of greatest importance, then you can set different `DB_RECOVERY_FILE_DEST_SIZE` settings for each database to meet your retention target for each database: 30 GB for `database1`, 50 GB for `database2`, and 70 GB for `database3`.

See Also: *Oracle Automatic Storage Management Administrator's Guide*

5.2.3.2 Creating the Fast Recovery Area Disk Group

To create an Oracle ASM disk group for the fast recovery area:

1. Navigate to the bin directory in the Grid home and start Oracle ASM Configuration Assistant (ASMCA). For example:

```
C:\> cd app\11.2.0\grid\bin
C:\> asmca
```

2. ASMCA opens at the Disk Groups tab. Click **Create** to create a new disk group
3. The Create Disk Groups window opens.

In the Disk Group Name field, enter a descriptive name for the fast recovery area disk group, for example, FRA.

In the Redundancy section, select the level of redundancy you want to use.

In the Select Member Disks field, select eligible disks to be added to the fast recovery area, and click **OK**.

4. The Diskgroup Creation window opens to inform you when disk group creation is complete. Click **OK**.
5. Click **Exit**.

5.3 Using Earlier Oracle Database Versions with Grid Infrastructure

Review the following sections for information about using earlier Oracle Database releases with Oracle Grid Infrastructure 11g Release 2 (11.2) installations:

- [General Restrictions for Using Earlier Oracle Database Versions](#)
- [Using ASMCA to Administer Disk Groups for Earlier Database Versions](#)
- [Using DBCA or Applying Patches for Oracle Database Releases 10.2.x or 11.x](#)
- [Pinning Cluster Nodes for Oracle Database Release 10.2.x or 11.x](#)
- [Using the Correct LSNRCTL Commands](#)

- [Starting and Stopping Oracle Clusterware Resources](#)

5.3.1 General Restrictions for Using Earlier Oracle Database Versions

You can use Oracle Database release 10.2 and release 11.1 with Oracle Clusterware and Oracle ASM release 11.2. If you upgrade an existing version of Oracle Clusterware and Oracle ASM to Oracle Grid Infrastructure 11g Release 2 (which includes Oracle Clusterware and Oracle ASM), and you also plan to upgrade your Oracle RAC database to Oracle Database 11g Release 2, then the required configuration of the existing databases is completed automatically when you complete the Oracle RAC upgrade, and this section does not concern you.

Note: Refer to *Oracle Automatic Storage Management Administrator's Guide* for details on configuring disk group compatibility for databases using Oracle Database versions 11.1 or earlier with Oracle Grid Infrastructure 11.2.

However, if you upgrade to Oracle Grid Infrastructure 11g Release 2, and you have existing Oracle RAC installations that you do not plan to upgrade, or if you install earlier versions of Oracle RAC (10.2 or 11.1) on a cluster running Oracle Grid Infrastructure 11g Release 2, then you must complete additional configuration tasks or apply patches, or both, before the earlier database versions will work correctly with Oracle Grid Infrastructure.

Oracle Database homes can be stored on Oracle ACFS only if the database version is Oracle Database 11g Release 2. Earlier releases of Oracle Database cannot be installed on Oracle ACFS because these releases were not designed to use Oracle ACFS.

Note: Before you start an Oracle RAC or Oracle Database install on an Oracle Clusterware release 11.2 installation, if you are upgrading from releases 11.1.0.7, 11.1.0.6, and 10.2.0.4, then Oracle recommends that you check for the latest recommended patches for the release you are upgrading from, and install those patches as needed on your existing database installations before upgrading.

For more information on recommended patches, refer to "Oracle Upgrade Companion," which is available through Note 785351.1 on My Oracle Support:

<https://metalink.oracle.com>

You can also refer to the *Oracle Database Readme* and Oracle Support Notes 756388.1 and 756671.1 for the current list of recommended patches for each release.

See Also: [Section 5.1.1, "Download and Install Patch Updates"](#)

5.3.2 Using ASMCA to Administer Disk Groups for Earlier Database Versions

Use Oracle ASM Configuration Assistant (ASMCA) to create and modify disk groups when you install earlier Oracle Database and Oracle RAC releases on Oracle Grid Infrastructure 11g installations. Starting with Oracle Grid Infrastructure 11g Release 2, Oracle ASM is installed as part of an Oracle Grid Infrastructure installation, with

Oracle Clusterware. You can no longer use Database Configuration Assistant (DBCA) to perform administrative tasks on Oracle ASM.

5.3.3 Using DBCA or Applying Patches for Oracle Database Releases 10.2.x or 11.x

Before you use DBCA to create an Oracle RAC or Oracle Database 10.2.x or 11.1.x database on an Oracle Clusterware and Oracle ASM release 11.2 installation, you must install patches to the Oracle RAC or Oracle Database home. Refer to the *Oracle Database Readme* for information about specific patches.

See Also: [Section 5.1.1, "Download and Install Patch Updates"](#)

If you are using Oracle Database 10g Release 2 software or Oracle Database 11g Release 1 software, then before you create a new database or apply any patches to your Oracle home, you must first stop the OracleRemExecService Windows service on all the nodes in your cluster. If you do not stop this process before creating a database or applying patches to your Oracle home, then OPatch or DBCA fails to start the Oracle RAC database instances on the remote nodes. This failure causes the database creation or patching operation to return errors.

5.3.4 Pinning Cluster Nodes for Oracle Database Release 10.2.x or 11.x

When Oracle Clusterware 11g Release 2 is installed on a cluster with no previous Oracle software version, it configures the cluster nodes dynamically, which is compatible with Oracle Database Release 11.2 and later, but Oracle Database 10g and 11.1 require a persistent configuration. Creating a persistent configuration for a node is called **pinning a node**.

Note: During an upgrade, all cluster member nodes are pinned automatically, and no manual pinning is required for existing databases. Pinning nodes is required only if you install earlier Oracle Database releases after installing Oracle Grid Infrastructure 11g Release 2 (11.2) software.

To pin a node in preparation for installing or using an earlier Oracle Database version, use `Grid_home\bin\crsctl` with the following format, where *nodes* is a space-delimited list of one or more nodes in the cluster whose configuration you want to pin:

```
crsctl pin css -n nodes
```

To determine if a node is in a pinned or unpinned state, use the `Grid_home\bin\olsnodes` command:

```
olsnodes -t -n
```

Example 5–1 Pinning Nodes in a Cluster Prior to Using an Earlier Oracle Database Release

If you plan to create an Oracle Database 10g Release 2 on nodes `node3` and `node4` of your cluster, then you need to pin those nodes. To pin nodes `node3` and `node4`, log in as an Administrator user and enter the following command:

```
C:\..\bin> crsctl pin css -n node3 node4
```

Example 5-2 Listing the Pinned Nodes in Your Cluster

To list all pinned nodes in your cluster, use the following command, where *Grid_home* is the path for your Oracle Grid Infrastructure installation:

```
C:\> Grid_home\bin\olsnodes -t -n
```

This command produces output similar to the following:

```
node1 1      Pinned
node2 2      Pinned
node3 3      Pinned
node4 4      Pinned
```

Example 5-3 Determining if an Individual Node is Pinned

To list the state of a particular node use the `-n` option with the `olsnodes` command, where *Grid_home* is the path for your Oracle Grid Infrastructure installation:

```
C:\> Grid_home\bin\olsnodes -t -n node3
```

This command produces output similar to the following:

```
node3 3      Pinned
```

See Also: *Oracle Clusterware Administration and Deployment Guide* for more information about pinning and unpinning nodes

5.3.5 Using the Correct LSNRCTL Commands

To administer local and SCAN listeners using the Listener Control utility (LSNRCTL) in Oracle Clusterware and Oracle ASM 11g Release 2, use the `lsnrctl` program located in the Grid home. Do not attempt to use the `lsnrctl` programs from Oracle home locations for previous releases because they cannot be used with the new release.

5.3.6 Starting and Stopping Oracle Clusterware Resources

Before shutting down Oracle Clusterware 11g Release 2, if you have an Oracle Database 10g Release 2 or Oracle Database 11g Release 1 database registered with Oracle Clusterware, then you must do one of the following:

- Stop the Oracle Database 10g Release 2 or Oracle Database 11g Release 1 database instances first, then stop the Oracle Clusterware stack
- Use the `crsctl stop crs -f` command to shut down the Oracle Clusterware stack and ignore any errors that are raised

5.4 Modifying Oracle Clusterware Binaries After Installation

After installation, if you must modify the software installed in your Grid home, then you must first stop the Oracle Clusterware stack. For example, to apply a one-off patch or modify any of the dynamic-link libraries (DLLs) used by Oracle Clusterware or Oracle ASM, you must follow these steps to stop and restart Oracle Clusterware.

Caution: To put the changes you make to the Oracle Grid Infrastructure home into effect, you must shut down all executables that run in the Grid home directory and then restart them. In addition, shut down any applications that use Oracle shared libraries or DLL files in the Grid home.

Prepare the Oracle Grid Infrastructure home for modification using the following procedure:

1. Log in using a member of the Administrators group and go to the directory *Grid_home\bin*, where *Grid_home* is the path to the Oracle Grid Infrastructure home.
2. Shut down Oracle Clusterware using the following command:

```
C:\..\bin> crsctl stop crs -f
```
3. After Oracle Clusterware is completely shut down, perform the updates to the software installed in the Grid home.
4. Use the following command to restart Oracle Clusterware:

```
C:\..\bin> crsctl start crs
```
5. Repeat steps 1 through 4 on each cluster member node.

How to Modify or Deinstall Oracle Grid Infrastructure

This chapter describes how to remove or deconfigure Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM) software from your server.

This chapter contains the following topics:

- [Deciding When to Deinstall Oracle Clusterware](#)
- [Migrating Standalone Grid Infrastructure Servers to a Cluster](#)
- [Changing the Oracle Grid Infrastructure Home Path](#)
- [Deconfiguring Oracle Clusterware Without Removing the Software](#)
- [Removing Oracle Clusterware and Oracle ASM Software](#)

See Also: Product-specific documentation for requirements and restrictions to remove an individual product

6.1 Deciding When to Deinstall Oracle Clusterware

Remove installed components in the following situations:

- You have successfully installed Oracle Clusterware, and you want to remove the Oracle Clusterware installation, either in an educational environment, or a test environment.
- You have encountered errors during or after installing or upgrading Oracle Clusterware, and you want to reattempt an installation.
- Your installation or upgrade stopped because of a hardware or operating system failure.
- You are advised by Oracle Support to reinstall Oracle Clusterware.

6.2 Migrating Standalone Grid Infrastructure Servers to a Cluster

If you have an Oracle Database installation using Oracle Restart (an Oracle Grid Infrastructure installation for a standalone server), and you want to configure that server as a cluster member node, then complete the following tasks:

1. Inspect the Oracle Restart configuration with the Server Control (SRVCTL) utility using the following syntax, where *db_unique_name* is the unique name for the database, and *lsnrname* is the name of the listener for the database:

```
srvctl config database -d db_unique_name
srvctl config service -d db_unique_name
```

```
srvctl config listener -l lsnrname
```

Write down the configuration information for the server, because you will need this information in a later step.

2. Stop all of the databases, services, and listeners that you discovered in step 1.
3. If present, unmount all Oracle ASM Cluster File System (Oracle ACFS) file systems.
4. Go to the directory *Grid_home*\crs\install, where *Grid_home* is the location of your Oracle Grid Infrastructure home (Grid home) directory, for example:


```
C:\> cd app\11.2.0\grid\crs\install
```
5. Deconfigure and deinstall the Oracle Grid Infrastructure installation for a standalone server (Oracle Restart) using the following command:


```
C:\..\install> C:\app\11.2.0\grid\perl\bin\perl.exe roothas.pl -deconfig
```
6. Prepare the server for Oracle Clusterware configuration, as described in either [Chapter 1, "Typical Installation for Oracle Grid Infrastructure for a Cluster"](#) or [Chapter 2, "Advanced Installation Oracle Grid Infrastructure for a Cluster Preinstallation Tasks"](#).
7. If you are using Oracle Grid Infrastructure release 11.2.0.2 or higher, then, as the Oracle Grid Infrastructure installation owner, run Oracle Clusterware Configuration Wizard. Save and stage the response file. For the `-responseFile` parameter, specify the full path name where the response file should be written by the Oracle Clusterware Configuration Wizard, for example:


```
C:\..\crs> cd ..\config
C:\..\config> config.bat -silent -responseFile C:\user\dbal\scripts\GI.rsp
```
8. If you are using Oracle Grid Infrastructure release 11.2.0.1, then configure the cluster using a response file as described in [Appendix B, "Installing and Configuring Oracle Grid Infrastructure Using Response Files."](#)
9. Mount the Oracle ASM disk group used by Oracle Restart.
10. If you used Oracle ACFS with Oracle Restart, then start Oracle ASM Configuration Assistant (ASMCA). Run the `volenable` command to enable all Oracle Restart disk group volumes.
11. If you used Oracle ACFS with Oracle Restart, then mount all Oracle ACFS file systems manually.
12. Add back Oracle Clusterware services to the Oracle Clusterware home, using the information you wrote down in step 1:
 - a. Register the Oracle ACFS resources. Use a command similar to the following, where *Grid_home* is the location of your Oracle Grid Infrastructure installation:


```
C:\> Grid_home\bin\srvctl add filesystem -d \\.\ORCLDATADISK4
-g ORestartData -v db1 -m C:\app\11.2.0\grid\db1 -u grid
```
 - b. Register the Oracle Database resources with Oracle Clusterware. Use the following command syntax, where *db_unique_name* is the unique name of the database on the node, and *nodename* is the name of the node:


```
srvctl add database -d db_unique_name -o %ORACLE_HOME% -x nodename
```

For example, for the database name `mydb` on the local node `node1`, first verify that the `ORACLE_HOME` environment variable is set to the location of the database home directory, then enter the following command to register the database with Oracle Clusterware:

```
srvctl add database -d mydb -o %ORACLE_HOME% -x node1
```

- c. Register each database service, using the command `srvctl add service`. For example, if your database name is `mydb` and you created a service named `myservice` for this database, then enter the following command:

```
srvctl add service -d mydb -s myservice
```

6.3 Changing the Oracle Grid Infrastructure Home Path

With release 11.2.0.3 and later, after installing Oracle Grid Infrastructure for a cluster, if you need to change the location of the Grid home, then use the following steps as a guide to detach the existing Grid home, and to attach a new Grid home that uses the new location:

Caution: Before changing the Grid home, you must shut down all executables that run in the Grid home directory that you are modifying. In addition, shut down all applications that use Oracle shared libraries.

1. Detach the existing Grid home by running the following command as an Administrator user, where `C:\app\11.2.0\grid` is the existing Grid home location:

```
C:\> cd app\11.2.0\grid\oui\bin
C:\..\bin> detachhome.bat -silent -local
```

2. Move the installed files for Oracle Grid Infrastructure from the old Grid home to the new Grid home. For example, if the old Grid home is `C:\app\11.2.0\grid` and the new Grid home is `C:\app\grid`, use the following command:

```
C:\> xcopy C:\app\11.2.0\grid C:\app\grid /E /I /H /K
```

3. Clone the Oracle Grid Infrastructure installation, using the instructions provided in "Creating a Cluster by Cloning Oracle Clusterware Step 3: Run the `clone.pl` Script on Each Destination Node," in *Oracle Clusterware Administration and Deployment Guide*.

When you run the `clone.pl` script in the `Grid_home\clone\bin` directory, provide values for the input parameters that provide the path information for the new Grid home.

4. Enter the following command to start Oracle Clusterware in the new home location:

```
C:\..\bin> cd C:\app\grid\crs\install
C:\..install> perl rootcrs.pl -patch -destcrshome C:\app\grid
```

5. Repeat steps 1 through 4 on each cluster member node.

You must reconfigure Oracle Clusterware and Oracle ASM every time you move the Grid home.

6.4 Deconfiguring Oracle Clusterware Without Removing the Software

Running the `rootcrs.pl` command with the flags `-deconfig -force` enables you to deconfigure Oracle Clusterware on one or more nodes without removing the installed software. This feature is useful if you encounter an error on one or more cluster nodes during installation, such as incorrectly configured shared storage. By running `rootcrs.pl -deconfig -force` on nodes where you encounter an installation error, you can deconfigure Oracle Clusterware on those nodes, correct the cause of the error, and then run `rootcrs.pl` again.

Note: Stop any databases, services, and listeners that may be installed and running before deconfiguring Oracle Clusterware.

Caution: Commands used in this section remove the Oracle Grid infrastructure installation for the entire cluster. If you want to remove the installation from an individual node, then refer to *Oracle Clusterware Administration and Deployment Guide*.

To deconfigure Oracle Clusterware:

1. Log in using a member of the Administrators group on a node where you encountered an error during installation.

2. Change directory to `Grid_home\crs\install`. For example:

```
C:\> cd C:\app\11.2.0\grid\crs\install
```

3. Run `rootcrs.pl` with the `-deconfig -force` flags. For example:

```
C:\..\install> perl rootcrs.pl -deconfig -force
```

Repeat on other nodes as required.

4. If you are deconfiguring Oracle Clusterware on all nodes in the cluster, then on the last node, enter the following command:

```
C:\..\install> perl rootcrs.pl -deconfig -force -lastnode
```

The `-lastnode` flag completes deconfiguration of the cluster, including the Oracle Cluster Registry (OCR) and voting disks.

Note: The `-force` flag must be specified when running the `rootcrs.pl` script if there exist running resources that depend on the resources started from the Oracle Clusterware home you are deleting, such as databases, services, or listeners. You must also use the `-force` flag if you are removing a partial, or failed installation.

6.5 Removing Oracle Clusterware and Oracle ASM Software

The `deinstall` tool removes Oracle Clusterware and Oracle ASM from your server. The following sections describe the command, and provide information about additional options to use with the command:

- [About the Deinstallation Tool](#)
- [Downloading The Deinstall Tool for Use with Failed Installations](#)

- [Using the Deinstallation Tool to Remove Oracle Clusterware and Oracle ASM](#)
- [Example Parameter File for Deinstall of Oracle Grid Infrastructure](#)

6.5.1 About the Deinstallation Tool

The Deinstallation tool (`deinstall.bat`) stops Oracle programs, and removes Oracle software and configuration files on the operating system. The Deinstallation tool is available in Oracle home directories after installation as `%ORACLE_HOME%\deinstall\deinstall.bat`. The Deinstallation tool command is also available for download from Oracle Technology Network (OTN) at the following URL:

<http://www.oracle.com/technetwork/database/enterprise-edition/downloads>

You can download the Deinstallation tool with the complete Oracle Database 11g Release 2 software, or as a separate archive file. To download the Deinstallation tool separately, click the **See All** link next to the software version.

The Deinstallation tool command uses the information you provide, plus information gathered from the software home to create a parameter file. You can alternatively supply a parameter file generated previously by the `deinstall.bat` command using the `-checkonly` flag and `-o` flag. You can also edit a response file template to create a parameter file.

The Deinstallation tool command stops Oracle software, and removes Oracle software and configuration files on the operating system for a specific Oracle home. If you run the Deinstallation tool to remove an Oracle Grid Infrastructure for a cluster installation, then the tool prompts you to run the `rootcrs.pl` script as a user that is a member of the Administrators group.

Caution: When you run the `deinstall` command, if the central inventory contains no other registered homes besides the home that you are deconfiguring and removing, then the Deinstallation tool removes the following files and directory contents in the Oracle base directory of the Oracle RAC installation owner:

- `admin`
- `cfgtoollogs`
- `checkpoints`
- `diag`
- `oradata`
- `flash_recovery_area`

Oracle strongly recommends that you configure your installations using an Optimal Flexible Architecture (OFA) configuration, and that you reserve Oracle base and Oracle home paths for exclusive use of Oracle software. If you have any user data in these locations in the Oracle base that is owned by the user account that owns the Oracle software, then the `deinstall` command deletes this data.

The Deinstallation tool uses the following syntax, where variable content is indicated by italics:

```
deinstall.bat [-home complete path of Oracle home] [-silent] [-checkonly] [-local]
[-paramfile complete path of input parameter property file]
```

```
[-params name1=value name2=value ...]
[-o complete path of directory for saving files]
[-tmpdir complete path of temporary directory to use]
[-logdir complete path of log directory to use] [-help]
```

Note: You cannot use the Deinstallation tool with the `-local` option for a shared Oracle home.

The default method for running the Deinstallation tool is from the `deinstall` directory in the Grid home. In addition, you can run the Deinstallation tool from other locations, or with a parameter file, or specify options when running the `deinstall.bat` command.

The options you can use with the `deinstall.bat` command are:

- `-home`

Use this flag to indicate the home path of the Oracle home to check or deinstall. To deinstall Oracle software using the `deinstall.bat` command located in the Oracle home being removed, provide a parameter file in a location outside the Oracle home, and do not use the `-home` flag.

If you run `deinstall` from the `Grid_home\deinstall` path, then the `-home` flag is not required because the tool knows from which home it is being run. If you use the standalone version of the tool, then `-home` is mandatory

- `-silent`

Use this flag to run the command in noninteractive mode. This option requires one of the following:

- A working system that the Deinstallation tool can access to determine the installation properties
- A properties file that contains the configuration values for the Oracle home that is being deinstalled or deconfigured

To create a properties file, modify the template file `deinstall.rsp.tmpl`, located in the `response` folder of the Deinstallation tool home or the Oracle home.

If you have a working system, you can generate a properties file to use or modify by running the `deinstall.bat` command with the `-checkonly` flag. The `deinstall.bat` command then discovers information from the Oracle home to deinstall and deconfigure. It generates the properties file, which you can then use with the `-silent` option.

- `-checkonly`

Use this flag to check the status of the Oracle software home configuration. Running the command with the `-checkonly` flag does not remove the Oracle configuration. This flag generates a properties file that you can use with the `deinstall.bat` command.

When you use the `-checkonly` flag to generate a properties file, you are prompted to provide information about your system. You can accept the default value the tool has obtained from your Oracle installation, indicated inside brackets (I), or you can provide different values. To accept the defaults, press Enter at each prompt.

- `-local`

Use this flag on a multinode environment to deconfigure Oracle software in a cluster.

When you run `deinstall.bat` with this flag, it deconfigures and deinstalls the Oracle software only on the local node (the node on which you run `deinstall.bat`) for non-shared Oracle home directories.

Note:

- This flag can only be used in cluster environments.
 - You cannot use the Deinstallation tool with the `-local` option for a shared Oracle home.
-
-

- `-paramfile` *complete path of input parameter property file*

This is an optional flag. You can use this flag to run `deinstall.bat` with a parameter file in a location other than the default. When you use this flag, provide the complete path where the parameter file is located. If you are running the `deinstall.bat` command from the Oracle home that you plan to deinstall, then you do not need to use the `-paramfile` flag.

The default location of the parameter file depends on the location of the Deinstallation tool:

- From the installation media or stage location: `<Drive>:\staging_location\deinstall\response`
- From a unzipped archive file downloaded from OTN: `<Drive>:\ziplocation\deinstall\response`, where `<Drive>:\ziplocation` refers to the directory in which the downloaded archive file was extracted.
- After installation, from the installed Oracle home: `%ORACLE_HOME%\deinstall\response`.

- `-params` [`name1=value name2=value name3=value ...`]

Use this flag with a parameter file to override one or more values in a parameter file that you created.

- `-o` *complete path of directory for saving response files*

Use this flag to provide a path other than the default location where the properties file (`deinstall.rsp.tpl`) is saved.

The default location of the properties file depends on the location of the Deinstallation tool:

- Extracted from an archive file downloaded from OTN: `<Drive>:\ziplocation\response`, where `<Drive>:\ziplocation` refers to directory in which the downloaded archive file was extracted.
- After installation, from the installed Oracle home: `%ORACLE_HOME%\deinstall\response`.

- `-tmpdir` *complete path of temporary directory*

Specifies a non-default location where the deinstallation tool writes the temporary files for the deinstallation.

- `-logdir` *complete path of log directory*

Specifies a non-default location where the deinstallation tool writes the log files for the deinstallation.

- -help

Use the help option (-help) to obtain additional information about the command option flags.

If you use the `deinstall.bat` command located in an Oracle home, or the `deinstall.bat` command downloaded from OTN (not installed in an Oracle home), then it writes log files in the `C:\Program Files\Oracle\Inventory\logs` directory. If, however, you are using the `deinstall.bat` command to remove the last Oracle home installed on the server, then the log files are written to:

- `%TEMP%\OraDeinstall<timestamp>\logs` if you use the `deinstall.bat` command located in the Oracle home
- `<Drive>:\ziplocation\deinstall\logs` if you use the `deinstall.bat` command downloaded from OTN, where `<Drive>:\ziplocation\` refers to directory in which the downloaded archive file was extracted

6.5.2 Downloading The Deinstall Tool for Use with Failed Installations

You can use the Deinstallation tool (`deinstall.bat`) to remove failed or incomplete installations. It is available as a separate download from the Oracle Technology Network (OTN) web site.

To download the Deinstallation tool:

1. Go to the following URL:

<http://www.oracle.com/technetwork/database/enterprise-edition/downloads/index.html>

2. Read and accept the OTN license agreement.
3. Under **Oracle Database 11g Release 2**, click **See All** for the respective platform for which you want to download the Deinstallation tool.

The Deinstallation tool is available for download at the end of this page.

6.5.3 Running the Deinstallation Tool

Oracle recommends that you run the `deinstall` command as the user that installed Oracle Grid Infrastructure (`grid` user) or as an Administrator user.

After downloading the Deinstallation tool, ensure that:

- The user running the Deinstallation tool is the same on all cluster member nodes
- User equivalence is set up

To run the Deinstallation tool, follow these steps:

1. Download or copy the Deinstallation tool to the `grid` user home directory.
2. Run the Deinstallation tool.

6.5.4 Using the Deinstallation Tool to Remove Oracle Clusterware and Oracle ASM

This section provides examples of using the Deinstallation tool to remove Oracle Grid Infrastructure software.

Example 6–1 Running deinstall.bat From Within the Oracle Home

The most common method of running the Deinstallation tool is to use the version installed in the Oracle home being removed. The Deinstallation tool determines the software configuration for the local Oracle home, and then provides default values at each prompt. You can either accept the default value, or override it with a different value. If the software in the Oracle home is not running (for example, after an unsuccessful installation), then the Deinstallation tool cannot determine the configuration, and you must provide all the configuration details either interactively or in a properties file.

To use the Deinstallation tool located in the Oracle home directory, issue the following commands, where `C:\app\11.2.0\grid` is the location of Grid home:

Example 6–2 Running the Deinstallation Tool Installed in an Oracle Home

To run the `deinstall.bat` command located in an Oracle Database home in the path `C:\app\11.2.0\grid`, enter the following command while logged in as a member of the Administrator group:

```
C:\> cd app\  
C:\app\> 11.2.0\grid\deinstall\deinstall.bat
```

To completely remove the Oracle Database installation, you must run the `deinstall.bat` command from a prompt that is located outside of the Oracle home. If you run the `deinstall.bat` command after changing into the `Oracle_home\deinstall` directory, then the Deinstallation tool will not be able to remove all the Oracle software files and directories.

Example 6–3 Running deinstall.bat Interactively From a Location Outside the Oracle Home

If you use the separately downloaded version of the Deinstallation tool, then when the `deinstall.bat` command runs, it uses the information you provide to determine the system configuration and then provides default values at each prompt. You can either accept the default value, or override it with a different value. If the software in the specified Oracle home is not running (for example, after an unsuccessful install attempt), then the Deinstallation tool cannot determine the configuration, and you must provide all the configuration details either interactively or in a properties file.

If your Oracle Grid Infrastructure for a cluster home is `C:\app\11.2.0\grid`, then enter the following command while logged in as a member of the Administrators group to remove the Oracle Grid Infrastructure installation from your cluster:

```
C:\> app\deinstall\deinstall.bat -home C:\app\11.2.0\grid
```

Provide additional information as prompted. When using the Deinstallation tool from a location other than within the Oracle home being removed, you must specify the `-home` option on the command line.

Example 6–4 Running deinstall.bat From the Oracle Home Using a Parameter File

To run the `deinstall.bat` command located in an Oracle Grid Infrastructure home and use a parameter file located at `C:\users\oracle\paramfile4.tmp1`, enter the following commands while logged in as a member of the Administrators group:

```
C:\> cd app\11.2.0  
C:\> grid\deinstall\deinstall.bat -paramfile C:\users\oracle\paramfile4.tmp1
```

Example 6-5 Generating a Response File For Use With the deinstall.bat Command

You can generate the a parameter file by running the `deinstall.bat` command with the `-checkonly` and `-o` flags before you run the command to deinstall the Oracle home, or you can use the response file template and manually edit it to create the parameter file.

To generate the parameter file `deinstall_OraCrsl1g_home1.rsp` using `deinstall.bat` command located in the Oracle home and the `-checkonly` flag, enter a command similar to the following, where `C:\app\11.2.0\grid` is the location of the Grid home and `C:\users\oracle` is the directory in which the generated parameter file is created:

```
C:\> app\11.2.0\grid\deinstall\deinstall -checkonly -o C:\users\oracle\
```

6.5.5 Example Parameter File for Deinstall of Oracle Grid Infrastructure

You can run the `deinstall` command with the `-paramfile` option. When you use this option, the Deinstallation tool uses the values specified in the parameter file and, if needed, prompts you to supply any missing information.

The following is an example of a parameter file for a cluster on nodes `node1` and `node2`, in which the Oracle Grid Infrastructure for a cluster is installed by the user `oracle`, the Grid home is `C:\app\11.2.0\grid`, the Oracle base (for the software owner, `oracle`) is `C:\app\oracle\`, the central Oracle Inventory home is `C:\Program Files\Oracle\Inventory`, the virtual IP addresses (VIP) are `192.0.2.2` and `192.0.2.4`, and the local node (the node on which you run the `deinstall.bat` command) is `node1`:

```
#Copyright (c) 2005, 2009 Oracle Corporation. All rights reserved.
VIP1_IP=192.0.2.2
LOCAL_NODE=node1
ORA_VD_DISKGROUPS+=DATA
VIP1_IF=PublicNIC
OCRID=
ObaseCleanupPtrLoc=C:\Temp\OraDeinstall112010-02-11_10-14-30AM\ut1\...
HELPJAR_NAME=help4.jar
local=false
ORACLE_HOME=C:\app\11.2.0\grid
ASM_HOME=C:\app\11.2.0\grid
ASM_DISK_GROUPS=
ASM_DISK_GROUP=DATA
ORA_DBA_GROUP=
ASM_DISCOVERY_STRING=
NEW_HOST_NAME_LIST=
PRIVATE_NAME_LIST=
ASM_DISKS=\\.\ORCLDISKDATA0,\\.\ORCLDISKDATA1,\\.\ORCLDISKDATA2
ASM_DISKSTRING=
CRS_HOME=true
JLIBDIR=C:\app\11.2.0\grid\jlib
OCRLOC=
JEW TJAR_NAME=jewt4.jar
EMBASEJAR_NAME=oemlt.jar
CRS_STORAGE_OPTION=1
ASM_REDUNDANCY=EXTERNAL
GPNPGCONFIGDIR=$ORACLE_HOME
LANGUAGE_ID='AMERICAN_AMERICA.WE8MSWIN1252'
CRS_NODEVIPS='node1-vip/255.255.252.0/PublicNIC,node2-vip/255.255.252.0/PublicNIC'
ORACLE_OWNER=Administrator
OLD_ACTIVE_ORACLE_HOME=
GNS_ALLOW_NET_LIST=
silent=false
```

```
LOGDIR=C:\Temp\OraDeinstall112010-02-11_10-14-30AM\logs\  
OCFS_CONFIG=  
NODE_NAME_LIST=node1,node2  
GNS_DENY_ITF_LIST=  
ORA_CRS_HOME=C:\app\11.2.0\grid  
JREDIR=C:\app\11.2.0\grid\jdk\jre  
ASM_LOCAL_SID=+asm1  
ORACLE_BASE=C:\app\oracle\  
GNS_CONF=false  
NETCFGJAR_NAME=netcfg.jar  
ORACLE_BINARY_OK=true  
OCR_LOCATIONS=NO_VAL  
ASM_ORACLE_BASE=C:\app\oracle  
OLRLOC=  
GPNP_CONFIGDIR=$ORACLE_HOME  
ORA_ASM_GROUP=  
GNS_DENY_NET_LIST=  
OLD_CRS_HOME=  
EWTJAR_NAME=ewt3.jar  
NEW_NODE_NAME_LIST=  
GNS_DOMAIN_LIST=  
ASM_UPGRADE=false  
NETCA_LISTENERS_REGISTERED_WITH_CRS=LISTENER  
CLUSTER_NODES=node1,node2  
CLUSTER_GUID=  
NEW_PRIVATE_NAME_LIST=  
ASM_DIAGNOSTIC_DEST=C:\APP\ORACLE  
CLSCFG_MISSCOUNT=  
SCAN_PORT=1521  
ASM_DROP_DISKGROUPS=true  
NETWORKS="PublicNIC"/192.0.2.1:public,"PrivateNIC"/10.0.0.1:cluster_interconnect  
OCR_VOTINGDISK_IN_ASM=true  
NODELIST=node1,node2  
ASM_IN_HOME=true  
HOME_TYPE=CRS  
GNS_ADDR_LIST=  
CLUSTER_NAME=myrac-cluster  
SHAREJAR_NAME=share.jar  
VOTING_DISKS=NO_VAL  
SILENT=false  
VNDR_CLUSTER=false  
GPNP_PA=  
CSS_LEASEDURATION=400  
REMOTE_NODES=node2  
ASM_SPFIL=\  
HOST_NAME_LIST=node1,node2  
SCAN_NAME=myrac-scan  
VIP1_MASK=255.255.252.0  
INVENTORY_LOCATION=C:\Program Files\Oracle\Inventory
```

Note: Do not use quotation marks around any of the values in this file, except in the following cases:

- Around addresses for the CRS_NODEVIPS parameter:

```
CRS_NODEVIPS='node1-vip/255.255.252.0/PublicNIC,node2-vip/..'
```

- Around interface names for the NETWORKS parameters:

```
NETWORKS="PublicNIC"/192.0.2.1:public,"PrivateNIC"/10.0.0.1  
:cluster_interconnect
```

Troubleshooting the Oracle Grid Infrastructure Installation Process

This appendix provides troubleshooting information for installing Oracle Grid Infrastructure.

See Also: The Oracle Database 11g Oracle Real Application Clusters (Oracle RAC) documentation set included with the installation media in the Documentation directory:

- *Oracle Clusterware Administration and Deployment Guide*
- *Oracle Real Application Clusters Administration and Deployment Guide*
- *Oracle Real Application Clusters Installation Guide for Microsoft Windows x64 (64-Bit)*

This appendix contains the following topics:

- [General Installation Issues](#)
- [Interpreting CVU "Unknown" Output Messages Using Verbose Mode](#)
- [Interpreting CVU Messages About Oracle Grid Infrastructure Setup](#)
- [About the Oracle Clusterware Alert Log](#)
- [Oracle Clusterware Install Actions Log Errors and Causes](#)
- [Performing Cluster Diagnostics During Oracle Grid Infrastructure Installations](#)
- [About Using CVU Cluster Healthchecks After Installation](#)
- [Interconnect Configuration Issues](#)
- [SCAN VIP and SCAN Listener Issues](#)
- [Storage Configuration Issues](#)
- [Completing an Installation That Exited Before Completing the Scripts](#)
- [Troubleshooting Windows Firewall Exceptions](#)

A.1 General Installation Issues

The following is a list of examples of types of errors that can occur during installation. It contains the following issues:

- [INS-32026 INSTALL_COMMON_HINT_DATABASE_LOCATION_ERROR](#)

- Failure to start network or VIP resources when Microsoft Failover Cluster is installed
- Nodes unavailable for selection from the OUI Node Selection screen
- Node nodename is unreachable
- Shared disk access fails
- Installation does not complete successfully on all nodes
- INS-20802: Grid Infrastructure configuration failed
- Timed out waiting for the CRS stack to start
- Other Installation Issues and Errors

INS-32026 INSTALL_COMMON_HINT_DATABASE_LOCATION_ERROR

Cause: The location selected for the Grid home for a cluster installation is located under an Oracle base directory.

Action: For Oracle Grid Infrastructure for a Cluster installations, the Grid home must not be placed under one of the Oracle base directories, or under Oracle home directories of Oracle Database installation owners, or in the home directory of an installation owner.

Failure to start network or VIP resources when Microsoft Failover Cluster is installed

Cause: If Microsoft Failover Cluster (MSFC) is installed on a Windows Server 2008 cluster (even if it is not configured) and you attempt to install Oracle Grid Infrastructure, the installation fails during the 'Configuring Grid Infrastructure' phase with an indication that it was unable to start the resource `ora.net1.network` or the VIP resources.

When MSFC is installed, it creates a virtual network adapter and places it at the top of the binding order. This change in the binding order can only be seen in the registry; it is not visible through 'View Network Connections' under Server Manager.

Action: Currently, the only solution is not to install MSFC and Oracle Grid Infrastructure or Oracle Clusterware on the same Windows Server 2008 cluster.

Nodes unavailable for selection from the OUI Node Selection screen

Cause: Oracle Grid Infrastructure is either not installed, or the Oracle Grid Infrastructure services are not up and running.

Action: Install Oracle Grid Infrastructure, or review the status of your installation. Consider restarting the nodes, because doing so may resolve the problem.

Node *nodename* is unreachable

Cause: Unavailable IP host.

Action: Attempt the following:

1. Run the command `ipconfig /all`. Compare the output of this command with the contents of the `C:\WINDOWS\system32\drivers\etc\hosts` file to ensure that the node IP is listed.
2. Run the command `nslookup` to see if the host is reachable.

Shared disk access fails

Cause: Windows 2003 R2 does not automount raw drives by default. This is a change from Windows 2000.

Action: Change the automount to enabled. Refer to [Section 3.5.2, "Enabling Automounting for Windows."](#)

Installation does not complete successfully on all nodes

Cause: If a configuration issue prevents the Oracle Grid Infrastructure software from installing successfully on all nodes, you might see an error message such as "Timed out waiting for the CRS stack to start", or when you exit the installer you might notice that the Oracle Clusterware managed resources were not created on some nodes, or have a status other than ONLINE on those nodes.

Action: One solution to this problem is to deconfigure Oracle Clusterware on the nodes where the installation did not complete successfully, and then fix the configuration issue that caused the installation on that node to error out. After the configuration issue has been fixed, you can then rerun the scripts used during installation to configure Oracle Clusterware. See ["Deconfiguring Oracle Clusterware Without Removing the Software"](#) on page 6-4 for details.

INS-20802: Grid Infrastructure configuration failed

Cause: If an error is encountered while running an Oracle Grid Infrastructure installation and the Deinstallation tool is used to remove the failed installation, the `rootcrs.pl -deconfig` command is not run.

Action: Run the `rootcrs.pl -deconfig` command manually after using the Deinstallation tool, then install Oracle Grid Infrastructure again.

Timed out waiting for the CRS stack to start

Cause: If a configuration issue prevents the Oracle Grid Infrastructure software from installing successfully on all nodes, then you may see error messages such as "Timed out waiting for the CRS stack to start," or you may notice that Oracle Clusterware-managed resources were not created on some nodes after you exit the installer. You also may notice that resources have a status other than ONLINE.

Action: Deconfigure the Oracle Grid Infrastructure installation without removing the software, and review the installation log files to determine the cause of the configuration issue. After you have fixed the configuration issue, rerun the scripts used during installation to configure Oracle Clusterware.

See Also: [Section 6.4, "Deconfiguring Oracle Clusterware Without Removing the Software"](#)

A.1.1 Other Installation Issues and Errors

For additional help in resolving error messages, refer to My Oracle Support. For example, the note with Doc ID 1367631.1 contains some of the most common installation issues for Oracle Grid Infrastructure and Oracle Clusterware.

A.2 Interpreting CVU "Unknown" Output Messages Using Verbose Mode

If you run Cluster Verification Utility (CVU) using the `-verbose` argument, and a Cluster Verification Utility command responds with `UNKNOWN` for a particular node, then this is because Cluster Verification Utility cannot determine if a check passed or failed. The following is a list of possible causes for an "Unknown" response:

- The node is down
- Common operating system command binaries required by Cluster Verification Utility are missing in the `bin` directory of the Oracle Grid Infrastructure home or Oracle home directory

- The user account starting Cluster Verification Utility does not have privileges to run common operating system commands on the node
- The node is missing an operating system patch, or a required package

A.3 Interpreting CVU Messages About Oracle Grid Infrastructure Setup

If the Cluster Verification Utility report indicates that your system fails to meet the requirements for Oracle Grid Infrastructure installation, then use the topics in this section to correct the problem or problems indicated in the report, and run Cluster Verification Utility again.

User Equivalence Check Failed

Cause: Failure to establish user equivalency across all nodes. This can be due to not creating the required users, the installation user not being the same on all nodes, or using a different password on the failed nodes.

Action: Cluster Verification Utility provides a list of nodes on which user equivalence failed. For each node listed as a failure node, review the installation owner user configuration to ensure that the user configuration is properly completed, and that user equivalence is properly completed.

Check to ensure that:

- You are using a Domain user account or a local account that has been granted explicit membership in the Administrators group on each cluster node.
- The user account has the same password on each node.
- If using a domain user, then the domain for the user is the same on each node.
- The user account has administrative privileges on each node.
- The user can connect to the registry of each node from the local node.
- If you are using Windows Server 2008 for your cluster, then you might have to change the Windows 2008 User Account Control settings on each node:
 - Change the elevation prompt behavior for administrators to "Elevate without prompting". See <http://technet.microsoft.com/en-us/library/cc709691.aspx>
 - Confirm that the Administrators group is listed under 'Manage auditing and security log'.

Node Reachability Check or Node Connectivity Check Failed

Cause: One or more nodes in the cluster cannot be reached using TCP/IP protocol, through either the public or private interconnects.

Action: Use the command `ping address` to check each node address. When you find an address that cannot be reached, check your list of public and private addresses to make sure that you have them correctly configured. Ensure that the public and private network interfaces have the same interface names on each node of your cluster.

Do not use the names PUBLIC and PRIVATE (all capital letters) for your public and interconnect network adapters (NICs). You can use private, Private, public, and Public for the network interface names.

See Also:

- *Oracle Clusterware Administration and Deployment Guide*
- [Chapter 2, "Advanced Installation Oracle Grid Infrastructure for a Cluster Preinstallation Tasks"](#)

A.4 About the Oracle Clusterware Alert Log

The Oracle Clusterware alert log is the first place to look for serious errors. In the event of an error, it can contain path information to diagnostic logs that can provide specific information about the cause of errors.

After installation, Oracle Clusterware posts alert messages when important events occur. For example, you might see alert messages from the Cluster Ready Services (CRS) daemon process when it starts, if it aborts, if the failover process fails, or if automatic restart of a CRS resource failed.

Oracle Enterprise Manager monitors the Oracle Clusterware alert log and posts an alert on the Cluster Home page if an error is detected. For example, if a voting disk is not available, then a CRS-1604 error is raised, and a critical alert is posted on the Cluster Home page. You can customize the error detection and alert settings on the Metric and Policy Settings page.

The location of the Oracle Clusterware log file is *Grid_home*\log\hostname\alerthostname.log, where *Grid_home* is the directory in which Oracle Grid Infrastructure was installed and *hostname* is the host name of the local node.

See Also: *Oracle Real Application Clusters Administration and Deployment Guide*

A.5 Oracle Clusterware Install Actions Log Errors and Causes

During installation of the Oracle Grid Infrastructure software, a log file named `installActions<Date_Timestamp>.log` is written to the `%TEMP%\OraInstall<Date_Timestamp>` directory.

The following is a list of potential errors in the `installActions.log`:

- PRIF-10: failed to initialize the cluster registry
Configuration assistant "Oracle Private Interconnect Configuration Assistant" failed
- KFOD-0311: Error scanning device *device_path_name*
- Step 1: checking status of Oracle Clusterware cluster
Step 2: configuring OCR repository
ignoring upgrade failure of ocr(-1073740972)
failed to configure Oracle Cluster Registry with CLSCFG, ret -1073740972

Each of these error messages can be caused by one of the following issues:

A.5.1 The OCFS for Windows format is not recognized on a remote cluster node

If you are using Oracle Cluster File System for Windows (OCFS for Windows) for your Oracle Cluster Registry (OCR) and Voting disk partitions, then:

1. Leave the Oracle Universal Installer (OUI) window in place.
2. Restart the second node, and any additional nodes.
3. Retry the assistants.

A.5.2 You have a Windows 2003 system and Automount of new drives is not enabled

If this is true, then:

For Oracle RAC on Windows Server 2003, you must issue the following commands on all nodes:

```
C:\> diskpart
DISKPART> automount enable
```

If you did not enable automounting of disks before attempting to install Oracle Grid Infrastructure, and the configuration assistants fail during installation, then you must clean up your Oracle Clusterware install, enable automounting on all nodes, reboot all nodes, and then start the Oracle Clusterware install again.

A.5.3 Symbolic links for disks were not removed

When you stamp a disk with ASMTOOL, it creates symbolic links for the disks. If these links are not removed when the disk is deleted or reconfigured, then errors can occur when attempting to access the disks.

To correct the problem, you can try stamping the disks again with ASMTOOL.

A.5.4 Discovery string used by Oracle Automatic Storage Management is incorrect

When specifying Oracle Automatic Storage Management (Oracle ASM) for storage, you have the option of changing the default discovery string used to locate the disks. If the discovery string is set incorrectly, Oracle ASM will not be able to locate the disks.

A.5.5 You used a period in a node name during Oracle Clusterware install

Periods (.) are not permitted in node names. Instead, use a hyphen (-).

To resolve a failed installation, remove traces of the Oracle Grid Infrastructure installation, and reinstall with a supported node name.

A.5.6 Ignoring upgrade failure of ocr(-1073740972)

This error indicates that the user that is performing the installation does not have Administrator privileges.

A.6 Performing Cluster Diagnostics During Oracle Grid Infrastructure Installations

If the installer does not display the Node Selection page, then use the following command syntax to check the integrity of the Cluster Manager:

```
cluvfy comp clumgr -n node_list -verbose
```

In the preceding syntax example, the variable *node_list* is the list of nodes in your cluster, separated by commas.

Note: If you encounter unexplained installation errors during or after a period when scheduled tasks are run, then your scheduled task may have deleted temporary files before the installation is finished. Oracle recommends that you complete the installation before scheduled tasks are run, or disable scheduled tasks that perform cleanup until after the installation is completed.

A.7 About Using CVU Cluster Healthchecks After Installation

Starting with Oracle Grid Infrastructure 11g Release 2 (11.2.0.3) and later, you can use the CVU healthcheck command to check your Oracle Clusterware and Oracle Database installations for their compliance with mandatory requirements and best practices guidelines, and to ensure that they are functioning properly.

Use the following syntax to run the healthcheck command option:

```
cluvfy comp healthcheck [-collect {cluster|database}] [-db db_unique_name]
[-bestpractice|-mandatory] [-deviations] [-html] [-save [-savedir directory_path]]
```

For example:

```
$ cd /home/grid/cvu_home/bin
$ ./cluvfy comp healthcheck -collect cluster -bestpractice -deviations -html
```

The options are:

- `-collect [cluster|database]`

Use this flag to specify that you want to perform checks for Oracle Clusterware (cluster) or Oracle Database (database). If you do not use the collect flag with the healthcheck option, then `cluvfy comp healthcheck` performs checks for both Oracle Clusterware and Oracle Database.

- `-db db_unique_name`

Use this flag to specify checks on the database unique name that you enter after the `db` flag.

CVU uses JDBC to connect to the database as the user `cvusys` to verify various database parameters. For this reason, if you want checks to be performed for the database you specify with the `-db` flag, then you must first create the `cvusys` user on that database, and grant that user the CVU-specific role, `CVUSAPP`. You must also grant members of the `CVUSAPP` role `SELECT` permissions on system tables.

The SQL script `cvusys.sql` is included in the `CVU_home/cv/admin/` directory to facilitate the creation of this user. Use this SQL script to create the `cvusys` user on all the databases that you want to verify using CVU.

If you use the `db` flag but do not provide a database unique name, then CVU discovers all the Oracle Databases on the cluster. If you want to perform best practices checks on these databases, then you must create the `cvusys` user on each database, and grant that user the `CVUSAPP` role with the `SELECT` privileges needed to perform the best practice checks.

- `[-bestpractice | -mandatory] [-deviations]`

Use the `bestpractice` flag to specify best practice checks, and the `mandatory` flag to specify mandatory checks. Add the `deviations` flag to specify that you want to see only the deviations from either the best practice recommendations or the mandatory requirements. You can specify either the `-bestpractice` or `-mandatory`

flag, but not both flags. If you specify neither `-bestpractice` or `-mandatory`, then both best practices and mandatory requirements are displayed.

- `-html`

Use the `html` flag to generate a detailed report in HTML format.

If you specify the `html` flag, and a browser CVU recognizes is available on the system, then the browser is started and the report is displayed on the browser when the checks are complete.

If you do not specify the `html` flag, then the detailed report is generated in a text file.

- `-save [-savedir dir_path]`

Use the `save` or `-save -savedir` flags to save validation reports (`cvuheckdreport_timestamp.txt` and `cvuheckreport_timestamp.htm`), where *timestamp* is the time and date of the validation report.

If you use the `save` flag by itself, then the reports are saved in the path `CVU_home/cv/report`, where *CVU_home* is the location of the CVU binaries.

If you use the flags `-save -savedir`, and enter a path where you want the CVU reports saved, then the CVU reports are saved in the path you specify.

A.8 Interconnect Configuration Issues

If you plan to use multiple network interface cards (NICs) for the interconnect, then you should use a third party solution to bond the interfaces at the operating system level. Otherwise, the failure of a single NIC will affect the availability of the cluster node.

If you install Oracle Grid Infrastructure and Oracle RAC, then they must use the same bonded NIC cards or teamed NIC cards for the interconnect. If you use bonded or teamed NIC cards, then they must be on the same subnet.

If you encounter errors, then perform the following system checks:

- Verify with your network providers that they are using the correct cables (length, type) and software on their switches. In some cases, to avoid bugs that cause disconnects under loads, or to support additional features such as Jumbo Frames, you may need a firmware upgrade on interconnect switches, or you may need newer NIC driver or firmware at the operating system level. Running without such fixes can cause later instabilities to Oracle RAC databases, even though the initial installation seems to work.
- Review virtual local area network (VLAN) configurations, duplex settings, and auto-negotiation in accordance with vendor and Oracle recommendations.

A.9 SCAN VIP and SCAN Listener Issues

If your installation reports errors related to the SCAN VIP addresses or listeners, check the following items to make sure your network is configured correctly:

- Check that the TCP/IP configuration settings are the same for the network interface on each node.
- Verify there is a DNS entry for the SCAN and that it resolved to three valid IP addresses. Use the command `nslookup scan-name`; this command should return the DNS server name and the three IP addresses configured for the SCAN.

- Use the `ping` command to test the IP addresses assigned to the SCAN; you should get a response for each IP address.

Note: If you do not have DNS configured for your cluster environment, you can create an entry for the SCAN in the `C:\WINDOWS\system32\drivers\etc\hosts` file on each node. However, doing so will result in only one SCAN being available for the entire cluster instead of three. Only the first entry for SCAN in the `hosts` file is used.

- Ensure the SCAN uses the same netmask that is used by the public interface.

If you need additional assistance troubleshooting errors related to the SCAN, SCAN VIP or listeners, refer to My Oracle Support. For example, the note with Doc ID 1373350.1 contains some of the most common issues for the SCAN VIPs and listeners.

A.10 Storage Configuration Issues

The following is a list of issues involving storage configuration:

- [Recovery from Losing a Node File System or Grid Home](#)
- [Oracle ASM Storage Issues](#)

A.10.1 Recovery from Losing a Node File System or Grid Home

With Oracle Clusterware release 11.2 and later, if you remove a file system by mistake, or encounter another storage configuration issue that results in losing the Oracle Local Registry or otherwise corrupting a node, you can recover the node in one of two ways:

1. Restore the node from an operating system level backup (preferred)
2. Remove the node from the cluster, and then add the node to the cluster. With Oracle Clusterware release 11.2 and later clusters, profile information for the cluster is copied to the node, and the node is restored.

The feature that enables cluster nodes to be removed and added again, so that they can be restored from the remaining nodes in the cluster, is called Grid Plug and Play (GPnP). Grid Plug and Play eliminates per-node configuration data and the need for explicit add and delete nodes steps. This allows a system administrator to take a template system image and run it on a new node with no further configuration. This removes many manual operations, reduces the opportunity for errors, and encourages configurations that can be changed easily. Removal of the per-node configuration makes the nodes easier to replace, because they do not need to contain individually-managed state.

Grid Plug and Play reduces the cost of installing, configuring, and managing database nodes by making their per-node state disposable. It allows nodes to be easily replaced with regenerated state.

Initiate recovery of a node using the `addnode` command, similar to the following, where *lostnode* is the node that you are adding back to the cluster:

If you are using Grid Naming Service (GNS):

```
C:\Grid_home\oui\bin> addNode.bat -silent "CLUSTER_NEW_NODES=lostnode"
```

If you are not using GNS:

```
C:\Grid_home\oui\bin> addNode.bat -silent "CLUSTER_NEW_NODES={lostnode}"  
"CLUSTER_NEW_VIRTUAL_HOSTNAMES={lostnode-vip}"
```

You must run the `addNode.bat` command as an Administrator user on the node that you are restoring, to recreate OCR keys and to perform other configuration tasks.

After the `addNode.bat` command finishes, run the following command on the node being added to the cluster:

```
C:\>Grid_home\crs\config\gridconfig.bat
```

A.10.2 Oracle ASM Storage Issues

This section describes Oracle ASM storage error messages, and how to address these errors.

ASM-0001: could not open device \\?\volume...

O/S-Error: (OS-5) Access is denied.

Cause: User Account Control (UAC), a new security component in Windows Server 2008 and later releases can require administrators to specifically approve administrative actions or applications before they are allowed to run. If you do not supply the proper credentials, the `asmtool` and `asmtoolg` utilities report these errors.

Action: There are a few ways to resolve this problem:

1. Click **Continue** in the UAC dialog box if you are logged in as an administrative user, or provide the credentials for an administrator user, then click **Continue**.
2. Create a desktop shortcut to a command window. Open the command window using the **Run as Administrator** option, then right-click the context menu, and launch `asmtool`.
3. Configure the UAC implementation on your Windows Server to turn off UAC or to change the elevation prompt behavior for administrator users.

Note: For information about managing security and UAC in a business or enterprise environment, see the User Account Control paper at <http://technet.microsoft.com/en-us/library/cc731416%28WS.10%29.aspx>.

O/S-Error: (OS-2) The system cannot find the file specified.

Cause: If a disk is disabled at the operating system level and enabled again, some of the Oracle ASM operations such as `CREATE DISKGROUP`, `MOUNT DISKGROUP`, `ADD DISK`, `ONLINE DISK`, or querying `V$ASM_DISK` fail with the error:

OS Error: (OS-2) The system cannot find the file specified.

This happens when a previously mounted disk is assigned a new volume ID by the operating system. When Oracle ASM uses the old volume ID, it fails to open the disk and signals the above error.

Action: Use `ASMTOOL` to restamp the disk and update the volume ID used by Oracle ASM.

Unable to mount disk group; ASM discovered an insufficient number of disks for diskgroup

Cause: You performed an Oracle Grid Infrastructure software-only installation, and want to configure a disk group for storing the OCR and voting disk files during the postinstallation configuration of Oracle Clusterware. You used ASMTOOL to stamp the disks, and then used ASMCMD to create a disk group using the stamped disks. If you then update a `crsconfig_params` file with the disk device or disk partition names that constitute the Oracle ASM disk group. During the configuration of Oracle Clusterware, errors are displayed such as ORA-15017: diskgroup "DATA" cannot be mounted.

Action: Change the `crsconfig_params` file to use the stamped names generated by ASMTOOL instead of the disk partition names, for example:

```
"\\.\ORCLDISKDATA0"
```

A.11 Completing an Installation That Exited Before Completing the Scripts

As part of the installation, OUI runs scripts at the operating system level to finish the installation and start the configuration assistants. If OUI exits before these scripts have finished running, then the Oracle Grid Infrastructure installation is incomplete.

To complete an interrupted installation, as Administrator user on the node where the installation was started, execute the following command:

```
Grid_home\cfgtoollogs\configToolAllCommands
```

Run this command on only the first node. Running this command completes the Oracle Grid Infrastructure installation. If the `configToolAllCommands` file does not exist, contact My Oracle Support for assistance in creating the file manually.

A.12 Troubleshooting Windows Firewall Exceptions

If you cannot establish certain connections even after granting exceptions to the executables listed in [Chapter 5, "Oracle Grid Infrastructure Postinstallation Procedures,"](#) then follow these steps to troubleshoot the installation:

1. Examine Oracle configuration files (such as `*.conf` files), the Oracle key in the Windows registry, and network configuration files in `%ORACLE_HOME%\network\admin`.
2. Pay particular attention to any executable listed in `%ORACLE_HOME%\network\admin\listener.ora` in a `PROGRAM=` clause. Each of these must be granted an exception in the Windows Firewall, because a connection can be made through the TNS listener to that executable.
3. Examine Oracle trace files, log files, and other sources of diagnostic information for details on failed connection attempts. Log and trace files on the database client computer may contain useful error codes or troubleshooting information for failed connection attempts. The Windows Firewall log file on the server may contain useful information as well.
4. If the preceding troubleshooting steps do not resolve a specific configuration issue on Windows, then provide the output from the following command to Oracle Support for diagnosis and problem resolution:

```
netsh firewall show state verbose=enable
```

See Also:

- [Section 5.1.2, "Configure Exceptions for the Windows Firewall"](#)
- <http://www.microsoft.com/downloads/details.aspx?FamilyID=a7628646-131d-4617-bf68-f0532d8db131&displaylang=en> for information on Windows Firewall troubleshooting
- <http://support.microsoft.com/default.aspx?scid=kb;en-us;875357> for more information on Windows Firewall configuration

Installing and Configuring Oracle Grid Infrastructure Using Response Files

This appendix describes how to install and configure Oracle Grid Infrastructure software using response files. It includes information about the following topics:

- [About Response Files](#)
- [Preparing a Response File](#)
- [Running the Installer Using a Response File](#)
- [Running Net Configuration Assistant Using a Response File](#)
- [Postinstallation Configuration Using a Response File](#)

B.1 About Response Files

When you start the installer, you can use a response file to automate the installation and configuration of Oracle software, either fully or partially. The installer uses the values contained in the response file to provide answers to some or all installation prompts.

Typically, the installer runs in interactive mode, which means that it prompts you to provide information in graphical user interface (GUI) screens. When you use response files to provide this information, you run the installer from a command prompt using either of the following modes:

- **Silent mode**

If you include responses for all of the prompts in the response file and specify the `-silent` option when starting the installer, then it runs in silent mode. During a silent mode installation, the installer does not display any screens. Instead, it displays progress information in the terminal that you used to start it.
- **Response file mode**

If you include responses for some or all of the prompts in the response file and omit the `-silent` option, then the installer runs in response file mode. During a response file mode installation, the installer displays all the screens, screens for which you specify information in the response file, and also screens for which you did not specify the required information in the response file.

You define the settings for a silent or response file installation by entering values for the variables listed in the response file. For example, to specify the Oracle home name, supply the appropriate value for the `ORACLE_HOME` variable:

```
ORACLE_HOME="OraCrs11g_home1"
```

Another way of specifying the response file variable settings is to pass them as command line arguments when you run the installer. For example:

```
-silent "ORACLE_HOME=OraCrs11g_home1" ...
```

Ensure that you enclose the variable and its setting in double-quotes.

See Also: *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX* for more information about response files

B.1.1 Reasons for Using Silent Mode or Response File Mode

The following table provides use cases for running the installer in silent mode or response file mode.

Mode	Uses
Silent	<p>Use silent mode to do the following installations:</p> <ul style="list-style-type: none"> ■ Complete an unattended installation, which you schedule using operating system utilities such as <code>at</code>. ■ Complete several similar installations on multiple systems without user interaction. ■ Install the software on a system that cannot display the OUI graphical user interface. <p>The installer displays progress information on the terminal that you used to start it, but it does not display any of the installer screens.</p>
Response file	<p>Use response file mode to complete similar Oracle software installations on multiple systems, providing default answers to some, but not all of the installer prompts.</p> <p>In response file mode, all the installer screens are displayed, but defaults for the fields in these screens are provided by the response file. You have to provide information for the fields in screens where you have not provided values in the response file.</p>

B.1.2 General Procedure for Using Response Files

The following are the general steps to install and configure Oracle products using the installer in silent or response file mode:

Note: You must complete all required preinstallation tasks on a system before running the installer in silent or response file mode.

1. Prepare a response file.
2. Run the installer in silent or response file mode.
3. If you completed a software-only installation, then perform the steps necessary to configure the Oracle product.

These steps are described in the following sections.

B.2 Preparing a Response File

This section describes the following methods to prepare a response file for use during silent mode or response file mode installations:

- [Editing a Response File Template](#)

- [Recording a Response File](#)

B.2.1 Editing a Response File Template

Oracle provides response file templates for each product and installation type, and for each configuration tool. For Oracle Grid Infrastructure, the response file is located in the *staging_dir\clusterware\response* directory on the installation media and in the *Grid_home\inventory\response* directory after installation.

[Table B-1](#) lists the response files provided with this software:

Table B-1 *Response files for Oracle Grid Infrastructure*

Response File	Description
<code>crs_install.rsp</code>	Silent installation of Oracle Grid Infrastructure installations

Caution: When you modify a response file template and save a file for use, the response file may contain plain text passwords. Ownership of the response file should be given to the Oracle software installation owner only. Oracle strongly recommends that database administrators or other administrators delete or secure response files when they are not in use.

To copy and modify a response file:

1. Copy the response file from the response file directory to a directory on your system.
2. Open the response file in a text editor.

See Also: *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX* for detailed information on creating response files

3. Follow the instructions in the file to edit it.

Note: The installer or configuration assistant fails if you do not correctly configure the response file.

4. Secure the response file.

Note: A fully specified response file for an Oracle Grid Infrastructure installation can contain the passwords for Oracle Automatic Storage Management (Oracle ASM) administrative accounts and for a user who is a member of the `ORA_DBA` group and the Administrators group. Ensure that only the Oracle software owner user can view or modify response files or consider deleting the modified response file after the installation succeeds.

B.2.2 Recording a Response File

You can use the installer in interactive mode to record a response file, which you can edit and then use to complete silent mode or response file mode installations. This

method is useful for customized or software-only installations. If you use record mode during a response file mode installation, then the installer records the variable values that were specified in the original source response file into the new response file.

Starting with Oracle Database 11g Release 2 (11.2), you can save all the installation steps into a response file during installation by clicking **Save Response File** on the Summary page. You can use the generated response file for a silent installation later.

When you record the response file, you can either complete the installation, or you can exit from the installer on the Summary page, before it starts to copy the software to the server.

Note: Oracle Universal Installer (OUI) does not record passwords in the response file.

To record a response file:

1. Complete preinstallation tasks as for a normal installation.

When you run the installer to record a response file, it checks the system to verify that it meets the requirements to install the software. For this reason, Oracle recommends that you complete all of the required preinstallation tasks and record the response file while completing an installation.

2. Log in as a user that is a member of the local Administrators group. Ensure that this user (the Oracle Grid Infrastructure software owner) has permissions to create or write to the Grid home path that you specify during installation.
3. Start the installer. On each installation screen, specify the required information.
4. When the installer displays the Summary screen, perform the following steps:
 - a. Click **Save Response File**. In the pop-up window, specify a file name and location to save the values for the response file, then click **Save**.
 - b. Click **Finish** to continue with the installation.

Click **Cancel** if you do not want to continue with the installation. The installation will stop, but the settings you have entered will be recorded in the response file.

5. Before you use the saved response file on another system, edit the file and make any required changes.

Use the instructions in the file as a guide when editing it.

B.3 Running the Installer Using a Response File

To use a response file during installation, you start OUI from the command line, specifying the response file you created. The OUI executable, `setup.exe`, provides several options. For information about the full set of these options, run the `setup.exe` command with the `-help` option, for example:

```
C:\...\bin> setup.exe -help
```

The help information appears in your session window after a short period of time.

To run the installer using a response file:

1. Complete the preinstallation tasks as for any installation
2. Log in as an Administrator user.

3. To start the installer in silent or response file mode, enter a command similar to the following:

```
C:\> directory_path\setup.exe [-silent] [-noconfig] \
-responsefile responsefilename
```

Note: Do not specify a relative path to the response file. If you specify a relative path, then the installer fails.

In this example:

- *directory_path* is the path of the DVD or the path of the directory on the hard drive where you have copied the installation software.
- `-silent` runs the installer in silent mode.
- `-noconfig` suppresses running the configuration assistants during installation, and a software-only installation is performed instead.
- *responsefilename* is the full path and file name of the installation response file that you configured.

If you use record mode during a response file mode installation, then the installer records the variable values that were specified in the original source response file into the new response file.

B.4 Running Net Configuration Assistant Using a Response File

You can run Net Configuration Assistant (NETCA) in silent mode to configure and start an Oracle Net listener on the system, configure naming methods, and configure Oracle Net service names. To run NETCA in silent mode, you must copy and edit a response file template. Oracle provides a response file template named `netca.rsp` in the `database\inventory\response` directory in the Oracle home directory after installation or in the `database\response` directory on the installation media.

To run NETCA using a response file:

1. Copy the `netca.rsp` response file template from the response file directory to a directory on your system.

If you have copied the software to a hard drive, then you can edit the file in the response directory.

2. Open the response file in a text editor.
3. Follow the instructions in the file to edit it.

Note: NETCA fails if you do not correctly configure the response file.

4. Log in as an Administrator user and set the `ORACLE_HOME` environment variable to specify the correct Oracle home directory.
5. Enter a command similar to the following to run NETCA in silent mode:

```
C:\> Oracle_home\bin\netca -silent -responsefile X:\local_dir\netca.rsp
```

In this command:

- The `-silent` option runs NETCA in silent mode.
- `X:\local_dir` is the full path of the directory where you copied the `netca.rsp` response file template, where `X` represents the drive on which the file is located, and `local_dir` the path on that drive.

B.5 Postinstallation Configuration Using a Response File

Use the following sections to create and run a response file configuration after installing Oracle software.

B.5.1 About the Postinstallation Configuration File

When you run a silent or response file installation, you provide information about your servers in a response file that you otherwise provide manually using a graphical user interface. However, the response file does not contain passwords for user accounts that configuration assistants require after software installation is complete. The configuration assistants are started with a script called `configToolAllCommands`. You can run this script in response file mode by creating and using a password response file. The script uses the passwords to run the configuration tools in succession to complete configuration.

If you keep the password file to use for clone installations, then Oracle strongly recommends that you store it in a secure location. In addition, if you have to stop an installation to fix an error, then you can run the configuration assistants using `configToolAllCommands` and a password response file.

The `configToolAllCommands` password response file consists of the following syntax options:

- `internal_component_name` is the name of the component that the configuration assistant configures
- `variable_name` is the name of the configuration file variable
- `value` is the desired value to use for configuration.

The command syntax is as follows:

```
internal_component_name | variable_name=value
```

For example:

```
oracle.assistants.asm|S_ASMPASSWORD=myPassWord
```

Oracle strongly recommends that you maintain security with a password response file.

B.5.2 Running Postinstallation Configuration Using a Response File

To run configuration assistants with the `configToolAllCommands` script:

1. Create a response file using the format `filename.properties` for the file name.
2. Open the file with a text editor, and cut and paste the password template, modifying as needed.

Example B-1 Password response file for Oracle Grid Infrastructure Installation

Oracle Grid Infrastructure requires passwords for Oracle Automatic Storage Management Configuration Assistant (ASMCA), and for Intelligent Platform Management Interface Configuration Assistant (IPMICA) if you have a baseboard

management controller (BMC) card and you want to enable this feature. Provide the following response file:

```
oracle.assistants.asm|S_ASMPASSWORD=password  
oracle.assistants.asm|S_ASMMONITORPASSWORD=password  
oracle.crs|S_BMCPASSWORD=password
```

If you do not have a BMC card, or you do not want to enable Intelligent Platform Management Interface (IPMI), then leave the `S_BMCPASSWORD` input field blank.

- 3.** Change directory to `Oracle_home\cfgtoollogs`, and run the configuration script using the following syntax:

```
configToolAllCommands RESPONSE_FILE=\path\filename.properties
```

For example:

```
C:\..\cfgtoollogs> configToolAllCommands RESPONSE_FILE=C:\users\oracle  
\grid\cfgrsp.properties
```

Oracle Grid Infrastructure for a Cluster Installation Concepts

This appendix explains the reasons for preinstallation tasks that you are asked to perform, and other installation concepts.

This appendix contains the following sections:

- [Understanding Preinstallation Configuration](#)
- [Understanding Storage Configuration](#)
- [Understanding Server Pools](#)
- [Understanding Out-of-Place Upgrade](#)

C.1 Understanding Preinstallation Configuration

This section reviews concepts about Oracle Grid Infrastructure for a cluster preinstallation tasks. It contains the following sections:

- [Understanding the Oracle Inventory Directory](#)
- [Understanding the Oracle Base Directory Path](#)
- [Understanding Network Addresses](#)
- [Understanding Network Time Requirements](#)

C.1.1 Understanding the Oracle Inventory Directory

The Oracle Inventory directory is the central inventory location for all Oracle software installed on a server. The location of the Oracle Inventory directory is `<System_drive>\Program Files\Oracle\Inventory`.

The first time you install Oracle software on a system, the installer checks to see if an Oracle Inventory directory exists. The location of the Oracle Inventory directory is determined by the Windows Registry key `HKEY_LOCAL_MACHINE\SOFTWARE\Oracle\inst_loc`. If an Oracle Inventory directory does not exist, then the installer creates one in the default location of `C:\Program Files\Oracle\Inventory`.

Note: Changing the value for `inst_loc` in the Windows registry is not supported.

By default, the Oracle Inventory directory is not installed under the Oracle base directory for the installation owner. This is because all Oracle software installations share a common Oracle Inventory, so there is only one Oracle Inventory for all users, whereas there is a separate Oracle Base directory for each user.

C.1.2 Understanding the Oracle Base Directory Path

During installation, you are prompted to specify an Oracle base location, which is owned by the user performing the installation. You can choose a location with an existing Oracle home, or choose another directory location that does not have the structure for an Oracle base directory. The default location for the Oracle base directory is `<SYSTEM_DRIVE>:\app\user_name\`.

Using the Oracle base directory path helps to facilitate the organization of Oracle installations, parameter, diagnostic, and log files, and helps to ensure that installations of multiple databases maintain an Optimal Flexible Architecture (OFA) configuration.

Multiple Oracle Database installations can use the same Oracle base directory. The Oracle Grid Infrastructure installation uses a different directory path, one outside of Oracle base. If you use different operating system users to perform the Oracle software installations, then each user will have a different default Oracle base location.

C.1.3 Understanding Network Addresses

During installation, you are asked to identify the planned use for each network interface that Oracle Universal Installer (OUI) detects on your cluster node. Identify each interface as a public or private interface, or as an interface that you do not want Oracle Clusterware to use. Public and virtual internet protocol (VIP) addresses are configured on public interfaces. Private addresses are configured on private interfaces.

Refer to the following sections for detailed information about each address type:

- [About the Public IP Address](#)
- [About the Private IP Address](#)
- [About the Virtual IP Address](#)
- [About the Grid Naming Service Virtual IP Address](#)
- [About the SCAN](#)

C.1.3.1 About the Public IP Address

The public IP address is assigned dynamically using dynamic host configuration protocol (DHCP), or defined statically in a domain name system (DNS) or `hosts` file. It uses the public interface (the interface with access available to clients).

C.1.3.2 About the Private IP Address

Oracle Clusterware uses interfaces marked as private for internode communication. Each cluster node must have an interface that you identify during installation as a private interface. Private interfaces must have addresses configured for the interface itself, but no additional configuration is required. Oracle Clusterware uses the interfaces you identify as private for the cluster interconnect. Any interface that you identify as private must be on a subnet that connects to every node of the cluster. Oracle Clusterware uses all the interfaces you identify for use as private interfaces.

For the private interconnects, because of Cache Fusion and other traffic between nodes, Oracle strongly recommends using a physically separate, private network. If

you configure addresses using a DNS, then you should ensure that the private IP addresses are reachable only by the cluster nodes.

After installation, if you modify the interconnect for Oracle Real Application Clusters (Oracle RAC) with the `CLUSTER_INTERCONNECTS` initialization parameter, then you must change the interconnect to a private IP address, on a subnet that is not used with a public IP address, nor marked as a public subnet by `oifcfg`. Oracle does not support changing the interconnect to an interface using a subnet that you have designated as a public subnet.

You should not use a firewall on the network with the private network IP addresses, because this can block interconnect traffic.

C.1.3.3 About the Virtual IP Address

The virtual IP (VIP) address is registered in the grid naming service (GNS), or the DNS. Select an address for your VIP that meets the following requirements:

- The IP address and host name are currently unused (it can be registered in a DNS, but should not be accessible by a `ping` command)
- The VIP is on the same subnet as your public interface

C.1.3.4 About the Grid Naming Service Virtual IP Address

The GNS VIP address is a static IP address configured in the DNS. The DNS delegates queries to the GNS VIP address, and the GNS daemon responds to incoming name resolution requests at that address.

Within the subdomain, the GNS uses multicast Domain Name Service (mDNS), included with Oracle Clusterware, to enable the cluster to map host names and IP addresses dynamically as nodes are added and removed from the cluster, without requiring additional host configuration in the DNS.

To enable GNS, you must have your network administrator provide a set of IP addresses for a subdomain assigned to the cluster (for example, `grid.example.com`), and delegate DNS requests for that subdomain to the GNS VIP address for the cluster, which GNS will serve. The set of IP addresses is provided to the cluster through DHCP, which must be available on the public network for the cluster.

See Also: *Oracle Clusterware Administration and Deployment Guide* for more information about GNS

C.1.3.5 About the SCAN

Oracle Database 11g Release 2 clients connect to the database using a single client access name (SCAN). The SCAN and its associated IP addresses provide a stable name for clients to use for connections, independent of the nodes that make up the cluster. SCAN addresses, virtual IP addresses, and public IP addresses must all be on the same subnet.

The SCAN is a VIP name, similar to the names used for VIP addresses, such as `node1-vip`. However, unlike a VIP, the SCAN is associated with the entire cluster, rather than an individual node, and associated with multiple IP addresses, not just one address.

The SCAN resolves to multiple IP addresses reflecting multiple listeners in the cluster that handle public client connections. When a client submits a request, the SCAN listener listening on a SCAN IP address and the SCAN port is made available to a client. Because all services on the cluster are registered with the SCAN listener, the SCAN listener replies with the address of the local listener on the least-loaded node

where the service is currently being offered. Finally, the client establishes connection to the service through the listener on the node where service is offered. All of these actions take place transparently to the client without any explicit configuration required in the client.

During installation, listeners are created. These SCAN listeners listen on the SCAN IP addresses. The SCAN listeners are started on nodes determined by Oracle Clusterware. Oracle Net Services routes application requests to the least loaded instance providing the service. Because the SCAN addresses resolve to the cluster, rather than to a node address in the cluster, nodes can be added to or removed from the cluster without affecting the SCAN address configuration.

The SCAN should be configured so that it is resolvable either by using GNS within the cluster, or by using DNS. For high availability and scalability, Oracle recommends that you configure the SCAN name so that it resolves to three IP addresses. At a minimum, the SCAN must resolve to at least one address.

If you specify a GNS domain, then the SCAN name defaults to *clustername-scan.GNS_domain*. Otherwise, it defaults to *clustername-scan.current_domain*. For example, if you start Oracle Grid Infrastructure installation from the server `node1`, the cluster name is `mycluster`, and the GNS domain is `grid.example.com`, then the SCAN Name is `mycluster-scan.grid.example.com`.

Clients configured to use IP addresses for Oracle Database releases prior to Oracle Database 11g Release 2 can continue to use their existing connection addresses; using SCANs is not required. When you upgrade to Oracle Clusterware 11g Release 2 (11.2), the SCAN becomes available, and you should use the SCAN for connections to Oracle Database 11g Release 2 or later databases. When an earlier version of Oracle Database is upgraded, it registers with the SCAN listeners, and clients can start using the SCAN to connect to that database. The database registers with the SCAN listener through the remote listener parameter in the `init.ora` file. The `REMOTE_LISTENER` parameter must be set to `SCAN:PORT`. Do not set it to a `TNSNAMES` alias with a single address with the SCAN, for example, using `HOST= SCAN_name`.

The SCAN is optional for most deployments. However, clients using Oracle Database 11g Release 2 and later policy-managed databases using server pools must access the database using the SCAN. This is required because policy-managed databases can run on different servers at different times, so connecting to a particular node by using the virtual IP address for a policy-managed database is not possible.

C.1.4 Understanding Network Time Requirements

Oracle Clusterware 11g Release 2 (11.2) is automatically configured with Cluster Time Synchronization Service (CTSS). This service provides automatic synchronization of the time settings on all cluster nodes using the optimal synchronization strategy for the type of cluster you deploy. If you have an existing cluster synchronization service, such as network time protocol (NTP) or Windows Time Service, then it will start in an observer mode. Otherwise, it will start in an active mode to ensure that time is synchronized between cluster nodes. CTSS will not cause compatibility issues.

The CTSS module is installed as a part of Oracle Grid Infrastructure installation. CTSS daemons are started by the Oracle High Availability Services daemon (`ohasd`), and do not require a command-line interface.

C.2 Understanding Storage Configuration

The following sections describe concepts related to Oracle Automatic Storage Management (Oracle ASM) storage:

- [Understanding Oracle Automatic Storage Management Cluster File System](#)
- [About Migrating Existing Oracle ASM Instances](#)
- [About Converting Standalone Oracle ASM Installations to Clustered Installations](#)

C.2.1 Understanding Oracle Automatic Storage Management Cluster File System

Oracle ASM has been extended to include a general purpose file system, called Oracle Automatic Storage Management Cluster File System (Oracle ACFS). Oracle ACFS is a new multi-platform, scalable file system, and storage management technology that extends Oracle ASM functionality to support customer files maintained outside of the Oracle Database. Files supported by Oracle ACFS include application executable files and application reports. Other supported files are video, audio, text, images, engineering drawings, and other general-purpose application file data.

Note:

- Oracle ACFS is only supported on Windows Server 2003 x64 and Windows Server 2003 R2 x64 in Oracle ASM 11g Release 2 (11.2.0.1).
 - Starting with Oracle ASM 11g Release 2 (11.2.0.2), Oracle ACFS is also supported on Windows Server 2008 x64 and Windows Server 2008 R2 x64.
-
-

C.2.2 About Migrating Existing Oracle ASM Instances

If you have an Oracle ASM installation from a prior release installed on your server, or in an existing Oracle Clusterware installation, then you can use Oracle Automatic Storage Management Configuration Assistant (ASMCA, located in the path *Grid_home\bin*) to upgrade the existing Oracle ASM instance to Oracle ASM 11g Release 2 (11.2), and subsequently configure failure groups, Oracle ASM volumes, and Oracle ACFS.

Note: You must first shut down all database instances and applications on the node with the existing Oracle ASM instance before upgrading it.

During installation, if you chose to use Oracle ASM and ASMCA detects that there is a prior Oracle ASM version installed in another Oracle ASM home, then after installing the Oracle ASM 11g Release 2 (11.2) software, you can start ASMCA to upgrade the existing Oracle ASM instance. You can then configure an Oracle ACFS deployment by creating Oracle ASM volumes and using the upgraded Oracle ASM to create the Oracle ACFS.

On an existing Oracle Clusterware or Oracle RAC installation, if the prior version of Oracle ASM instances on all nodes is Oracle ASM 11g Release 1, then you are provided with the option to perform a rolling upgrade of Oracle ASM instances. If the prior version of Oracle ASM instances on an Oracle RAC installation are from an Oracle ASM release prior to Oracle ASM 11g Release 1, then rolling upgrades cannot be performed. Oracle ASM is then upgraded on all nodes to 11g Release 2 (11.2).

C.2.3 About Converting Standalone Oracle ASM Installations to Clustered Installations

If you have an existing standalone Oracle ASM installation on one or more nodes that are member nodes of the cluster, then OUI proceeds to install Oracle Grid

Infrastructure for a cluster. If you place Oracle Clusterware files (OCR and voting disks) on Oracle ASM, then ASMCA is started at the end of the clusterware installation, and provides prompts for you to migrate and upgrade the Oracle ASM instance on the local node, so that you have an Oracle ASM 11g Release 2 (11.2) installation.

On remote nodes, ASMCA identifies any standalone Oracle ASM instances that are running, and prompts you to shut down those Oracle ASM instances, and any database instances that use them. ASMCA then extends clustered Oracle ASM instances to all nodes in the cluster. However, disk group names on the cluster-enabled Oracle ASM instances must be different from existing standalone disk group names.

See Also: *Oracle Automatic Storage Management Administrator's Guide*

C.3 Understanding Server Pools

The following topics provide a short overview of server pools:

- [Overview of Server Pools and Policy-based Management](#)
- [How Server Pools Work](#)
- [The Free Server Pool](#)
- [The Generic Server Pool](#)

See Also: *Oracle Clusterware Administration and Deployment Guide* for information about how to configure and administer server pools

C.3.1 Overview of Server Pools and Policy-based Management

With Oracle Clusterware 11g Release 2 (11.2) and later, resources managed by Oracle Clusterware are contained in logical groups of servers called **server pools**. Resources are hosted on a shared infrastructure and are contained within server pools. The resources are restricted with respect to their hardware resource (such as CPU and memory) consumption by policies, behaving as if they were deployed in a single-system environment.

You can choose to manage resources dynamically using server pools to provide policy-based management of resources in the cluster, or you can choose to manage resources using the traditional method of physically assigning resources to run on particular nodes.

The Oracle Grid Infrastructure installation owner has privileges to create and configure server pools, using the Server Control utility (SRVCTL), Oracle Enterprise Manager Database Control, or Oracle Database Configuration Assistant (DBCA).

Policy-based management provides the following functionality:

- Enables dynamic capacity assignment when needed to provide server capacity in accordance with the priorities you set with policies
- Enables allocation of resources by importance, so that applications obtain the required minimum resources, whenever possible, and so that lower priority applications do not take resources from more important applications
- Ensures isolation where necessary, so that you can provide dedicated servers in a cluster for applications and databases

Applications and databases running in server pools do not share resources. Because of this, server pools isolate resources where necessary, but enable dynamic capacity assignments as required. Together with role-separated management, this capability

addresses the needs of organizations that have a standardized cluster environment, but allow multiple administrator groups to share the common cluster infrastructure.

C.3.2 How Server Pools Work

Server pools divide the cluster into groups of servers hosting the same or similar resources. They distribute a uniform workload (a set of Oracle Clusterware resources) over several servers in the cluster. For example, you can restrict Oracle databases to run only in a particular server pool. When you enable role-separated management, you can explicitly grant permission to operating system users to change attributes of certain server pools.

Caution: By default, any named user may create a server pool. To restrict the operating system users that have this privilege, Oracle strongly recommends that you add specific users to the CRS Administrators list. See *Oracle Clusterware Administration and Deployment Guide* for more information about adding users to the CRS Administrators list.

Top-level server pools:

- Logically divide the cluster
- Are always exclusive, meaning that one server can only reside in one particular server pool at a certain point in time

Each server pool has three attributes that are assigned when the server pool is created:

- **MIN_SIZE:** The minimum number of servers the server pool can contain. If the number of servers in a server pool is below the value of this attribute, then Oracle Clusterware automatically moves servers from elsewhere into the server pool until the number of servers reaches the attribute value or until there are no free servers available from less important pools.
- **MAX_SIZE:** The maximum number of servers the server pool should contain.
- **IMPORTANCE:** A number from 0 to 1000 (0 being least important) that ranks a server pool among all other server pools in a cluster.

When Oracle Clusterware is installed, two server pools are created automatically: Generic and Free. All servers in a new installation are assigned to the Free server pool, initially. Servers move from the Free server pool to newly defined server pools automatically. When you upgrade Oracle Clusterware, all nodes are assigned to the Generic server pool, to ensure compatibility with database releases before Oracle Database 11g Release 2 (11.2).

C.3.3 The Free Server Pool

The Free server pool contains servers that are not assigned to any other server pools. The attributes of the Free server pool are restricted, as follows:

- **SERVER_NAMES**, **MIN_SIZE**, and **MAX_SIZE** cannot be edited by the user
- **IMPORTANCE** and **ACL** can be edited by the user

See Also: *Oracle Clusterware Administration and Deployment Guide* for more information about how servers are assigned to server pools.

C.3.4 The Generic Server Pool

The Generic server pool stores Oracle Database 11g Release 1 (11.1) databases and earlier releases, and administrator-managed databases that have fixed configurations. Additionally, the Generic server pool contains servers that match either of the following:

- Servers that you specified in the `HOSTING_MEMBERS` attribute of all resources of the application resource type
- Servers with names you specified in the `SERVER_NAMES` attribute of the server pools that list the Generic server pool as a parent server pool

The attributes of the Generic server pool are restricted, as follows:

- The configuration attributes of the Generic server pool cannot be modified (all attributes are read-only).
- When you specify a server name in the `HOSTING_MEMBERS` attribute, Oracle Clusterware only allows it if the server is:
 - Online and exists in the Generic server pool
 - Online and exists in the Free server pool, in which case Oracle Clusterware moves the server into the Generic server pool
 - Online and exists in any other server pool and the client is either a CRS Administrator or is allowed to use the server pool's servers, in which case, the server is moved into the Generic server pool
 - Offline and the client is a CRS Administrator
- When you register a child server pool with the Generic server pool, Oracle Clusterware only allows it if the server names pass the same requirements as previously specified for the resources.

Servers are initially considered for assignment into the Generic server pool at cluster startup time or when a server is added to the cluster, and only after that to other server pools.

C.4 Understanding Out-of-Place Upgrade

During an out-of-place upgrade of Oracle Grid Infrastructure, the installer installs the newer version of the software in a separate Grid home. Both versions of Oracle Clusterware are on each cluster member node, but only one version is active.

If you have separate Oracle Clusterware homes on each node, then you can perform an out-of-place upgrade on all nodes, or perform an out-of-place rolling upgrade, so that some nodes are running Oracle Clusterware from the earlier version Oracle Clusterware home, and other nodes are running Oracle Clusterware from the new Oracle Clusterware home. Rolling upgrade avoids downtime and ensure continuous availability while the software is upgraded to a new version.

An in-place upgrade of Oracle Clusterware 11g Release 2 is not supported.

See Also: [Appendix D, "How to Upgrade to Oracle Grid Infrastructure 11g Release 2"](#) for instructions on completing rolling upgrades

How to Upgrade to Oracle Grid Infrastructure 11g Release 2

This appendix describes how to perform Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM) upgrades.

Oracle Clusterware upgrades can be rolling upgrades, in which a subset of nodes are brought down and upgraded while other nodes remain active. Oracle ASM 11g Release 2 (11.2) upgrades can be rolling upgrades. If you upgrade a subset of nodes, then a software-only installation is performed on the existing cluster nodes that you do not select for upgrade.

This appendix contains the following topics:

- [About Oracle ASM and Oracle Grid Infrastructure Installation and Upgrade](#)
- [Restrictions for Oracle Clusterware and Oracle ASM Upgrades](#)
- [Understanding Out-of-Place and Rolling Upgrades](#)
- [Preparing to Upgrade an Existing Oracle Clusterware Installation](#)
- [Using CVU to Verify System Readiness for Patches and Upgrades](#)
- [Back Up the Oracle Software Before Upgrades](#)
- [Performing a Rolling Upgrade of Oracle Clusterware](#)
- [Performing a Rolling Upgrade of Oracle ASM](#)
- [Updating Oracle Enterprise Manager Target Parameters](#)
- [Checking Cluster Health Monitor Repository Size After Upgrading](#)
- [Troubleshooting Upgrade Issues](#)
- [Downgrading Oracle Clusterware After an Upgrade](#)

D.1 About Oracle ASM and Oracle Grid Infrastructure Installation and Upgrade

In past releases, Oracle ASM was installed as part of the Oracle Database installation. With Oracle Database 11g Release 2 (11.2), Oracle ASM is installed when you install the Oracle Grid Infrastructure software. Oracle ASM shares an Oracle home with Oracle Clusterware when installed in a cluster such as with Oracle RAC or with Oracle Restart on a standalone server. The directory in which Oracle Clusterware and Oracle ASM is installed is called the Grid home.

If you have an existing Oracle ASM instance, you can either upgrade it at the time that you install Oracle Grid Infrastructure, or you can upgrade it after the installation,

using Oracle ASM Configuration Assistant (ASMCA). However, a number of Oracle ASM features are disabled until you upgrade Oracle ASM, and Oracle Clusterware management of Oracle ASM does not function correctly until Oracle ASM is upgraded, because Oracle Clusterware only manages Oracle ASM when it is running in the Oracle Grid Infrastructure home. For this reason, Oracle recommends that if you do not upgrade Oracle ASM at the same time as you upgrade Oracle Clusterware, then you should upgrade Oracle ASM immediately afterward.

You can perform out-of-place upgrades to an Oracle ASM instance using ASMCA. In addition to running ASMCA using the graphic user interface (GUI), you can run ASMCA in non-interactive (silent) mode.

In earlier releases, you could use Database Upgrade Assistant (DBUA) to upgrade either an Oracle Database, or Oracle ASM. With Oracle Database 11g Release 2 (11.2), you can use DBUA to upgrade only an Oracle Database instance. To upgrade Oracle ASM separately, you use ASMCA.

See Also: *Oracle Database Upgrade Guide* and *Oracle Automatic Storage Management Administrator's Guide* for additional information about upgrading existing Oracle ASM installations

D.2 Restrictions for Oracle Clusterware and Oracle ASM Upgrades

Be aware of the following restrictions and changes for upgrades to Oracle Grid Infrastructure installations, which consists of Oracle Clusterware and Oracle ASM.

- [Upgrade Your Existing Installation to the Minimum Required Version](#)
- [Apply Required Patches](#)
- [Other Requirements and Restrictions](#)
- [Changes to the Upgrade Process](#)

D.2.1 Upgrade Your Existing Installation to the Minimum Required Version

- To upgrade existing Oracle Clusterware installations to Oracle Grid Infrastructure 11g, your current release must be at least 10.1.0.3, 10.2.0.3, 11.1.0.6, or 11.2.
- To upgrade existing Oracle ASM installations to Oracle Grid Infrastructure 11g Release 2 (11.2) using the rolling upgrade method, your current release must be at least 11.1.0.6.

See Also: Oracle Upgrade Companion" Note 785351.1 on My Oracle Support:

<https://support.oracle.com>

See Also: *Oracle Database Upgrade Guide*

D.2.2 Apply Required Patches

To upgrade Oracle Grid Infrastructure release 11.2.0.1 to Oracle Grid Infrastructure release 11.2.0.2, you must first do at least one of the following:

- Patch the Oracle Grid Infrastructure release 11.2.0.1 home with the patch for bugs 9413827 (9978481) and 9706490 (10047003).

- Install the latest bundle for the cumulative patches for Oracle Grid Infrastructure (Patch 11 bundle or higher).

D.2.3 Other Requirements and Restrictions

- Adding nodes to a cluster during a rolling upgrade is not supported.
- Oracle Clusterware and Oracle ASM upgrades are always out-of-place upgrades. With Oracle Grid Infrastructure 11g Release 2 (11.2), you cannot perform an in-place upgrade of Oracle Clusterware and Oracle ASM to existing homes.
- With Oracle Clusterware 11g Release 1 and later releases, the same user that owned the Oracle Clusterware 10g software must perform the Oracle Clusterware 11g upgrade. Before the Oracle Database 11g release, either all Oracle software installations were owned by a single user, typically `oracle`, or Oracle Database software was owned by `oracle`, and Oracle Clusterware software was owned by a separate user, typically `crs`.

D.2.4 Changes to the Upgrade Process

- If the existing Oracle Clusterware home is a shared home, you can use a non-shared home for the Oracle Grid Infrastructure for a Cluster home for Oracle Clusterware and Oracle ASM 11g Release 2 (11.2).
- Oracle ASM and Oracle Clusterware both run in the Oracle Grid Infrastructure home.
- During a major version upgrade to Oracle Clusterware 11g Release 2 (11.2), the software in the Grid home for Oracle Grid Infrastructure 11g Release 2 (11.2) is not fully functional until the upgrade is completed. Running the Server Control Utility (SRVCTL), `crsctl`, and other commands from the 11g Release 2 (11.2) Grid home is not supported until the upgrade is complete across all nodes.

To manage pre-existing databases using earlier versions (release 10.x or 11.1) of Oracle Database software during the Oracle Grid Infrastructure upgrade, use SRVCTL in the existing database homes.

D.3 Understanding Out-of-Place and Rolling Upgrades

Oracle Clusterware upgrades can be rolling upgrades, in which a subset of nodes are brought down and upgraded while other nodes remain active. Oracle ASM 11g Release 2 (11.2) upgrades can be rolling upgrades. If you upgrade a subset of nodes, then a software-only installation is performed on the existing cluster nodes that you do not select for upgrade. Rolling upgrades avoid downtime and ensure continuous availability while the software is upgraded to a new version.

Note: In contrast with releases prior to Oracle Clusterware 11g Release 2, Oracle Universal Installer (OUI) always performs rolling upgrades, even if you select all nodes for the upgrade.

During an out-of-place upgrade, the installer installs the newer version in a separate Oracle Clusterware home. Both versions of Oracle Clusterware are on each cluster member node, but only one version is active. By contrast, an in-place upgrade overwrites the software in the current Oracle Clusterware home.

To perform an out-of-place upgrade, you must create new Oracle Grid Infrastructure homes on each node. Then you can perform an out-of-place rolling upgrade, so that

some nodes are running Oracle Clusterware from the original Oracle Clusterware home, and other nodes are running Oracle Clusterware from the new Oracle Grid Infrastructure home.

If you have an existing Oracle Clusterware installation, then you upgrade your existing cluster by performing an out-of-place upgrade. An in-place upgrade of Oracle Clusterware 11g Release 2 is not supported.

See Also: ["Performing a Rolling Upgrade of Oracle Clusterware"](#) on page D-7 for instructions on completing rolling upgrades

D.4 Preparing to Upgrade an Existing Oracle Clusterware Installation

If you have an existing Oracle Clusterware installation, then you upgrade your existing cluster by performing an out-of-place upgrade. You cannot perform an in-place upgrade. The following sections describe the tasks you should complete before starting an upgrade:

- [Verify System Readiness for Patches and Upgrades](#)
- [Gather the Necessary System Information](#)
- [Upgrade to the Minimum Required Oracle Clusterware Version](#)
- [Unset Environment Variables Used By Oracle Software](#)

D.4.1 Verify System Readiness for Patches and Upgrades

If you are completing a patch update of Oracle Clusterware or Oracle ASM, then after you download the patch software and before you start to patch or upgrade your software installation, review the Patch Set Release Notes that accompany the patch to determine if your system meets the system requirements for the operating system and the hardware.

Use the Cluster Verification Utility (CVU) to assist you with system checks in preparation for patching or upgrading. You can run CVU before starting the upgrade, however, the installer runs the appropriate CVU checks automatically, and prompts you to fix problems before proceeding with the upgrade.

See Also:

- ["Using CVU to Verify System Readiness for Patches and Upgrades"](#) on page D-5
- *Oracle Database Upgrade Guide*

D.4.2 Gather the Necessary System Information

Ensure that you have the information you will need when installation Oracle Grid Infrastructure into a new home directory, including the following:

- The Oracle home location for the current Oracle Clusterware installation.
With Oracle Clusterware 11g Release 2 (11.2), you can perform upgrades on a shared Oracle Clusterware home.
- An Oracle Grid Infrastructure home location that is different from your existing Oracle Clusterware home or Grid home location
- A single client access name (SCAN) address

- Local Administrator user access, or access as the user who performed the previous Oracle Clusterware installation

D.4.3 Upgrade to the Minimum Required Oracle Clusterware Version

If your current Oracle Clusterware installation is not currently running at least the minimum supported version for that release (10.1.0.3, 10.2.0.3, 11.1.0.6, or 11.2), then a prerequisite check failure is reported. You must upgrade your current Oracle Clusterware installation to at least the minimum supported version for that release before upgrading. For example, if you plan to upgrade your Oracle Clusterware 10g Release 1 installation to Oracle Clusterware 11g Release 2 (11.2) and your current Oracle Clusterware installation is version 10.1.0.2, then you must upgrade your current Oracle Clusterware installation to version 10.1.0.3 or higher before starting the upgrade

D.4.4 Unset Environment Variables Used By Oracle Software

If you have had an existing installation on your system, and you are using the same user account to install this installation, then unset the following environment variables, and any other environment variable set for the Oracle installation user that is connected with Oracle software homes.

- ORACLE_HOME
- ORACLE_SID
- ORA_NLS10
- TNS_ADMIN
- ORA_CRS_HOME

If you have set ORA_CRS_HOME as an environment variable, following instructions from Oracle Support, then unset it before starting an installation or upgrade. You should *never* use ORA_CRS_HOME as an environment variable except under explicit direction from Oracle Support.

To remove the environment variable settings for all sessions, from the Start menu, right click **My Computer** and select **Properties**. In the System Properties window, select **Advanced**, then click the **Environment Variables** button.

Also, check to ensure that the user profile for the installation owner does not set any of these environment variables.

D.5 Using CVU to Verify System Readiness for Patches and Upgrades

If you are completing a patch update of Oracle Clusterware or Oracle ASM, then after you download the patch software and before you start to patch or upgrade your software installation, review the Patch Set Release Notes that accompany the patch to determine if your system meets the system requirements for the operating system and the hardware.

Navigate to the staging area for the upgrade, where the `runcluvfy` command is located, and run the command `runcluvfy stage -pre crsinst -upgrade` to check the readiness of your Oracle Clusterware installation for upgrades. Running `runcluvfy` with the `-pre crsinst -upgrade` flags performs system checks to confirm if the cluster is in a correct state for upgrading from an existing clusterware installation.

The command uses the following syntax, where variable content is indicated by italics:

```
runcluvfy stage -pre crsinst -upgrade [-n node_list] [-rolling] -src_crshome
```

```
src_Gridhome -dest_crshome dest_Gridhome -dest_version dest_version
[-fixup[-fixupdir fixupdirpath]] [-verbose]
```

The options used in this command are:

Option	Description
-n <i>nodelist</i>	The -n flag indicates cluster member nodes, and <i>nodelist</i> is the comma-delimited list of non-domain qualified node names on which you want to run a preupgrade verification. If you do not add the -n flag to the verification command, then all the nodes in the cluster are verified.
-rolling	Use this flag to verify readiness for rolling upgrades.
-src_crshome <i>src_Gridhome</i>	Use this flag to indicate the location of the source Oracle Clusterware or Grid home that you are upgrading, where <i>src_Gridhome</i> is the path to the home that you want to upgrade.
-dest_crshome <i>dest_Gridhome</i>	Use this flag to indicate the location of the upgrade Grid home, where <i>dest_Gridhome</i> is the path to the Grid home.
-dest_version <i>dest_version</i>	Use the <i>dest_version</i> flag to indicate the release number of the upgrade, including any Patch set. The release number must include the five digits designating the release to the level of the platform-specific patch. For example: 11.2.0.2.0.
-fixup [-fixupdir <i>fixupdirpath</i>]	(Linux and UNIX) Use the -fixup flag to indicate that you want to generate instructions for any required steps you need to complete to ensure that your cluster is ready for an upgrade. The default location is the CVU work directory. If you want to place the fixup instructions in a different directory, then add the flag -fixupdir, and provide the path to the fixup directory
-verbose	Use the -verbose flag to produce detailed output of individual checks

Use the Cluster Verification Utility (CVU) to assist you with system checks in preparation for patching or upgrading. You can run CVU before starting the upgrade, however, the installer runs the appropriate CVU checks automatically, and prompts you to fix problems before proceeding with the upgrade.

Example D-1 Using CVU to Verify System Upgrade Readiness for Grid Infrastructure

You can verify that the permissions required for installing Oracle Clusterware have been configured on the nodes node1 and node2 by running the following command:

```
C:\stage> runcluvfy.bat stage -pre crsinst -upgrade -n node1,node2 -rolling
-src_crshome C:\app\11.2.0\grid -dest_crshome C:\app\11.2.0.3\grid
-dest_version 11.2.0.3.0 -fixup -fixupdirpath C:\user\grid\fixup -verbose
```

See Also: *Oracle Database Upgrade Guide*

D.6 Back Up the Oracle Software Before Upgrades

Before you make any changes to the Oracle software, Oracle recommends that you create a backup of the Oracle software and databases.

D.7 Performing a Rolling Upgrade of Oracle Clusterware

Use the following procedure to upgrade Oracle Clusterware from an earlier release to Oracle Clusterware 11g Release 2. You can also choose to upgrade Oracle ASM during the upgrade of Oracle Clusterware.

1. If there are non-clustered, or single-instance, Oracle databases that use Oracle ASM running on any of the nodes in the cluster, they must be shut down before you start the upgrade. Listeners associated with those databases do not have to be shut down.

Note: Oracle recommends that you leave Oracle Real Application Clusters (Oracle RAC) instances running during the Oracle Clusterware upgrade. During the upgrade process, the database instances on the node being upgraded are stopped and started automatically during the upgrade process.

2. Stop the Enterprise Manager Database Control on each node. Run the following command to stop Database Control:

```
C:\> emctl stop dbconsole
```

3. Start the installer, and select the option to upgrade an existing Oracle Clusterware and Oracle ASM installation.
4. On the node selection page, select all nodes.

Note: In contrast with releases prior to Oracle Clusterware 11g Release 2, all upgrades are rolling upgrades, even if you select all nodes for the upgrade. If you are upgrading from Oracle Clusterware 11g release 11.2.0.1 to release 11.2.0.2, then all nodes are selected by default. You cannot select or de-select the nodes.

5. Select installation options as prompted.
6. If prompted to do so, run the scripts as directed.
7. When the Oracle Clusterware upgrade is complete, if an earlier version of Oracle ASM is installed, then the installer starts ASMCA to upgrade Oracle ASM to release 11.2. You can upgrade Oracle ASM at this time, or upgrade it later.

Oracle recommends that you upgrade Oracle ASM at the same time that you upgrade Oracle Clusterware. Until Oracle ASM is upgraded, Oracle databases that use Oracle ASM cannot be created. Until Oracle ASM is upgraded, the Oracle ASM management tools in the Oracle Grid Infrastructure 11g Release 2 (11.2) home (for example, SRVCTL) will not work.

Note: After the upgrade, if you set the Oracle Cluster Registry (OCR) backup location manually to the earlier release Oracle Clusterware home (CRS home), then you must change the OCR backup location to the Oracle Grid Infrastructure home (Grid home). If you did not set the OCR backup location manually, then this issue does not concern you.

Because upgrades of Oracle Clusterware are out-of-place upgrades, the CRS home for the earlier release Oracle Clusterware cannot be the location of the OCR backups for Oracle Clusterware 11g Release 2. Backups in the old Oracle Clusterware home could be deleted.

D.8 Performing a Rolling Upgrade of Oracle ASM

After you have completed the Oracle Clusterware 11g Release 2 (11.2) upgrade, if you did not choose to upgrade Oracle ASM when you upgraded Oracle Clusterware, then you can do it separately using ASMCA to perform rolling upgrades.

You can use ASMCA to complete the upgrade of Oracle ASM separately, but you should perform the upgrade as soon as possible after you upgrade Oracle Clusterware, because Oracle ASM management tools such as SRVCTL will not work until Oracle ASM is upgraded.

Note: ASMCA performs a rolling upgrade only if the earlier version of Oracle ASM is either 11.1.0.6 or 11.1.0.7. Otherwise, ASMCA performs a normal upgrade, during which ASMCA shuts down all Oracle ASM instances on all nodes of the cluster, and then starts an Oracle ASM instance on each node from the new Oracle Grid Infrastructure home.

D.8.1 About Upgrading Oracle ASM Separately

Note the following if you intend to perform rolling upgrades of Oracle ASM:

- The active version of Oracle Clusterware must be 11g Release 2 (11.2). To determine the active version, enter the following command from the Grid home:

```
C:\..\bin> crsctl query crs activeversion
```
- You can upgrade a single instance Oracle ASM installation to a clustered Oracle ASM installation. However, you can only upgrade an existing single instance Oracle ASM installation if you run the installation from the node on which the Oracle ASM installation is installed. You cannot upgrade a single instance Oracle ASM installation on a remote node.
- You must ensure that any rebalance operations on your existing Oracle ASM installation are completed before starting the upgrade.
- During the upgrade, you alter the state of the Oracle ASM instances to an upgrade state. Because this upgrade state limits Oracle ASM operations, you should complete the upgrade soon after you begin. The following operations are allowed when an Oracle ASM instance is in the upgrade state:
 - Diskgroup mounts and dismounts
 - Opening, closing, resizing, or deleting database files
 - Recovering instances

- Queries of fixed views and packages: Users are allowed to query fixed views and run anonymous PL/SQL blocks using fixed packages, such as DBMS_DISKGROUP)

D.8.2 Using ASMCA to Upgrade Oracle ASM

Complete the following procedure to upgrade Oracle ASM:

1. On the node on which you plan to start the upgrade, set the environment variable `ASMCA_ROLLING_UPGRADE` to `true` to put the Oracle ASM instance in an upgrade state, for example:

```
C:\> set ASMCA_ROLLING_UPGRADE=true
```

2. From the Oracle Grid Infrastructure 11g Release 2 (11.2) home, start ASMCA, as shown in the following example, where `C:\app\11.2.0\grid` is the Grid home:

```
C:\> cd app\11.2.0\grid\bin
C:\..\bin> asmca.bat
```

3. **Select Upgrade.**

ASMCA upgrades Oracle ASM in succession for all nodes in the cluster.

4. When the upgrade is complete for all the nodes, unset the environment variable `ASMCA_ROLLING_UPGRADE`:

```
C:\> set ASMCA_ROLLING_UPGRADE=
```

See Also: *Oracle Database Upgrade Guide* and *Oracle Automatic Storage Management Administrator's Guide* for additional information about preparing an upgrade plan for Oracle ASM, and for starting, completing, and stopping Oracle ASM upgrades

D.9 Updating Oracle Enterprise Manager Target Parameters

Because Oracle Clusterware 11g Release 2 (11.2) is an out-of-place upgrade, the upgraded software has a new location for the Grid home. The path for the Oracle Clusterware home in some Oracle Enterprise Manager parameter files must be changed. If you do not change the parameter, then you will encounter errors such as "cluster target broken" on Oracle Enterprise Manager Database Control or Grid Control.

Use the following procedure to resolve this issue:

1. Log in to Database Control or Grid Control.
2. Select the **Cluster** tab.
3. Click **Monitoring Configuration**.
4. Update the value for **Oracle Home** with the new path for the Grid home.

D.10 Checking Cluster Health Monitor Repository Size After Upgrading

If you are upgrading from a prior release using IPD/OS to Oracle Grid Infrastructure Release 2 (11.2.0.3), then you should review the Cluster Health Monitor repository size (the CHM repository). Oracle recommends that you review your CHM repository needs, and enlarge the repository size if you want to maintain a larger CHM repository.

Note: Your previous IPD/OS repository is deleted when you install Oracle Grid Infrastructure.

By default, the CHM repository size for release 11.2.0.3 and later is a minimum of either 1GB or 3600 seconds (1 hour).

To enlarge the CHM repository, use the following command syntax, where *RETENTION_TIME* is the size of CHM repository in number of seconds:

```
oclumon manage -repos resize RETENTION_TIME
```

The value for *RETENTION_TIME* must be more than 3600 (one hour) and less than 259200 (three days). If you enlarge the CHM repository size, then you must ensure that there is local space available for the repository size you select on each node of the cluster. If there is not sufficient space available, then you can move the repository to shared storage.

For example, to set the repository size to four hours:

```
C:\> oclumon manage -repos resize 14400
```

D.11 Troubleshooting Upgrade Issues

This section describes some commonly encountered problems during the upgrade process.

- [OUI-35078: Error in updating env on nodes nodename](#)

OUI-35078: Error in updating env on nodes *nodename*

Cause: Processes from a prior release are not completely stopped before the upgrade. Typically, a dbconsole process is running

Action: Run the command `emctl stop dbconsole`. Check to ensure other Oracle processes from the earlier release software are stopped.

D.12 Downgrading Oracle Clusterware After an Upgrade

After a successful or a failed upgrade to Oracle Clusterware 11g Release 2 (11.2), you might want to restore Oracle Clusterware to the previous version.

To restore Oracle Clusterware 11g Release 2 (11.2) to an earlier version of Oracle Clusterware, use the following procedure. In the following procedure, the *local node* is the first node on which the `rootupgrade` script was run. The *remote nodes* are all other nodes that were upgraded.

1. Use the downgrade procedure for the release to which you want to downgrade.

Downgrading to Oracle Clusterware 11g Release 1 (11.1) or Oracle Clusterware 10g Release 2 (10.2):

There is currently no supported downgrade procedure. Instead, you must reinstall Oracle Clusterware for the target release and then reapply all required patches.

Downgrading to releases 11.2.0.1, 11.2.0.2, or 11.2.0.3:

Use the command syntax `Grid_home\perl\bin\perl rootcrs.pl -downgrade -oldcrshome oldGridHomePath -version oldGridversion`, where *oldGridhomepath* is the path to the previous release Oracle Grid Infrastructure home, and *oldGridversion* is the release to which you want to downgrade. For example:

```
C:\app\11.2.0.3\grid\perl\bin\perl> rootcrs.pl -downgrade -oldcrshome
C:\app\grid -version 11.2.0.1.0
```

Note: Ensure that Oracle Clusterware version is specified in the correct format. For example, 11.1.0.1.0.

If you want to stop a partial or failed 11g Release 2 (11.2) installation and restore the previous release of Oracle Clusterware, then use the `-force` flag with this command.

2. After the `rootcrs.pl -downgrade` script has completed on all remote nodes, on the local node use the command `Grid_home\perl\bin\perl\rootcrs.pl -downgrade -lastnode -oldcrshome oldGridhome -version oldGridversion [-force]`, where `oldGridhome` is the home of the earlier Oracle Clusterware installation, and `oldGridversion` is the release number of the earlier Oracle Clusterware installation.

For example:

```
C:\app\11.2.0.3\grid\perl\bin\perl> rootcrs.pl -downgrade -lastnode
-oldcrshome C:\app\grid -version 11.2.0.1.0
```

This script downgrades the OCR. If you want to stop a partial or failed 11g Release 2 (11.2) installation and restore the previous release Oracle Clusterware, then use the `-force` flag with this command.

3. Run the `gridconfig.bat` script as prompted by the `rootcrs.pl -downgrade` command.
4. Log in as the Grid Infrastructure installation owner and run the following commands, where `C:\app\11.2.0\grid` is the location of the new Grid home (11.2):

```
setup.exe -nowait -waitforcompletion -ignoreSysPrereqs
-updateNodeList -silent CRS=false ORACLE_HOME=C:\app\11.2.0\grid
```

Append `-cfs` to the end of the above command if the Oracle Grid home is a shared home.

5. **If the newer version of Oracle Grid Infrastructure is 11.2.0.2 or later**
 - a. If you are downgrading from Oracle Grid Infrastructure Release 2 (11.2.0.4) to an earlier release of 11.2, after execution of the upgrade scripts is completed on all cluster nodes, run the following command from the 11.2.0.4 Grid home:

```
acfsroot uninstall
```

After the command completes, from the earlier release Grid home, run the following command as an Administrator user:

```
acfsroot install
```

- b. On each node, start Oracle Clusterware from the earlier release Oracle Clusterware home using the command `crsctl start crs`. For example, where the earlier release home is `C:\app\grid`, use the following command on each node:

```
C:\app\grid\bin> crsctl start crs
```

6. Run the `gridconfig.bat` script as prompted by the `rootcrs.pl -downgrade` command from the earlier release Grid home in sequence on each member node of the cluster. After you complete this task, downgrade is completed.

Running `gridconfig.bat` from the earlier release Oracle Clusterware installation home restarts the Oracle Clusterware stack, starts up all the resources previously registered with Oracle Clusterware in the older version, and configures the old initialization scripts to run the earlier release Oracle Clusterware stack.

7. As the Grid infrastructure installation owner, run the following command, where `C:\app\grid` represents the home directory of the earlier Oracle Clusterware installation, for example:

```
setup.exe -nowait -waitforcompletion -ignoreSysPrereqs  
-updateNodeList -silent CRS=true ORACLE_HOME=C:\app\grid
```

Append `-cfs` to the end of the above command if the Oracle Clusterware home is a shared home.

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