

Oracle® Real Application Clusters

Installation Guide

12c Release 1 (12.1) for Microsoft Windows x64 (64-Bit)

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Oracle Real Application Clusters Installation Guide, 12c Release 1 (12.1) for Microsoft Windows x64 (64-Bit)
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Preface

Oracle Real Application Clusters Installation Guide for Microsoft Windows x64 (64-Bit) explains how to install and configure Oracle Real Application Clusters (Oracle RAC). Before you use this guide, you must first complete successfully an installation of Oracle Clusterware, as described in *Oracle Grid Infrastructure Installation Guide* for your platform.

Audience

Oracle Real Application Clusters Installation Guide for Microsoft Windows x64 (64-Bit) provides database installation information for database administrators (DBAs) who install and configure Oracle RAC.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info> or visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> if you are hearing impaired.

Java Access Bridge and Accessibility

Java Access Bridge enables assistive technologies to read Java applications running on the Windows platform. Assistive technologies can read Java-based interfaces, such as Oracle Universal Installer and Oracle Enterprise Manager Database Express.

See Also: *Oracle Database Installation Guide for Microsoft Windows* for more information about installing Java Access Bridge

Related Documents

For more information, see the following documents in the Oracle Database 12c Release 1 (12.1) documentation set.

Oracle Real Application Clusters Documentation

Most Oracle error message documentation is available only in HTML format. If you have access to the Oracle Documentation, then browse the error messages by range. After you find a range, use your browser's "find in page" 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 Grid Infrastructure Installation Guide for IBM AIX on POWER Systems (64-Bit)*
- *Oracle Grid Infrastructure Installation Guide for HP-UX*
- *Oracle Grid Infrastructure Installation Guide for Linux*
- *Oracle Grid Infrastructure Installation Guide for Microsoft Windows x64 (64-Bit)*
- *Oracle Grid Infrastructure Installation Guide for Oracle Solaris*

Operating System-Specific Administrative Guides

- *Oracle Database Administrator's Reference for Linux and UNIX-Based Operating Systems*
- *Oracle Database Platform Guide for Microsoft Windows*

Oracle Database 12c Release 1 (12.1) Real Application Clusters Management

- *Oracle Clusterware Administration and Deployment Guide*
- *Oracle Real Application Clusters Administration and Deployment Guide*
- *Oracle Database 2 Day DBA*
- *Oracle Database 2 Day + Real Application Clusters Guide*
- *Getting Started with the Oracle Diagnostics Pack*

Generic Documentation

- *Oracle Database Sample Schemas* describes the sample schemas provided in a basic installation of Oracle Database. Many of the examples in the Oracle Database Documentation Library use these schemas.
- *Oracle Database New Features Guide*
- *Oracle Database Net Services Administrator's Guide*
- *Oracle Database Concepts*
- *Oracle Database Reference*

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

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

If you have a user name and password for OTN, then you can go directly to the documentation section of the OTN website:

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

Oracle error message documentation is available only in HTML. You can browse the error messages by range in *Oracle Database Error Messages*. When you find a range, use

your browser's "find in page" 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.

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.

Changes In This Release for Oracle Real Application Clusters

This preface lists changes in *Oracle Real Application Clusters Installation Guide*:

Changes in Oracle Real Application Clusters 12c Release 1 (12.1)

The following are changes in *Oracle Real Application Clusters Installation Guide* for Oracle RAC 12c Release 1 (12.1).

- [New Features for Oracle Database 12c Release 1 \(12.1.0.2\)](#)
- [New Features for Oracle Database 12c Release 1 \(12.1.0.1\)](#)
- [Deprecated Features](#)
- [Desupported Features](#)
- [Other Changes](#)

New Features for Oracle Database 12c Release 1 (12.1.0.2)

The following features are new in this release:

- Standard Edition Replacement

Starting with Oracle Database 12c Release 1(12.1.0.2), Standard Edition 2 (SE2) replaces Standard Edition. Standard Edition 2 can run on systems with up to two sockets and can support a two-node Oracle RAC cluster.

See Also: My Oracle Support Note 2027072.1 for more information:

<https://support.oracle.com/epmos/faces/DocumentDisplay?id=2027072.1&displayIndex=1>

- Oracle Clusterware and Oracle RAC Support for the Diagnosability Framework

The Diagnosability Framework enables Oracle products to use a standardized and simplified way of storing and analyzing diagnosability data.

Note: The Oracle Trace File Analyzer (TFA) Collector is not supported on Windows operating systems.

See *Oracle Real Application Clusters Administration and Deployment Guide* for information about locating Oracle RAC trace files.

- Automatic Installation of Grid Infrastructure Management Repository

The Grid Infrastructure Management Repository is automatically installed with Oracle Grid Infrastructure 12c Release 1 (12.1.0.2).

- IPv6 Support for Public Networks

Oracle RAC 12c Release 1 (12.1.0.2) on Windows supports IPv6-based public IP and VIP addresses.

IPv6-based IP addresses have become the latest standard for the information technology infrastructure in today's data centers. With this release, Oracle RAC and Oracle Grid Infrastructure support this standard. You can configure cluster nodes during installation with either IPv4 or IPv6 addresses on the same network. Database clients can connect to either IPv4 or IPv6 addresses. The Single Client Access Name (SCAN) listener automatically redirects client connects to the appropriate database listener for the IP protocol of the client request.

See *Oracle Grid Infrastructure Installation Guide*.

New Features for Oracle Database 12c Release 1 (12.1.0.1)

The following features are new in this release:

- Database Upgrade Automation Using DBUA

There are three areas that are being enhanced for upgrade ease-of-use. First, in the pre-upgrade phase, the existing manual steps are eliminated and give more explicit advice or even generate a fixup script to find issues identified in the pre-upgrade phase. Second, in the post-upgrade phase, there is a post-upgrade health check that indicates that the upgrade was successful. Finally, partner documents (such as SAP) and major customer upgrade documents are used to further identify manual steps that may be automated and generalized to a wider customer base.

Automating the upgrade process provides major improvements in usability and ease-of-use. There is also better integration of database upgrade with Oracle Grid Infrastructure for a cluster and Oracle Enterprise Manager Cloud Control.

See *Oracle Database Upgrade Guide*.

- Oracle Home User Support for Oracle RAC on Windows

Starting with Oracle Database 12c Release 1 (12.1), Oracle Database supports the use of an Oracle Home User, which can be specified at installation time. The Oracle Home User is associated with a Windows domain user. The Windows domain user should be a standard (non-Administrator) account to ensure that the Oracle Home User has a limited set of privileges, thus ensuring that the Oracle Database services have only those privileges required to run Oracle products.

Windows Administrator user privileges are still required to perform Oracle software maintenance tasks including install, upgrade, patching and so on. Oracle Database administrative tools have been enhanced to ask for the password of the Oracle Home User, if needed. In Oracle RAC environments, you can store the password for the Oracle Home User in a secure wallet. If such a wallet exists, then the Oracle Database administrative tools automatically use the password from the wallet and do not require the user to enter the password for the Oracle Home User.

See *Oracle Database Platform Guide for Microsoft Windows*.

- Oracle Home User Control Utility

This release introduces a new Windows utility called Oracle Home User Control. This is a command line tool that displays the Oracle Home User name associated with the current Oracle Home. This utility also enables you to modify the

Windows Services used by Oracle to use a new password when the password for Oracle Home User is changed.

- Oracle ACFS Auditing and Support for Importing Auditing Data into Oracle Audit Vault Server

This feature provides auditing for Oracle ACFS security and encryption. In addition, this feature also generates an XML file containing Oracle ACFS audit trail data which can be imported by Oracle Audit Vault Server.

See *Oracle Automatic Storage Management Administrator's Guide*.

- DBCA Support for Multitenant Container Database and Pluggable Database Configurations

Starting with Oracle Database 12c Release 1 (12.1), Oracle Database Configuration Assistant (DBCA) allows you to create either a multitenant container database (CDB) or a non-CDB. You can create the CDB with zero, one, or more pluggable databases (PDBs).

You can also create a CDB with one PDB during the database installation.

See "Introduction to Pluggable Databases" in *Oracle Database Administrator's Guide*.

- Oracle Enterprise Manager Database Express 12c

Oracle Database 12c introduces Oracle Enterprise Manager Database Express (Oracle EM Express), a web management product built into Oracle Database without any need for special installation or management. Using Oracle EM Express, you can perform administrative tasks such as managing user security, and managing database memory and storage. You can also view performance and status information about your database.

See *Oracle Database 2 Day DBA* for information about Oracle Enterprise Manager Database Express.

- Policy-Based Cluster Management and Administration

Oracle Grid Infrastructure allows running multiple applications in one cluster. Using a policy-based approach, the workload introduced by these applications can be allocated across the cluster using a policy. In addition, a policy set enables different policies to be applied to the cluster over time as required. Policy sets can be defined using a web-based interface or a command-line interface.

Hosting various workloads in the same cluster helps to consolidate the workloads into a shared infrastructure that provides high availability and scalability. Using a centralized policy-based approach allows for dynamic resource reallocation and prioritization as the demand changes.

See *Oracle Clusterware Administration and Deployment Guide*.

- Simplified Oracle Database Vault Installation

Oracle Database Vault installs by default as part of the Oracle Database installation. You can also configure, enable, or disable Oracle Database Vault after completing the Oracle Database installation, either by using Oracle DBCA, or by running SQL statements.

See *Oracle Grid Infrastructure Installation Guide* for your platform and "Managing Administrative Privileges" in *Oracle Database Security Guide*.

- Simplified Oracle Label Security Installation

Oracle Label Security installs by default as part of the Oracle Database installation. You can also configure Oracle Label Security after the Oracle Database installation using Oracle DBCA.

See *Oracle Label Security Administrator's Guide*.

- Support for Separation of Database Administration Duties

Oracle Database 12c Release 1 (12.1) provides support for separation of administrative duties for Oracle Database by introducing task-specific and least-privileged administrative privileges that do not require the SYSDBA administrative privilege. These new privileges are: SYSBACKUP for backup and recovery, SYSDG for Oracle Data Guard, and SYSKM for encryption key management.

See *Oracle Grid Infrastructure Installation Guide* for your platform and "Managing Administrative Privileges" in *Oracle Database Security Guide*.

- Unified Database Audit Configuration

Starting with Oracle Database 12c, you can create named audit policies. An audit policy contains a set of audit options, which is stored in the database as an object. The advantage of creating a named audit policy is that it reduces the number of commands that are required to create a database audit policy, and it simplifies the implementation of an audit configuration for security and compliance with conditional auditing. This new audit policy framework is included with the database installation.

See "Auditing Activities with Unified Audit Policies and the AUDIT Statement" in *Oracle Database Security Guide*.

Deprecated Features

The following features are deprecated in this release, and may be desupported in another release. See *Oracle Database Upgrade Guide* for a complete list of deprecated features in this release.

- Single-letter SRVCTL command-line interface (CLI) options

All SRVCTL commands have been enhanced to accept full-word options instead of the single-letter options. All new SRVCTL command options added in this release support full-word options, only, and do not have single-letter equivalents. The use of single-letter options with SRVCTL commands might be desupported in a future release.

- Oracle Restart

Oracle Restart is a feature provided as part of Oracle Grid Infrastructure. Oracle Restart monitors and can restart Oracle Database instances, Oracle Net Listeners, and Oracle ASM instances. Oracle Restart is currently restricted to manage single instance Oracle Databases and Oracle ASM instances only, and is subject to desupport in future releases. Oracle continues to provide Oracle ASM as part of the Oracle Grid Infrastructure installation for Standalone and Cluster deployments.

- Standalone Deinstallation Tool

The deinstallation tool is now integrated with the database installation software.

See [Section 7.3.1, "About the Deinstallation Tool."](#)

- The `-cleanup0Base` flag of the deinstallation tool

The `-cleanup0Base` flag of the deinstallation tool is deprecated in this release. There is no replacement for this flag.

- Oracle Enterprise Manager Database Express replaces Oracle Enterprise Manager Database Control.
- A deinstall option using Oracle Universal Installer (OUI) replaces the standalone deinstall utility.

Desupported Features

The following features are no longer supported by Oracle. See *Oracle Database Upgrade Guide* for a complete list of desupported features in this release.

- Oracle Enterprise Manager Database Control
- `CLEANUP_ORACLE_BASE` property removed
- Deinstall standalone utility
- Oracle Counters for Windows Performance Monitor
- Oracle Cluster File System for Windows (OCFS for Windows)

Other Changes

The following are additional changes in the release:

- LREG (listener registration process) replaces the PMON (process monitor) for notifying listeners about instances, services, handlers and endpoints.
- Oracle RAC is supported on Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2.

Preinstallation Checklist

This chapter is intended for database administrators to use in consultation with system and storage administrators to coordinate the installation and plan the tasks for Oracle Clusterware, in preparation for completing an installation of Oracle Real Application Clusters (Oracle RAC). This chapter contains the following topics:

This chapter contains the following topics:

- [Before You Start: Planning Your Installation](#)
- [Overview of Server Hardware, Network, and Operating System](#)
- [Overview of Oracle RAC Storage](#)
- [Additional Information to Prepare for Installation](#)
- [Confirming Cluster Readiness for Oracle RAC Installation with CVU](#)
- [About Installing Oracle Database 12c on Systems with Existing Databases](#)

1.1 Before You Start: Planning Your Installation

This section provides a list of tasks that Oracle recommends you complete before starting Oracle Clusterware and Oracle RAC installation. Whether your location is a data center with a large project team of system administrators, storage administrators, network administrators, database administrators, and third-party hardware and software vendors, or you are a project team of one, planning is important to help ensure that your installation proceeds smoothly.

It is beyond the scope of this documentation set to advise how to determine hardware sizing or capacity planning for your installation. With Oracle Clusterware and Oracle RAC, you can add nodes and instances as needed in response to testing, or in response to increased workloads.

Review and complete the following steps as part of your installation plan:

- [Review Installation Steps for Oracle RAC](#)
- [Check My Oracle Support](#)
- [Check Oracle Technology Network](#)
- [Review Documentation](#)
- [Select a Security Notification Contact](#)
- [Review Administrator Task Delegation Options With Your System Administrator](#)
- [Review How to Use Cluster Verification Utility \(CVU\)](#)
- [Review Existing Oracle Installations and Upgrade Plans](#)

- [Consider Memory Allocation and Automatic Memory Management](#)
- [Review Globalization Requirements](#)

1.1.1 Review Installation Steps for Oracle RAC

Installing Oracle RAC consists of the following steps:

1. Prepare servers (system, users and groups, network, and storage administration), as described in *Oracle Grid Infrastructure Installation Guide* for your platform. These tasks include the following:
 - Install the operating system and install the operating system packages and patches to the required version.
 - Create the required users and software homes.
 - Set up the domain name forwarding for Grid Naming Service (GNS) if you plan to deploy GNS or Multi-Cluster GNS, and set up the network addresses in the DNS and on the server as needed.
 - Set up the required storage.
 - (Optional) Stage all of the software on one node for installation (the "local node").
2. Install Oracle Grid Infrastructure for a cluster, which includes Oracle Clusterware and Oracle ASM (system and storage administration):

Note:

- You must have Oracle Grid Infrastructure installed successfully before you attempt to install Oracle RAC.
-
-

3. Install Oracle RAC (database administration):
 - Install Oracle RAC or Oracle RAC One Node.
 - Complete the postinstallation configuration of the Oracle RAC database.

1.1.2 Check My Oracle Support

Before you decide whether you want to install Oracle Database 12c Release 1 (12.1), log on to My Oracle Support:

<https://support.oracle.com>

You must register online before using My Oracle Support.

To access certifications for your installation for your platform:

1. Log on to My Oracle Support.
2. Click the Certifications tab. If you do not see a tab titled Certifications, then click **More** and select Certifications from the list.
3. In the **Certification Search** frame, select Oracle Real Application Clusters, select the release number, and select your operating system platform on which you intend to install. When you have completed your selections, click **Search** to generate a product certification list for your installation.

Refer to Oracle.com (<http://www.oracle.com>) for additional resources about planning for specific implementation scenarios, best practices, and other information that can help you with your installation plan. In particular, refer to the Oracle Real Application Clusters pages on the Oracle Technology Network:

<http://www.oracle.com/goto/rac>

1.1.3 Check Oracle Technology Network

Oracle Technology Network (OTN) contains white papers about deployment options, capacity planning, best practices on various NFS platforms, and extended clusters deployments, which are not addressed in this guide. You can review available papers at the following website:

<http://www.oracle.com/goto/rac>

In particular, check the Oracle RAC Technologies Certification Matrix for your platform:

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

1.1.4 Review Documentation

Before installing Oracle RAC, review the *Oracle Grid Infrastructure Installation Guide* for your operating system platform to confirm that all cluster member nodes are configured with the required users, and that the system, storage, and network administrators have completed any other tasks required for an Oracle RAC installation.

Oracle Grid Infrastructure Installation Guide also contains most tasks requiring Administrator privileges or storage administrator privileges that must be completed before starting an Oracle RAC installation.

In addition, review the Release Notes and My Oracle Support (<https://support.oracle.com>) to ensure that you have the most current information about system requirements and other information that can affect your installation. The small amount of time that this review takes can save a much greater amount of time required to track down causes of installation errors later. Also, verify that you have the most current version of this document; Oracle documentation is updated after the initial release and posted to the following website:

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

Oracle recommends that you install a web browser on at least one of your cluster nodes, both to enable Oracle Enterprise Manager and Oracle Application Express, and to access online documentation as needed. Online documentation is available in PDF and HTML formats.

See Also:

- Oracle Database Concepts for an overview of Oracle Database
- *Oracle Real Application Clusters Administration and Deployment Guide* for additional information about Oracle Clusterware or Oracle RAC configuration and deployment
- *Oracle Grid Infrastructure Installation Guide* for server and storage configuration information for Oracle RAC

1.1.5 Select a Security Notification Contact

Oracle issues security alerts as needed for vulnerability fixes that are determined to be too critical to wait for distribution in the next Critical Patch Update.

During installation, you are asked in the Configure Security Updates screen to provide a security contact. Select one of the following options:

- Provide an email address to receive security information for your installation.
- Provide a My Oracle Support email address or account name to receive security information for your installation, and to enroll your system for Security Updates. You can receive information about alerts through My Oracle Support.

You can choose not to provide this information, but Oracle strongly recommends that you configure a security notification contact.

The information collected by Security Updates is limited to configuration information. The data collected does not include personally identifiable information (except a local contact name in case of transmission problems). You may still use all licensed Oracle functionality if you decline to enable Security Updates.

To choose not to receive security notifications, leave all fields in the Configure Security Updates screen blank, and click **Next** to continue.

If you provide your My Oracle Support credentials, then Security Updates automatically gathers configuration information regarding your installed Oracle products and uploads it to Oracle's support systems. You can access the information it collects through your My Oracle Support account, and review health check recommendations, patch recommendations and other recommendations for your system in addition to security alerts.

See Also: The Oracle Security Policies page, which is available from the following URL:

<http://www.oracle.com/us/support/assurance/fixing-policies/index.html>

1.1.6 Review Administrator Task Delegation Options With Your System Administrator

During installation, Oracle Universal Installer (OUI) requires you to run scripts with superuser (or Administrator) privileges to complete many system configuration tasks.

1.1.7 Review How to Use Cluster Verification Utility (CVU)

You can use CVU before running OUI to ensure that your cluster is prepared for an Oracle RAC installation. CVU is incorporated into OUI, so CVU runs when you start an Oracle RAC installation. However, you can use CVU to ensure that any packages or configuration information that is required for Oracle RAC are in place before you begin your Oracle RAC installation.

Oracle provides CVU to perform system checks in preparation for an installation, patch updates, or other system changes.

Using CVU can help system, storage, and database administrators ensure that all system configuration and preinstallation steps are completed, so that installations, updates, or patches complete successfully. You can obtain the latest version of CVU at the following URL:

<http://www.oracle.com/technetwork/database/options/clustering/downloads/cvu-download-homepage-099973.html>

If you have vendors performing hardware or operating system configuration steps, then ask the vendors to complete the relevant CVU checks of the cluster after they complete their work to ensure that your system is configured correctly. Database administrators should review "[Confirming Cluster Readiness for Oracle RAC Installation with CVU](#)" on page 1-19 to confirm that their system is prepared for installation before they start an Oracle RAC installation.

1.1.8 Review Existing Oracle Installations and Upgrade Plans

If you have an existing Oracle installation, then document version numbers, patches, and other configuration information, and review upgrade procedures for your existing installation. Review the Oracle upgrade documentation before proceeding with installation, to decide how to proceed.

To install Oracle RAC 12c Release 1 (12.1), you must have Oracle Grid Infrastructure (Oracle Clusterware and Oracle ASM) 12c Release 1 (12.1) installed on your cluster. The Oracle Clusterware version must be equal to or greater than the Oracle RAC version that you plan to install.

See Also: *Oracle Grid Infrastructure Installation Guide*

For the most current updates and best practices about pre-upgrade, post-upgrade, compatibility, and interoperability discussions, refer to "Oracle Upgrade Companion" for this release. "Oracle Upgrade Companion" is available through Note 1462240.1 on My Oracle Support:

<https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=1462240.1>

For upgrades, note the following:

- You can have only one version of Oracle Clusterware running on a cluster at a time. The Oracle Clusterware version must be the most recent release of any software (Oracle Clusterware, Oracle Database, Oracle RAC, and Oracle ASM) running on the cluster. Before upgrading your database to Oracle Database 12c, all nodes in the cluster must be upgraded to Oracle Clusterware and Oracle ASM 12c Release 1 (12.1).
- You can have multiple Oracle homes for Oracle databases on your cluster. However, the Oracle RAC database software in these homes must be from a version that is equal to or before the version of Oracle Clusterware that is installed; you cannot have a version of Oracle Database running on Oracle Clusterware that was released after the version of Oracle Clusterware that you use.

For example:

- If your servers use Oracle Grid Infrastructure 12c Release 1 (12.1), then you can have an Oracle Database 12c Release 1 (12.1) single-instance database running on one node, and separate Oracle RAC 11g Release 1 or Release 2, or Oracle RAC 12c Release 1 (12.1) databases also running on the cluster.
- You cannot have Oracle Grid Infrastructure 11g release 2 (11.2) installed on your cluster, and install Oracle RAC 12c Release 1 (12.1).
- You can use Database Upgrade Assistant (DBUA) for patch set upgrades with Oracle RAC. You can also use DBUA to upgrade between major point releases of Oracle RAC. For example, you can upgrade from Oracle Database 11g release 2 (11.2) to Oracle Database 12c Release 1 (12.1).
- Database upgrade is supported only for the following configurations:

- The same Windows User Account is used for the Oracle Home User across all Oracle Homes
- The home from which the database is being upgraded has the built-in account (LocalSystem) for the Oracle Home User.

Note that all older releases (Oracle Database 11.2 and earlier) supported the use of only the built-in account for the Oracle Home User.

- If you are upgrading an existing Oracle RAC installation, then you must use the same type of Oracle home that you have in your existing installation. For example, if you have a shared Oracle home in your existing installation, then you must upgrade to a shared Oracle home with Oracle RAC 12c Release 1 (12.1).

Similarly, if you have local Oracle homes on cluster nodes, then you must upgrade to local Oracle homes on cluster nodes.

- For the Oracle RAC database being upgraded, each cluster member node that hosts an instance of the database must be a member of the upgraded installation. For example, if you have an existing Oracle RAC database running on a three-node cluster, then you must upgrade Oracle RAC on all three nodes. You cannot upgrade only two nodes of the cluster, and then remove the third node and instance in the upgrade.
- If you have any database data stored on RAW devices, then before you start Oracle Grid Infrastructure and Oracle RAC installation, you must use RMAN to copy that data to Oracle ASM or to another supported file system.
- As with any system change, follow common industry standards for data recovery planning, and back up your existing database before upgrading your software.

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

1.1.9 Consider Memory Allocation and Automatic Memory Management

During a Typical installation, you create your database with Database Configuration Assistant (DBCA), and automatic memory management is enabled. If you choose advanced installation, then you can either specify memory allocation manually, or enable automatic memory management.

With automatic memory management, the Oracle RAC instances automatically manage and tune memory for you. With automatic memory management, you choose a memory target, and the instance automatically distributes memory between the system global area (SGA) and the instance program global area (instance PGA). As memory requirements change, the instance dynamically redistributes memory between the SGA and instance PGA.

If you choose not to enable automatic memory management during installation, then you can enable it after installation. Enabling automatic memory management after installation involves a shutdown and restart of the database.

See Also: *Oracle Database Administrator's Guide* for more information about automatic memory management

1.1.10 Review Globalization Requirements

Before you start an installation on which you want to support languages other than English, review *Oracle Database Globalization Support Guide*.

Note the following:

- Oracle recommends that you use Unicode AL32UTF8 as the database character set. Unicode is the universal character set that supports most of the currently spoken languages. Unicode also supports many historical scripts (alphabets). Unicode is the native encoding of many technologies, including Java, XML, XHTML, ECMAScript, and LDAP. Unicode is ideally suited for databases connected to the Internet and the global economy.
- The locale setting of your operating system session determines the language of the user interface and the globalization behavior for components such as Oracle Universal Installer, Oracle Net Configuration Assistant (NETCA), and Database Configuration Assistant (DBCA). The locale setting also determines the globalization behavior of Oracle Database sessions created by a user application through the Oracle JDBC driver, unless overridden by the application.
- The character set specified by the `NLS_LANG` environment variable determines the language of the user interface and the globalization behavior for components such as `SQL*Plus`, `exp`, and `imp`. This variable also sets the language and territory used by the client application and the database. The `NLS_LANG` environment variable also declares the character set for entering and displaying data by the client application.

The `NLS_LANG` environment variable should reflect the setting of the operating system character set of the client. For example, if the database character set is AL32UTF8 and the client is running on a Windows operating system, then you should not set the `NLS_LANG` environment variable to AL32UTF8 because there are no UTF-8 WIN32 clients. Instead, the `NLS_LANG` setting should reflect the code page of the client. For example, on an English Windows client, the code page is 1252, so an appropriate setting for `NLS_LANG` is `AMERICAN_AMERICA.WE8MSWIN1252`.

Note: *Oracle Database Installation Guide* for your platform contains a more detailed discussion of database character sets used with different languages, and provides more information about installing and configuring Oracle Database globalization support.

1.2 Overview of Server Hardware, Network, and Operating System

Oracle Clusterware must be installed successfully as part of an Oracle Grid Infrastructure for a cluster installation before attempting to install Oracle RAC.

To complete installations successfully, ensure that required hardware, network, and operating system preinstallation steps for Oracle software are performed as required. Failure to complete the required preinstallation steps is the most common reason for unsuccessful installations.

Before Oracle Clusterware is installed as part of an Oracle Grid Infrastructure for a cluster installation, you must have completed installing and configuring CPUs, memory, shared storage, local disks, network cards, host bus adapters, interconnects, and any other networking or server hardware. You should also have installed the operating system, and any required packages or third-party software. Review your vendor documentation to complete these tasks, and if relevant, work with your vendor to complete the Oracle preinstallation steps that are listed in this document to confirm that the vendor hardware and software is correctly configured.

Server and network preparation for installation includes the following:

- [Review Server Hardware and Software Requirements](#)

- [Overview of Server Environment Configuration](#)
- [Overview of Oracle Base Directories](#)
- [Overview of Network and Internet Configuration](#)
- [Overview of Platform-Specific Server Configuration](#)

1.2.1 Review Server Hardware and Software Requirements

The following summary of server hardware and software configuration requirements and recommendations will enable you to prepare for a successful installation of Oracle RAC:

- [Cluster Node Member Requirements for Oracle RAC](#)
- [Recommended for Oracle RAC: System Administrator Tasks](#)
- [Additional Options: System Administrators and Vendors](#)

1.2.1.1 Cluster Node Member Requirements for Oracle RAC

Each node in a cluster requires the following:

- Supported server hardware, including processors and system configuration.
Review the Oracle RAC Technologies Certification Matrix before starting an installation on your current hardware and before purchasing new hardware to ensure that the hardware is supported by Oracle Clusterware with Oracle RAC 12c Release 1 (12.1). You can view the certification matrix on Oracle Technology Network. See [Section 1.1.3, "Check Oracle Technology Network."](#)

Also review the preinstallation chapters in *Oracle Grid Infrastructure Installation Guide* for more details about the supported configurations.

Note: You must use the same operating system on each node in the cluster. Oracle strongly recommends that you use the same software configurations on each node of the cluster. Oracle Clusterware and Oracle RAC do not support heterogeneous platforms (each server must run the same Oracle software binaries) in the same cluster.

- Operating system updates listed in the system requirements.
For some operating systems, Oracle may require updates, such as service packs and individual patches. If such requirements exist, then they are stated in the Release Notes for a particular release. You can also apply other operating system patches as recommended by Microsoft, if there are no "certification exceptions" listed in the Release Notes. Refer to your operating system vendor for required operating system updates.

1.2.1.2 Recommended for Oracle RAC: System Administrator Tasks

Oracle recommends the following tasks to simplify server installation and maintenance, and to prevent service issues:

- Using a time protocol, such as Network Time Protocol (NTP), to ensure that all nodes in the cluster use the same reference time. With Oracle Clusterware 12c Release 1 (12.1), if NTP servers are not provided during Oracle Grid Infrastructure installation, then the Oracle Clusterware installation enables the Cluster Time Synchronization Service (CTSS).

- Configuring redundant switches, for all cluster sizes.
- Using identical server hardware on each node, to simplify server maintenance.
- Avoiding resource contention issues by not installing Oracle RAC on a primary domain controller or backup domain controller.

1.2.1.3 Additional Options: System Administrators and Vendors

After you have set up server hardware, review "Checking the Hardware Requirements" in *Oracle Grid Infrastructure Installation Guide* to ensure that your system has enough RAM, that the `TEMP` environment variable points to a location that has enough available space for the installation, and that your system meets other hardware requirements.

1.2.2 Overview of Server Environment Configuration

Configure the users and user environments as described in the preinstallation chapters of *Oracle Grid Infrastructure Installation Guide*. These include the following tasks:

- Creating operating system users to install Oracle software
- Configuring the Oracle software owner user environments

See Also: *Oracle Database Platform Guide for Microsoft Windows* for information about creating user groups

1.2.2.1 About Operating System Users for Installation of Oracle RAC

To install the Oracle Real Application Clusters software, you should use a Windows Domain User Account. You can use a Local User to perform the installation provided the user has the same password on all node. The user that performs the software installation is the **Oracle Installation User**.

During installation, you can specify an **Oracle Home user**. The Oracle Home User may be the Windows Built-in Account or a Windows Domain User Account. Oracle recommend the use of Windows Domain User Account as Oracle Home User for Oracle RAC homes.

Note: You must use a Windows Domain user account for the Oracle Home user to install the Oracle RAC software on Oracle ACFS.

See Also: *Oracle Grid Infrastructure Installation Guide for Microsoft Windows x64 (64-Bit)* for more information about the Oracle Installation user and the Oracle Home user and their requirements on Windows platforms

1.2.2.2 Operating System Groups Created During Installation of Oracle RAC

During installation, the following user groups are created, if they do not already exist, as described in [Table 1-1](#). In the following table, the *Homename* variable refers to the logical *Homename* for a software installation, which is of the form *OraproductmajorVersionHomename*. For example, *OraDB12cHome1*.

Table 1–1 User Groups Created During Oracle RAC Installation

Operating System Group Name	Related System Privilege	Description
ORA_DBA	SYSDBA system privilege for all Oracle Database instances on the server	<p>A special OSDBA group for the Windows operating system.</p> <p>Members of this group can use operating system authentication to gain SYSDBA privileges for any database installed on the server.</p>
ORA_OPER	SYSOPER system privilege for all Oracle Database instances on the server	<p>A special OSOPER group for the Windows operating system.</p> <p>Members of this group can use operating system authentication to gain SYSOPER privileges for any database installed on the server; this group is empty on initial creation. You can add users manually to this group after installation.</p>
ORA_Homename_DBA	SYSDBA system privilege for Oracle Database instances that run from the Oracle home named <i>Homename</i>	<p>An OSDBA group for a specific Oracle Home with a name of <i>Homename</i>.</p> <p>Members of this group can use operating system authentication to gain SYSDBA system privilege for any database that runs from the specific Oracle home. If you specified an Oracle Home User during installation, the user is added to this group during installation.</p>
ORA_Homename_OPER	SYSOPER system privilege for Oracle Database instances that run from the Oracle home named <i>Homename</i>	<p>An OSDBA group for the Oracle Home with a name of <i>Homename</i>.</p> <p>Members of this group can use operating system authentication to gain SYSOPER system privilege for any database that runs from the specific Oracle home. This group does not have any members after installation, but you can manually add users to this group after the installation completes.</p>
ORA_ASMDBA	SYSDBA system privilege on the Oracle ASM instance	<p>The OSDBA group for the Oracle ASM instance.</p> <p>This group grants access for the database to connect to Oracle ASM. During installation, the Oracle Installation Users are configured as members of this group. After you create an Oracle Database, this groups contains the Oracle Home Users of those database homes.</p>
ORA_Homename_ SYSBACKUP	SYSBACKUP system privilege for Oracle Database instances that run from the Oracle home named <i>Homename</i>	<p>OSBACKUPDBA group for a specific Oracle Home with a name of <i>Homename</i>.</p> <p>Members of this group have privileges necessary for performing database backup and recovery tasks on all database instances that run from the specified Oracle Home.</p>

Table 1–1 (Cont.) User Groups Created During Oracle RAC Installation

Operating System Group Name	Related System Privilege	Description
ORA_Homename_SYSDG	SYSDG system privilege for Oracle Database instances that run from the Oracle home named <i>Homename</i>	OSDGDBA group for a specific Oracle Home with a name of <i>Homename</i> . Members of this group have privileges necessary for performing Data Guard administrative tasks on all database instances that run from the specified Oracle Home.
ORA_Homename_SYSKM	SYSKM system privilege for Oracle Database instances that run from the Oracle home named <i>Homename</i>	OSKMDBA group for a specific Oracle Home with a name of <i>Homename</i> . Members of this group have privileges necessary for performing encryption key management tasks on all database instances that run from the specified Oracle Home.

Oracle creates and populates the groups listed in [Table 1–1](#) during installation to ensure proper operation of Oracle products. You can manually add other users to these groups to assign these database privileges to other Windows users.

Oracle creates other groups during installation, such as `ORA_INSTALL`, `ORA_CLIENT_LISTENERS`, `ORA_GRID_LISTENERS`, and `ORA_HOMENAME_SVCSIDS`. You should not change the groups, memberships, and ACLs associated with the various operating system groups created by Oracle software.

See Also:

- *Oracle Database Administrator's Guide* for more information about database system privileges
- *Oracle Automatic Storage Management Administrator's Guide* for more information about Oracle ASM system privileges

1.2.2.3 Job Role Separation Operating System Privileges Groups and Users

A Job Role Separation privileges configuration of Oracle ASM is a configuration with groups and users that divide administrative access privileges to the Oracle ASM installation from other administrative privileges users and groups associated with other Oracle installations. Administrative privileges access is granted by membership in separate operating system groups, and installation privileges are granted by using different installation owners for each Oracle installation.

Note: This configuration is optional, to restrict user access to Oracle software by responsibility areas for different administrator users.

You can create new administrative privileges that are more task-specific and less privileged than the SYSDBA and SYSOPER system privileges. These additional privileges support specific administrative privileges tasks required for everyday database operation, such as backing up databases, monitoring Data Guard, or managing encryption keys. Users granted these system privileges are also authenticated through operating system group membership.

See Also:

- *Oracle Grid Infrastructure Installation Guide* for more information about system privileges and operating systems groups

1.2.3 Overview of Oracle Base Directories

The Oracle base directory is the location where Oracle software and configuration files installed are stored. By default, OUI installs the Oracle Database software binary files by version and Oracle Home Name in a subdirectory of the Oracle base directory. An Oracle base directory can be used for multiple installations of software by a given installation owner. A separate Oracle base directory is created for each Oracle Home user you specify during installing of the Oracle Database software.

The Oracle Home User has complete control over the Oracle base directory. For reasons of security, different Windows User Accounts used as Oracle Home Users for different Oracle home directories are not allowed to share the same Oracle base directory. However, to support Oracle Database upgrade, Oracle supports the sharing of an Oracle base directory between a Built-in Account and a Windows User Account. If you choose to reuse an Oracle base directory from an earlier release of Oracle Database in Oracle Database 12c Release, then the Oracle Home User of the Oracle Database 12c Release has complete control over the Oracle base directory of the earlier release.

The default Oracle base path contains the Oracle Home User name if an Oracle Home User is specified during installation of the Oracle Database software. In a default Windows installation, the Oracle base directory appears as follows, where *username* is the Oracle Installation user if you choose Windows Built-in Account as the Oracle Home User, or it is the Oracle Home user if one is specified:

```
DRIVE_LETTER:\app\username
```

If you have separate Oracle Home Users for the Oracle Grid Infrastructure installation and the Oracle RAC installation, then you have two Oracle base paths that are in accordance with Optimal Flexible Architecture (OFA) guidelines. For example, if the user `grid` is the Oracle Home User for the Oracle Grid infrastructure installation and the user `oracle` is the Oracle Home User for the Oracle Database installation, then you have two Oracle base directories. In the following examples, *x*: represents a mounted disk:

- `X:\app\grid`—This is the Oracle base for the Grid user (`grid` in this example), which is the Oracle Home User for the Oracle Grid Infrastructure installation
- `X:\app\oracle`—This is the Oracle base for the Oracle user (`oracle` in this example), which is the Oracle Home User for the Oracle Database installation

Caution: After installing Oracle Database 12c Release 1 (12.1) (or later) release with a Windows User Account as Oracle Home User, do not install older versions of Oracle Databases that share the same Oracle Base Directory. During installation of the software for older releases, the ACLs are reset and Oracle Database 12c Release 1 (12.1) (or later) services may not be able to access the Oracle Base directory and files.

1.2.4 Overview of Oracle Home Directories

The Oracle home directory is located under the Oracle base directory. For example, in a default Windows installation, if you name the Oracle home directory `dbhome_1`, it

appears in the Oracle base directory as follows, where *username* is the Oracle Installation user if you do not choose Windows security, or it is the Oracle Home user if one is specified:

```
DRIVE_LETTER:\app\username\product\12.1.0\dbhome_1
```

Oracle homes also have a name associated with them, which is automatically assigned by the installer.

Ensure that the paths that you select for Oracle software, such as Oracle home paths and the Oracle base path, use only ASCII characters. Because some Oracle software directory paths use installation user names by default, this ASCII character restriction applies to user names, file names, and directory names.

1.2.5 Overview of Network and Internet Configuration

You must configure each server so it can communicate with the other nodes in the cluster. Also, you should configure one or more nodes to access the internet and support a web browser.

1.2.5.1 Overview of Network Interface Configuration

During the installation of Oracle Grid Infrastructure for a cluster, identify the planned use for the global interface for each node, and provide the interface information required for the type of node (Processing Node or Core Node) that you are configuring.

Identify each interface as one of the following:

- A *Public* interface type (used with public IP addresses and virtual IP addresses)
- A *Private* interface type (used with the networks for the interconnect between cluster member nodes)
- An *ASM* interface type (used for communication with Oracle ASM instances on other nodes)
- An *ASM and Private* interface type (used for both the interconnect network between cluster member nodes and communication with Oracle ASM instances on other nodes)
- A *Do not use* interface type, which Oracle Clusterware and Oracle RAC ignores

For example, an interface used as a dedicated interface for a network file system such as NFS should be marked as a *Do not use* interface type.

You configure the network during the Oracle Grid Infrastructure installation; you do not perform additional network configuration during an Oracle RAC installation.

1.2.5.2 Overview of Configuring Internode Communication

The Oracle software is installed on one node in the cluster and then OUI copies the software to the other nodes in the cluster. Verify that each node in your cluster can communicate with the other nodes using the `net use` command, for example, on `node1` you would use the following command:

```
C:\> net use \\node2\c$
The command completed successfully.
```

On `node2`, you would use the following command:

```
C:\> net use \\node1\c$
The command completed successfully.
```

1.2.5.3 Overview of Browser Requirements

You need a web browser to access documentation, to use Oracle Enterprise Manager Database Express, and to use Oracle Application Express. Web browsers must support JavaScript and the HTML 4.0 and Cascading Style Sheets (CSS) 1.0 standards. The following browsers meet these requirements:

- Microsoft Internet Explorer 8.0
- Microsoft Internet Explorer 9.0
- Firefox 3.x
- Firefox 8.0
- Google Chrome
- Safari

1.2.6 Overview of Platform-Specific Server Configuration

Oracle Clusterware and Oracle RAC are tested with specific operating system versions, and specific operating system components. Oracle requires that you use the operating system versions and components that are certified for this release.

Oracle recommends that you or your system administrator review the system requirements carefully in *Oracle Grid Infrastructure Installation Guide* before beginning installation, to ensure that your system meets these requirements. If your system does not meet minimum hardware, operating system version, and component requirements, then your installation may fail to complete, or other errors may develop during Oracle Clusterware or Oracle Database run time.

In addition to the standard system requirements configuration, deployment on specific server hardware can include additional operating system configuration steps. Review the preinstallation chapter in *Oracle Grid Infrastructure Installation Guide*, and check the My Oracle Support Certify page to ensure that you are aware of any additional requirements or recommendations for your specific hardware and platform configuration.

1.3 Overview of Oracle RAC Storage

For both the Enterprise and Standard Editions of Oracle RAC, the hard disk requirements for Oracle Database components include 32 MB required to install Java Runtime Environment (JRE) and OUI on the disk partition where the operating system is installed. If sufficient space is not detected, then the installation fails and an error message appears.

To install Oracle RAC, you must configure shared storage for the database files and optionally the recovery files. The database fast recovery area must be located on shared storage.

See *Oracle Grid Infrastructure Installation Guide* to review storage options for installation planning. Storage and system administrators can see this chapter to configure storage for database files for an Oracle RAC database.

See Also: *Oracle Database Administrator's Guide* for information about recovery areas

1.3.1 About Oracle RAC Storage and Oracle ACFS

Oracle Automatic Storage Management Cluster File System (Oracle ACFS) is a 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 database and application executable files, trace files, alert logs, application reports, BFILEs, and configuration files.

1.3.1.1 About the Oracle ASM Dynamic Volume Manager

The Oracle ASM Dynamic Volume Manager (Oracle ADVM) provides volume management services for disks and a standard disk device driver interface to clients (users and applications). File systems and other disk-based applications issue I/O requests to Oracle ADVM volume devices as they would to other storage devices on a vendor operating system. Oracle ADVM extends Oracle ASM by providing a disk driver interface to Oracle ASM storage allocated as Oracle ASM volume files. You can use Oracle ADVM to create virtual disks that contain file systems. These file systems contained on Oracle ASM volumes can support files beyond Oracle database files, such as executable files, report files, trace files, alert logs, and other application data files.

1.3.2 General Storage Considerations for Oracle RAC

For all installations, you must choose the storage option to use for Oracle RAC database files. You do not have to use the same storage option for each file type.

Use the following guidelines when choosing the storage options to use for each file type. 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 database and recovery files.
- For Standard Edition and Standard Edition 2 (SE2) Oracle RAC installations, Oracle ASM is the only supported shared storage option for database or recovery files.
- If you do not have a storage option that provides external file redundancy, then you must configure at least three voting file areas to provide voting file redundancy.
- If you intend to use Oracle ASM with Oracle RAC and you did not use Oracle ASM for the Oracle Clusterware files (Oracle Cluster Registry (OCR) and voting file), then you must configure one or more Oracle ASM instances with Oracle ASM Configuration Assistant (ASMCA) before starting OUI.
- If you intend to upgrade an existing Oracle RAC database, then you must ensure that your system meets the following conditions:
 - OUI and DBCA are run on the node where the Oracle RAC database instance is located.
 - The Oracle RAC database instance is running on the *same* nodes that you intend to make members of the new cluster installation. For example, if you have an existing Oracle RAC database running on a three-node cluster, then you must install the upgrade on all three nodes. You cannot upgrade only two nodes of the cluster, removing the third instance in the upgrade.

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

1.3.3 Overview of Oracle Database and Recovery File Options

There are two ways of storing Oracle Database and recovery files:

Note: When creating a new Oracle RAC database using OUI, storing data files and recovery files directly on raw devices (unformatted partitions) is not supported. Place data files and recovery files on a shared file system or on Oracle ASM.

- **Oracle Automatic Storage Management:** Oracle ASM is an integrated, high-performance database file system and disk manager for Oracle Database files. It performs striping and mirroring of database files automatically.

Note: For Standard Edition and Standard Edition 2 (SE2) Oracle Database installations using Oracle RAC, Oracle ASM is the only supported storage option.

- **A supported shared file system:** Supported file systems include the following:
 - **Direct Network File Systems (NFS) Client:** You can configure Oracle Database to access NFS servers directly using Direct NFS Client. The Direct NFS Client supports using NFSv3, NFSv4 and NFSv4.1 (excluding Parallel NFS) to access the NFS server. Direct NFS Client is an optimized NFS client that provides faster and more scalable access to NFS storage located on NAS storage devices (accessible over TCP/IP). Direct NFS Client is built directly into the database kernel and provides faster performance than what can be provided by the operating system's NFS driver. When accessing NFS servers, Oracle Database bypasses the operating system and generates exactly the requests it needs (no user configuration or tuning required).

See Also: *Oracle Grid Infrastructure Installation Guide for Microsoft Windows x64 (64-Bit)* for instructions on how to create an Oracle RAC database that uses Direct NFS for storage

Table 1–2 shows the storage options supported for storing Oracle Database files and Oracle Database recovery files. Oracle Database files include data files, control files, redo log files, the server parameter file (SPFILE), and the password file.

Table 1–2 Supported Storage Options for Oracle Database and Recovery Files

Storage Option	File Types Supported	
	Database	Recovery
Oracle ASM	Yes	Yes
Oracle ASM Cluster File System (Oracle ACFS)	Yes (Oracle Database 12c Release 12.1 and later) except on Windows platforms	Yes (Oracle Database 12c Release 12.1 and later) except on Windows platforms
Direct NFS Client	Yes	Yes
Local storage	No	No

Table 1–2 (Cont.) Supported Storage Options for Oracle Database and Recovery Files

Storage Option	File Types Supported	
	Database	Recovery
Shared unformatted partitions	No	No

1.4 Additional Information to Prepare for Installation

This section contains additional information about Oracle Clusterware, Oracle Automatic Storage Management (Oracle ASM), and Oracle RAC that may be helpful for your installation plan team to read and decide how you want to configure your installation.

This section contains the following topics:

- [Oracle ASM Is Installed with Oracle Grid Infrastructure](#)
- [Oracle Clusterware and Vendor Clusterware](#)
- [Cluster Nodes and Shared Components of Oracle RAC Installations](#)
- [Simplified Upgrade of TIMESTAMP WITH TIME ZONE Data](#)
- [Oracle Database 12c Real Application Clusters Release Compatibility](#)

1.4.1 Oracle ASM Is Installed with Oracle Grid Infrastructure

In past releases, Oracle ASM was installed as part of the Oracle Database installation. With Oracle Database 11g release 2 (11.2) and later releases, Oracle ASM is part of an Oracle Grid Infrastructure installation. If you are upgrading an existing Oracle ASM installation, then you must upgrade Oracle ASM by running an Oracle Grid Infrastructure upgrade.

If you did not select Oracle ASM as the storage option for the Oracle Clusterware files, then you must first use Oracle ASM Configuration Assistant (ASMCA) on one of the cluster nodes to configure Oracle ASM, create an Oracle ASM instance, and create a disk group to use for your Oracle Database storage.

1.4.2 Oracle Clusterware and Vendor Clusterware

Oracle Clusterware provides clustering services. Currently, there are no supported clusterware products other than Oracle Clusterware for the Microsoft Windows platforms. If you intend to install Oracle RAC, then you must first install Oracle Grid Infrastructure for a cluster, which includes Oracle Clusterware.

1.4.3 Cluster Nodes and Shared Components of Oracle RAC Installations

For Oracle RAC, you and your system administrator should note that all Oracle RAC database instances share the control file, server parameter file (SPFILE), redo log files, and all data files. These files must be placed on Oracle ASM, and all the cluster database instances on cluster nodes must have access to these files. Each instance also has its own set of redo log files. During failures, shared access to redo log files enables surviving instances to perform recovery.

See Also: *Oracle Automatic Storage Management Administrator's Guide* for more information about storage access from cluster nodes

1.4.4 Simplified Upgrade of TIMESTAMP WITH TIME ZONE Data

As part of an installation of Oracle Database 12c Release 1 (12.1), time zone files from versions 1 to 12 are installed in the path `Oracle_home\oracore\zoneinfo`. You can continue to use the current time zone file or upgrade to the latest version. Oracle recommends that you upgrade the server to the latest version of the time zone file. Upgrading to a new version of the time zone file may cause existing TIMESTAMP WITH TIME ZONE (TSTZ) data to become stale. Using the newly provided DBMS_DST PL/SQL package, you can update the TSTZ data transparently, with minimal manual procedures and system downtime.

All instances of an Oracle RAC database must use the same time zone. The Oracle RAC database time zone defaults to the time zone setting of the Grid user, unless an instance is started with SQL*Plus. When you use SQL*Plus, you must be sure to use the same time zone setting for the database instance that is used for Oracle Clusterware. You can change the time zone Oracle Clusterware uses for a database by using the following command, where `time_zone` is the time zone to which you want to change:

```
srvctl setenv database -env "TZ=time_zone"
```

Time zone version files are also installed with Oracle Client installations. You do not have to upgrade Oracle Client time zone files immediately. Upgrades can be done at a time when it is most convenient to the system administrator. However, there could be a small performance penalty when client and server use different time zone versions.

See Also:

- *Oracle Database Upgrade Guide* for information about preparing to upgrade TSTZ data
- *Oracle Database Globalization Support Guide* for information about how to upgrade the time zone file and TSTZ data
- *Oracle Call Interface Programmer's Guide* for information about performance effects of clients and servers operating with different versions of time zone files

1.4.5 Oracle Database 12c Real Application Clusters Release Compatibility

You can install and operate different releases of Oracle Database software on the same computer.

- If you have Oracle Clusterware installed and different releases of other Oracle software installed, then the Oracle Clusterware release must be later than or equal to the Oracle Database software release. Oracle Clusterware and Oracle ASM are both upgraded to 12c Release 1 (12.1) when you perform an Oracle Grid Infrastructure 12c Release 1 (12.1) installation.
- If you have an existing Oracle Database home, then you can create a new Oracle Database home and install Oracle Database 12c Release 1 (12.1) into the new Oracle home. You should ensure that Oracle Clusterware is in a separate Oracle Grid Infrastructure home (referred to as the Grid home). Oracle Grid Infrastructure installations cannot be installed in the Oracle base directory for Oracle Database.
- If you use the Oracle9i release of Oracle RAC, and you want to continue to use that release, then you must run cluster software that is compatible with that release, such as Oracle Cluster Manager.

Note: To remove third party cluster software after upgrading your database, you must first remove the third party cluster software, and then re-install Oracle Clusterware.

- If OUI detects an earlier database release, then OUI asks you about your upgrade preferences. You have the option to upgrade an earlier release database with DBUA or to create a new database using DBCA. The information collected during this OUI dialog is passed to DBUA or DBCA after the software is installed.

If OUI detects an earlier Oracle Clusterware release, then you are asked to upgrade the existing Oracle Clusterware installation. Only one Oracle Clusterware version can be active on a server, and a server must be a member of only one cluster.

- You cannot install Oracle Grid Infrastructure for a standalone server (Oracle Restart) and then install Oracle Grid Infrastructure for a cluster. If you have Oracle Restart installed, then you must remove that installation before you can install Oracle Grid Infrastructure for a cluster.

Note: Do not move Oracle executable files from the directory in which they were installed to another location. To move the executable files to a new location, you must reinstall the software.

- You can run different releases of Oracle Database and Oracle ASM. For example, you can use Oracle ASM 12c Release 1 (12.1) with an Oracle Database 11g release 2 (11.2) database.

Note: When using different Oracle ASM and Oracle Database releases, the functionality of each depends on the functionality of the earlier software release. For example, an Oracle Database 11g release 11.2 database using an Oracle ASM 12c Release 1 (12.1) instance is not able to use new features available for Oracle ASM 12c Release 1 (12.1), but instead can use only Oracle ASM 11g release 11.2 features.

See Also:

- *Oracle Grid Infrastructure Installation Guide* for information about using earlier Oracle Database releases with Oracle Grid Infrastructure

1.5 Confirming Cluster Readiness for Oracle RAC Installation with CVU

Before you start your Oracle RAC installation, use CVU to ensure that your system is prepared for installing Oracle RAC. If any checks fail, then fix the errors reported, or contact your system or storage administrator to have the cause of the errors addressed.

CVU is available in the Grid home, in the bin directory. For example, if the Grid home is C:\app\12.1.0\grid, then CVU is located in the C:\app\12.1.0\grid\bin directory. To start CVU, navigate to the Grid home bin directory, and use a command similar to the following:

```
cluvfy.bat stage -pre dbinst -fixup -n nodelist -r release -verbose
```

In the preceding command, *nodelist* is a comma-delimited list of node names and *release* is the version of the Oracle Database software being installed. The `-fixup` and `-verbose` flags are optional.

For example, for a two-node cluster with *node1* and *node2*, where you are testing the cluster to prepare to install Oracle Database 12c Release 1 (12.1) with Oracle RAC, the following command checks for system readiness:

```
cluvfy.bat stage -pre dbinst -fixup -n node1,node2 -r 12c -verbose
```

For more information about CVU commands, run the command `cluvfy.bat -help`.

See Also: *Oracle Clusterware Administration and Deployment Guide* for detailed information about CVU

1.6 About Installing Oracle Database 12c on Systems with Existing Databases

If you are planning an installation on a system where you have an existing Oracle RAC or Oracle Database installation, then you must perform additional tasks to prepare your system for installation.

[Table 1–3](#) provides an overview of what you must do if you have an existing Oracle Database installation. Review the table and perform tasks as required.

See Also: *Oracle Database Upgrade Guide* for additional information about preparing for and performing upgrades

Table 1–3 Overview of System Preparation for Upgrades or Co-existing Databases

Installation Scenario	What you need to do
Upgrading from Oracle Database 10g release 1 (10.1) to 12c Release 1 (12.1)	No additional tasks. Refer to "Installing Oracle Database 12c on a System with Oracle Database 10g" on page 1-20
Installing Oracle Database 12c Release 1 (12.1) on a system to coexist with Oracle Database 10g release 1 (10.1)	No additional tasks. Refer to "Installing Oracle Database 12c on a System with Oracle Database 10g" on page 1-20

1.7 Installing Oracle Database 12c on a System with Oracle Database 10g

If your system has an Oracle Database 10g installation, and you install Oracle Database 12c Release 1 (12.1) either to coexist with or to upgrade the Oracle Database 10g installation, then most installation types configure and start a default Oracle Net listener using TCP/IP port 1521 and the IPC key value `EXTPROC`. One of the following occurs:

- During a co-existing installation, Database Configuration Assistant (DBCA) automatically migrates the listener and related files from the Oracle Database 10g Oracle home to the Oracle Database 11g Oracle home.
- During an upgrade, Oracle Database Upgrade Assistant (DBUA) automatically locates the existing Oracle Database 10g listener, and migrates the listener to Oracle Database 12c Release 1 (12.1).

Note: For Oracle Database 12c Release 1 (12.1) to coexist with Oracle Database 10g release 1 (10.1) databases using Oracle ASM, the Oracle Database 10g database must be release 10.1.0.3 or later.

Installing Oracle Database 12c with Oracle Real Application Clusters

This chapter describes phase two of the installation procedures for installing Oracle Database 12c Release 1 (12.1) with Oracle Real Application Clusters (Oracle RAC). Phase one is the completion of the Oracle Clusterware installation, as described in *Oracle Grid Infrastructure Installation Guide*.

If a Windows Domain User is used as Oracle Home User, then both the user id and password should be specified during installation. For installations using Built-in Account as Oracle Home User, no user id or password for Oracle Home User is needed during the installation.

See Also: *Oracle Database Installation Guide for Microsoft Windows* for additional information, such as how to open compressed installation files, and other information about setting up files for installation

Also, during installation, click **Help** to find explanations of options and prompts for each installation screen, and click **Details** to see the log file.

This chapter contains the following topics:

- [Selecting a Security Notification Contact](#)
- [Selecting an Installation Option](#)
- [Selecting the Database Type for Oracle Grid Infrastructure Deployments](#)
- [Choosing the Cluster Database Management Type](#)
- [Selecting an Installation Type](#)
- [Selecting an Oracle Database Configuration Type](#)
- [Selecting a Database Name](#)
- [Creating Database Passwords](#)
- [Specify Oracle Home User Name and Password](#)
- [Understanding the Actions of OUI and DBCA During Installation](#)
- [Using Oracle Universal Installer to Install Oracle RAC](#)
- [Using Oracle Universal Installer to Install Oracle RAC One Node](#)
- [Installing the Oracle Database Vault Option](#)
- [Updating Environment Variables on Remote Nodes](#)

2.1 Selecting a Security Notification Contact

Oracle issues security alerts as needed for vulnerability fixes that are determined to be too critical to wait for distribution in the next Critical Patch Update.

During installation, you are asked in the Configure Security Updates screen to provide a security contact. Select one of the following options:

- Provide an email address to receive security information for your installation.
- Provide a My Oracle Support email address or account name to receive security information for your installation, and to enroll your system for Security Updates. You can receive information about alerts through My Oracle Support.

You can choose not to provide this information, but Oracle strongly recommends that you configure a security notification contact.

The information collected by Security Updates is limited to configuration information. The data collected does not include personally identifiable information (except a local contact name in case of transmission problems). You may still use all licensed Oracle functionality if you decline to enable Security Updates.

To choose not to receive security notifications, leave all fields in the Configure Security Updates screen blank, and click **Next** to continue.

If you provide your My Oracle Support credentials, then Security Updates automatically gathers configuration information regarding your installed Oracle products and uploads it to Oracle's support systems. You can access the information it collects through your My Oracle Support account, and review health check recommendations, patch recommendations and other recommendations for your system in addition to security alerts.

See Also: The Oracle Security Policies page, which is available from the following URL:

<http://www.oracle.com/us/support/assurance/fixing-policies/index.html>

2.2 Selecting an Installation Option

On the Select Installation Option page, you can select one of the following options:

- **Create and Configure a Database:** Provides you with the option to create a database using a preconfigured database template designed for particular system load demands, such as an online transaction processing (OLTP) database, or a decision support or data warehouse database.
- **Install database software only:** Installs Oracle Database software; you must complete the database configuration after the installation completes using the installed utilities.
- **Upgrade an existing database:** Upgrades an existing database.

If you are installing Oracle Database software, then Oracle recommends that you use a preconfigured database option, or select the **Advanced** option on the Select Configuration page, and configure a custom starter database. See "[Selecting an Oracle Database Configuration Type](#)" for more information about the different preconfigured database options.

If you have an existing Oracle installation, then write down the version numbers, patches, and other configuration information, and review upgrade procedures for

your existing installation. Review *Oracle Database Upgrade Guide* before proceeding with the installation, to decide how you want to proceed.

See Also: For the most recent updates and best practices about pre-upgrade, post-upgrade steps, compatibility, and interoperability discussions, see "Oracle Upgrade Companion," which is available through Note 1462240.1 on My Oracle Support:

<https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=1462240.1>

2.3 Selecting the Database Type for Oracle Grid Infrastructure Deployments

During installation, OUI detects if you have Oracle Grid Infrastructure for a cluster installed. If you do, then you must specify the type of database you plan to create:

- A single-instance database
- An Oracle RAC database
- An Oracle RAC One Node database

If you plan to create databases of different types on this cluster, then choose the most advanced option. For example, if you plan to create only single-instance and Oracle RAC One Node databases, then choose the Oracle RAC One Node database option. If you plan to create single-instance databases and Oracle RAC databases, then choose the Oracle RAC database option.

You can install Oracle RAC One Node on two or more nodes in the cluster. An Oracle RAC One Node installation starts an instance on one of the nodes you select as an Oracle RAC One Node pool member. If that instance goes down, then the Oracle RAC One Node instance fails over to another pool member. This feature relocates database instances and connections to other cluster nodes for high availability

See Also:

- *Oracle Database High Availability Overview* for information about Oracle RAC One Node
- *Oracle Real Application Clusters Administration and Deployment Guide* for information about how to convert single-instance databases to Oracle RAC

2.4 Choosing the Cluster Database Management Type

When creating an Oracle RAC database, you can choose to create on of the following types of databases:

- A **policy-managed database**: The database instances are automatically managed based on server pools for effective resource utilization.
- An **administrator-managed database**: The database instances are tied to specific servers in the cluster.

See Also: *Oracle Real Application Clusters Administration and Deployment Guide* for more information about server pools and the different cluster database management types

2.5 Selecting an Installation Type

When you run Oracle Universal Installer (OUI) to install Oracle RAC, you can select the **Typical** or the **Advanced** installation type.

The Typical installation type installs a default configuration of Oracle Database, with basic configuration choices. Oracle recommends that most users select Typical as their installation type.

The Advanced installation type is for customized installations, and is necessary only when you have a specific requirement for it, such as adding specific components to your installation, requiring different passwords for the SYS, SYSTEM and DBSNMP accounts, using a different database character set than is in use on your servers, changing product languages, or other nonstandard configurations.

If you plan to use any of the following options during installation, then you should choose the Advanced Installation Type:

- [Preconfigured Database Types Supplied with Oracle Database](#)
- [Using Advanced Database Configuration](#)
- [Installing Oracle Database with Other Languages](#)

2.5.1 Preconfigured Database Types Supplied with Oracle Database

The General Purpose and Transaction Processing type and the Data Warehouse type use preconfigured database templates optimized for each type of database.

During installation, OUI starts Oracle Net Configuration Assistant (NETCA) and DBCA, and installs the preconfigured database without further input. During database installation, OUI displays a progress indicator.

DBCA processing for these two configuration types creates a starter database, and configures the Oracle network services.

2.5.2 Using Advanced Database Configuration

Advanced configuration options available using this installation type include Oracle RAC, Automatic Storage Management, backup and recovery configuration, integration with Oracle Enterprise Manager Cloud Control, more fine-grained memory tuning, and other options.

2.5.3 Installing Oracle Database with Other Languages

To use languages other than the default (English), either for the database or for applications running on the database, you must use the Advanced Installation method.

See Also:

- *Oracle Database Globalization Support Guide* for detailed information about character sets and language configuration
- *Oracle Database Installation Guide for Microsoft Windows* for information about configuring globalization

2.6 Selecting an Oracle Database Configuration Type

When you choose the Advanced Installation option in OUI, then you can select the **General Purpose/Transaction Processing**, **Data Warehouse**, or **Advanced** database

configuration type. If you choose the Typical Installation Option, then the database configuration type defaults to General Purpose/Transaction Processing.

If you select Advanced configuration, then you can use Oracle Database Configuration Assistant (DBCA) to create the database as described in [Chapter 3, "Creating Oracle RAC Databases with DBCA"](#). Oracle recommends that you use DBCA to create your database.

2.7 Selecting a Database Name

The database name input field sets the following Oracle initialization parameter values:

- DB_NAME
- DB_UNIQUE_NAME
- DB_DOMAIN

In Oracle RAC environments, the database name (DB_UNIQUE_NAME) portion is a string of no more than 30 characters that can contain alphanumeric, underscore (_), dollar (\$), and pound (#) characters, but must begin with an alphabetic character. No other special characters are permitted in a database name. The DB_NAME parameter for a database is set to the first 8 characters of the database name.

The domain portion of the global database name (DB_DOMAIN) can be no more than 128 characters. Domain names using underscores (_) are not allowed. The values for DB_UNIQUE_NAME.DB_DOMAIN in its entirety must be unique within the enterprise.

For example, if your database has a global database name of `orl$racprod2551.example.com` which you supplied during installation, then the following values are used for initialization parameters:

Parameter	Value
DB_UNIQUE_NAME	orl\$racprod2551
DB_DOMAIN	example.com
DB_NAME	orl\$racp

The Oracle Service Identifier (SID) prefix is the first 8 characters of the database name. The SID prefix can contain only the characters a-z, A-Z, and 0-9. The SID prefix cannot contain operating system special characters, so if you use special characters in the first 8 characters of the database name, then these special characters are omitted in the SID prefix. There is a single SID prefix for every database. The SID prefix for a database must be unique within the cluster.

For an Oracle RAC database, each instance has a unique identifier, ORACLE_SID, which consists of the SID prefix and an instance number. The ORACLE_SID for Oracle RAC database instances is generated differently, depending on how you choose to manage the database. If you select a policy-managed database, then Oracle generates the SID in the format `name_#`, where `name` is the first eight alphanumeric characters of DB_UNIQUE_NAME, and `#` is the instance number. If you select an administrator-managed database, then DBCA generates the default SID for the instance names, using the format `name#`, where `name` is the first eight alphanumeric characters of DB_UNIQUE_NAME, and `#` is the instance number. However, during installation or database creation you can specify a nondefault value for the SID; the instance number is automatically added to the end of this string for each instance.

For example, if the `DB_UNIQUE_NAME` for a database is `or1$racprod2551`, then the following SID values are used:

Database or Instance Type	Value Used for ORACLE_SID
Single-instance Oracle database	or1racpr
Policy-managed Oracle RAC instance	or1racpr_1
Admin-managed Oracle RAC instance	or1racpr1

2.8 Creating Database Passwords

Apply the following minimal guidelines when specifying passwords during installation:

- Passwords should be between 8 and 30 characters long.
- Passwords should not start with a numeral.
- Password cannot contain invalid characters: `!@% ^ & * () + = \ | ` ~ [{] } ; : ' " , < > ?`
- Passwords should not be the same as the user name (case-insensitive).
- Passwords should not be Oracle reserved words.
- The `SYS` account password should not be `change_on_install` (case-insensitive).
- The `SYSTEM` account password should not be `manager` (case-insensitive).
- If you choose to use the same password for all the accounts, then that password cannot be `change_on_install`, `manager`, `sysman`, or `dbsnmp` (case-insensitive).
- Passwords should have at least one alphabetic, one numeric, and one special character.
- Passwords should not be simple or obvious words, such as `welcome`, `account`, `database`, `oracle`, or `user`.

See Also: *Oracle Database Security Guide* for detailed information about creating secure passwords

2.9 Specify Oracle Home User Name and Password

Starting with Oracle Database 12c Release 1 (12.1), Oracle Database supports the use of an Oracle Home User. An Oracle Home User is a standard Windows User Account (not an Administrator account), specified during installation, that runs the Windows services required by Oracle Database for the Oracle home. The Oracle Home User is associated with an Oracle Home and it cannot be changed post installation. Different Oracle Homes on a system can share the same Oracle Home User or use different Oracle Home User names. For Oracle RAC databases, the Windows user account for the Oracle Home must be a domain account and it has to be an existing account.

For Administrator-managed databases, you can store the password for the Oracle Home User in a secure wallet in the Oracle Cluster Registry (OCR). If such a wallet exists in the OCR, then Oracle Database administration tools automatically use the password from the wallet and do not require you to enter the password for the Oracle Home User during administrative operations.

For Policy-managed databases, you must store the password for the Oracle Home User in a secure wallet in the OCR. DBCA automatically creates the wallet (if one does not exist) when a Policy-managed database is created.

See Also:

- *Oracle Grid Infrastructure Installation Guide for Microsoft Windows x64 (64-Bit)* for information on configuring the Oracle Installation User and Oracle Home User.
- *Oracle Database Platform Guide for Microsoft Windows* for information about creating Oracle wallets for Oracle Database services

2.10 Understanding the Actions of OUI and DBCA During Installation

After installing Oracle Database, OUI runs DBCA to create your database, in accordance with Optimal Flexible Architecture (OFA) guidelines. An installation created following OFA guidelines means that DBCA creates your database files, including the default server parameter file (SPFILE), using standard file naming and file placement practices.

You can also use DBCA in standalone mode to create or delete a database.

See Also:

- [Chapter 3, "Creating Oracle RAC Databases with DBCA"](#)
- *Oracle Database Net Services Administrator's Guide* if you experience problems (for example, with the listener configuration), and for more information about Lightweight Directory Access Protocol (LDAP) support

2.10.1 Managing Database Services After Installation

You cannot use DBCA to manage database services for Oracle RAC databases. Use the Server Control Utility (SRVCTL), Oracle Enterprise Manager Database Express, or Oracle Enterprise Manager Cloud Control for all administration and monitoring of database services for an Oracle RAC database.

Oracle Enterprise Manager Cloud Control is available separately on the Oracle Enterprise Manager Cloud Control installation media, and on the Oracle Technology Network website at the following website:

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

See Also:

- *Oracle Database 2 Day + Real Application Clusters Guide* for service management using Oracle Enterprise Manager
- *Oracle Enterprise Manager Cloud Control Basic Installation Guide*

2.11 Using Oracle Universal Installer to Install Oracle RAC

To install Oracle Database 12c Release 1 (12.1) with Oracle RAC:

1. Log in to Windows as a user with Administrator privileges.

2. Verify that you have Administrator privileges on the other nodes. To verify privileges, enter the following command for each node that is a part of the cluster where *node_name* is the name of the remote node:

```
net use \\node_name\C$
```

3. Run the `setup.exe` command from the base directory of the Oracle Database 12c Release 1 (12.1) installation media, and select the database type to install.
4. Provide information when prompted by OUI. If you need assistance during installation, then click **Help**. If you encounter problems during installation, then click **Details** to examine the log file. The log file is located in the Oracle Inventory directory with a name that includes the time stamp (*date_time*) of the installation process, as shown in this example:

```
C:\Program Files\Oracle\Inventory\logs\installActionsdate_time.log
```

In the preceding example, the variables *date* and *time* represent the date and the time of the log file.

Caution: The Oracle home name and path that you provide during database installation *must be different* from the home that you used for the Oracle Grid Infrastructure software. **Do not** install the Oracle Database with Oracle RAC software into the same home in which you installed Oracle Grid Infrastructure software.

Note that because Oracle ASM is part of the Oracle Grid Infrastructure home, it cannot be upgraded during an Oracle RAC installation.

When you have completed this second and final phase of the installation, proceed to [Chapter 4, "Oracle Real Application Clusters Postinstallation Procedures"](#) to perform the postinstallation tasks.

Caution: After you complete the installation create the database, to install additional Oracle Database 12c Release 1 (12.1) products in the database, you must stop *all* processes running in the Oracle home before you attempt to install the additional products. See [Appendix D, "How to Stop Processes in an Existing Oracle Real Application Clusters Database"](#) for additional information.

2.12 Using Oracle Universal Installer to Install Oracle RAC One Node

To install Oracle RAC One Node:

1. Login to Windows as a user with Administrator user privileges.
2. Run the `setup.exe` command from the base directory of the Oracle Database 12c Release 1 (12.1) installation media.
3. Select to configure an Oracle RAC One Node database, and select to install Oracle RAC on all nodes where Oracle RAC One Node will run.
4. Provide information when prompted by OUI. If you need assistance during installation, then click **Help**. Click **Details** to see the log file.

If you encounter problems during installation, then examine the OUI actions recorded in the installation log file. The log file is located in the Oracle Inventory

directory with a name that includes the timestamp (*date_time*) of the install process, as shown in this example:

```
C:\Program Files\Oracle\Inventory\logs\installActionsdate_time.log
```

Caution: The Oracle home name and path that you provide during database installation *must be different* from the home that you used for the Oracle Grid Infrastructure software. **Do not** install the Oracle Database with Oracle RAC software into the same home in which you installed Oracle Grid Infrastructure software.

Note that because Oracle ASM is part of the Oracle Grid Infrastructure home, it cannot be upgraded during an Oracle RAC installation.

2.13 Installing the Oracle Database Vault Option

Installing and configuring Oracle Database Vault requires actions during and after installation, as described in the following topics:

- [Starting the Listener with Oracle Database Vault Installations](#)
- [Configuring Oracle Database Using DBCA](#)
- [Perform Postinstallation Configuration for Oracle Database Vault](#)

2.13.1 Starting the Listener with Oracle Database Vault Installations

You must start the listener and database instance on all Oracle RAC nodes other than the one on which the installation is performed. You must use Server Control (SRVCTL) to start and stop the Oracle RAC instances being configured for Oracle Database Vault. Do not use SQL*Plus to start and stop Oracle RAC instances.

2.13.2 Configuring Oracle Database Using DBCA

You can configure Oracle Database Vault during or after installation using DBCA.

To install Oracle Database Vault while installing Oracle RAC:

1. Install the Oracle RAC Enterprise Edition database and create an Oracle RAC database.
2. Start DBCA, and select the option **Configure Database**.
3. In the component list, select **Oracle Label Security** and **Oracle Database Vault**.
4. Provide the required administrative user accounts and passwords, and proceed with configuration.
5. After you have finished, you must restart each node to finish the software configuration.

See Also: *Oracle Database Vault Administrator's Guide* for information about configuring and using Oracle Database Vault

2.13.3 Perform Postinstallation Configuration for Oracle Database Vault

After you install the Oracle Database Vault option, you may be required to make additional changes to your database. See *Oracle Database Vault Administrator's Guide* for this information.

Additionally, if you use other Oracle Database products, then you might be required to perform additional configuration. See *Oracle Database Vault Administrator's Guide* for information about integrating Database Vault with other Oracle products, such as Transparent Data Encryption or Oracle Data Guard.

2.14 Updating Environment Variables on Remote Nodes

During the installation, the Windows registry and environment variables are modified on each node on which you installed Oracle RAC. The new registry entries and environment variable settings are visible on the node where the installation was performed. However, the new settings on the remote nodes are not immediately available to your user session. Attempting to run scripts or applications from the newly installed Oracle home can produce errors similar to the following:

- ORACONFIG.exe - Unable to Locate Component
- OCI.dll not found

To make the modified environment variables available on the remote nodes, you can close your current session on the remote nodes (log off) and then log on to the remote nodes to create a new session, or perform the following actions:

1. From the Start menu, right-click **My Computer**, then select **Properties**.

Alternatively, enter **SYSDM.CPL** in the Run window.

2. Select the **Advanced** tab.
3. Click **Environment Variables**.

The modified environment variables are now visible.

4. Click **OK** to close the System Properties window.

Creating Oracle RAC Databases with DBCA

This chapter describes how to use Database Configuration Assistant (DBCA) in standalone mode to create and delete Oracle Real Application Clusters (Oracle RAC) databases. The topics in this chapter include the following:

- [Using Database Configuration Assistant with Oracle RAC](#)
- [Benefits of Using Database Configuration Assistant](#)
- [Automatic Listener Migration from Earlier Releases](#)
- [Verifying Requirements for DBCA](#)
- [Creating an Oracle RAC Database with DBCA](#)
- [Using DBCA to Configure Oracle RAC One Node](#)
- [Deleting an Oracle RAC Database Using DBCA](#)

See Also: *Oracle Real Application Clusters Administration and Deployment Guide* for information about using DBCA to add and delete instances

3.1 Using Database Configuration Assistant with Oracle RAC

DBCA has the following primary database functions:

- Create and delete databases
- Create database templates
- Create, plug, unplug, and delete pluggable databases (PDBs)
- Add and delete database instances
- Register databases in Oracle Enterprise Manager Cloud Control
- Configure and register database options (such as Oracle Database Vault) with the Directory Server

Note: Cluster Managed Services are no longer managed through DBCA. Instead, use the Cluster Managed Services page in Oracle Enterprise Manager Cloud Control, if available, or SRVCTL. For more information, see *Oracle Real Application Clusters Administration and Deployment Guide*.

See Also:

- ["Creating an Oracle RAC Database with DBCA"](#) on page 3-3 for more information about using DBCA in standalone mode
- *Oracle Database Net Services Administrator's Guide* to resolve problems—for example, with the listener configuration—and for more information about Lightweight Directory Access Protocol (LDAP)-compliant directory support
- *Oracle Database 2 Day + Real Application Clusters Guide* for more information about using Oracle Enterprise Manager

3.2 Benefits of Using Database Configuration Assistant

Oracle recommends that you use DBCA to create your Oracle RAC database, because preconfigured databases optimize your environment for features such as the server parameter file (SPFILE), and automatic undo management.

DBCA enables you to create both policy-managed and administrator-managed databases. With DBCA, you can create site-specific tablespaces as part of database creation. If you have data file requirements that differ from those offered by DBCA templates, then create your database with DBCA and modify the data files later. You can also run user-specified scripts as part of your database creation process.

DBCA also configures your Oracle RAC environment for various Oracle high availability features, such as cluster administration tools. DBCA also starts any database instances required to support your defined configuration.

You can use DBCA to create a database from templates supplied by Oracle, or from templates that you create. The templates contain settings optimized for a particular type of workload.

Oracle ships templates for the following two workload types:

- General purpose or transaction processing
- Data warehouse

For more complex environments, you can select the **Custom Database** option. This option does not use templates and results in a more extensive interview, which means that it takes longer to create your database.

Click **Show Details** to see the configuration for each type of database. Select the template suited to the type of workload your database will support. If you are not sure which to choose, then select the default **General Purpose or Transaction Processing** template.

3.3 Automatic Listener Migration from Earlier Releases

If your system has an Oracle Database 10g or 11g installation, and you install Oracle Database 12c Release 1 (12.1) either to coexist with or to upgrade the Oracle Database 10.1, 10.2, 11.1, or 11.2 installation, then most installation types automatically migrate the existing Oracle Database listener to the 12c Release 1 (12.1) Oracle home. During migration, the upgrade process configures and starts a default Oracle Net listener using the same TCP/IP port as the existing listener, with the IPC key value.

During the Oracle Clusterware upgrade, the default listener (`LISTENER_NODENAME`) was migrated to the Oracle Grid Infrastructure home (Grid home). DBCA always uses the default listener.

The listener migration process stops the listener in the existing Oracle home, and restarts it in the new Oracle home. If the database was using the default listener (`LISTENER_NODENAME`), then Oracle Net Configuration Assistant (NETCA) migrates the listener automatically to the Grid home as part of the Oracle Grid Infrastructure upgrade. If the database was using a nondefault listener, then Database Upgrade Assistant (DBUA) migrates the nondefault listener to the Oracle Database home.

Note: During migration, client applications might not be able to connect to any databases that are registered to the listener that is being migrated.

3.4 Verifying Requirements for DBCA

To use Database Configuration Assistant (DBCA) to change the database configuration, run Cluster Verification Utility (CVU) to verify that your system is prepared for configuration changes using the following command syntax:

In the preceding syntax example, the variable `Grid_home` is the Oracle Grid Infrastructure home, the variable `node_list` is the list of nodes in your cluster, separated by commas, and the variable `Oracle_home` is the path for the Oracle home directory where OUI creates or modifies the database.

For example, to verify that your system is prepared for an Oracle Database with Oracle RAC installation on a two-node cluster with nodes `node1` and `node2`, with the Grid home `C:\app\12.1.0\grid`, and with the Oracle home path `C:\app\oracle\product\12.1.0\dbhome_1`, enter the following command:

You can select the option `-verbose` to receive progress updates as CVU performs its system checks, and detailed reporting of the test results.

If the CVU summary indicates that the cluster verification check fails, then review and correct the relevant system configuration steps, and run the test again.

3.5 Creating an Oracle RAC Database with DBCA

To create a database with DBCA, you must have run the Oracle Net Configuration Assistant (NETCA) to configure your Oracle Net `listener.ora` file. You no longer need to set the operating system environment variables `ORACLE_HOME` to the Oracle RAC database home. You do not need to set `ORACLE_UNQNAME` to the database unique name unless you are using Oracle Transparent Data Encryption with Oracle RAC.

3.5.1 Using DBCA to Create an Oracle RAC Database

The following topics in this section describe how to use DBCA to create and configure an Oracle RAC database:

- [Starting DBCA](#)
- [Cluster Detection and Node Selection when Using DBCA](#)
- [Using DBCA to Select Storage to Use With Oracle RAC Database](#)
- [Using DBCA to Specify Database Initialization Parameters for Oracle RAC](#)
- [Actions Performed By DBCA for Oracle RAC Databases](#)

3.5.1.1 Starting DBCA

To start DBCA, log in as an Administrator user. The user should also be a member of ORA_DBA or ORA_Homename_DBA group and should also be a member of ORA_ASMDBA if Oracle ASM is used as storage for the Oracle RAC database. You are prompted to enter the password for the Oracle Home User if you are administering an Administrator-managed Oracle RAC database and chose not to store the password in an Oracle Wallet.

Enter the command `dbca` from the `oracle_home\bin` directory. On Windows-based platforms, you can also use the following method to start DBCA:

1. .
2. Select Programs.
3. Under Programs, select .
4. Select **Configuration and Migration Tools**.
5. Select .

After you have started DBCA, to create an Oracle RAC database, you select the following:

- **Create Database** on the Database Operation/Welcome page
- **Advanced Mode** on the Creation Mode page
- **Oracle RAC database** on the Database Template page

Note: To run DBCA, you no longer need to set operating system environment variables ORACLE_HOME to the Oracle RAC database home, or ORACLE_UNQNAME to the database unique name. However, if you are using Oracle Transparent Data Encryption with Oracle RAC, then you still need to configure the ORACLE_UNQNAME parameter.

3.5.1.2 Cluster Detection and Node Selection when Using DBCA

When you start DBCA, it automatically shows options for Oracle RAC if it detects from the central Oracle Inventory that the Oracle Home is enabled for Oracle RAC.

If DBCA does not detect the Oracle home as an Oracle RAC home, check that the OUI inventory is correctly located in the directory `C:\Program Files\Oracle\Inventory`, and that the `oraInventory` file is not corrupted. Also, perform clusterware diagnostics by using the following CVU command syntax:

```
Grid_home\bin\cluvfy\cluvfy.bat stage -post crsinst -n nodelist
```

For example, if the Grid Home is `D:\app\12.1.0\grid`, and the nodes are named `node1` and `node2`, then run the following command:

```
D:\app\12.1.0\grid\bin> cluvfy stage -post crsinst -n node1,node2
```

When using DBCA, if nodes that are part of your cluster installation do not appear on the Node Selection page, then run the `Opatch lsinventory` command to perform inventory diagnostics. Also use CVU to perform clusterware diagnostics.

3.5.1.3 Using DBCA to Select Storage to Use With Oracle RAC Database

You can choose to use either Oracle ASM Disk groups or a shared file system as storage for Oracle RAC database files.

On the Specify Database Storage Options page, if you do not see the diskgroups in DBCA, then either Oracle ASM is not configured, or diskgroups are not mounted. You can create diskgroups using ASMCA in the Grid home before starting DBCA.

If you are using Oracle ASM, then you can also select the Fast Recovery Area and size on this page.

3.5.1.4 Using DBCA to Specify Database Initialization Parameters for Oracle RAC

On the Initialization Parameters page, if you intend to add more nodes in your cluster than you have during the current DBCA session, then click **All Initialization Parameters**, and change the parameter `CLUSTER_DATABASE_INSTANCES` to the total number of nodes that you plan to add to the cluster.

In addition, if you click **All Initialization Parameters**, note that if your global database name is longer than 8 characters, then the database name value (in the `DB_NAME` parameter) is truncated to the first 8 characters, and the `DB_UNIQUE_NAME` parameter value is set to the global name.

See Also: *Oracle Database Administrator's Guide* for information about initialization parameters

3.5.1.5 Actions Performed By DBCA for Oracle RAC Databases

After you respond to DBCA prompts, review the Summary dialog information and click **OK**, DBCA does the following:

- Creates an Oracle RAC database, and its instances
- Creates the Oracle RAC data dictionary views
- Starts the Oracle Clusterware high availability services
- Starts the database instances across cluster nodes

Caution: After you have created the Oracle RAC database, to install additional Oracle Database products in the Oracle RAC database you have created, before you attempt to install the products, you must stop all processes running in the Oracle RAC database homes.

You must stop all processes running in the Oracle RAC homes so that Oracle Universal Installer can relink certain executables and libraries. Refer to [Appendix D, "How to Stop Processes in an Existing Oracle Real Application Clusters Database"](#) for additional information.

3.6 Creating an Oracle RAC Database on Direct NFS

This section describes how to install and create an Oracle RAC database that uses Direct NFS (dNFS) for storage. There are different configuration processes you must perform to use dNFS for your database file system.

1. [Perform a Software-Only Installation of Oracle Database](#)
2. [Use ASMCA to Configure an ACFS Mount Point](#)
3. [Use DBCA to Create and Configure the Database](#)
4. [Enable and Configure Direct NFS](#)

5. [Use ASMCA to Remove the ACFS Mount Point](#)

3.6.1 Perform a Software-Only Installation of Oracle Database

In a software-only installation you install the Oracle Database software but do not create a database as part of the installation process.

1. Start OUI by running `setup.exe` from the software staging location.
2. On the Select Installation Option screen select "Install database software only".
3. On the Grid Installation Options screen, select the product to install, for example "Oracle Real Application Clusters database software installation."
4. Select the nodes on which you want to install the database software.
5. Choose the languages to use with the installed software.
6. Select the database edition to install. For Oracle RAC databases, you must choose Enterprise Edition.
7. Specify an Oracle Home user, or choose to use a Windows-built in user for the software installation owner.
8. On the Specify Installation Location screen, enter a path to the Oracle base directory and the software location (Oracle home directory).
9. On the Summary screen, verify your selections, then click **Install**.

3.6.2 Use ASMCA to Configure an ACFS Mount Point

ASMCA enables you to create a ACFS mount point which will be used in the "common file location" step of DBCA.

When creating Oracle ACFS file systems on Windows, run ASMCA as a Windows domain user who is also an administrator of the computer.

1. From the `Grid_home/bin` directory, run `asmca.exe` to start the Oracle ASM Configuration Assistant.
2. Select the **Disk Groups** tab.
3. Right-click **Disk Group Name** and select **Create ACFS for Database use**.
4. In the Create ACFS for Database window specify the mount point location, volume name, and size, then click **OK**.

For example, you might specify the following:

- Mount Point: `C:\oradatamnt`
 - Volume Name: `dbnfs`
 - Size (GB): `70`
5. Click **OK** in the informational pop-up window that appears. This window summarizes the actions performed by ASMCA.
 6. Select the **ASM Cluster File Systems** tab.
 7. The mount point you just created should be displayed on this page.

See Also: *Oracle Automatic Storage Management Administrator's Guide* for more information about creating an Oracle ACFS file system for database use

3.6.3 Use DBCA to Create and Configure the Database

Use DBCA to create an Oracle database.

1. From the *Oracle_home\bin* directory, run `dbca.exe` to start the Database Configuration Assistant.
2. On the Database Operation screen, select **Create Database**.
3. On the Creation Mode screen, select **Advanced Mode**.
4. On the Database Template screen, select **Oracle Real Application Clusters (RAC) database** for the Database Type.
For the Configuration Type, you can choose either Policy-Managed or Administrator-Managed. Select the template most appropriate for the type of database you want to create.
5. For the next four screen, make selections and provide information that best meet your business requirements.
6. On the Storage Locations screen, select **File System** for the Database files Storage type. Select the option **Use Common Location for All Database Files**. In the File location field, specify the location of the mount point you created in "[Use ASMCA to Configure an ACFS Mount Point](#)," for example, `C:\oradatamnt`.
7. On the Specify Database Options screen, choose any additional configuration you want for your database.
8. On the Initialization Parameters screen, use the default settings, or provide customized values for the initialization parameters.
9. On the Creation Options screen, select the option "**Generate Database Creation Scripts**." Specify a destination directory for the script file, or use the default value.
10. After the Prerequisite checks complete, on the Summary screen, minimize the installation window. **DO NOT** click Finish at this point.
11. Enable the Direct NFS option as described in "[Enable and Configure Direct NFS](#)."
12. Remove the virtual mount point you created with ASMCA, as described in "[Use ASMCA to Remove the ACFS Mount Point](#)."
13. Create all the directories needed locally on each node as well as on the NFS server. For this example, you would create the following, where `orcl` represents the database SID and `pdb1` represents the Pluggable Database (PDB) name:
 - On each node, create the directory `c:\oracle\oradatamnt\orcl\pdb1`
 - On the NFS server, create the directory `/export/abcd/orcl/pdb1`
14. Return to the DBCA window and click **Finish**.
15. Run the generated scripts on the cluster node to create the database.
16. Map a drive letter to a CIFS share on the NFS server that represents the location of the database files.

Use a command similar to the following:

```
NET USE * \\filer\vol0\orcl
```

After you complete this step, both Oracle and the Windows OS can access the location where the database files reside. Oracle is using DNFS, but the Windows OS uses CIFS to access the same location on the NFS server.

17. Verify Direct NFS is configured for the database.

1. Start SQL*Plus.
2. Connect to the newly created database as a DBA user.
3. Run the following SQL command:

```
SELECT * FROM v$dns_servers;
```

3.6.4 Enable and Configure Direct NFS

To enable the Direct NFS option, run the program `Oracle_home\bin\enable_dnfs.bat`.

You must also create an `oranfstab` file. See *Oracle Grid Infrastructure Installation Guide for Microsoft Windows x64 (64-Bit)* for details.

3.6.5 Use ASMCA to Remove the ACFS Mount Point

Now you have configured the mount point using Direct NFS, you can remove the ACFS mount point using ASMCA.

When creating Oracle ACFS file systems on Windows, run ASMCA as a Windows domain user who is also an administrator of the computer.

1. From the `Grid_home/bin` directory, run `asmca.exe` to start the Oracle ASM Configuration Assistant.
2. Select the **ASM Cluster File System** tab.
3. Select the mount point created earlier (`C:\oradatamnt`), then click **Dismount All**.
4. Select the **Volumes** tab.
5. Right-click the mount point you created in "Use ASMCA to Configure an ACFS Mount Point," then select **Delete**.

3.7 Using DBCA to Configure Oracle RAC One Node

If you have selected to install only the Oracle RAC software on cluster nodes, then you can use Oracle Database Configuration Assistant (DBCA) to configure Oracle RAC One Node.

- [Using DBCA to Configure Non-CDBs](#)

See Also: Oracle Technology Network for more information about Oracle RAC One Node:

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

3.7.1 Using DBCA to Configure Non-CDBs

After installation, start DBCA. From the Database Operation page, select the option **Create Database**. On the Creation Mode page, select **Advanced Mode**. On the Database Template page, select **Oracle RAC One Node database**.

Selecting one node deploys Oracle RAC One Node on a single node. Oracle recommends that you select all nodes in the cluster to which you want Oracle RAC One Node to be able to fail over.

If you select less than two nodes, or create server pools with a cardinality of 2 or more, then DBCA posts a warning message that the configuration you select will not support failover of the Oracle RAC One Node instance.

When you create an administrator-managed Oracle RAC One Node database, note that while the database is started on only one of the pool of nodes you installed the binaries, all the candidate servers are placed into the Generic server pool. If the servers are not already in Generic or Free, then this may result in stopping resources that run on candidate servers.

See Also: *Oracle Database Concepts* and *Oracle Real Application Clusters Administration and Deployment Guide* for more information about PDBs and adding services

3.8 Deleting an Oracle RAC Database Using DBCA

Deleting an Oracle RAC database using DBCA involves first deleting the database, and then removing the database's initialization parameter files, instances, Optimal Flexible Architecture (OFA) structure, and the Oracle network configuration for the database.

To delete a database using DBCA:

1. Start DBCA on one of your cluster nodes:

DBCA displays the Operations page, displaying different database deployment options.

2. Select **Delete a database**, and click **Next**.

DBCA displays a list of all Oracle RAC and single-instance databases running from the Oracle home where DBCA is run.

3. If your user ID and password are not operating-system authenticated, then the List of Cluster Databases page displays the user name and password fields. If these fields appear, then enter a user ID and password for a user account that has SYSDBA privileges.

4. Select the database to delete, and click **Finish**.

After you click Finish, DBCA displays a dialog box to confirm the database and instances that you have configured DBCA to delete.

5. Click **OK** to begin the deletion of the database and its associated files, services, and environment settings, or click **Cancel** to stop the operation.

When you click OK, DBCA continues the operation and deletes all the associated instances for this database. DBCA also removes the parameter files and password files.

At this point, you have accomplished the following:

- Deleted the selected Oracle RAC database from the cluster
- Deleted the selected Oracle RAC Database Oracle services on Windows-based platforms
- Deleted high availability services assigned to the Oracle RAC database
- Deleted the Oracle Net configuration for the Oracle RAC database
- Deconfigured Oracle Enterprise Manager for the Oracle RAC database
- Deleted the OFA directory structure for that Oracle RAC database from the cluster
- Deleted the Oracle RAC database data files

3.9 Configuring Services on Oracle RAC with CDBs

During installation, if you select a multitenant container database (CDB), and configure pluggable databases (PDBs), then Oracle recommends that you add services to the PDBs after installation. If you do not add services to PDBs, and then the Oracle RAC One Node CDB fails over to another node, or you manually relocate the CDB to another node, then by default, all PDBs associated with that CDB that do not have registered services are restarted in `MOUNTED` state.

PDBs are opened in `Read Write` mode after failover or relocation only after you have configured the PDBs to have associated services. If you have not associated services to PDBs, then the PDBs remains in `MOUNTED` state when the CDB instance restarts.

To add services to a PDB, use the following `srvctl` command syntax, where *cdbname* is the name of the CDB, *service_name* is the name of the service, and *pdbname* is the name of the PDB:

```
srvctl add service -d cdbname -s service_name -pdb pdbname
```

After you add services to your PDBs, if you relocate the CDB with which the PDBs are associated, or the CDB fails over, then the PDBs associated with that CDB automatically open in `Read Write` state.

Oracle Real Application Clusters Postinstallation Procedures

This chapter describes how to complete the postinstallation tasks after you have installed the Oracle Database 12c Release 1 (12.1) with Oracle Real Application Clusters (Oracle RAC) software. This chapter contains the following topics:

- [Required Postinstallation Tasks](#)
- [Recommended Postinstallation Tasks](#)
- [Configuring the Oracle Home User](#)
- [Oracle Configuration Manager Postinstallation Configuration for Oracle RAC](#)
- [Enabling and Disabling Database Options After Installation](#)

Note: This chapter describes only basic configurations. See also:

- *Oracle Database Platform Guide for Microsoft Windows* and the product administration and tuning guides for more detailed configuration and tuning information
 - *Oracle Database Installation Guide for Microsoft Windows* for additional postinstallation configuration information
-
-

4.1 Required Postinstallation Tasks

Perform the following tasks after completing your installation:

- [Determine If Any Patches Are Required For Your New Software](#)
- [Configuring Exceptions for the Windows Firewall](#)
- [Creating the OraMTS Service for Microsoft Transaction Server](#)
- [Configuring Oracle Products](#)
- [Recompile All PL/SQL Modules](#)
- [Configuring Storage for External Tables, Shared Files, or Directory Objects](#)

4.1.1 Determine If Any Patches Are Required For Your New Software

If you did not choose to download software options during installation, then after installing Oracle RAC, verify if there are any patches needed for your system. To determine if any patches are required for your system, review the *Oracle Database Readme* and the *Oracle Database Release Notes for Microsoft Windows*.

4.1.2 Configuring 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 TCP network ports are blocked to incoming connections. As a result, any Oracle product that listens for incoming connections on a TCP port does not receive any of those connection requests and the clients making those connection requests report errors.

If the Windows Firewall feature is enabled on one or more nodes of your Oracle RAC cluster, then you must create exceptions for Oracle RAC applications and ports as described in *Oracle Grid Infrastructure Installation Guide* if you have not done so already.

4.1.3 Creating the OraMTS Service for Microsoft Transaction Server

Oracle Services for Microsoft Transaction Server (OraMTS) permit Oracle databases to be used as resource managers in Microsoft application coordinated transactions. OraMTS acts as a proxy for the Oracle database to the Microsoft Distributed Transaction Coordinator (MSDTC). As a result, OraMTS provides client-side connection pooling and allows client components that leverage Oracle to participate in promotable and distributed transactions. In addition, OraMTS can operate with Oracle databases running on any operating system, given that the services themselves are run on Windows.

On releases earlier than Oracle Database 12c, the OraMTS service was created as part of a software-only installation. Starting with Oracle Database 12c, you must use a configuration tool to create this service.

To create the OraMTS service after performing a software-only installation of Oracle RAC or after adding a node to an existing cluster, perform the following steps:

1. Open a command window.
2. Change directories to %ORACLE_HOME%\bin.
3. Run the `OraMTSctl` utility to create the OraMTS Service, where `host_name` is a list of nodes on which the service should be created:

```
C:\..bin> oramtsctl.exe -new -host host_name
```

See Also: *Oracle Services for Microsoft Transaction Server Developer's Guide for Microsoft Windows* for more information about OraMTS, which allows Oracle databases to be used as resource managers in distributed transactions.

4.1.4 Configuring Oracle Products

Many Oracle products and options must be configured before you use them for the first time. Before using individual Oracle Database 12c Release 1 (12.1) products or options, refer to the appropriate manual in the product documentation library, which is available on the Oracle Technology Network (OTN) website at:

<http://docs.oracle.com>

Refer to these sections for information about configuring various products and features after installation:

- [Configuring Oracle Database Vault](#)
- [Configuring Oracle Database Security Settings](#)
- [Configuring Oracle Label Security](#)

- [Configuring the OraClrAgnt Service for Oracle Database Extensions for .NET](#)
- [Configuring Oracle XML DB](#)

4.1.4.1 Configuring Oracle Database Vault

OUI installs Oracle Database Vault by default when you install the Oracle RAC software, but you must register Oracle Database Vault with the Oracle RAC database and create database user accounts before you can use it. You must create the Database Vault Owner user and, optionally, the Database Vault Account Manager administrative user accounts.

See Also: [Section 2.13.3, "Perform Postinstallation Configuration for Oracle Database Vault"](#)

4.1.4.2 Configuring Oracle Database Security Settings

To enable or disable the database security configuration after installation, you must use command-line Oracle Database Configuration Assistant (DBCA) options. By design, the DBCA graphical user interface (GUI) does not have the option to enable or disable secure configuration. For example, to enable the security settings after installation, you would use a command of the following form, where `myRACdb1.example.com` is either the name of the local database instance or the `DB_UNIQUE_NAME`:

```
dbca -configureDatabase -sourceDB myRACdb1.example.com -SID
-enableSecurityConfiguration true
```

See Also: *Oracle Database Installation Guide for Microsoft Windows* for more information about enabling and disabling the database security option

4.1.4.3 Configuring Oracle Label Security

After installation, you must configure Oracle Label Security in a database before you use it. You can configure Oracle Label Security in two ways: with Oracle Internet Directory integration and without Oracle Internet Directory integration.

Configuration	Requirements
With Oracle Internet Directory integration	To configure Oracle Label Security with Oracle Internet Directory integration, Oracle Internet Directory must be installed in your environment and the Oracle database must be registered in the directory.
Without Oracle Internet Directory integration	If you configure Oracle Label Security (OLS) without Oracle Internet Directory integration, then you cannot configure it to use Oracle Internet Directory at a later stage. To configure Oracle Label Security with Oracle Internet Directory on your database at a later time, you must remove the OLS option on the database and configure the OLS with Oracle Internet Directory integration option.

See Also: *Oracle Label Security Administrator's Guide* for information about configuring Oracle Label Security

4.1.4.4 Configuring the OraClrAgnt Service for Oracle Database Extensions for .NET

Oracle Database Extentions (ODE) for .NET depends on a Windows service to operate properly. This service is called the OraClrAgnt service.

In earlier versions of Oracle Database, this CLR service was created automatically by the installer. Starting with Oracle Database 12c, after installation you use the OraClrCtl.exe utility to create, start, stop, and delete the OraClrAgnt service. When you use the OraClrCtl.exe utility to create the service, a new service is created named OracleHomenamClrAgent, where *Homenam* represents an Oracle Home name. The OraClrAgnt service is configured by this tool using the Oracle Home User account specified during the Oracle Database installation..

See Also: *Oracle Database Extensions for .NET Developer's Guide for Microsoft Windows* for more information about the OraClrCtl.exe tool and installing and configuring the OraClrAgnt service

4.1.4.5 Configuring Oracle XML DB

Oracle XML DB is a required component of the Oracle Database installation. However, you must manually configure the FTP and HTTP ports for Oracle XML DB.

See Also: *Oracle XML DB Developer's Guide* for information on configuring the FTP and HTTP protocols for Oracle XML DB

4.1.5 Recompile All PL/SQL Modules

Run the utlrp.sql script after creating or upgrading a database. This script recompiles all PL/SQL modules that might be in an invalid state, including packages, procedures, and types. Run the utlrp.sql script immediately following installation, not at a later date.

1. (Optional) Complete setting up the Oracle Installation User environment, as described in [Section 4.2.1, "Setting the Oracle User Environment Variables."](#)
2. Log in as an Administrator user, or as the Oracle Home user.
3. Start SQL*Plus, as follows:

Click **Start**, select **Programs** (or **All Programs**), then **Oracle - HOME_NAME**, then **Application Development**, and then **SQL*Plus**.

Login as a SYSDBA user.

4. Run the utlrp.sql script, where *oracle_home* is the Oracle home path:

```
SQL> @Oracle_home\rdbms\admin\utlrp.sql
```

4.1.6 Configuring Storage for External Tables, Shared Files, or Directory Objects

If your Oracle RAC database uses files that are external to the database, then the external files should be located on shared storage that is accessible to all nodes. Each node should use the same mount point to access the file. Acceptable shared file systems include Database File System (DBFS), Oracle ASM Cluster File System (Oracle ACFS), or a supported network file system (NFS) using the Direct NFS Client.

The database directory object used to write and read files external to the database must point to a shared storage location, and each node must use the same mount point for the same shared storage location. For example, each node might have a directory object called DPUMP for the mount point C:\app\acfsmounts\dpump, which accesses Oracle ACFS shared storage.

Note: There is no checking of the contents of the external files or directory object specified as part of the external table to ensure that the directory contents are consistent on each node. To avoid unpredictable results, you must ensure that the same file is accessed from all nodes, or that the same file is used on all nodes.

See Also: *Oracle Grid Infrastructure Installation Guide* for more information about configuring storage

4.2 Recommended Postinstallation Tasks

Oracle recommends that you complete the following tasks after completing an Oracle RAC installation:

- [Setting the Oracle User Environment Variables](#)
- [Setting Up User Accounts](#)

4.2.1 Setting the Oracle User Environment Variables

Unlike on other platforms, you should not set `ORACLE_HOME` as a fixed environment variable when running Oracle Database on Windows operating systems. This is because the Oracle software determines where executable files reside at run time.

When you invoke an Oracle executable program on Windows, for example `sqlplus.exe`, the `ORACLE_HOME`, `ORACLE_BASE`, and `ORACLE_SID` variables are determined by the `PATH` environment variable and the location of the executable program (which Oracle home it resides in). To use SQL*Plus to manage a different database or Oracle ASM instance, click the Windows Start button, select the correct Oracle Home for the instance you want to manage, and then select the SQL*Plus utility.

You can use Oracle Universal Installer (OUI) to specify an Oracle home as the default Oracle home and update the `PATH` environment variable to point to that Oracle home. Refer to [Section 6.5, "Working with Multiple Oracle Home Directories on Windows"](#) for detailed instructions on how to change the default Oracle home.

4.2.2 Setting Up User Accounts

You can set up additional user accounts to manage your database. For information about setting up additional optional user accounts, see *Oracle Database Platform Guide for Microsoft Windows* and *Oracle Database Security Guide*.

4.2.3 Configuring Oracle Administration Assistant for Windows

Oracle Administration Assistant for Windows requires the Microsoft Management Console and HTML Help 1.2 or later to run. Microsoft Management Console (MMC) version 3.0 of MMC is available with Windows Server 2008 and later. Oracle recommends that you use the latest version of MMC that is available.

See Also:

- *Oracle Database Platform Guide for Microsoft Windows*
- Microsoft documentation at:
<http://www.microsoft.com/>

4.3 Configuring the Oracle Home User

Under certain circumstances you may have to perform additional configuration steps for the Oracle Home user, such as:

- Creating an OCR wallet for Oracle Home user
- Changing the password for the Oracle Home user

See the *Oracle Database Platform Guide for Microsoft Windows* for details on performing these tasks.

4.4 Oracle Configuration Manager Postinstallation Configuration for Oracle RAC

If you have installed Oracle Configuration Manager, then you must run a script to create a database account to collect database configuration collections. You must create this account in both *Connected* and *Disconnected* modes. The database account stores the PL/SQL procedures that collect the configuration information, and the account owns the database management system (DBMS) job that performs the collection. After the account has been set up, the account is locked because login privileges are no longer required.

To configure the database for configuration collection, run the following script:

The script `installCCRSQL.exe` creates an Oracle Configuration Manager user and loads the PL/SQL procedure into the database defined by the `ORACLE_SID` environment variable. You can also specify the database SID by using the `-s` option in the command line, as in the following example, where the SID is `orcl`:

For Oracle RAC, you must run the database script against only one instance, such as the local instance on which you performed the installation. However, Oracle Configuration Manager must be installed in all instance homes.

Note:

- If you specify the user name without specifying the password (with the `-p` parameter), then the script prompts you to enter the password.
 - If you specify only the password without specifying the user name, then the script uses the user `SYS` by default.
-
-

See Also:

- *Oracle Configuration Manager Installation and Administration Guide* for more information

4.5 Enabling and Disabling Database Options After Installation

When you install Oracle Database, some options are enabled and others are disabled. You can view the enabled Oracle Database options by querying the `V$OPTION` view using `SQL*Plus`.

See Also: *Oracle Database Administrator's Guide* for information about connecting to the database using `SQL*Plus`

To enable or disable a particular database feature for an Oracle home, shut down the database and use the `chopt` tool. The `chopt` tool is a command-line utility that is located in the `Oracle_home\bin` directory. The syntax for `chopt` is as follows:

```
chopt [ enable | disable] db_option
```

Table 4–1 describes the possible values for `db_option`:

Table 4–1 Database Options for Chopt Tool Command

Value	Description
dm	Oracle Data Mining Database Files
olap	Oracle OLAP
partitioning	Oracle Partitioning
rat	Oracle Real Application Testing
ode_net	Oracle Database Extensions for .NET

Before you run the `chopt` tool, shut down any Oracle databases running from the Oracle home being modified.

Example 4–1 How to Enable the Oracle Label Security Database Option Using Chopt

In this example, the `chopt` tool enables Oracle Label Security in the database `oradb1`:

1. Shut down the Oracle RAC database, and any other databases running out of the Oracle home directory, using the Server Control Utility (SRVCTL).

```
srvctl stop database -db oradb1
```

2. Change directories to the `Oracle_home\bin` directory:

3. Run the `chopt` tool, as follows:

```
chopt enable lbac
```

4. Use SRVCTL to restart the databases you stopped in Step 1, for example:

```
srvctl start database -db oradb1
```

Using Server Pools with Oracle RAC

This chapter describes server pool concepts in Oracle Real Application Clusters (Oracle RAC) environments. This chapter contains the following topics:

- [Policy-Managed Clusters and Capacity Management](#)
- [Oracle RAC Database and Server Pools](#)
- [About Creating Server Pools for Oracle RAC Databases](#)
- [Oracle RAC One Node and Server Pools](#)

5.1 Policy-Managed Clusters and Capacity Management

Oracle Clusterware 11g release 2 (11.2) introduced server pools, where resources that Oracle Clusterware manages are contained in logical groups of servers called **server pools**. Resources are hosted on a shared infrastructure and are contained within server pools. Resources are no longer defined as belonging to a specific instance or node. Instead, the priority of resource requirements is defined. You can use a cluster configuration policy set to provide dynamic management of cluster policies across the cluster.

The following sections provide additional concepts about server pools:

- [Server Pools and Server Categorization](#)
- [Server Pools and Policy-Based Management](#)
- [How Server Pools Work](#)
- [Default Server Pools](#)

See Also: *Oracle Real Application Clusters Administration and Deployment Guide*

5.1.1 Server Pools and Server Categorization

You can manage servers dynamically using server pools by identifying servers distinguished by particular attributes, a process called **server categorization**. In this way, you can manage clusters made up of heterogeneous nodes.

5.1.2 Server Pools and Policy-Based Management

With policy-based management, database administrators specify the server pool (excluding Generic or Free) in which the database resource runs

Policy-based management:

- 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
- Enables policies to be configured to change pools in accordance with business needs or application demand, so that pools provide the right service at the right time

Applications and databases running in server pools do not share resources. Because server pools do not share resources, they 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 standardized cluster environments, but allow multiple administrator groups to share the common cluster infrastructure.

Oracle Clusterware efficiently allocates different resources in the cluster. You need only to provide the minimum and maximum number of nodes on which a resource can run, combined with a level of importance for each resource that is running on these nodes.

See Also:

- *Oracle Clusterware Administration and Deployment Guide* for more information about resource attributes
- *Oracle Clusterware Administration and Deployment Guide* for details about managing server pools to respond to business or application demand

5.1.3 How Server Pools Work

Server pools divide the cluster into groups of servers hosting singleton and uniform database services and applications. 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 certain server pools. When you enable role-separated management, you can grant permission to operating system users to use server pools.

You manage server pools that contain Oracle RAC databases with the Server Control (SRVCTL) utility. Use the Oracle Clusterware Control (CRSCTL) utility to manage all other server pools. Only cluster administrators have permission to create top-level server pools.

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

5.1.4 Default Server Pools

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 *Free* to newly defined server pools automatically.

5.1.4.1 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

5.1.4.2 The Generic Server Pool

The Generic server pool stores any Oracle Database that is not policy managed. Additionally, the Generic server pool contains 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 Generic server pool's attributes are restricted, as follows:

- No one can modify configuration attributes of the Generic server pool (all attributes are read-only)
- When DBCA or SRVCTL specifies a server name in the `HOSTING_MEMBERS` resource 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 user is either a cluster 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 user is a cluster administrator

5.2 Oracle RAC Database and Server Pools

Oracle RAC databases support two different management styles and deployment models:

- **Policy-managed:** Deployment is based on server pools, where database services run within a server pool as *singleton* or *uniform* across all of the servers in the server pool. Databases are deployed in one or more server pools and the size of the server pools determine the number of database instances in the deployment. Policy management allows clusters and databases to expand or shrink as requirements change.

A policy-managed database is defined by **cardinality**, which is the number of database instances you want running during normal operations. A policy-managed database runs in one or more database server pools that the cluster administrator creates in the cluster, and it can run on different servers at different times. A database instance starts on all servers that are in the server pools defined for the database.

Clients can connect to a policy-managed database using the same SCAN-based connect string no matter which servers they happen to be running on at the time.

- **Administrator-managed:** Deployment is based on the Oracle RAC deployment types that existed before Oracle Database 11g release 2 (11.2) and requires that you statically configure each database instance to run on a specific node in the cluster, and that you configure database services to run on specific instances belonging to a certain database using the preferred and available designation.

When you review the database resource for an administrator-managed database, you see a server pool defined with the same name as the Oracle database. This server pool is part of a special Oracle-defined server pool called Generic. Oracle RAC manages the Generic server pool to support administrator-managed databases. When you add or remove an administrator-managed database using either SRVCTL or DBCA, Oracle RAC creates or removes the server pools that are members of the Generic server pool.

See Also:

- *Oracle Clusterware Administration and Deployment Guide* for detailed information about server pools
- *Oracle Clusterware Administration and Deployment Guide* for information about policy sets

5.3 About Creating Server Pools for Oracle RAC Databases

You can create a server pool with DBCA while creating an Oracle RAC database, but Oracle recommends that you create server pools before you deploy database software and databases. Oracle also recommends that you:

- Enable role separation before you create the first server pool in the cluster.
- Create and manage server pools using configuration policies and a respective policy set.

You can implement role-separated management in one of two ways:

- **Vertical implementation** (between layers) describes a role separation approach based on different operating system users and groups used for various layers in the technology stack. Permissions on server pools and resources are granted to different users (and groups) for each layer in the stack using access control lists. Oracle Automatic Storage Management (ASM) offers setting up role separation as part of the Oracle Grid Infrastructure installation based on a granular assignment of operating system groups for specific roles.
- **Horizontal implementation** (within one layer) describes a role separation approach that restricts resource access within one layer using access permissions for resources that are granted using access control lists assigned to server pools and policy-managed databases or applications.

For example, consider an operating system user called `grid`, that installs Oracle Grid Infrastructure and creates two database server pools. The operating system users `ouser1` and `ouser2` must be able to operate within a server pool, but should not be able to modify those server pools and withdraw hardware resources from other server pools either accidentally or intentionally.

See Also:

- *Oracle Clusterware Administration and Deployment Guide* for information about creating policy sets
- *Oracle Clusterware Administration and Deployment Guide* for information about configuring role-separated management

5.4 Oracle RAC One Node and Server Pools

Note the following about Oracle RAC One Node and server pools:

- Oracle RAC One Node runs only in one server pool. This server pool is treated the same as any other server pool.
- Online relocation of an Oracle RAC One Node database instance permits planned migrations of an Oracle RAC One Node database from one node to another node. Relocations must always be within a server pool.

Understanding the Oracle Real Application Clusters Installed Configuration

This chapter describes the Oracle Real Application Clusters (Oracle RAC) installed configuration.

This chapter contains the following topics:

- [Understanding the Configured Environment in Oracle RAC](#)
- [Understanding Operating System Privileges Groups](#)
- [Understanding Time Zone Settings on Cluster Nodes](#)
- [Working with Multiple Oracle Home Directories on Windows](#)
- [About PDBs in Oracle RAC](#)
- [Database Components Created Using Database Configuration Assistant](#)
- [Managing Undo Tablespaces in Oracle RAC](#)
- [Initialization Parameter Files](#)
- [Oracle Net Services Configuration for Oracle RAC Databases](#)
- [Performance Features of Oracle Net Services and Oracle RAC](#)
- [Oracle Net Services Configuration Files and Parameters](#)

6.1 Understanding the Configured Environment in Oracle RAC

Oracle Net Configuration Assistant (NETCA) and Database Configuration Assistant (DBCA) configure your environment to meet the requirements for database creation and Oracle Enterprise Manager discovery of Oracle RAC databases.

Note: Configuration files are created on each node of your cluster database.

Avoid changing host names after you complete your Oracle RAC installation, including adding or deleting domain qualifications. Node names are created from the host names during an Oracle Clusterware installation and are used extensively with database processes. Nodes with changed host names must be deleted from the cluster and added back with the new host names.

6.2 Understanding Operating System Privileges Groups

As an administrator, you often perform special operations such as shutting down or starting up a database, or configuring storage. Because only an administrator responsible for these administration decisions should perform these operations, system privileges for Oracle Database or Oracle Automatic Storage Management (Oracle ASM) administration require a secure authentication scheme.

Membership in special operating system groups enables administrators to authenticate to Oracle Database or Oracle ASM through the operating system rather than with a user name and password. This is known as **operating system authentication**. Each Oracle Database in a cluster can have its own operating system privileges groups, so that operating system authentication can be separated for each Oracle Database on a cluster. Because there can be only one Oracle Grid Infrastructure installation on a cluster, there can be only one set of operating system privileges groups for Oracle ASM.

During installation of Oracle Grid Infrastructure and Oracle Database, the installer creates operating system groups. These operating system groups are designated with the logical role of granting operating system authentication for administration system privileges for Oracle Database and Oracle ASM. Oracle Grid Infrastructure uses operating system authentication to manage Oracle Database. To enable this access, you must set the `AUTHENTICATION_SERVICES` parameter in the `sqlnet.ora` file to contain the value `NTS`, as described in the section "[Net Services Profile File \(sqlnet.ora\)](#)" on page 6-19.

You can use a single operating system group as the logical group whose members are granted all system privileges for Oracle Database and Oracle ASM, or you can delegate system privileges to two or more operating system groups. Oracle recommends that you designate separate operating system groups for each logical system privilege. Using separate operating system groups enables you to grant one or more subsets of administrator system privileges to database administrators. These database administrators can then perform standard database administration tasks without requiring the `SYSDBA` system privileges.

System privileges groups are listed in [Table 1-1, "User Groups Created During Oracle RAC Installation"](#).

See Also:

- [Section 1.2.2, "Overview of Server Environment Configuration"](#)
- *Oracle Database Administrator's Guide* for more information about operating system groups and Oracle Database system privileges
- *Oracle Automatic Storage Management Administrator's Guide* for more information about operating system groups and Oracle ASM system privileges

6.3 Understanding Time Zone Settings on Cluster Nodes

Oracle RAC requires that all cluster nodes have the same time zone setting. During an Oracle Grid Infrastructure for a cluster installation, the installation process determines the time zone setting of the Oracle Installation user on the node where Oracle Universal Installer (OUI) runs. OUI uses that time zone value on all of the nodes as the default time zone setting for all processes that Oracle Clusterware manages. This default setting is used for databases, Oracle ASM, and any other managed processes. However, if you start an instance with `SQL*Plus`, you must ensure that the time zone value that Oracle RAC uses is the same as the Oracle Clusterware time zone. You can

change the time zone that Oracle Clusterware uses for a database by running the command `srvctl setenv database -env 'TZ=time zone`.

6.4 Understanding the Server Parameter File for Oracle RAC

When you create the database, Oracle Database creates an SPFILE in the file location that you specify. This location can be either an Oracle ASM disk group or a cluster file system.

All instances in the cluster database use the same SPFILE at startup. Because the SPFILE is a binary file, do not directly edit the SPFILE with an editor. Instead, change SPFILE parameter settings using Oracle Enterprise Manager or ALTER SYSTEM SQL statements.

See Also: *Oracle Real Application Clusters Administration and Deployment Guide* for information about creating and modifying SPFILE

6.5 Working with Multiple Oracle Home Directories on Windows

Each Oracle product should be installed in its own Oracle home. In other words, each product should be installed into a different directory structure from other Oracle products. The value for `%ORACLE_BASE%` is stored in the registry (for example, in `HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE\HOME0`). The values for `ORACLE_HOME` and `ORACLE_SID` are also stored in the registry. Symbolic links for these directories, like those used on UNIX platforms, are not supported on Windows platforms.

See Also: *Oracle Database Platform Guide for Microsoft Windows* for more information about the registry keys

Oracle Universal Installer (OUI) records the values for environment variables such as `ORACLE_BASE`, `ORACLE_HOME`, and `ORACLE_SID` in the registry and also updates the value for the `PATH` environment variable for the user performing the installation. In Linux and UNIX systems, you must manually set these environment variables in the user session or user profile.

To change the current setting for `%ORACLE_HOME%` (the default Oracle home), perform the following steps:

1. Start the Oracle Universal Installer.
2. Click the **Installed Products** button.
3. Click the **Environment** tab at the top of the window.
4. Move the Oracle home directory that you want as your default to the top of the list.
5. Apply the changes, and exit the installer.

This procedure changes the value of the default `ORACLE_HOME` variable in the registry to the value you selected. It also ensures that the `%ORACLE_HOME%\bin` directories for each product are listed in the correct order in your `PATH` environment variable.

6.6 About PDBs in Oracle RAC

Starting in Oracle Database 12c, you must create a database as either a multitenant container database (CDB) or as an Oracle database that is non-CDB. This also applies

to Oracle RAC databases. The only difference to the installation process is to choose whether to create the Oracle RAC database as a CDB or a non-CDB.

A pluggable database (PDB) is a portable collection of schemas, schema objects, and nonschema objects that appears to an Oracle Net client as a non-CDB. PDBs can be plugged into CDBs. A CDB can contain multiple PDBs. Each PDB appears on the network as a separate database.

If you create an Oracle RAC database as a CDB and plug one or more PDBs into the CDB, then, by default, a PDB is not started automatically on any instance of the Oracle RAC CDB. With the first dynamic database service assigned to the PDB (other than the default database service which has the same name as the database name), the PDB is made available on those instances on which the service runs.

Whether a PDB is available on more than one instance of an Oracle RAC CDB is typically managed by the services running on the PDB. You can manually enable PDB access on each instance of an Oracle RAC CDB by starting the PDB manually on that instance.

See Also:

- *Oracle Database Concepts* for more information about PDBs
- *Oracle Database Administrator's Guide* for more information about managing PDBs
- *Oracle Real Application Clusters Administration and Deployment Guide* for information specific to the administration of Oracle RAC CDBs

6.7 Database Components Created Using Database Configuration Assistant

This section describes the database components that DBCA creates, which include:

- [Tablespaces and Data Files](#)
- [Control Files](#)
- [Online Redo Log Files](#)

6.7.1 Tablespaces and Data Files

For both single-instance and cluster database environments, Oracle Database is divided into smaller logical areas of space known as **tablespaces**. Each tablespace corresponds to one or more data files on the shared storage. [Table 6-1](#) shows the tablespace names used by an Oracle RAC database and the types of data they contain.

Table 6–1 Tablespace Names Used with Oracle Real Application Clusters Databases

Tablespace Name	Contents
SYSAUX	An auxiliary system tablespace that contains the DRSYS (contains data for Oracle Text), CWM_LITE (contains the OLAP schemas), XDB (for XML features), ODM (for Oracle Data Mining), and INDEXTYPE tables
SYSTEM	Consists of the data dictionary, including definitions of tables, views, and stored procedures needed by the database. Oracle Database automatically maintains information in this tablespace.
TEMP	Contains temporary tables and indexes created during SQL statement processing. You may need to expand this tablespace if you run a SQL statement that involves significant sorting, such as ANALYZE COMPUTE STATISTICS on a very large table, or the constructs GROUP BY, ORDER BY, or DISTINCT.
UNDOTBS#	Contains undo tablespaces for each instance that DBCA creates for automatic undo management
USERS	Consists of application data. As you create and enter data into tables, Oracle Database fills this space with your data.
EXAMPLE	Stores the sample schemas, if you opted to include them during database creation.

You cannot alter these tablespace names when using the preconfigured database configuration option from OUI. However, you can change the names of the tablespaces if you use the advanced database creation method.

As mentioned, each tablespace has one or more data files on shared file systems. The data file names created by the preconfigured database configuration options vary by storage type such as Oracle ASM or a cluster file system.

See Also:

- *Oracle Database Administrator's Guide* for more information about the SYSTEM, SYSAUX, and other tablespaces
- ["Selecting an Oracle Database Configuration Type"](#) on page 2-4 for more information about database configuration types.

6.7.2 Control Files

The database is configured with two control files that must be stored on shared storage. Every database must have one unique control file; any additional control files configured for the database are identical copies of the original control file.

If a control file becomes unusable, then the database instance fails when it attempts to access the damaged control file. By multiplexing (creating multiple copies of) a control file on different disks, the database can achieve redundancy and thereby avoid a single point of failure.

See Also:

- *Oracle Database Concepts*
- *Oracle Database Administrator's Guide*

6.7.3 Online Redo Log Files

Each database instance must have at least two online redo log files. The online redo log files for a database instance are called the **redo thread**. Each Oracle RAC database instance has its own redo thread to avoid contention for a single set of online redo log

files. In case of instance failure, the online redo log files must be accessible by the surviving instances. Therefore, the online redo log files for an Oracle RAC database must be placed on shared storage or Oracle ASM. If you use a file system for storage, then the file system must be a shared or cluster file system.

The file names of the redo log files that are created with the preconfigured database configuration option vary by storage type.

See Also:

- *Oracle Database Concepts* for more information about the online redo log files
- *Oracle Real Application Clusters Administration and Deployment Guide* for more information about storage for online redo log files

6.8 Managing Undo Tablespaces in Oracle RAC

Oracle Database stores rollback or undo information in undo tablespaces. To manage undo tablespaces, Oracle recommends that you use Automatic Undo Management. Automatic Undo Management is an automated management mode for undo tablespaces that is easier to administer than manual undo management.

When Oracle ASM and Oracle Managed Files are used along with Automatic Undo Management, an instance that is started for the first time, and thus does not have an undo tablespace, has its undo tablespace created for it by another instance automatically. The same is also true for online redo logs.

See Also:

- *Oracle Database Administrator's Guide* for more information about automatic undo management
- *Oracle Real Application Clusters Administration and Deployment Guide* for more information about managing undo tablespaces

6.9 Initialization Parameter Files

Oracle recommends using the server parameter file (SPFILE) for storing Oracle Database initialization parameters. Oracle recommends that you store all SPFILEs on Oracle ASM, including the Oracle ASM SPFILE. SPFILEs must be located on shared storage; all instances in a cluster database can access this parameter file.

See Also: *Oracle Real Application Clusters Administration and Deployment Guide* for more information about the creation and use of parameter files

6.10 Oracle Net Services Configuration for Oracle RAC Databases

Users can access an Oracle RAC database using a client/server configuration or through one or more middle tiers, with or without connection pooling. When connecting to an Oracle Database, you can use a connect descriptor or a net service name. For Oracle RAC databases, you can also use the single client access name (SCAN) to connect to any available instance of the Oracle RAC database.

This section contains the following topics:

- [Database Services for an Oracle RAC Database](#)
- [Naming Methods and Connect Descriptors](#)

- [Easy Connect Naming Method](#)
- [Understanding SCANs](#)
- [How to Connect to an Oracle RAC Database Using SCANs](#)
- [Listener Configuration for an Oracle RAC Database](#)
- [Service Registration for an Oracle RAC Database](#)
- [How Database Connections are Created When Using SCANs](#)

See Also: *Oracle Database Net Services Administrator's Guide* for more information about Oracle Net Services concepts

6.10.1 Database Services for an Oracle RAC Database

Each database is represented by one or more services. A service is identified by a service name, such as `sales.example.com`. A client uses a service name to identify the database it must access. During installation, Oracle RAC databases are configured with a default database service that has the same name as the database. This service can be used for performing database management tasks. Additional services should be created for client and application connections to the database.

A service name can be associated with multiple database instances, and an instance can be associated with multiple services. The listener acts as a mediator between the client and database instances and routes the connection request to the appropriate instance. Clients connecting to a service do not have to specify which instance they want to connect to.

6.10.2 Naming Methods and Connect Descriptors

Each net service name is associated with a connect descriptor. A **connect descriptor** provides the location of the database and the name of the database service. A connect descriptor includes one or more protocol addresses of the listener and the connect information for the destination service.

The information needed to use a service name to create a database connection can be stored in a repository, used by one or more naming methods. A **naming method** is a resolution method used by a client application to resolve a service name to a connect descriptor. Oracle Net Services offers several types of naming methods that support localized configuration on each client, or centralized configuration that can be accessed by all clients in the network.

6.10.3 Easy Connect Naming Method

The Easy Connect naming method eliminates the need to look up service names in the `tnsnames.ora` file or other repository for TCP/IP environments. With Easy Connect, clients use a connect string for a simple TCP/IP address, which consists of a host name, and an optional port and service name. If you use this method, then no naming or directory system is required. See [Example 6-1, "Connecting to Oracle RAC Using the Easy Connect Naming Method"](#) for an example.

Networking elements for the Oracle Database server and clients are preconfigured for most environments. The Easy Connect naming method is enabled by default and does not require a repository. If you use a naming method other than Easy Connect, then additional configuration of Oracle Net Services may be required.

6.10.4 Understanding SCANS

This section contains the following topics:

- [About the SCAN](#)
- [SCAN VIP Addresses](#)
- [SCAN Listeners](#)

6.10.4.1 About the SCAN

The SCAN is a domain name registered to at least one and up to three IP addresses, either in domain name service (DNS) or in Grid Naming Service (GNS). During the installation of Oracle Grid Infrastructure, several Oracle Clusterware resources are created for the SCAN:

- A SCAN virtual IP (VIP) is created for each IP address that SCAN resolves to
- A SCAN listener is created for each SCAN VIP
- A dependency on the SCAN VIP is configured for the SCAN listener

SCANS are defined using one of two options:

- The SCAN is defined in DNS

If you configure a SCAN manually, and use DNS for name resolution, then your network administrator should create a single name for the SCAN that resolves to three IP addresses on the same network as the public network for the cluster. The SCAN name must be resolvable without the domain suffix (for example, the address `sales1-scan.example.com` must be resolvable using `sales1-scan`). The SCAN must not be assigned to a network interface, because Oracle Clusterware resolves the SCAN.

The default SCAN is `cluster_name-scan.domain_name`. For example, in a cluster that does not use GNS, if your cluster name is `sales1`, and your domain is `example.com`, then the default SCAN address is `sales1-scan.example.com:1521`

- The SCAN is defined in GNS

When using GNS and DHCP, Oracle Clusterware configures the VIP addresses for the SCAN name that is provided during cluster configuration. The node VIP and the three SCAN VIPs are obtained from the DHCP server when using GNS. If a new server joins the cluster, then Oracle Clusterware dynamically obtains the required VIP address from the DHCP server, updates the cluster resource, and makes the server accessible through GNS.

Oracle recommends that you configure clients connecting to the cluster to use the SCAN name, rather than node VIPs used in releases before Oracle Grid Infrastructure 11g Release 2 (11.2). Clients connecting to Oracle RAC databases using SCANS do not have to be configured with addresses of each node that hosts a particular database or database instance. For example, if you configure policy-managed server pools for a cluster, then connecting to the database using a SCAN enables connections to server pools in that database, regardless of which nodes are allocated to the server pool. You can add or remove nodes from the database without having to reconfigure clients connecting to the database.

See Also: *Oracle Grid Infrastructure Installation Guide* for your platform for more information about SCAN configuration and requirements

6.10.4.2 SCAN VIP Addresses

SCAN virtual IP addresses (VIPs) function like node VIPs. However, unlike node VIPs, SCAN VIPs can run on any node in the cluster. Clients (users or applications) that connect using a SCAN instead of a node VIP name or address do not have to update the list of node names or addresses in their local `tnsnames.ora` file when nodes are added to or removed from the cluster, or when a database instance runs on a different node.

Note: Configuring three SCAN VIPs in DNS does not by itself ensure failover of connections. Instead, the Oracle Client uses the returned SCAN VIPs to failover the connection request to a different SCAN listener. If the connection attempt to a SCAN VIP fails, then the client uses the next returned SCAN VIP address to connect. For this reason, Oracle recommends that you use Oracle Client 11g Release 2 or later clients for connections that use the SCAN.

If you use GNS for name resolution, then you only provide the SCAN name during installation (for example, `sales1-scan`). GNS obtains DHCP address leases for three IP addresses and resolves these addresses to the SCAN. The GNS daemon listens for registrations. When a SCAN VIP starts on a node, it registers its addresses with GNS.

Service requests to the cluster domain that GNS manages are routed to the GNS VIP address, which routes these requests to the GNS daemon for the cluster. When GNS receives a request from a DNS for the SCAN, it returns the registered addresses of the SCAN listeners to the DNS. The DNS then returns the three SCAN VIP addresses to the client.

See Also: *Oracle Clusterware Administration and Deployment Guide* for more information about SCAN names, listeners, and client service requests

6.10.4.3 SCAN Listeners

During Oracle Grid Infrastructure installation, SCAN listeners are created for as many IP addresses as there are SCAN VIP addresses assigned to resolve to the SCAN. Oracle recommends that the SCAN resolves to three VIP addresses, to provide high availability and scalability. If the SCAN resolves to three addresses, then three SCAN VIPs and three SCAN listeners are created.

Each SCAN listener depends on its corresponding SCAN VIP. The SCAN listeners cannot start until the SCAN VIP is available on a node.

The addresses for the SCAN listeners resolve either through an external domain name service (DNS), or through the Grid Naming Service (GNS) within the cluster. SCAN listeners and SCAN VIPs can run on any node in the cluster. If a node where a SCAN VIP is running fails, then the SCAN VIP and its associated listener fails over to another node in the cluster. If the number of available nodes within the cluster falls to less than three, then one server hosts two SCAN VIPs and SCAN listeners.

See Also: *Oracle Clusterware Administration and Deployment Guide* for more information about SCAN listeners

6.10.5 How to Connect to an Oracle RAC Database Using SCANS

Oracle recommends that you configure Oracle RAC database clients to use the SCAN and the Easy Connect naming method to connect to the database instead of configuring the `tnsnames.ora` file.

Clients configured to connect to the cluster using node VIP addresses for Oracle RAC releases earlier than Oracle Database 11g Release 2 can continue to use their existing connection addresses; using the SCAN is not required. When an earlier release of Oracle Database is upgraded, the database is not only registered with the local listeners, but is also registered with the SCAN listeners, allowing clients to start using the SCAN to connect to that database.

Example 6–1 Connecting to Oracle RAC Using the Easy Connect Naming Method

If the Oracle RAC database runs on a cluster for which the SCAN is `sales1-scan.mycluster.example.com`, then you can submit a connection request for the database service `oltp.example.com` by using a connect descriptor similar to the following:

```
sqlplus system/manager@sales1-scan.mycluster.example.com:1521/oltp
```

If the SCAN is resolved by DNS, then DNS returns all three SCAN VIP addresses in round-robin order to the client. If the SCAN is resolved by GNS, then DNS zone delegation sends the lookup request to GNS, which then returns all three SCAN VIP addresses in round-robin order to the client.

The client then uses one of the returned SCAN VIP addresses to contact a SCAN listener. When a SCAN listener receives a connection request from a client, the SCAN listener identifies the least loaded instance in the cluster that provides the requested service. It then redirects the connection request to the local listener on the node where the least loaded instance is running, and the client is given the local listener address. The local listener then creates the connection to the database instance.

6.10.6 Listener Configuration for an Oracle RAC Database

An Oracle database receives connection requests through the local listener. The local listener brokers a client request, handing off the request to the server. The listener is configured with a protocol address, and clients configured with the same protocol address can send connection requests to the listener. When a connection is established, the client and Oracle database communicate directly with one another.

The local listener, or default listener, is located in the Grid home when you have Oracle Grid Infrastructure installed. Local listeners are configured to respond to database connection requests, and to non-database connection requests, such as external procedures or Oracle XML Database (XDB) requests. When the database starts, the Database Agent process (`oraagent.exe`, previously known as `racgimon`) sets the `LOCAL_LISTENER` parameter to a connect descriptor that does not require an Oracle Net service name. The value for `LOCAL_LISTENER` is computed to be the endpoints of the Grid home listeners.

You can configure multiple Oracle Database listeners, each with a unique name, in one `listener.ora` file. Multiple listener configurations for database listeners are possible because each of the top-level configuration parameters has a suffix of the listener name or is the listener name itself. To configure a database to register with multiple local listeners, you must manually modify the `LOCAL_LISTENER` parameter.

Note: Oracle recommends running only one listener for each node in most customer environments.

For an Oracle RAC database, the database parameter `REMOTE_LISTENER` identifies the SCAN listeners. The database registers with the local and SCAN listeners by using the connect description information contained in these parameters. Oracle Database 11g Release 2 and later instances only register with SCAN listeners as remote listeners. Upgraded databases register with SCAN listeners as remote listeners, and also continue to register with all node listeners.

The `REMOTE_LISTENER` parameter for an Oracle RAC database is always set to the SCAN address. For example, if the SCAN for the cluster is `myscan`, and the GNS subdomain for the cluster is `mycluster.example.com`, then the `REMOTE_LISTENER` parameter has the following value:

```
myscan.mycluster.example.com:1521
```

Note: Do not set the `REMOTE_LISTENER` parameter for an Oracle RAC database to an Oracle Net alias that has a single address that uses the SCAN for the host name (`HOST=scan`).

6.10.7 Service Registration for an Oracle RAC Database

An Oracle Database 12c Release 1 (12.1) database service automatically registers with the listeners specified in the database initialization parameters `LOCAL_LISTENER` and `REMOTE_LISTENER`. During registration, the listener registration (LREG) process sends information such as the service name, instance names, and workload information to the listeners. This feature is called **service registration**.

When a listener starts after the Oracle instance starts, and the listener is available for service registration, registration does not occur until the next time the Oracle Database LREG process starts its discovery routine. By default, the LREG discovery routine is started every 60 seconds. To override the 60-second delay, use the SQL statement `ALTER SYSTEM REGISTER`. This statement forces LREG to register the service immediately.

Note: Oracle recommends that you create a script to run the `ALTER SYSTEM REGISTER` statement immediately after starting the listener. If you run this statement when the instance is registered and all services are currently registered, or while the listener is down, then the statement has no effect.

See Also: *Oracle Database Net Services Administrator's Guide* for more information about service registration

6.10.8 How Database Connections are Created When Using SCANS

Based on the environment, the following actions occur when you use a SCAN to connect to an Oracle RAC database using a service name. The numbered actions correspond to the arrows shown in [Figure 6-1](#).

1. The LREG process of each instance registers the database services with the default listener on the local node and with each SCAN listener, which is specified by the

REMOTE_LISTENER database parameter. The listeners are dynamically updated on the amount of work being handled by the instances and dispatchers.

- The client issues a database connection request using a connect descriptor of the form:

```
orausr/@scan_name:1521/webapp
```

Note: If you use the Easy Connect naming method, then ensure that the `sqlnet.ora` file on the client contains `EZCONNECT` in the list of naming methods specified by the `NAMES.DIRECTORY_PATH` parameter.

- The client uses DNS to resolve `scan_name`. After DNS returns the three addresses assigned to the SCAN, the client sends a connect request to the first IP address. If the connect request fails, then the client attempts to connect using the next IP address.
- When the connect request is successful, the client connects to a SCAN listener for the cluster that hosts the `sales` database and has an instance offering the `webapp` service, which in this example is `sales1` and `sales2`. The SCAN listener compares the workload of the instances `sales1` and `sales2` and the workload of the nodes on which they run. If the SCAN listener determines that `node2` is less loaded than `node1`, then the SCAN listener selects `node2` and sends the address for the local listener on that node back to the client.
- The client connects to the local listener on `node2`. The local listener starts a dedicated server process for the connection to the database.
- The client connects directly to the dedicated server process on `node2` and accesses the `sales2` database instance.

Figure 6–1 Load Balancing Actions for Oracle RAC Connections That Use SCAN

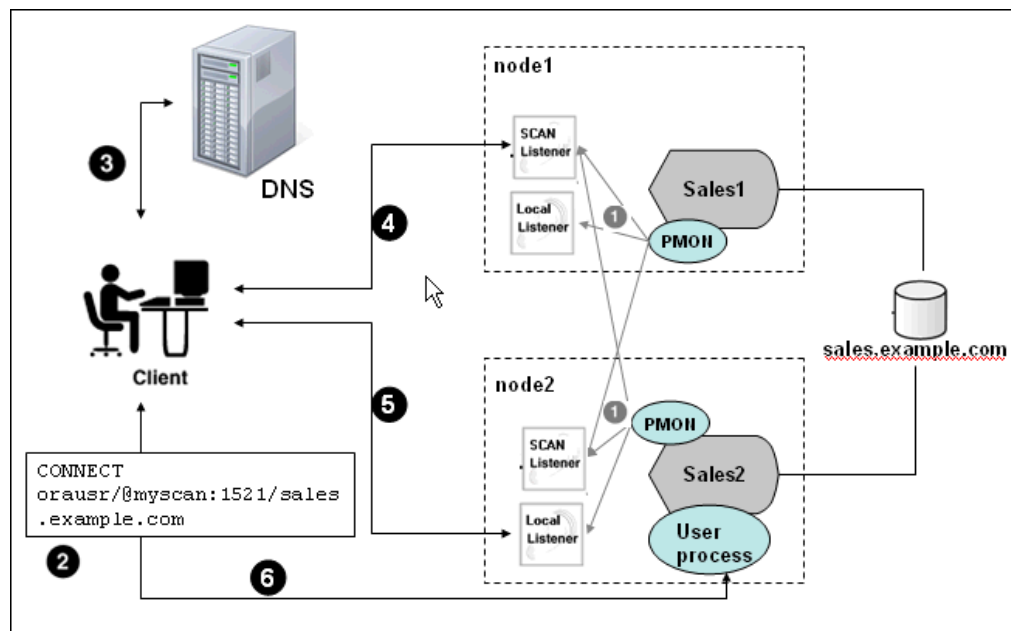


Figure 7-1 is an illustration of how load balancing works on an Oracle RAC system when SCAN is used. It contains 5 callout steps, and one visual presentation of an action. Step 1 is in the center right of the frame, corresponding with step 1 of the preceding description. Step 2 is in the lower left side of the frame, corresponding with step 2 of the preceding description. Step 3 is in the upper right side of the image, corresponding with step 3 of the description. Step 4 is in the upper center of the image, corresponding with step 4 of the description. Step 5 is in the lower center of the image, corresponding with step 5 of the description. There is no callout for step 6 of the description. The image of a person connecting to the database through a terminal, on the left center of the image, represents the client, and the database instance on node 2 is on the lower right side of the image. There is a line between the client and the database instance on node 2, representing the connection between the client and the database.

6.11 Performance Features of Oracle Net Services and Oracle RAC

Oracle RAC databases provide the important benefits of connection load balancing and failover.

- [Load Balancing of Connections to Oracle RAC Databases](#)
- [Connection Failover for Oracle RAC Databases](#)
- [Shared Server Configuration for an Oracle RAC Database](#)

6.11.1 Load Balancing of Connections to Oracle RAC Databases

Services coordinate their sessions by registering their **workload**, or the amount of work they are currently handling, with the local listener and the SCAN listeners. Clients are redirected by the SCAN listener to a local listener on the least-loaded node that is running the instance for a particular service. This feature is called **load balancing**. The local listener either directs the client to a dispatcher process (if you configured the database to use shared servers), or directs the client to a dedicated server process.

There are two types of load balancing that you can implement for an Oracle RAC database: client-side and server-side load balancing. Client-side load balancing balances the connection requests across the listeners. With server-side load balancing, the SCAN listener directs a connection request to the best instance currently providing the service by using the load balancing advisory.

See Also:

- *The Oracle Grid Infrastructure Installation Guide* for more information about SCAN and its configuration
- *Oracle Real Application Clusters Administration and Deployment Guide* for more information about failover, load balancing, and the load balancing advisory

6.11.2 Connection Failover for Oracle RAC Databases

When a client issues a connection request using SCAN, the three SCAN addresses are returned to the client. If the first address fails, then the connection request to the SCAN fails over to the next address. Using multiple addresses allows a client to connect to an instance of the database even if the initial instance has failed.

Oracle RAC provides failover with the node VIP addresses by configuring multiple listeners on multiple nodes to manage client connection requests for the same database service. If a node fails, then the service connecting to the VIP is relocated transparently to a surviving node, enabling fast notification of the failure to the clients connecting through the VIP. If the application and client are configured with transparent application failover options, then the client is reconnected to the surviving node.

6.11.3 Shared Server Configuration for an Oracle RAC Database

Standalone Oracle databases perform load balancing by distributing connections among the shared server dispatcher processes. By default, DBCA configures your Oracle RAC database with dedicated servers, not shared servers. However, if you select the shared server option when using DBCA, then DBCA configures shared servers. Oracle RAC uses both dedicated and shared server processing when shared servers are configured.

See Also: *Oracle Database Net Services Administrator's Guide* for more information about shared and dedicated server configurations

6.12 Oracle Net Services Configuration Files and Parameters

Networking elements for the Oracle Database server and clients are preconfigured for most environments. The Easy Connect naming method is enabled by default and does not require a repository. If you use a naming method other than Easy Connect, then additional configuration of Oracle Net Services may be required.

The following sections describe the Oracle Net Services configuration files and parameters for an Oracle RAC database:

- [Database Initialization Parameters for Database Service Registration](#)
- [Net Service Names and the tnsnames.ora File](#)
- [Net Service Names Created by DBCA](#)
- [Listener Configuration and the listener.ora File](#)
- [Net Services Profile File \(sqlnet.ora\)](#)

6.12.1 Database Initialization Parameters for Database Service Registration

An Oracle Database 12c Release 1 (12.1) database service automatically registers with the listeners specified in the `LOCAL_LISTENER` and `REMOTE_LISTENER` parameters. During registration, the listener registration (LREG) process sends information such as the service name, instance names, and workload information to the listeners.

When a listener starts after the Oracle instance starts, and the listener is available for service registration, registration does not occur until the next time the Oracle Database LREG process starts its discovery routine. By default, the LREG discovery routine is started every 60 seconds. To override the 60-second delay, use the SQL statement `ALTER SYSTEM REGISTER`. This statement forces LREG to register the service immediately.

Note: Oracle recommends that you create a script to run the `ALTER SYSTEM REGISTER` statement immediately after starting the listener. If you run this statement when the instance is registered and all services are currently registered, or while the listener is down, then the statement has no effect.

See Also: *Oracle Database Net Services Administrator's Guide* for more information about service registration

6.12.2 Net Service Names and the tnsnames.ora File

The installation process creates a `tnsnames.ora` file on each node. This file acts as a repository of net service names. Each net service name is associated with a connect identifier. A **connect identifier** is an identifier that maps a user-defined name to a connect descriptor. A connect descriptor contains the following information:

- The network route to the service, including the location of the listener through a protocol address
- The `SERVICE_NAME` parameter, with the value set to the name of a database service

Note: The `SERVICE_NAME` parameter you use in the `tnsnames.ora` file is singular, because you can specify only one service name. The `SERVICE_NAME` parameter is different from the `service_names` database initialization parameter. The `service_names` database parameter defaults to the global database name, a name comprising the `db_name` and `db_domain` parameters in the initialization parameter file. When you add service names using `SRVCTL` or Oracle Enterprise Manager Cloud Control, it lists additional cluster-managed services for the database.

The `tnsnames.ora` file is located in both the `Grid_home\network\admin` and `Oracle_home\network\admin` directories. By default, the `tnsnames.ora` file is read from the Grid home when Oracle Grid Infrastructure is installed.

With Oracle Clusterware 11g Release 2 and later, the listener association no longer requires `tnsnames.ora` file entries. The listener associations are configured as follows:

- DBCA no longer sets the `LOCAL_LISTENER` parameter. The Oracle Clusterware agent that starts the database sets the `LOCAL_LISTENER` parameter dynamically, and it sets it to the actual value, not an alias. So `listener_alias` entries are no longer needed in the `tnsnames.ora` file.
- The `REMOTE_LISTENER` parameter is configured by DBCA to reference the `SCAN` and `SCAN` port, without any need for a `tnsnames.ora` entry. Oracle Clusterware uses the Easy Connect naming method with `scaname:scanport`, so no listener associations for the `REMOTE_LISTENER` parameter are needed in the `tnsnames.ora` file.

For example, after you create the database, to add a second listener, listening on port 2012, use a command similar to the following command to have the database register with both listeners on startup:

```
SQL> alter system set local_listener='(DESCRIPTION=
(AADDRESS_LIST=(ADDRESS=(PROTOCOL=TCP) (HOST=192.168.0.61) (PORT=1521))
(ADDRESS=(PROTOCOL=TCP) (HOST=192.168.0.61) (PORT=2012))) )'
scope=BOTH SID='OCRL1';
```

See Also:

- *Oracle Database Administrator's Guide*
- *Oracle Database Net Services Administrator's Guide* for more information about the `tnsnames.ora` file

6.12.3 Net Service Names Created by DBCA

DBCA creates net service names for connections as described in the following sections:

- [Net Service Names for Database Connections](#)
- [Net Service Names for Instance Connections](#)

6.12.3.1 Net Service Names for Database Connections

Clients that connect to any instance of Oracle RAC use the SCAN in the connect descriptor. You can also use net service names to connect to Oracle RAC. The default database service created by DBCA enables Oracle Enterprise Manager to discover an Oracle RAC database, and should not be used for client connections.

If you use DBCA to create an Oracle RAC database that is a multitenant container database (CDB), then DBCA creates a database service that has the same name as the database. Clients that use this database service can connect to any database instance for the Oracle RAC CDB. However, if you use DBCA to add a pluggable database (PDB) to an existing CDB, then DBCA does not create a database service for the new PDB.

Example 6–2 Example Net Service Name Entry for a Database Connection

This example shows a connect descriptor that is used in a `tnsnames.ora` file. The connect identifier in this case is the same as the cluster domain, `mycluster.example.com`. Instead of specifying the address for an individual server, a virtual Internet Protocol (VIP) address, or a cluster node name, the connect descriptor uses the SCAN, which is `myscan.mycluster.example.com`.

```
mycluster.example.com =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP) (HOST = host=myscan.mycluster.example.com)
      (PORT = 1522))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = myApp)
    )
  )
```

Oracle Clusterware resolves connection requests that use the net service name `mycluster.example.com` to any of the database instances of the `mycluster` database that run the `myApp` database service. The specific cluster node on which the instance is running is invisible to the client.

The net service name does not require a fully qualified domain name for the server on which a database, database instance, or listener runs. SCANS are resolved by the DNS or GNS, which returns three addresses to the client. The client then submits connection requests to each address in succession until a connection is made.

6.12.3.2 Net Service Names for Instance Connections

Clients that connect to a particular instance of the database use the net service name for the instance. The following example shows a net service name configured to connect to a specific database instance.

Example 6–3 Example Net Service Name Entry for an Instance Connection

In this example, the connect identifier is the same as the instance name, `mycluster1.example.com`. The connect descriptor uses the SCAN to locate the instance within the cluster. Clients connecting to the net service name `mycluster1.example.com`

are connected to the `mycluster1` database instance of the `mycluster` database. Oracle Clusterware resolves that connection to the cluster node on which the instance is running. The specific cluster node on which the instance is running is invisible to the client.

```
mycluster1.example.com=
  (DESCRIPTION=
    (ADDRESS= (PROTOCOL=TCP) (HOST=myscan.mycluster.example.com) (PORT=1521))
    (CONNECT_DATA=
      (SERVICE_NAME=mycluster.example.com)
      (INSTANCE_NAME=mycluster1)
    )
  )
)
```

6.12.4 Listener Configuration and the listener.ora File

In Oracle RAC environments, Oracle recommends that you let the Oracle Agent manage Oracle listeners for Oracle Databases. The following sections describe Oracle Net listener configuration:

- [Local Listener for an Oracle RAC Database](#)
- [Remote Listeners for an Oracle RAC Database](#)
- [Managing Multiple Listeners for an Oracle RAC Database](#)
- [How Oracle Database Uses the Listener File \(listener.ora\)](#)

Note: If you enable GNS, then you do not have to manually configure the listener.

6.12.4.1 Local Listener for an Oracle RAC Database

The local listener, or default listener, is located in the Grid home when you have Oracle Grid Infrastructure installed. The `listener.ora` file is located in the `Grid_home\network\admin` directory. If needed, you can edit the `listener.ora` file for the Grid home listeners to define listener parameters for node and SCAN listeners. Do not modify the endpoints because these are automatically managed by the listener agent.

During Oracle Database creation, the `LOCAL_LISTENER` parameter is automatically configured to point to the local listener for the database. You can set a value manually for `LOCAL_LISTENER`. If you modify the value of the `LOCAL_LISTENER` parameter, then the Database Agent process does not automatically update this value. Oracle recommends that you leave the parameter unset so that the Database Agent process can maintain it automatically. If you do not set `LOCAL_LISTENER`, then the Database Agent process automatically updates the database associated with the local listener in the Grid home, even when the ports or IP address of that listener are changed.

See Also:

- ["Net Service Names and the tnsnames.ora File"](#) on page 6-15 for more information about listener associations defined in the `tnsnames.ora` file
- *Oracle Database Net Services Reference* for more information about the `listener.ora` file
- *Oracle Database Net Services Administrator's Guide* for information about understanding and configuring listeners

6.12.4.2 Remote Listeners for an Oracle RAC Database

A **remote listener** is a listener residing on one computer that redirects connections to a database instance on another computer. For example, SCAN listeners are remote listeners. In Oracle RAC environments, Oracle recommends that you let the Oracle Agent manage the Oracle listeners for the databases.

See Also:

- ["Net Service Names and the tnsnames.ora File"](#) on page 6-15 for more information about listener associations defined in the `tnsnames.ora` file
- *Oracle Database Net Services Reference* for more information about the `listener.ora` file
- *Oracle Database Net Services Administrator's Guide* for information about understanding and configuring listeners

6.12.4.3 Managing Multiple Listeners for an Oracle RAC Database

To administer Oracle Database 12c Release 1 (12.1) local and SCAN listeners using the `lsnrctl` command, use the `LSRNCTL` executable located in the Grid home. Do not attempt to use the `lsnrctl` executables from Oracle home locations for earlier releases, because they cannot be used with Oracle Database 12c Release 1 (12.1).

For listeners not managed by Oracle Clusterware, you can use a nondefault location for the `listener.ora` file by setting the `TNS_ADMIN` environment variable or registry value to point to the directory that contains the Oracle Net Services configuration files. To use a nondefault location for a listener managed by Oracle Clusterware, you must use `SRVCTL` and the `setenv` command to modify the value of `TNS_ADMIN` for each listener.

6.12.4.4 How Oracle Database Uses the Listener File (listener.ora)

The `listener.ora` file is the configuration file for a listener. It can include the protocol addresses it is accepting connection requests on, a list of the database and other services it is listening for, and control parameters used by the listener. You can modify the configuration of the listeners used by Oracle Clusterware and Oracle RAC with Server Control Utility (`SRVCTL`) commands, or by using `NETCA`. Manual editing of the `listener.ora` file is not required.

Each listener is configured with one or more protocol addresses that specify its listening endpoints. The listener agent dynamically updates endpoints with the listener. Starting with Oracle Database 11g Release 2, the `listener.ora` file now only contains an IPC key and the following information:

```
(ADDRESS = (PROTOCOL=TCP) (HOST=) (PORT=1521))
```


In the previous example, the protocol ADDRESS refers implicitly to the HOST endpoint of the local node. The `listener.ora` file is the same on every node for an Oracle RAC database. Listening endpoints, such as the port numbers, are dynamically registered with the listener.

Before you install Oracle RAC, during the Oracle Grid Infrastructure installation, NETCA creates and starts a default listener in the Grid home called LISTENER. The listener is configured with default protocol listening addresses. The listener is configured to respond to connection requests that are directed to one protocol address specified during installation.

During the Oracle RAC installation, the Oracle RAC database uses the listener in the Grid home, and configures service information about the Oracle RAC database. The database services automatically register their information with the listener, such as the service name, instance names, and load information. Dynamic service registration eliminates the need for static configuration of database services. However, static service configuration is required if you plan to use Oracle Enterprise Manager.

Example 6–4 Example listener.ora File for an Oracle RAC Node

The following is an example `listener.ora` file as it would appear after installation, with an entry for a node named `node1` and a SCAN listener.

```

LISTENER_SCAN1=(DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=IPC)(KEY=LISTENER_SCAN1))))
# line added by Agent
LISTENER_NODE1=(DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=IPC)(KEY=LISTENER))))
# line added by Agent
# listener.ora.mycluster Network Configuration File:
C:\app\oracle\product\12.1.0\dbhome_1\network\admin\listener.ora.mycluster
# Generated by Oracle configuration tools.

LISTENER_NODE1 =
  (DESCRIPTION_LIST =
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1521))
    )
  )

ENABLE_GLOBAL_DYNAMIC_ENDPOINT_LISTENER_NODE1=ON# line added by Agent
ENABLE_GLOBAL_DYNAMIC_ENDPOINT_LISTENER_SCAN2=ON# line added by Agent
ENABLE_GLOBAL_DYNAMIC_ENDPOINT_LISTENER_SCAN1=ON# line added by Agent

```

6.12.5 Net Services Profile File (sqlnet.ora)

Oracle Universal Installer starts Oracle Net Configuration Assistant (NETCA) after the database software is installed. NETCA creates the Oracle Net Services profile, or the `sqlnet.ora` file. In an Oracle Grid Infrastructure installation, the `sqlnet.ora` file is located in the following directory by default:

```
Grid_home\network\admin
```

For the local listener for the Oracle RAC database instance, the default location of the `sqlnet.ora` file is `%ORACLE_HOME%\network\admin` directory. In this directory there is a default `sqlnet.ora` file. Also, you can find a sample `sqlnet.ora` file in the subdirectory `sample`.

During installation of the Oracle RAC software, NETCA creates the following entries in the `sqlnet.ora` file, where `%ORACLE_BASE%` is the path to the Oracle base directory for the Oracle RAC installation:

```
NAMES.DIRECTORY_PATH=(TNSNAMES, EZCONNECT)
ADR_BASE =%ORACLE_BASE%
```

The `AUTHENTICATION_SERVICES` parameter specifies the method by which users are authenticated for database access. The value `NTS` indicates that Microsoft Windows native authentication should be used to authorize access to the database. Oracle Databases that use Oracle Automatic Storage Management (Oracle ASM) and the databases that are managed by Oracle Grid infrastructure must use Windows native authentication, which is enabled by default.

The parameter `NAMES.DIRECTORY_PATH` specifies the priority order of the naming methods to use to resolve connect identifiers to connect descriptors. The `ADR_BASE` parameter specifies the base directory into which tracing and logging incidents are stored when Automatic Diagnostic Repository (ADR) is enabled for the database.

See Also:

- *Oracle Database Net Services Administrator's Guide* for more information about the `sqlnet.ora` file
- *Oracle Database Concepts* for more information about authentication
- *Oracle Database Client Installation Guide for Microsoft Windows* for more information about configuring clients for database connectivity
- *Oracle Database Administrator's Guide* for more information about ADR

Removing Oracle Real Application Clusters Software

This chapter describes how to completely remove all Oracle databases, instances, and software from an Oracle Real Application Clusters (Oracle RAC) Oracle home directory.

This chapter contains the following topics:

- [Overview of Deinstallation Procedures](#)
- [Identifying All Instances On a Cluster](#)
- [Deinstalling Oracle RAC Software](#)

See Also: The product-specific documentation, for example *Oracle Database Client Installation Guide for Microsoft Windows*, for information on removing a single product. Review the requirements and restrictions that apply for that product.

7.1 Overview of Deinstallation Procedures

To completely remove all Oracle databases, instances, and software from an Oracle home directory:

- Identify all instances associated with the Oracle home
- Shut down processes
- Remove listeners installed in the Oracle Database home
- Remove database instances
- Remove Oracle Automatic Storage Management (Oracle ASM) release 11.1 or earlier
- Remove Oracle Clusterware and Oracle ASM (Oracle Grid Infrastructure)

Note:

- For information on removing Oracle Database Vault, see *Oracle Database Vault Administrator's Guide*.
 - For information on removing Oracle Configuration Manager, see *Oracle Configuration Manager Installation and Administration Guide*.
 - With Oracle Grid Infrastructure 11g release 2 (11.2) and later, Oracle ASM and Oracle Clusterware comprise the Oracle Grid Infrastructure installation. These components are installed and removed together.
-
-

Caution: If any cluster member node has more than one database with the same global database name (GDN) on a server, then you cannot use the deinstallation tool to remove only one database. For example, if you have a standalone database on one of your cluster nodes with the GDN `mydb.example.com`, and your Oracle RAC database GDN is also `mydb.example.com`, then both databases on that node are removed by the deinstallation tool.

7.2 Identifying All Instances On a Cluster

You can identify the database instances on your cluster using either SRVCTL or the Windows Services control interface.

7.2.1 Identifying All Instances On a Cluster Using SRVCTL

To identify all instances associated with the Oracle home to remove, enter the following command, where *dbname* is the name of the database:

```
C:\.> srvctl status database -db dbname
```

7.2.2 Identifying All Instances On a Cluster Using the Windows Services Control Manager

You can identify all instances and services associated with the Oracle home that you want to remove by performing the following steps:

1. Log in to a cluster node as a user with Administrator privileges.
2. Locate the Oracle services related to the Oracle home.

Use the Windows Services Control Manager to manage the services. Look for any Oracle services (their names begin with *Ora*) that access the Oracle home you are removing and have the status Started.

To determine which Oracle home a service is associated with, check "Path to Executable" for a service to see the directory where the executable for the service is located.

7.3 Deinstalling Oracle RAC Software

The deinstallation tool removes Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM) from your server, and Oracle Database installations, for

both Oracle RAC and single-instance databases. The following sections describe the deinstallation tool, and provide information about additional options you can use:

- [About the Deinstallation Tool](#)
- [Example of Running the Deinstall Command for Oracle RAC](#)
- [Example of a Deinstallation Response File for Oracle RAC](#)

7.3.1 About the Deinstallation Tool

Starting with Oracle Database 12c, the deinstallation tool is integrated with the database installation media. You can run the deinstallation tool using the `setup.exe` command with the `-deinstall` and `-home` options from the base directory of the database, client or grid infrastructure installation media.

The deinstallation tool is also available as a separate command (`deinstall.bat`) in Oracle home directories after installation. It is located in the `%ORACLE_HOME%\deinstall` directory.

The `deinstall.bat` command uses the information you provide, plus information gathered from the software home to create a response file. You can alternatively supply a response file generated previously by the `deinstall.bat` command using the `-checkonly` and `-o` flags. You can also edit a response file template to create a response file.

The deinstallation tool (`deinstall.bat`) stops Oracle services, instances, and processes, 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 Windows installation, then the deinstaller automatically runs the appropriate scripts to deconfigure Oracle Grid Infrastructure or Oracle Grid Infrastructure for standalone server.

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 response file.

Caution: When you run the deinstallation tool, 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 Database installation owner:

- admin
- cfgtoollogs
- checkpoints
- diag
- oradata
- fast_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 deinstallation tool deletes this data.

The default method for running the deinstallation tool is from the `deinstall` directory in the Oracle home as the installation owner:

```
C:\> cd %ORACLE_HOME%\deinstall
C:\..\dbhome_1\> deinstall.bat
```

The `deinstall.bat` command uses the following syntax, where variable content is indicated by italics:

```
deinstall.bat [-silent] [-checkonly] [-local]
[-paramfile complete path of input response 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]
```

To run the deinstallation tool from the database installation media, use the `setup.exe` command with the `-deinstall` option, followed by the `-home` option to specify the path of the Oracle home you want to remove using the following syntax, where variable content is indicated in italics:

```
setup.exe -deinstall -home complete path of Oracle home [-silent] [-checkonly]
[-local] [-paramfile complete path of input response 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]
```

Provide information about your servers as prompted or accept the defaults.

The deinstallation tool stops Oracle software, and removes Oracle software and configuration files on the operating system.

In addition, you can run the deinstallation tool with a response file, or select any of the following options when using deinstallation tool:

- `-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 within the Oracle home being removed, provide a response file in a location outside the Oracle home, and do not use the `-home` flag.

If you run `deinstall.bat` from the `%ORACLE_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 command `setup.exe -deinstall` from the installation media, then the `-home` flag is mandatory.

- `-silent`

Use this flag to run the command in silent or response file mode. If you use the `-silent` flag, then you must use the `-paramfile` flag and provide a response file that contains the configuration values for the Oracle home to deinstall or deconfigure.

If you have a working system, then you can generate a response 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 response file, which you can then use with the `-silent` option.

You can also modify the template file `deinstall.rsp.tmpl`, located in the `%ORACLE_HOME%\deinstall\response` folder.

- `-checkonly`

Use this flag to check the status of the Oracle software home configuration. Running the `deinstall.bat` command with the `-checkonly` flag does not remove the Oracle configuration. The `-checkonly` flag generates a response file that you can use with the `deinstall.bat` command.

When you run the `deinstall.bat` command with the `-checkonly` flag to generate a response file, you are prompted to provide information about your system. You can accept the default value the deinstallation tool has obtained from your Oracle installation, indicated inside brackets ([]), or you can provide different values. To accept the defaults, click **Enter** at each prompt.

- `-local`

Use this flag in a multinode environment to deinstall Oracle software on a local node of a cluster.

When you run the `deinstall.bat` command with this flag, it deconfigures and deinstalls the Oracle software on the local node (the node on which you run the `deinstall.bat` command). On remote nodes, it deconfigures Oracle software, but does not deinstall the Oracle software.

Note: You cannot use the deinstallation tool with the `-local` option for a shared Oracle home.

- `-paramfile` *complete path of input response file*

This is an optional flag. Use this flag to run the `deinstall.bat` command with a response file in a location other than the default. When you use this flag, provide the complete path where the response file is located. If you run the `deinstall.bat`

command from the Oracle home that you plan to deinstall, then you do not need to use the `-paramfile` option.

The default location of the response file depends on the location of the `deinstall.bat` command you use:

Location of <code>deinstall.bat</code>	Default Location of the Response File
In the installation media or stage location:	<code>X:\staging_location\response</code> where <code>X:\staging_location</code> refers to the directory that contains the installation software
After installation, in the installed Oracle home	<code>%ORACLE_HOME%\deinstall\response</code>

- `-params name1=value[name2=value ...]`
Use this flag with a response file to override one or more values in a response 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 response file (`deinstall_Oracle_home_name.rsp`) is saved.

The default location of the response file depends on the location of the deinstallation tool:

Location of <code>deinstall.bat</code>	Default Location of the Response File
In the installation media or stage location:	<code>X:\staging_location\response</code>
After installation, in the installed Oracle home	<code>%ORACLE_HOME%\deinstall\response</code>

- `-tmpdir complete path of temporary directory`
Specifies a non-default location where Oracle Deinstallation Tool writes the temporary files for the deinstallation.
- `-logdir complete path of log directory`
Specifies a non-default location where Oracle Deinstallation Tool writes the log files for the deinstallation.
- `-help`
Use this flag (`-help` or `-h`) to obtain additional information about the command options and flags.

If you use the `deinstall.bat` command located in an Oracle home, then the command, by default, writes log files in the `C:\Program Files\Oracle\Inventory\logs` directory. If, however, you are removing the last Oracle home installed on the server, then, by default, the utility writes the log files to:

- `%TEMP%\deinstall\logs` if you use the `deinstall.bat` command located in the Oracle home
- `%TEMP%\deinstall_bootstrap\log` if you use the `setup.exe -deinstall -home Oracle_home` command

7.3.2 Example of Running the Deinstall Command for Oracle RAC

If you use the `setup.exe -deinstall` command to run the deinstallation tool, then you must provide the home directory of the Oracle software to remove from your system. You may be prompted for additional information required by the deinstallation tool.

If you run the `setup.exe -deinstall` command without additional parameters, then the usage information for the command is displayed.

If you run the `deinstall.bat` command from the `%ORACLE_HOME%/deinstall` folder, then deinstallation starts without prompting you for a home address.

Example 7-1 Running the Deinstallation Tool from the Installer

To remove the Oracle Database home `dbhome_1` using the deinstallation tool started from the installer, use commands similar to the following while logged in as a member of the Administrator group, where `directory_path` is the path to the database directory on the installation media:

```
C:\> cd directory_path\  
C:\database> setup.exe -deinstall -home C:\app\oracle\product\12.1.0\dbhome_1\  

```

Example 7-2 Running the Deinstallation Tool with a Response File

In the following example, the `runInstaller` command is in the path `/directory_path`, where `directory_path` is the path to the database directory on the installation media. This example also uses a response file in the software owner location `C:\user\oracle`:

```
C:\> cd directory_path\  
C:\..database> setup.exe -deinstall -paramfile C:\user\oracle\my_db_parmfile.tmpl  

```

7.3.3 Example of a Deinstallation Response File for Oracle RAC

You can run the deinstallation tool on Oracle RAC Databases with the `-paramfile` option to use the values you specify in the response file. The following is an example of a response file used with the deinstallation tool.

Example 7-3 Sample Response File to use with the Deinstallation Tool to Uninstall Oracle RAC

The following is an example of a response file created by the deinstallation tool. The response file contains the following information:

- The Oracle Home User is `oracle`
- The Oracle Database home (Oracle home) is in the path
`C:\app\oracle\product\12.1.0\dbhome_1`
- The Oracle base is `C:\app\oracle`
- The Grid home is `C:\app\12.1.0\grid`
- The central Oracle Inventory home is `C:\Program Files\Oracle\Inventory`
- The virtual IP address (VIP) is `192.0.2.1`
- The name of the local node (the node on which you run the deinstallation tool) is `node1`
- The name of the remote node is `node2`
- The database name is `orcl` and it is an Oracle RAC database

- The database uses Oracle ASM for storage

```
#Copyright (c) 2005, 2010 Oracle Corporation. All rights reserved.
LOCAL_NODE=node1
HOME_TYPE=RACDB
ORACLE_BASE=C:\app\oracle
DB_TYPE.orcl=RAC_DB
silent=false
ORA_CRS_HOME=C:\app\12.1.0\grid\
LOGDIR=C:\Program Files\Oracle\Inventory\logs\
DATAFILE_LOC.orcl=
ORACLE_BINARY_OK=true
DUMP_DESTINATION_LOC.orcl=C:\app\oracle\admin\orcl
EMCP.DB_UNIQUE_NAME_LIST=orcl
CLUSTER_NODES=node1,node2
REMOTE_NODES=node2
SPFILE_LOC.orcl=+DATA/orcl/spfileorcl.ora
ARCHIVE_LOG_DESTINATION_LOC.orcl=
ORACLE_BASE.orcl=C:\app\oracle
LOCAL_SID.orcl=orcl1
local=false
INVENTORY_LOCATION=C:\Program Files\Oracle\Inventory
NODE_LIST.orcl=node1,node2
RAW_MAPPING_FILE.orcl=
DIAG_DEST.orcl=C:\APP\ORACLE\diag\rdbms\orcl
ORACLE_HOME=C:\app\oracle\product\12.1.0\dbhome_1\
STORAGE_TYPE.orcl=ASM
CCR_CONFIG_STATUS=CCR_DEL_HOME
CRS_HOME=false
EMCP.CHECK_POINT.orcl=WINDOWS_SERVICE_REGISTRY_CREATE,DBCONTROL_START
CONFIGFILE_LOC.orcl=+DATA/orcl/controlfile/current.260.712754807,C:\APP\ORACLE
\PRODUCT\12.1.0\DBHOME_1\DATABASE\DR1ORCL.DAT,C:\APP\ORACLE\PRODUCT\12.1.0\
DBHOME_1\DATABASE\DR2ORCL.DAT
SID_LIST.orcl=orcl1,orcl2
OLD_ACTIVE_ORACLE_HOME=
CREATION_MODE.orcl=y
COMPS_TO_REMOVE=ode.net.ntoledb,oramts
DB_UNIQUE_NAME_LIST=orcl
FLASH_RECOVERY_LOC.orcl=
```

Troubleshooting Oracle Real Application Clusters Installations

This appendix provides troubleshooting information for installing Oracle Real Application Clusters (Oracle RAC). It contains the following sections:

- [Troubleshooting Oracle RAC Installation Errors](#)
- [Resolving Oracle RAC Installations Errors](#)
- [Troubleshooting Configuration Assistant Errors](#)
- [Troubleshooting Silent or Noninteractive Installations](#)
- [About Using CVU Cluster Healthchecks After Installation](#)
- [Cleaning Up After a Failed Installation](#)

See Also:

- *Oracle Real Application Clusters Administration and Deployment Guide*
- *Oracle Clusterware Administration and Deployment Guide*

A.1 Troubleshooting Oracle RAC Installation Errors

The following information explains how to proceed if you encounter an error during installation of Oracle RAC.

A.1.1 Verifying Requirements

Before you try any of the troubleshooting steps in this appendix, do the following:

- Check [Chapter 1, "Preinstallation Checklist"](#) to ensure that your system meets the requirements and that you have completed all of the preinstallation tasks.
- Read the release notes for the product on your platform before installing it. You can find the latest version of the release notes on the Oracle Technology Network website:

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

A.1.2 Understanding How To Resolve Installation Errors

If you encounter an error during installation:

- Do not exit Oracle Universal Installer (OUI).

- If you clicked **Next** after you entered incorrect information in an installation window, then click **Back** to return to the window and correct the information.
- If you encounter an error while OUI is copying files, then see [Section A.1.3, "Locating the Log File For an Installation Session"](#) for interactive installations or [Section A.4, "Troubleshooting Silent or Noninteractive Installations"](#) for more information.
- If you encounter an error while a configuration assistant is running, then see the [Section A.3, "Troubleshooting Configuration Assistant Errors"](#) section.
- If you cannot resolve the problem, then remove the failed installation by following the steps listed in [Section A.6, "Cleaning Up After a Failed Installation."](#)

A.1.3 Locating the Log File For an Installation Session

During an installation, OUI records all the actions that it performs in a log file. If you encounter problems during the installation, then review the log file for information about possible causes of the problem.

By default, the log files are located in the following directory:

```
%SYSTEMDRIVE%\Program Files\Oracle\Inventory\logs
```

Log file names from interactive installations have the form:

```
installActionsdate_time.log
```

For example, if an interactive installation occurred at 9:00:56 a.m. on October 14, 2009, then the log file would be named:

```
installActions2009-10-14_09-00-56AM.log
```

A.2 Resolving Oracle RAC Installations Errors

This section contains the following topics:

- [General Installation Issues](#)
- [Performing Cluster Diagnostics During Oracle RAC Installations](#)
- [Reviewing the Log of an Installation Session](#)

A.2.1 General Installation Issues

The following list contains examples of the types of errors that can occur during installation:

- [Nodes unavailable for selection from the OUI Node Selection screen](#)
- [Node nodename is unreachable](#)
- [PROT-8: Failed to import data from specified file to the cluster registry](#)
- [Time stamp is in the future](#)
- [Administrative user unable to log in to SQL*Plus using the SYSDBA privilege](#)

Nodes unavailable for selection from the OUI Node Selection screen

Cause: Oracle Clusterware is either not installed, or the Oracle Clusterware services are not active or started.

Action: Install Oracle Clusterware, or review the status of the Oracle Clusterware stack. Consider restarting the nodes, because doing so may resolve the problem.

Node *nodename* is unreachable

Cause: The IP host was unavailable.

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 verify that the host is reachable.

PROT-8: Failed to import data from specified file to the cluster registry

Cause: Insufficient space in an existing Oracle Cluster Registry device partition, which causes a migration failure at the end of the installation. To confirm this issue, look for the error "Not enough space in the backing store" in the log file `Grid_home\log\hostname\client\ocrconfig_pid.log`.

Action: Identify a disk partition that has 280 MB or more available space. Copy the contents of the existing disk partition to the new device using the command `XCOPY`.

Time stamp is in the future

Cause: One or more nodes had a different clock time than the local node. If this was the case, then you may see output similar to the following:

```
time stamp 2019-04-04 14:49:49 is 106 s in the future
```

Action: Ensure that all member nodes of the cluster have the same clock time.

Administrative user unable to log in to SQL*Plus using the SYSDBA privilege

Cause: When Oracle Database on Microsoft Windows was installed, Oracle Universal Installer created a Windows local group called `ORA_DBA`, and then added the user name of the user performing the installation to this group. Members of `ORA_DBA` automatically receive the SYSDBA privilege. However, for cluster installations, OUI does not add the user to `ORA_DBA` if they have performed the installation remotely. As a result, this user could not log in to SQL*Plus using the SYSDBA privilege.

Action: Manually add remote users to `ORA_DBA`.

See Also: *Oracle Database Administrator's Guide* for information about connecting to the database using SQL*Plus

A.2.2 Performing Cluster Diagnostics During Oracle RAC Installations

When installing Oracle RAC, if Oracle Universal Installer (OUI) does not display the Node Selection page, then perform clusterware diagnostics by running the `olsnodes -v` command from the `bin` directory in the Oracle Clusterware home (`Grid_home\bin`) and analyzing its output. See *Oracle Clusterware Administration and Deployment Guide* if the detailed output indicates that your clusterware is not running.

In addition, use the following command to check the integrity of the Cluster Manager, where the variable `node_list` is the list of nodes in your cluster, separated by commas:

```
C:\..grid\bin> cluvfy comp clumgr -n node_list -verbose
```

A.2.3 Reviewing the Log of an Installation Session

During an installation, OUI records all of the actions that it performs in a log file. If you encounter problems during the installation, then review the log file for information about possible causes of the problem.

To view the log file, follow these steps:

1. Go to the logs subdirectory of the Oracle Inventory directory:

```
C:\> cd Program Files\Oracle\Inventory\logs
```

2. View the file details for the folder to determine the most recent file. Installer log files have names similar to the following, where *date_time* indicates the date and time that the installation started:

```
installActionsdate_time.log
```

3. Use a text editor to view the most recent entries in the log file, where information about a problem is most likely to appear.

A.3 Troubleshooting Configuration Assistant Errors

To troubleshoot an installation error that occurs when a configuration assistant is running, do the following:

- Review the installation log files listed in the section [Section A.3.1, "Reviewing Configuration Assistant Errors."](#)
- Review the specific configuration assistant log file located in the Oracle base directory for the installation user, in the path %ORACLE_BASE%\cfgtoollogs. Try to fix the issue that caused the error.
- If you see the "Fatal Error. Reinstall" message, then look for the cause of the problem by reviewing the log files. See the section [Section A.3.3, "Resolving Irrecoverable Errors Reported by Configuration Assistants"](#) for further instructions.

A.3.1 Reviewing Configuration Assistant Errors

To troubleshoot an installation error that occurs when a configuration assistant, such as Oracle Net Configuration Assistant (NETCA), is running:

1. Review the installation log files as described in the section [Section A.2.3, "Reviewing the Log of an Installation Session."](#)
2. Review the specific configuration assistant log file as described in [Section A.3.2, "Identifying Configuration Assistant Failures."](#) Try to fix the issue that caused the error.
3. If you see the "Fatal Error. Reinstall" message, then look for the cause of the problem by reviewing the log files. See [Section A.3.3, "Resolving Irrecoverable Errors Reported by Configuration Assistants"](#) for more information.

A.3.2 Identifying Configuration Assistant Failures

If an Oracle configuration assistant is not able to complete its configuration tasks, then it reports a status of 'Failed'. Oracle configuration assistant failures are noted at the bottom of the installation screen. The configuration assistant interface displays additional information, if available.

The configuration assistant execution status is stored in the following file:

C:\Program Files\Oracle\Inventory\logs\installActionsdate_time.log

More details about errors related to the configuration assistant can be found in the following directory, where the Oracle base directory is the Oracle base for the Oracle RAC installation user:

%ORACLE_BASE%\cfgtoollogs

Completion status codes are listed in the following table:

Status Result	Code
Configuration assistant succeeded	0
Configuration assistant failed	1
Configuration assistant canceled	-1

A.3.3 Resolving Irrecoverable Errors Reported by Configuration Assistants

If you receive an irrecoverable (or *fatal*) error while a configuration assistant is running, then you must complete the following tasks:

1. Remove the failed installation as described in [Section A.6, "Cleaning Up After a Failed Installation."](#)
2. Correct the cause of the irrecoverable error.
3. Reinstall the Oracle software.

See Also: [Chapter 7, "Removing Oracle Real Application Clusters Software"](#)

A.4 Troubleshooting Silent or Noninteractive Installations

To determine whether a silent or noninteractive installation succeeds or fails, check the `silentInstallActionsdate_time.log` file, located in `DRIVE_LETTER:\Program Files\Oracle\Inventory\logs`, as described in [Section A.2.3, "Reviewing the Log of an Installation Session."](#)

A silent or noninteractive installation fails if:

- You do not specify a response file.
- You specify an incorrect or incomplete response file.

For example, a common problem is that while all the product-specific data is correct, the staging area location may be incorrect. If this is the case, then check the `FROM_LOCATION` variable and ensure that it points to the `products.xml` file in the installation media. In the installation media, this `products.xml` is in `database\stage`.

- OUI encounters an error, such as insufficient disk space.

OUI or a configuration assistant validates the response file at run time. If the validation fails, then the silent or noninteractive installation or configuration process ends. OUI treats values for parameters that are of the wrong context, format, or type as if no value had been specified in the file.

See Also: [Section A.1.3, "Locating the Log File For an Installation Session"](#)

A.5 About Using CVU Cluster Healthchecks After Installation

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:

```
cluvfy comp healthcheck [-collect {cluster|database}] [-db db_unique_name]
[-bestpractice|-mandatory] [-deviations] [-html] [-save [-savedir directory_path]]
```

For example:

```
C:\> cd app\12.1.0\grid\bin
C:\.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` command, 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. To perform best practices checks on these databases, 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 that is recognized by CVU 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 (`cvuchecdkreport_timestamp.txt` and `cvucheckreport_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 executable files.

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.6 Cleaning Up After a Failed Installation

If an installation fails, then you must remove the Oracle home directory and remove all files that OUI created during the attempted installation. Perform the following steps to clean up the failed installation:

1. Follow the instructions in [Chapter 7, "Removing Oracle Real Application Clusters Software"](#) to run OUI to deinstall Oracle RAC.
2. Manually remove the directory that was used as the Oracle home directory during the installation.
3. Remove the following Windows Registry keys created by OUI during the previous installation attempt:

```
HKEY_LOCAL_MACHINE\SOFTWARE\ODBC\ODBCINST.INI
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Oracle11\Performance
\KEY_ORACLE_HOME_NAME
```

After you have completed these steps, you can start the installation again.

Using Scripts or Response Files to Create Oracle Real Application Clusters Databases

This appendix describes the steps for noninteractive installations during which you can create Oracle Real Application Clusters (Oracle RAC) databases using scripts.

Note: The scripts generated by Database Configuration Assistant (DBCA) are for reference only. Oracle strongly recommends that you use DBCA to create a database.

See Also: *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX* for detailed information about generating scripts

This appendix contains the following topics:

- [Using DBCA to Generate Installation Scripts for Oracle RAC](#)
- [About DBCA Noninteractive \(Silent\) Configuration for Oracle RAC](#)
- [DBCA Commands for Noninteractive \(Silent\) Configuration of Oracle RAC](#)
- [Understanding How Response Files are Used During Installation](#)
- [Preparing Response Files](#)
- [Running Oracle Universal Installer Using a Response File](#)
- [Postinstallation Configuration Using Response Files](#)
- [Running Configuration Assistants Using Response Files](#)

B.1 Using DBCA to Generate Installation Scripts for Oracle RAC

To generate scripts to create an Oracle RAC database, create a database using the generated scripts, and prepare the database for use, complete the following steps:

1. Start DBCA and select your preferred options to build the Oracle RAC database.

On the Creation Options page of your DBCA session, deselect Create Database and select **Generate Database Creation Scripts** before you click **Finish**. You can accept the default destination directory for the scripts, or browse for a different location. In either case, you should note the path name for use in the next step.

See Also: [Chapter 3, "Creating Oracle RAC Databases with DBCA"](#) for additional information about running a DBCA session

2. Go to the directory where DBCA created the scripts, and review the SQL scripts to ensure that they contain the statements to build a database with the characteristics you require. If they do not, then Oracle recommends that you rerun DBCA to create scripts with the desired configuration rather than editing the scripts yourself.
3. On each cluster node you identified during your DBCA session, run the script *sid.bat*, where *sid* is the SID prefix that you entered on the DBCA Database Name page.
4. Set the initialization parameter, *cluster_database*, to the value `TRUE` in your SPFILE by entering an `ALTER SYSTEM` statement in SQL*Plus, or by uncommenting the parameter in the PFILE for each instance.
5. Configure Oracle Net Services to support your new database and instances as described in [Chapter 6, "Understanding the Oracle Real Application Clusters Installed Configuration"](#).
6. Set the `REMOTE_LISTENER` parameter to the `SCAN` (using the Easy Connect Naming syntax *scanname:scanport*) in your SPFILE by entering an `ALTER SYSTEM` statement in SQL*Plus, or by uncommenting the parameter in the PFILE for each instance.
7. Run the Server Control Utility (SRVCTL) to configure and start database and instance applications as described in *Oracle Real Application Clusters Administration and Deployment Guide*.

See Also: *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX* for additional information about creating and using scripts to install Oracle software with OUI

B.2 About DBCA Noninteractive (Silent) Configuration for Oracle RAC

You can perform a noninteractive, or *silent* configuration of Oracle RAC using DBCA. To perform a silent configuration, you must have completed an Oracle Grid Infrastructure (Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM)) installation.

You can use DBCA to create a database from templates supplied by Oracle, or from templates that you create. The templates contain settings optimized for a particular type of workload.

Oracle provides templates for the following two workload types:

- General purpose or transaction processing
- Data warehouse

For more complex environments, you can select the Custom Database option. This option does not use templates and results in a more extensive installation interview, which means that it takes longer to create your database.

B.3 DBCA Commands for Noninteractive (Silent) Configuration of Oracle RAC

You can use the following command syntax to create an Oracle RAC database using the general purpose template, placing the data files in an existing Oracle ASM disk group. Nodes *node1* and *node2* are the cluster nodes on which Oracle RAC database instances are created. The disk group name is `+ASMgrp1`. An Oracle Home User was specified for this installation, and is indicated with the `-serviceUserPassword` option:

```
%ORACLE_HOME%\bin\dbca -silent -createDatabase -templateName General_Purpose.dbc
-gdbName %DBNAME% -sid %ORACLE_SID% -sysPassword -systemPassword
-sysmanPassword -dbnmpPassword -serviceUserPassword
-emConfiguration LOCAL -storageType ASM -diskGroupName +ASMgrp1
-datafileJarLocation %ORACLE_HOME%\assistants\dbca\templates
-nodeinfo node1,node2 -characterset WE8MSWIN1252
-obfuscatedPasswords false -sampleSchema false -asmSysPassword
```

After you run this command, if you did not include the passwords as values in the above command, then DBCA prompts you for the passwords for the SYS, SYSTEM, SYSMAN, DBSNMP, Oracle Home (or Oracle Service) and SYSASM users, for example:

```
Enter SYS user password:
password
Enter SYSTEM user password:
password
...
```

See Also: *Oracle Database Administrator's Guide* for a complete description of the dbca commands and options

B.4 Understanding How Response Files are Used During Installation

When you start OUI, you can use a response file to automate the installation and configuration of Oracle software, either fully or partially. OUI 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

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

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 specified 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_NAME` variable:

```
ORACLE_HOME_NAME="OraDBHome1"
```

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_NAME=OraDBHome1" ...
```

Enclose the variable name and its value in double quotation marks.

See Also: *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX* for more information about response files

B.4.1 Deciding to Use Silent Mode or Response File Mode

The following table provides reasons for running the installer in silent mode or response file mode:

Mode	Reasons to Use
Silent	<p>Use silent mode for the following installations:</p> <ul style="list-style-type: none"> ■ To complete an unattended installation, which you schedule using operating system utilities ■ To complete several similar installations on multiple systems without user interaction <p>OUI 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 more than one system, providing default answers to some, but not all the OUI prompts.</p> <p>If you do not specify information required for a particular OUI screen in the response file, then OUI displays that screen. OUI suppresses screens for which you have provided all of the required information.</p>

B.4.2 Creating a Database Using Oracle ASM for Database Files in Silent Mode

Before you create a database that uses Oracle ASM, you must run the `root.bat` script. For this reason, you cannot create a database using Oracle ASM as the storage option for database files during a silent-mode installation. Instead, you can complete a software-only installation using silent-mode, and then run the Oracle Net Configuration Assistant and DBCA in silent mode after you have completed the software-only installation and you have run the `root.bat` script.

Note: This limitation applies only to databases that use Oracle Automatic Storage Management as the storage option for database files. You can create a database that uses the file system option during a silent-mode installation.

See Also: ["Perform a Software-Only Installation of Oracle Database"](#) on page 3-6

B.4.3 General Procedure for Using Response Files

Use the following general steps for installing and configuring 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. Verify the Windows Registry key `HKEY_LOCAL_MACHINE\Software\Oracle` exists and that the value for `inst_loc` is the location of the Oracle Inventory directory on the local node.

To install Oracle RAC, you must first have installed Oracle Grid Infrastructure on your cluster nodes. The Oracle Inventory directory was created and added to the Windows registry during the installation of Oracle Grid Infrastructure. If the `inst_loc` key does not exist in the Windows registry, then install Oracle Grid Infrastructure for a cluster before continuing.

Note: Changing the value for `inst_loc` in the Windows registry is not supported after the installation of Oracle software.

2. Prepare a response file.
3. Run OUI in silent or response file mode.
4. If you completed a software-only installation, then run Oracle Net Configuration Assistant (NETCA) and DBCA in silent or response file mode.

The following sections describe these steps.

B.5 Preparing Response Files

The following sections describe methods you can use to prepare response files for silent mode or response file mode installations:

- [Editing a Response File Template](#)
- [Recording Response Files](#)

B.5.1 Editing a Response File Template

Oracle provides response file templates for each product and installation type and for each configuration tool. For Oracle Database, these files are located in the `database\response` directory on the installation media or in the `Oracle_home\inventory\response` directory after the software has been installed.

Note: If you copied the installation media to a directory on a local disk (referred to as the `staging_dir` directory), then the response files are located in the directory `staging_dir\database\response`.

[Table B-1](#) lists the response files provided with the Oracle RAC software.

Table B-1 Response Files for Oracle Database

Response File	Used For
<code>db_install.rsp</code>	Silent installation of Oracle Real Application Clusters
<code>dbca.rsp</code>	Silent creation and configuration of an Oracle database using DBCA
<code>netca.rsp</code>	Silent configuration of Oracle Net using NETCA

Caution: When you modify a response file template and save a file for use, the response file may contain plain text passwords. Oracle strongly recommends that database administrators or other administrators delete or secure the 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.

If you have copied the installation media to a hard drive, then you can edit the file in the `staging_dir\database\response` directory.

2. Open the response file in a text editor.

During installation, you can specify sensitive information, such as passwords, at the command line rather than within the response file. The section [Section B.4, "Understanding How Response Files are Used During Installation"](#) explains this method.

See Also: *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX* for detailed information about creating response files

3. Follow the instructions in the file to edit it.

Note: OUI or the configuration assistants fail if you do not correctly configure the response file.

4. Secure the response file.

Ensure that only the user that installed the Oracle software can view or modify response files. Consider deleting the modified response file after the installation succeeds.

Note: A fully specified response file for an Oracle Database installation contains the passwords for database administrative accounts and for a user who is a member of the operating system groups `ORA_DBA` and `Administrators`.

B.5.2 Recording Response Files

You can use OUI in interactive mode to record response files, which you can then edit and use to complete silent mode or response file mode installations. This method is useful for Advanced or software-only installations.

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 OUI on the Summary page, before OUI starts to copy the software to the local disk.

If you use record mode during a response file mode installation, then OUI records the variable values that were specified in the original source response file into the new response file.

Note: You cannot save passwords while recording the response file.

To record a response file:

1. Complete preinstallation tasks as for a standard installation.

When you use OUI 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. Ensure that the Oracle Installation User has permissions to create or write to the Oracle home path that you will specify when you run the installer.
3. On each installation screen, specify the required information.
4. When OUI displays the Summary screen, perform the following steps:

- a. Click **Save Response File**. In the pop up window, specify a file name and location for the new response file. Click **Save** to write the settings you have entered to the file.
- b. Click **Finish** to continue with the installation.

Click **Cancel** if you do not want to continue with the installation. The installation stops, but the recorded response file is retained.

5. If you do not complete the installation, then delete the Oracle home directory that the installer created using the path you specified in the Specify File Locations screen.
6. 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.6 Running Oracle Universal Installer Using a Response File

Now, you are ready to run OUI at the command line, specifying the response file you created, to install the Oracle Database software. The OUI executable file, `setup.exe`, provides several options.

B.6.1 Viewing the Help Information for OUI

For information about all the available options for OUI, run the `setup.exe` command with the `-help` option. For example, if the installation software is accessed through a DVD disk drive mounted as `E:`, then you would use the following commands:

```
C:\> E:
E:\> database\setup.exe -help
```

If the installation software has been extracted from a downloaded ZIP file to the directory `X:\staging_dir`, where `X:` is a drive on your system, then you would use the following command:

```
C:\> X:
X:\> staging_dir\database\setup.exe -help
```

The help information appears in your session window after a brief delay.

B.6.2 Running OUI Using a Response File for Input

To use OUI with a response file to install the Oracle Database software, complete the following steps:

1. Complete the preinstallation tasks as for a typical installation.
2. Log in as the Oracle Installation User.
3. Start OUI in silent or response file mode by entering a command similar to the following:

```
X:\staging_dir> database\setup.exe [-silent] [-noconfig] \  
-responseFile responsefilename
```

Note: Do not specify a relative path to the response file. If you specify a relative path, then OUI fails. Use the full path location for the response file.

In this example:

- *X:staging_dir* is either the location of the installation media (for example, a DVD drive) or the path of staging directory on the local node.
- `-silent` runs OUI 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 previously. See [Section B.5.1, "Editing a Response File Template."](#)

B.7 Postinstallation Configuration Using Response Files

The following sections explain how to create and run a response file configuration after installing Oracle software. The topics in this section are:

- [About the Postinstallation Configuration File](#)
- [Creating a Password Response File](#)
- [Performing Postinstallation Configuration Using a Response File](#)

B.7.1 About the Postinstallation Configuration File

When you perform an installation using silent mode or response file mode, 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. To run the configuration assistants after the installation completes in silent mode, you must provide the passwords used by the assistants in a password file.

The configuration assistants are started with a script called `configToolAllCommands`. You can run this script in silent mode by using a password response file. The script uses the passwords in the file to run the configuration tools in succession to complete

the software configuration. If you keep the password file to use when cloning installations, then Oracle strongly recommends that you store the password file in a secure location.

You can also use the password file to restart a failed installation. If you stop an installation to fix an error, then you can rerun the configuration assistants using `configToolAllCommands` and a password response file.

The `configToolAllCommands` password response file has the following 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, to set the password for the SYS user of Oracle ASM:

```
oracle.assistants.asm|S_ASMPASSWORD=myPassWord
```

Oracle Database configuration assistants require the SYS, SYSTEM, and DBSNMP passwords for use with DBCA. You might need to specify the following additional passwords, depending on your system configuration:

- If the database is using Oracle ASM for storage, then you must specify a password for the `S_ASMSNMPPASSWORD` variable. If you are not using Oracle ASM, then leave the value for this password variable blank.
- If you selected to configure Oracle Enterprise Manager, then you must set the value of the `S_HOSTUSERPASSWORD` variable to the password of the Oracle software installation owner. If you do not want to enable Oracle Enterprise Manager, then leave the value for this password variable blank.
- If you create a multitenant container database (CDB) with one or more pluggable databases (PDBs), then you must specify a password for the `ORACLE.INSTALL.DB.CONFIG.STARTERDB.PASSWORD.PDBADMIN` variable.
- If you specified an Oracle Home user for the Oracle Database installation, then specify a password for the `oracle.assistants.server|S_WINSERVICEUSERPASSWORD` variable.

B.7.2 Creating a Password Response File

To create a password response file to use with the configuration assistants, perform the following steps:

1. Create a response file that has a name of the format *filename.properties*.
2. Open the file with a text editor, and cut and paste the sample password file contents, as shown in [Example B-1](#), modifying as needed.
3. If the file is stored on a volume formatted for Windows New Technology File System (NTFS), then modify the security permissions to secure the file.

Example B-1 Sample Password Response File for Oracle RAC Databases

This example provides a template for a password response file to use with the database configuration assistants.

```

oracle.assistants.server|S_SYSPASSWORD=password
oracle.assistants.server|S_SYSTEMPASSWORD=password
oracle.assistants.server|S_DBSNMPPASSWORD=password
oracle.assistants.server|S_PDBADMINPASSWORD=password
oracle.assistants.server|S_EMADMINPASSWORD=password
oracle.assistants.server|S_ASMSNMPPASSWORD=password
oracle.assistants.server|S_WINSERVICEUSERPASSWORD=password

```

If you do not want to enable access for Oracle Enterprise Manager or Oracle ASM, then leave those password fields blank.

B.7.3 Performing Postinstallation Configuration Using a Response File

To run configuration assistants with the `configToolAllCommands` script in silent mode or response file mode, perform the following steps:

1. Change directory to `%ORACLE_HOME%\cfgtoollogs`.
2. Run the configuration script using the following syntax:

```
configToolAllCommands RESPONSE_FILE=\path\name.properties
```

Example B-2 Running Configuration Assistants in Response File Mode

Assume you created a password response file in the `C:\users\oracle\db` directory with a name of `cfg_db.properties`. To run the configuration assistants in response file mode to configure the Oracle software after installation, enter commands similar to the following:

```

C:\> cd %ORACLE_HOME%\cfgtoollogs
C:\..\cfgtoollogs> configToolAllCommands RESPONSE_FILE=C:\users\oracle\db\cfg_
_db.properties

```

B.8 Running Configuration Assistants Using Response Files

You can run configuration assistants in response file to configure and start Oracle software after it is installed on your system. To run configuration assistants in response file mode, you must first copy and edit a response file template.

Note: If you copied the software to a hard disk, then the response file template is located in the directory `X:\staging_dir\database\response`

This section contains the following topics:

- [Silent Mode of Database Configuration Assistant](#)
- [Progress Only Mode of Database Configuration Assistant](#)
- [Running Database Configuration Assistant in Response File Mode](#)
- [Running Oracle Net Configuration Assistant Using Response Files](#)

B.8.1 Silent Mode of Database Configuration Assistant

Use the `-silent` flag in combination with the `-responseFile` flag to set the mode to silent. In the silent mode, Database Configuration Assistant uses values that you specify, in the response file or as command-line options, to create a database. No window or user interface is displayed in the silent mode.

B.8.2 Progress Only Mode of Database Configuration Assistant

Use the `-progressOnly` flag in combination with the `-responseFile` flag, to set the mode to progress only. As it configures and starts the database, Database Configuration Assistant displays a window that contains status messages and a progress bar. This window is similar to the window that is displayed when you choose to create a preconfigured database during an Enterprise Edition, Standard Edition, or Standard Edition 2 (SE2) installation.

In this mode, Database Configuration Assistant uses values that you specify, in the response file or as command line options, to create a database.

B.8.3 Running Database Configuration Assistant in Response File Mode

You can run Database Configuration Assistant (DBCA) in response file mode, either in silent mode or progress only mode, to configure and start an Oracle database on the system. To run Database Configuration Assistant in response file mode, you must copy and edit a response file template.

To run DBCA in response file mode, you must use the `-responseFile` flag in combination with either the `-silent` or `-progressOnly` flag:

1. Oracle provides a response file template named `dbca.rsp` in the `response` directory on the installation media. Copy the `dbca.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 `X:\staging_dir\database\response` directory if you prefer.

Note: As an alternative to editing the response file template, you can also create a database by specifying all required information as command-line options when you run DBCA. For information about the list of options supported, enter the following command:

```
C:\> %ORACLE_HOME%\bin\dbca -help
```

2. Log in as the Oracle Home user. Set the `%ORACLE_HOME%` environment variable to the correct Oracle home directory. See [Section 6.5, "Working with Multiple Oracle Home Directories on Windows."](#)
3. Open the response file in a text editor.
4. Edit the file, following the instructions in the file.

In response file mode, DBCA uses values that you specify in the response file or as command-line options, to create a database.

Note: DBCA fails if you do not correctly configure the response file.

5. Open a command-line window. Change directories to the location of the Oracle home directory.
6. Use a command similar to the following example to run DBCA in silent or response file mode using a response file:

```
C:\> %ORACLE_HOME%\bin\dbca {-progressOnly | -silent} -responseFile \
local_dir\dbca.rsp
```

In this example:

- The `-silent` option runs DBCA in silent mode, suppressing user prompts.
- The `-progressOnly` option runs DBCA in response file mode.
- `local_dir` is the full path of the directory where the `dbca.rsp` response file is located.

As DBCA configures and starts the database, it displays a window that contains status messages and a progress bar. The window that DBCA displays is the same window that is displayed when you choose to create a preconfigured database during an Oracle Database Enterprise Edition, Standard Edition, or Standard Edition 2 (SE2) installation.

See Also:

- *Oracle Database Administrator's Guide* for information about using DBCA in noninteractive, or silent mode, to create a database
- *Oracle Automatic Storage Management Administrator's Guide* for information about running Oracle ASMCA in noninteractive mode

B.8.4 Running Oracle Net Configuration Assistant Using Response Files

You can run Oracle 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 `response` subdirectory of:

- The `Oracle_home\inventory\response` directory after a software-only installation
- The `database\response` directory on the installation media or staging area

To run NETCA using a response file:

1. Copy the `netca.rsp` response file template from the response file directory on the installation media to a directory on your system.

If the software is staged on a hard drive, or has already been installed, then you can edit the file in the `response` directory located on the local disk instead.

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 the Oracle Home user. Set the `%ORACLE_HOME%` environment variable to the correct Oracle home directory. See [Section 6.5, "Working with Multiple Oracle Home Directories on Windows."](#)
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.

Directory Structure for Oracle Real Application Clusters Environments

This appendix describes the directory structures for Oracle Real Application Clusters (Oracle RAC) software environments. This appendix contains the following topics:

- [Understanding the Oracle RAC Directory Structure](#)
- [Directory Structures for Oracle RAC](#)

C.1 Understanding the Oracle RAC Directory Structure

When you install Oracle Database 12c Release 1 (12.1) with Oracle RAC, all subdirectories except for the Oracle Inventory directory, the Oracle Automatic Storage Management (Oracle ASM) home (if applicable), and the Oracle Clusterware home, are under a top-level Oracle base directory. The Oracle home and `admin` directories are also located under the Oracle base directory.

See Also: *Oracle Database Installation Guide for Microsoft Windows* for more information about the Oracle home and `admin` directories

C.2 Directory Structures for Oracle RAC

[Table C-1](#) shows the hierarchical directory tree of a sample Optimal Flexible Architecture (OFA)-compliant database for Oracle RAC:

Table C-1 Directory Structure for a Sample OFA-Compliant Environment

Root	Second-Level	Third-Level	Fourth-Level	Description
%ORACLE_BASE%				C:\app\oracle The default ORACLE_BASE directory, where the software was installed by the Oracle Installation user
	<i>installation type</i>			C:\app\oracle\product\12.1.0\db The type of installation under the Oracle base directory. For example, when installing Oracle Database 12c Release 1 (12.1), the value for installation type is product\12.1.0\db.
		%ORACLE_HOME%		The location in which the Oracle Database software is installed. You can also choose to add a counter, if you have multiple installations of the software. For example, if you are creating a second Oracle home for the Oracle Database 11g release 2 software, then the path is as follows: C:\app\oracle\product\12.1.0\dbhome_2 Note that the Oracle database home is under the Oracle base directory path. An Oracle Clusterware directory must <i>not</i> be under the Oracle base directory path where the database executable files are located.
			database	The directory in which the local initialization parameter file is stored for the database.
	admin			C:\app\oracle\admin The administrative directory. Note that with Oracle Database 11g and later releases, bdump, cdump, and udump files are relocated to the directory associated with %ADR_BASE%.
		db_unique_name		The database unique name; this is the same as dbname when the database name is 8 or fewer characters in length. For example, if your database name is sales, the directory path is: C:\app\oracle\admin\sales
			ndump pfile	The dump destinations for the database server.
%ADR_BASE%			\bdump \cdump \udump	Automatic Diagnostic Repository dump destination trace files. Note that this directory path is set by the initialization parameter DIAGNOSTIC_DEST, and that the path for the Automatic Diagnostic Repository must be located on a shared storage location available to all the nodes. By default, this path is a subset of the Oracle base directory, in the following path: %ORACLE_BASE%\diag\
Oracle Grid Infrastructure for a cluster home (Grid home)				An OFA-compliant path for the Oracle Clusterware home. The default value is: C:\app\12.1.0\grid During the Oracle Grid Infrastructure for a cluster installation, Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM) software is installed.
	bin			The subtree for Oracle Clusterware and Oracle ASM executable files.
	network			The subtree for Oracle Net Services configuration files and utilities.

How to Stop Processes in an Existing Oracle Real Application Clusters Database

This appendix describes how to stop all processes in an Oracle Real Application Clusters (Oracle RAC) database, in preparation for adding additional products to an existing database, or in preparation for patch updates. This appendix contains the following topics:

- [Backing Up the Oracle RAC Database](#)
- [Shutting Down Oracle RAC Databases](#)
- [Stopping All Oracle Processes](#)
- [Using CVU to Validate Readiness for Oracle RAC Upgrades](#)

D.1 Backing Up the Oracle RAC Database

Before you make any changes to the Oracle software, Oracle recommends that you create a backup of the Oracle Database installation.

See Also:

- *Oracle Database Upgrade Guide*
- *Oracle Database Backup and Recovery User's Guide*
- *Oracle Database Platform Guide for Microsoft Windows*

D.2 Shutting Down Oracle RAC Databases

Shut down any existing Oracle Database instances on each node, with normal or immediate priority. You can use Oracle Enterprise Manager or the Server Control (SRVCTL) utility to shut down the Oracle RAC databases and their instances.

Note: If you are using Oracle Clusterware or Oracle Restart, then you must shut down all Oracle Database instances on all cluster nodes before modifying the Oracle software. If you are performing a patch update, then review the instructions in the Patch Set Notes for detailed instructions.

See Also:

- *Oracle Database Administrator's Guide* for more information about Oracle Restart
- [Section 4.1.1, "Determine If Any Patches Are Required For Your New Software"](#) for more information about patches and patch sets

D.3 Stopping All Oracle Processes

Stop all listener and other processes running in the Oracle home directories where you want to modify the database software.

Note: Before you can shut down Oracle ASM instances, Oracle Clusterware, or Oracle Restart, you must first shut down all database instances that use them.

D.3.1 Stopping Oracle Database Processes Before Adding Products or Upgrading

This section provides an overview of what must be done before adding additional products to Oracle Database 12c Release 1 (12.1). If you are updating only the Oracle Database software, then you only need to stop the databases instances that run from the Oracle home being updated. If you are performing a patch upgrade, then refer to the Database Patch Set Notes for the patch for additional instructions.

Note: You must perform these steps in the order listed.

1. Shut down any processes in the Oracle home on each node that can access a database.

Note: Before you shut down any processes that are monitored by Oracle Enterprise Manager Cloud Control, set a blackout in Oracle Enterprise Manager Cloud Control for the processes that you intend to shut down. This is necessary so that the availability records for these processes indicate that the shutdown was planned downtime, rather than an unplanned system outage.

2. Shut down all Oracle RAC instances on all nodes. To shut down all Oracle RAC instances for a database, enter the following command, where *db_name* is the name of the database:

```
C:\> %ORACLE_HOME%\bin\svrctl stop database -db db_name
```

See Also:

- *Oracle Database Administrator's Guide* for information about configuring blackouts with Oracle Enterprise Manager
- [Section 4.1.1, "Determine If Any Patches Are Required For Your New Software"](#) for more information about patches and patch sets

D.3.2 Stopping Oracle Clusterware and Oracle ASM Instances

If you are updating the Oracle Clusterware or Oracle ASM software, then you must first stop all Oracle RAC database instances and all Oracle database instances that use Oracle ASM for storage. After stopping the database instances, shut down the Oracle ASM instances and Oracle Clusterware, as described in the following steps:

Note: You must perform these steps in the order listed.

1. Shut down any processes in the Oracle home on each node that might be accessing a database, for example, an Oracle Enterprise Manager Cloud Control agent or an Oracle Net Services listener.

Note: Before you shut down any processes that are monitored by Oracle Enterprise Manager Cloud Control, set a blackout in Oracle Enterprise Manager Cloud Control for the processes that you intend to shut down. This is necessary so that the availability records for these processes indicate that the shutdown was planned downtime, rather than an unplanned system outage.

2. Shut down all Oracle RAC instances on all nodes. To shut down all Oracle RAC instances for a database, enter the following command, where *db_name* is the name of the database:

```
Oracle_home\bin\srvctl stop database -db db_name
```

3. Stop all Oracle Clusterware node applications and resources on all nodes. To stop node applications running on a node, enter the following command, where *C:\app\12.1.0\grid* is the Grid home, and *node* is the name of the node where the applications run:

```
C:\> cd app\12.1.0\grid\bin
C:\..\bin> srvctl stop nodeapps -node node
```

4. Shut down the Oracle Clusterware processes and the Oracle ASM instance on each node by entering the following command on all nodes as a user with Administrator privileges:

```
C:\app\...\bin> crsctl stop cluster
```

To stop Oracle Clusterware and Oracle ASM instances on all nodes in the cluster, you can enter a single command: `crsctl stop cluster -all`.

Note: The `crsctl stop crs` command stops Oracle Restart services for single-instance databases.

5. Shut down the Oracle Clusterware processes from the Services window.

Access the Services window by clicking **Start**, selecting **Control Panel**, selecting **Administrative Tools**, and then selecting **Services**. In the Services window, shut down the following services:

- Oracle Object Service
- OracleClusterVolumeService

- OracleOHService

Note: Depending on your configuration, your nodes might not be running all of the services listed.

D.4 Using CVU to Validate Readiness for Oracle RAC Upgrades

Review the contents in this section to validate that your Oracle RAC cluster is ready for upgrades.

D.4.1 About the CVU Database Upgrade Validation Command Options

Use the Cluster Verification Utility (CVU) command `cluvfy stage -pre dbinst -upgrade` to check the readiness of your Oracle RAC installation for upgrades. Running `cluvfy` with the `-pre dbinst -upgrade` flags performs system checks to confirm if the cluster is in a correct state for upgrading from an existing Oracle RAC installation.

The command uses the following syntax, where variable content is indicated by italics:

```
cluvfy stage -pre dbinst -upgrade -src_dbhome src_RAChome -dest_dbhome  
dest_RAChome -dest_version dest_version] [-verbose]
```

The options are:

- `-src_dbhome src_RAChome`

Use this flag to indicate the location of the source Oracle RAC home that you are upgrading, where *src_RAChome* is the path to the home that you want to upgrade.

- `-dest_dbhome dest_RAChome`

Use this flag to indicate the location of the upgrade Oracle RAC home, where *dest_RAChome* is the path to the Oracle RAC home.

- `-dest_version dest_version`

Use the `dest_version` flag to indicate the release number of the upgrade, including any patchset. The release number must include the five digits designating the release to the level of the platform-specific patch. For example: 12.1.0.1.0.

See Also: *Oracle Database Administrator's Guide* for information about release number format

- `-verbose`

Use the `-verbose` flag to produce detailed output of individual checks

D.4.2 Example of Verifying System Upgrade Readiness for Oracle RAC Infrastructure

You can verify that the permissions required for installing Oracle RAC have been configured on the nodes `node1` and `node2` by running the following command:

```
C:\..bin> cluvfy stage -pre dbinst -upgrade -src_dbhome  
C:\app\oracle\product\11.2.0\dbhome_1 -dest_dbhome  
C:\app\oracle\product\12.1.0\dbhome_1 -dest_version 12.1.0.0.0 -verbose
```

D.4.3 Verifying System Readiness for Oracle Database Upgrades

Use Cluster Verification Utility to assist you with system checks in preparation for starting a database upgrade. The installer runs the appropriate CVU checks automatically, and prompts you to fix problems before proceeding with the upgrade.

See Also: *Oracle Database Upgrade Guide*

Managing Oracle Database Port Numbers

This appendix lists the default port numbers and describes how to change the assigned port after installation. This appendix contains the following topics:

- [About Managing Ports](#)
- [Viewing Port Numbers and Access URLs](#)
- [Port Numbers and Protocols of Oracle Components](#)
- [Changing the Oracle Services for Microsoft Transaction Server Port](#)

E.1 About Managing Ports

During installation, Oracle Universal Installer (OUI) assigns port numbers to components from a set of default port numbers. Many Oracle Real Application Clusters (Oracle RAC) components and services use ports. As an administrator, it is important to know the port numbers used by these services, and to ensure that the same port number is not used by two services on your system.

Most port numbers are assigned during installation. Every component and service has an allotted port range, which is the set of port numbers Oracle RAC attempts to use when assigning a port. Oracle RAC starts with the lowest number in the range and performs the following checks:

- Is the port used by another Oracle Database installation on the system?
The installation can be either active or inactive at the time; Oracle Database can still detect if the port is used.
- Is the port used by a process that is currently running?
This could be any process on the host, including processes other than Oracle Database processes.

If the answer to any of the preceding questions is yes, then Oracle RAC moves to the next highest port in the allotted port range and continues checking until it finds a free port.

E.2 Viewing Port Numbers and Access URLs

In most cases, the Oracle Database component's port number is listed in the tool used to configure the port. In addition, ports for some Oracle Database applications are listed in the `portlist.ini` file. This file is located in the directory `%ORACLE_HOME%\install`.

If you change a port number after installation, then it is not updated in the `portlist.ini` file, so you can rely on this file only immediately after installation. To find or change a port number, use the methods described in this appendix.

E.3 Port Numbers and Protocols of Oracle Components

Table E-1 lists the port numbers and protocols used by components that are configured during the installation. By default, the first port in the range is assigned to the component, if it is available.

Table E-1 Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol	Used Only On Interconnect
Cluster Manager The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	TCP	Yes
Cluster Synchronization Service daemon (CSSD) The Cluster Synchronization Service (CSS) daemon uses a fixed port for node restart advisory messages. This port is used on all interfaces that have broadcast capability. Broadcast occurs only when a node eviction restart is imminent.	42424	Dynamic	TCP	Yes
Grid Plug and Play (GPNPD) GPNPD provides access to the Grid Plug and Play profile, and coordinates updates to the profile among the nodes of the cluster to ensure that all of the nodes have the most recent profile.	Dynamic	Dynamic		No
Multicast Domain Name Service (MDNSD) The mDNS process is a background process on Linux and UNIX, and a service on Windows, and is necessary for Grid Plug and Play and GNS.	5353	Dynamic		No
Oracle Cluster Registry The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	TCP	Yes
Oracle Clusterware Daemon (CRSD) Oracle Clusterware daemon internode connection. The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	TCP	Yes
Oracle Connection Manager Listening port for Oracle client connections to Oracle Connection Manager. You can configure Oracle Connection Manager after installation using NETCA.	1630	1630	TCP	No
Oracle Containers for J2EE (OC4J). The CRS Agent uses port 8888 locally to manage the lifecycle of the container.	8888	8888	TCP	Not applicable

Table E-1 (Cont.) Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol	Used Only On Interconnect
Oracle Data Guard Shares the Oracle Net listener port and is configured during installation. To reconfigure this port, use Oracle Net Configuration Assistant (NETCA) to reconfigure the listener.	1521 (same value as the listener)	modifiable manually to any available port	TCP	No
Oracle Event Manager (EVM) Generates events for Oracle Clusterware. The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	TCP	Yes
Oracle Grid Interprocess Communication (GIPCD) A support daemon that enables Redundant Interconnect Usage.	42424	Dynamic	TCP	Yes
Oracle Grid Naming Service (GNSD) The Oracle Grid Naming Service daemon provides a gateway between the cluster mDNS and external DNS servers. The <code>gnsd</code> process performs name resolution within the cluster.	53 (public), Dynamic (interconnect)	53 (public), Dynamic (interconnect)	TCP (public), TCP interconnect	No
Oracle HA Services daemon (OHASD) The Oracle High Availability Services (OHAS) daemon starts the Oracle Clusterware stack.	42424	Dynamic	TCP	Yes
Oracle Net Listener Allows Oracle clients to connect to the database by using Oracle Net Services. You can configure this port during installation. To reconfigure this port, use NETCA.	1521	Port number changes to the next available port. Modifiable manually to any available port.	TCP	No
Oracle Notification Services (ONS) Port for ONS, used for the publish and subscribe service for communicating information about Fast Application Notification (FAN) events. The FAN notification process uses system events that Oracle Database publishes when cluster servers become unreachable or if network interfaces fail. Use <code>srvctl</code> to modify ONS ports.	6100 (local) 6200 (remote)	Configured manually	TCP	No
Oracle Real Application Clusters The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	TCP	Yes

Table E-1 (Cont.) Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol	Used Only On Interconnect
<p>Oracle Services for Microsoft Transaction Server</p> <p>The port number for Microsoft Transaction Server is configured automatically by Oracle Universal Installer (OUI) the first time you install the software on a particular server. If you install the software in multiple Oracle homes on the same server, then OUI uses the same port number for all installations.</p> <p>In most cases, you do not have to reconfigure the port number. Section E.4, "Changing the Oracle Services for Microsoft Transaction Server Port" explains how to change this port number.</p>	Dynamic	49152 to 65535	TCP	No
<p>Oracle XML DB - FTP</p> <p>The Oracle XML DB FTP port is used when applications must access an Oracle database from an FTP listener. The port is configured during installation and you <i>cannot</i> view it afterward.</p> <p>Refer to <i>Oracle XML DB Developer's Guide</i> for information about changing this port number.</p>	0	Configured manually	FTP	No
<p>Oracle XML DB - HTTP</p> <p>The Oracle XML DB HTTP port is used if web-based applications must access an Oracle database from an HTTP listener. The port is configured during installation, and you <i>cannot</i> view it afterward.</p> <p>Refer to <i>Oracle XML DB Developer's Guide</i> for information about changing this port number.</p>	0	Configured manually	HTTP	No

See Also: *Oracle Enterprise Manager Cloud Control Advanced Installation and Configuration Guide* for information on Oracle Management Agent ports

E.4 Changing the Oracle Services for Microsoft Transaction Server Port

In most cases, you are not required to reconfigure the port number for the Oracle Services for Microsoft Transaction Server. If you must change the port number, then you can use the Registry Editor to edit its value in the HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE\OracleMTSRecoveryService\Protid_0 Windows Registry key to any available port within the range 1024 to 65535.

During installation, Oracle Universal Installer takes the value for the port from the key, if it exists. Otherwise, a free port ranging from 49152 to 65535 is chosen automatically.

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