Oracle® Real Application Clusters

Installation Guide

11*g* Release 2 (11.2) for Microsoft Windows

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Oracle Real Application Clusters Installation Guide, 11*g* Release 2 (11.2) for Microsoft Windows

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Primary Author: Janet Stern, Douglas Williams

Contributing Authors: Mark Bauer, Jonathan Creighton, Reema Khosla, Barb Lundhild, Venkat Maddali, Markus Michalewicz, Philip Newlan

Contributors: Eric Belden, Karin Brandauer, Willard Cole, Bjørn Engsig, Mark Fuller, Alexander Keh, Roland Knapp, To-Choi Lau, Satish Panchumarthy, Srinivas Poovala, Rajesh Prasad, Mohammed Quadri, Ravi Ramikissoon, Kevin Reardon, Trivikrama Samudrala, David Schreiner, Jacueline Sideri, Janelle Simmons, James Stenoish, Preethi Vallam, Nitin Vengurlekar, Xiaofang Wang, Martin Widjaja, Sergiusz Wolicki

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Preface

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

Documentation Accessibility

Our goal is to make Oracle products, services, and supporting documentation accessible to all users, including users that are disabled. To that end, our documentation includes features that make information available to users of assistive technology. This documentation is available in HTML format, and contains markup to facilitate access by the disabled community. Accessibility standards will continue to evolve over time, and Oracle is actively engaged with other market-leading technology vendors to address technical obstacles so that our documentation can be accessible to all of our customers. For more information, visit the Oracle Accessibility Program Web site at

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http://www.oracle.com/accessibility/support.html if you are hearing impaired.

Related Documents

For more information, see the following documents in the Oracle Database 11*g* Release 2 (11.2) documentation set:

Oracle Real Application Clusters Documentation

Most Oracle error message documentation is only available in HTML format. If you only have access to the Oracle Documentation media, then browse the error messages by range. Once 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. However, error messages for Oracle Clusterware and Oracle RAC tools are included in *Oracle Clusterware Administration and Deployment Guide*, or in *Oracle Real Application Clusters Administration and Deployment Guide*.

Installation Guides

- *Oracle Diagnostics Pack Installation Guide*
- *Oracle Grid Infrastructure Installation Guide for AIX Based Systems*
- *Oracle Grid Infrastructure Installation Guide for HP-UX Itanium, HP-UX PA-RISC (32-Bit), HP-UX PA-RISC (64-Bit), HP-UX PA-RISC 10.20*
- *Oracle Grid Infrastructure Installation Guide for Linux*
- *Oracle Grid Infrastructure Installation Guide for Microsoft Windows*
- *Oracle Grid Infrastructure Installation Guide for Solaris Operating System*

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 11*g* Release 2 (11.2) 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, please visit the Oracle Technology Network (OTN). You must register online before using OTN; registration is free and can be done at the following Web site:

http://otn.oracle.com/membership/

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

http://otn.oracle.com/documentation/

Oracle error message documentation is available only in HTML. You can browse the error messages by range in the Documentation directory of the installation media. 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.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

What's New in Oracle Real Application Clusters Installation?

This section describes new features as they pertain to the installation and configuration of Oracle Real Application Clusters (Oracle RAC). The topics in this section are:

- New Features for Oracle Database 11g Release 2 (11.2)
- New Features for Oracle Database 11g Release 1 (11.1)

New Features for Oracle Database 11*g* Release 2 (11.2)

The following is a list of new features for Oracle RAC 11*g* release 2 (11.2):

- Oracle Automatic Storage Management and Oracle Clusterware Installation
- Oracle Automatic Storage Management Cluster File System (Oracle ACFS)
- Cluster Time Synchronization Service
- Database Agent and Listeners
- Daylight Savings Time Upgrade of Timestamp with Time Zone Data Type
- Oracle Enterprise Manager Database Control Provisioning
- Oracle Enterprise Manager Clusterware Resource Management
- Oracle Enterprise Manager Patch Application
- Grid Plug and Play
- Improved Deployment, Deconfiguration and Deinstallation
- SCAN for Simplified Client Access
- SRVCTL Command Enhancements for Patching
- Desktop Class and Server Class Installation Options
- Zero Downtime Patching for Oracle RAC
- Deinstallation Tool
- Deprecated Options with Oracle RAC 11g Release 2 (11.2)

Oracle Automatic Storage Management and Oracle Clusterware Installation

With Oracle Grid Infrastructure 11*g* release 2 (11.2), Oracle Automatic Storage Management (Oracle ASM) and Oracle Clusterware are installed into a single home directory, which is referred to as the Grid Infrastructure home. Configuration

assistants that start after the installer interview process configure Oracle ASM and Oracle Clusterware.

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

Oracle Automatic Storage Management Cluster File System (Oracle ACFS)

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

Note: Oracle ACFS is only supported on Windows Server 2003 and Windows Server 2003 R2 64-bit.

The Oracle ASM Dynamic Volume Manager (Oracle ADVM) extends Oracle ASM by providing a disk driver interface to Oracle ASM storage allocated as Oracle ASM volume files. You can use the Oracle ADVM to create virtual disks that contain file systems. 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. The 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.

Cluster Time Synchronization Service

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

Database Agent and Listeners

With this release, DBCA no longer sets the value for LOCAL_LISTENER. When Oracle Clusterware starts the database resource, it updates the instance parameters. The LOCAL_LISTENER is set to the virtual IP endpoint of the local node listener address. You should not modify the setting for LOCAL_LISTENER. New installation instances only register with Single Client Access (SCAN) listeners as remote listeners. SCANs are virtual IP addresses assigned to the cluster, rather than to individual nodes, so cluster members can be added or removed without requiring updates of clients served by the cluster. Upgraded databases continue to register with all node listeners, and additionally the SCAN listeners.

Daylight Savings Time Upgrade of Timestamp with Time Zone Data Type

When time zone version files are updated, TIMESTAMP WITH TIMEZONE (TSTZ) data could become stale. In previous releases, database administrators ran the SQL script `utltzuv2.sql` to detect TSTZ data affected by the time zone version changes and then had to perform extensive manual procedures to update the TSTZ data.

With this release, TSTZ data is updated transparently with very minimal manual procedures using newly provided DBMS_DST PL/SQL packages. In addition, there is no longer a need for clients to patch their time zone data files.

> **See Also:** *Oracle Database Upgrade Guide* for information about preparing to upgrade Timestamp with Time Zone data, *Oracle Database Globalization Support Guide* for information about how to upgrade the Time Zone file and Timestamp with Time Zone data, and *Oracle Call Interface Programmer's Guide* for information about performance effects of clients and servers operating with different versions of Time Zone files

Oracle Enterprise Manager Database Control Provisioning

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

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

Oracle Enterprise Manager Clusterware Resource Management

With this release, you can use Oracle Enterprise Manager Cluster Home page to perform full administrative and monitoring support for both standalone database and Oracle RAC environments, using High Availability Application and Oracle Clusterware Resource Management. Such administrative tasks include creating and modifying server pools.

Oracle Enterprise Manager Patch Application

With this release, you can apply patches to the Oracle RAC database using Oracle Enterprise Manager. A new Oracle Enterprise Manager feature, the Provisioning Advisor Console, enables you to customize, monitor, and deploy patch applications to nodes on the cluster.

Grid Plug and Play

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

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

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

Because servers perform these tasks dynamically, adding and removing nodes simply requires an administrator to connect the server to the cluster, and to allow the cluster to configure the node. Using Grid Plug and Play, and using best practices

recommendations, adding a node to the database cluster is part of the normal server restart, and removing a node from the cluster occurs automatically when a server is turned off.

Improved Deployment, Deconfiguration and Deinstallation

Oracle configuration assistants provide additional guidance to ensure recommended deployment, and to prevent configuration issues.

Oracle configuration assistants provide the capability of deconfiguring and deinstalling Oracle Real Application Clusters, without requiring additional manual steps.

SCAN for Simplified Client Access

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

SRVCTL Command Enhancements for Patching

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

Desktop Class and Server Class Installation Options

In this release, there are two installation types: Desktop Class and Server Class.

The Desktop Class installation type is a simplified installation with a minimal number of manual configuration choices. The Desktop Class installation performs a full Oracle Database installation with a basic configuration.

The Server Class installation type allows for more advanced configuration options. Select this option when installing Oracle RAC, if you use Oracle Enterprise Manager Grid Control, or to configure database storage on Oracle ASM.

Zero Downtime Patching for Oracle RAC

Opatch now can apply patches in multi-node, multi-patch fashion, and does not start instances that have a non-rolling patch applied to it if other instances of the database do not have that patch. Opatch also detects if the database schema is an earlier patch level than the new patch, and it runs SQL commands to bring the schema up to the new patch level.

> **See Also:** *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX*

Deinstallation Tool

Oracle Universal Installer no longer removes Oracle software. Use the new Deinstallation Tool (`deinstall.bat`) available on the installation media before installation and in the Oracle home directory after installation. This tool can also be downloaded from Oracle TechNet.

See Also: Chapter 8, "Removing Oracle Real Application Clusters Software" for more information

Deprecated Options with Oracle RAC 11*g* Release 2 (11.2)

Note the following changes with this release:

- Installing files on raw devices is no longer an option available during installation. You must use a shared file system, or use Oracle Automatic Storage Management. If you are upgrading from a previous release and currently use raw devices, then your existing raw devices can continue to be used. After upgrade is complete, you can migrate to Oracle ASM or to a shared file system if you choose.
- The SYSDBA privilege of acting as administrator on the Oracle ASM instance is removed with this release.

New Features for Oracle Database 11*g* Release 1 (11.1)

This section describes Oracle Database 11*g* release 1 features as they pertain to the installation and configuration of Oracle Real Application Clusters (Oracle RAC).

The topics in this section are:

- Changes in Installation Documentation
- Changes in the Install Options
- New Components Available for Installation
- Enhancements and New Features for Installation
- Deprecated Components in Oracle Database 11g Release 1 (11.1)

Changes in Installation Documentation

With Oracle Database 11*g* release 1 (11.1), Oracle Clusterware can be installed or configured as an independent product. In addition, new documentation is provided for Oracle Database storage administration. For installation planning, note the following documentation:

Oracle Database 2 Day + Real Application Clusters Guide

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

Oracle Clusterware Installation Guide

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

Oracle Real Application Clusters Installation Guide

This book (the guide that you are reading) provides procedures to install Oracle RAC after you have completed successfully an Oracle Clusterware installation. It contains database configuration instructions for database administrators.

Oracle Database Storage Administrator's Guide

This book provides information for database and storage administrators who administer and manage storage, or who configure and administer Oracle Automatic Storage Management (Oracle ASM).

Oracle Clusterware Administration and Deployment Guide

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

Oracle Real Application Clusters Administration and Deployment Guide

This is the administrator's reference for Oracle RAC. It contains information about administrative tasks. These tasks include database cloning, node addition and deletion, Oracle Cluster Registry (OCR) administration, use of Server Control Utility (SRVCTL) and other database administration utilities.

Changes in the Install Options

The following are installation option changes for Oracle Database 11*g* release 1 (11.1):

- **Oracle Application Express**: This feature is installed with Oracle Database 11*g*. It was previously named HTML DB, and was available as a separate Companion CD component.
- **Oracle Configuration Manager**: Oracle Configuration Manager (OCM) is integrated with Oracle Universal Installer. However, it is an optional component with database and client installations, and you must select Custom Installation to enable it. Oracle Configuration Manager, used in previous releases as Customer Configuration repository (CCR), is a tool that gathers and stores details relating to the configuration of the software stored in the Oracle ASM and database Oracle home directories.

  Refer to Oracle Configuration Manager for Improved Support in New Components Available for Installation in this chapter for further information.
- **Oracle Data Mining**: Enterprise Edition installation type selects Oracle Database Mining option by default.
- **Oracle Database Vault**: This feature is offered during installation. It is an optional component for database installation, available through Custom installation.
- **Oracle SQL Developer**: This feature is installed by default with template-based database installations, such as General Purpose, Transaction Processing, and Data Warehousing. It is also installed with database client Administrator, Run Time, and Custom installations.
- **Oracle Warehouse Builder**: This information integration tool is now installed with both Standard and Enterprise Edition versions of the Oracle Database. With Enterprise Edition, you can purchase additional extension processes. Installing the Oracle Database also installs a pre-seeded repository, OWBSYS, necessary for using Oracle Warehouse Builder.
- **Oracle XML DB**: Starting with Oracle Database 11*g*, Oracle XML DB is no longer an optional feature. It is installed and configured using Database Configuration Assistant for all database installations.

New Components Available for Installation

The following are the new components available while installing Oracle Database 11*g*:

- **Oracle Application Express**: Starting Oracle Database 11*g*, HTML DB is no longer available as a Companion CD component. Renamed as Oracle Application Express, this component is installed with Oracle Database 11*g*.

  With Oracle Database 11*g*, Oracle Application Express replaces *i*SQL*Plus.

- **Oracle Configuration Manager**: This feature is offered during custom installation. It was previously named Customer Configuration repository (CCR). It is an optional component for database and client installations. Oracle Configuration Manager gathers and stores details relating to the configuration of the software stored in database Oracle home directories.

- **Oracle SQL Developer**: This feature is installed by default with template-based database installations, such as General Purpose, Transaction Processing, and Data Warehousing. It is also installed with database client Administrator, Run Time, and Custom installations.

- **Oracle Warehouse Builder**: This feature is now included as an option in the Database installation.

- **Oracle Real Application Testing**: This feature is installed by default with the Enterprise Edition installation type of Oracle Database 11*g*.

  See Also: *Oracle Database Performance Tuning Guide* for more information about Oracle Real Application Testing

Enhancements and New Features for Installation

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

Automatic Diagnostic Repository

The Automatic Diagnostic Repository is a feature added to Oracle Database 11*g*. The main objective of this feature is to reduce the time required to resolve bugs. Automatic Diagnostic Repository is the layer of the Diagnostic Framework implemented in Oracle Database 11*g* that stores diagnostic data and also provides service APIs to access data. The default directory that stores the diagnostic data is `ORACLE_BASE\diag`.

The Automatic Diagnostic Repository implements the following:

- Diagnostic data for all Oracle products is written into an on-disk repository.
- Interfaces that provide easy navigation of the repository, and the capability to read and write data

For Oracle RAC installations, if you use a shared Oracle Database home, then the Automatic Data Repository must be located on a shared storage location available to all the nodes.

Oracle Clusterware continues to place diagnostic data in the directory *`CRS_home`*`\log`, where *`CRS_home`* is the Oracle Clusterware home.

Oracle Automatic Storage Management Fast Mirror Resync

Oracle ASM fast mirror resync quickly resynchronizes Oracle ASM disks within a disk group after transient disk path failures if the disk drive media is not corrupted. Any failures that render a failure group temporarily unavailable are considered transient failures. Disk path malfunctions, such as cable disconnections, host bus adapter or controller failures, or disk power supply interruptions, can cause transient failures. The duration of a fast mirror resync depends on the duration of the outage. The

duration of a resynchronization is typically much shorter than the amount of time required to completely rebuild an entire Oracle ASM disk group.

> **See Also:** *Oracle Database Storage Administrator's Guide*

Oracle ASM and Oracle RAC Deinstallation and Other Configuration Assistant Enhancements

Database Configuration Assistant (DBCA), Database Upgrade Assistant (DBUA), and Oracle Net Configuration Assistant (NETCA) have been improved. These improvements include the following:

DBCA

- Provides a command line feature, `deleteASM`, that removes Oracle ASM instances.
- Provides the option to switch from a database configured for Oracle Enterprise Manager Database Control to Oracle Enterprise Manager Grid Control.

DBUA

- Includes an improved pre-upgrade script to provide space estimation, initialization parameters, statistics gathering, and new warnings. DBUA also provides upgrades from Oracle Database releases 9.0, 9.2, 10.1, and 10.2.
- Supports in-place patch set upgrades
- Starts any services that were running before the upgrade

New SYSASM Privilege for Oracle ASM Administration

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

Oracle ASM Preferred Read Disk Groups

In previous releases, Oracle ASM used the disk with the primary copy of a mirrored extent as the preferred disk for data reads. With this release, using the new initialization file parameter `asm_preferred_read_failure_groups`, you can specify disks located near a specific cluster node as the preferred disks from which that node obtains mirrored data. This option is presented in Database Configuration Assistant (DBCA), or you can configure it after installation. This change facilitates faster processing of data with widely distributed shared storage systems or with extended clusters (clusters whose nodes are geographically dispersed), and improves disaster recovery preparedness.

Oracle Automatic Storage Management Rolling Migration

Rolling migration for Oracle ASM enables you to upgrade or patch Oracle ASM instances on clustered Oracle ASM nodes without affecting database availability. Rolling migration provides greater availability and more graceful migration of Oracle ASM software from one release to the next. This feature applies to Oracle ASM configurations that run on Oracle Database 11*g* release 1 (11.1) and later. In other words, you must have Oracle Database 11*g* release 1 (11.1) installed before you can perform rolling migrations.

> **Note:** You cannot change the owner of the Oracle ASM or Oracle Database home during an upgrade. You must use the same Oracle software owner that owns the existing Oracle ASM or Oracle Database home.

See Also: *Oracle Database Storage Administrator's Guide*

Conversion of Single-Instance Oracle ASM to clustered Oracle ASM

Using either Oracle Enterprise Manager Grid Control or `rconfig`, you can convert an existing Oracle ASM instance from a single-instance storage manager to a clustered storage manager. You can convert Oracle ASM release 11.1 instances directly, and convert releases prior to 11.1 by upgrading the instance to 11.1, and then performing the conversion.

Data Mining Schema Creation Option

In Oracle Database 11*g*, the data mining schema is created when you run the SQL script `catproc.sql` as the SYS user. Therefore, the data mining option is removed from the Database Features screen of Database Configuration Assistant.

Oracle Disk Manager Network File System Management

Oracle Disk Manager (ODM) can manage network file systems (NFS) on its own, without using the operating system kernel NFS driver. This is referred to as Direct NFS. Direct NFS implements NFS version 3 protocol within the Oracle RDBMS kernel. This change enables monitoring of NFS status using the ODM interface. The Oracle RDBMS kernel driver tunes itself to obtain optimal use of available resources.

This feature provides the following:

- Ease of tuning, and diagnosability, by giving the Direct NFS Client control over the input-output paths to Network File Server, and avoiding the need to tune network performance at the operating system level.
- A highly stable, highly optimized NFS client for database operations.
- Use of the Oracle buffer cache, rather than the file system cache, for simpler tuning.
- A common, consistent NFS interface, capable for use across Linux, UNIX and Windows platforms.
- Does not require additional configuration of NFS mounts. With operating system NFS drivers, even though NFS is a shared file system, NFS drives have to be mounted with the option `noac` (No Attribute Caching) to prevent the operating system NFS driver from optimizing the file system cache by keeping file attributes locally. ODM automatically recognizes Oracle RAC instances, and performs appropriate operations for data files without requiring additional reconfiguration from users, system administrators, or DBAs.

Optimal Flexible Architecture (OFA) Simplified

With the development of stripe and mirror everything architecture (SAME), and improved storage and throughput capacity for storage devices, the original OFA mission to enhance performance has shifted to its role of providing well-organized Oracle installations with separated software, configuration files and data. This separation enhances security, and simplifies upgrade, cloning, and other administrative tasks.

Oracle Database 11*g* release 1 (11.1) incorporates several changes to OFA to address this changed purpose.

As part of this change:

- During Oracle RAC installation, you are prompted to accept the default, or select a location for the Oracle base directory, instead of the Oracle home directory. This

change facilitates installation of multiple Oracle home directories in a common location, and separates software units for simplified administration. For this release, you are not required to use Oracle base, but this may become a requirement in a future release.

- With this release, as part of the implementation of Automatic Diagnostic Repository (ADR), the following `admin` directories are changed:
  - `bdump` (location set by the `background_dump_dest` initialization parameter; storage of Oracle background process trace files)
  - `cdump` (location set by the `core_dump_dest` initialization parameter; storage of Oracle core dump files)
  - `udump` (location set by the `user_dump_dest` initialization parameter; storage of Oracle user SQL trace files)

  By default, the location of these trace and core files is in the `\diag` directory, which is in the path `ORACLE_BASE\diag`.
- The initialization parameters `BACKGROUND_DUMP_DEST` and `USER_DUMP_DEST` are deprecated. They continue to be set, but you should not set these parameters manually.
- A new initialization parameter is introduced. `DIAGNOSTIC_DEST` contains the location of "ADR base," which is the base directory under which one or more Automatic Database Repository homes are kept. Oracle documentation commonly refers to these homes as ADR homes. Each database instance has an ADR home, which is the root directory for several other directories that contain trace files, the alert log, health monitor reports, and dumps for critical errors. You can also view alert and trace files with the SQL statement `select name, value from v$diag_info`.
- The default Flash Recovery area is moved from `ORACLE_HOME\..\flash_recovery_area` to `ORACLE_BASE\flash_recovery_area`.
- The default data file location is moved from `ORACLE_HOME\..\oradata` to `ORACLE_BASE\oradata`.
- A new utility, The ADR Command Interpreter (ADRCI), is introduced. The ADRCI facilitates reviewing alert log and trace files.

For Oracle RAC installations, Oracle requires that the flash recovery area and the data file location are on a location shared among all the nodes. The Oracle Universal Installer confirms that this is the case during installation. This change does not affect the location of trace files for Oracle Clusterware.

> **See Also:** *Oracle Database Administrator's Guide* for detailed information about these changes, and *Oracle Database Utilities* for information about viewing alert log and list trace files with ADRCI

Oracle Configuration Manager for Improved Support

During a custom installation, you are asked if you want to install Oracle Configuration Manager (OCM). OCM is an optional tool that enables you to associate your configuration information with your My Oracle Support account. This can facilitate handling of service requests by ensuring that server system information is readily available.

Configuring the OCM tool requires that you have the following information from your service agreement:

- Customer Identification Number (CSI)

- My Oracle Support user account name
- Country Code

In addition, you are prompted for server proxy information, if the host system does not have a direct connection to the Internet.

Support for Large Data Files

Large data file support is an automated feature that enables Oracle to support larger files on Oracle ASM more efficiently and to increase the maximum file size.

> **See Also:** *Oracle Database Storage Administrator's Guide*

Switching a Database from Database Control to Grid Control Configuration

In previous releases, Database Configuration Assistant contains the functionality to configure databases while creating them either with Database Control or with Grid Control, or to reconfigure databases after creation. However, to change the configuration from Database to Grid control requires significant work. With Oracle Database 11*g*, Database Configuration Assistant enables you to switch configuration of a database from Database Control to Grid Control by running the Oracle Enterprise Manager Configuration Plug-in.

New Features in Oracle Real Application Clusters Release 11.1

Oracle Real Application Clusters release 11.1 includes the following:

- ODP .NET Configuration

  Developers can now configure ODP .NET using configuration files, including application config, `web.config`, or `machine.config`.

  Settings in the `machine.config` override the registry settings and the settings in the application config or the `web.config` override the values in the `machine.config`.

- Performance Enhancements

  The following performance enhancements have been made:

  - Improved Parameter Context Caching

    This release enhances the existing caching infrastructure to cache ODP .NET parameter contexts. This enhancement is independent of database version and it is available for all the supported database versions. This feature provides significant performance improvement for the applications that execute the same statement repeatedly.

    This enhancement is transparent to the developer. No code changes are needed to use this feature.

  - Efficient LOB Retrieval

    This release improves the performance of small-sized LOB retrieval by reducing the number of round-trips to the database. This enhancement is available only with Oracle 11*g* release 1 or higher database versions.

    This enhancement is transparent to the developer. No code changes are needed to use this feature.

Deprecated Components in Oracle Database 11*g* Release 1 (11.1)

The following components that were part of Oracle Database 10*g* release 2 (10.2) are not available for installation with Oracle Database 11*g*:

- *i*SQL*Plus
- Oracle Workflow
- Data Mining Scoring Engine
- Oracle Enterprise Manager Java console

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Preinstallation Checklist

Most installation errors with Oracle Real Application Clusters (Oracle RAC) are due to a failure to complete all the required steps before starting Oracle Universal Installer (OUI).

This chapter is intended for database administrators to use in consultation with system administrators and storage administrators to coordinate and plan the installation tasks in preparation for completing an installation of Oracle RAC.

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
- Installing Oracle RAC on Systems with Coexisting Databases

1.1 Before You Start: Planning your Installation

This section provides a list of tasks Oracle recommends you complete before starting an Oracle RAC installation. Whether your location is a Tier IV 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 succeeds.

It is beyond the scope of this documentation set to advise how to determine hardware sizing or capacity planning for your installation. Note that with Oracle Clusterware and Oracle RAC, you can add additional 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:

- Check My Oracle Support
- Check Oracle Technical Network
- Review Installation Steps for Oracle RAC
- Review How to Use Cluster Verification Utility
- Review and Back Up Existing Oracle Installations
- Review Globalization Requirements

- Review Documentation

1.1.1 Check My Oracle Support

Before you decide whether you want to install Oracle Database 11*g* release 2 (11.2) on existing hardware, or decide what server and storage hardware to purchase for an installation, log on to My Oracle Support:

`https://support.oracle.com`

Click the **More...** tab then select **Certifications**. In the Find Certification Information field, choose the following:

- Product Line: Oracle Database Products
- Product Family: Oracle Database
- Product Area: Oracle Database
- Product: Oracle Server - Enterprise Edition
- Product Release: 11gR2 RAC
- Product Version: 11gR2 RAC
- Platform: Microsoft Windows x64 (64-bit)

After you have made these selections, click **Search**. Click the **Certified** link next to the value of Platform Version that matches your operating system, for example, Window Server 2008 R2.

Click the link for Certification notes to check the Certification Matrix for Oracle RAC to ensure that your hardware configuration is supported for use with Oracle Clusterware and Oracle RAC. My Oracle Support contains guidance about supported hardware options that can assist you with your purchasing decisions and installation planning.

In addition to specific certified hardware configurations, the Certify page provides support and patch information, and general advice about how to proceed with an Oracle Clusterware with Oracle RAC 11*g* release 2 (11.2) installation, including important information about configuration issues. View the Product Notes and Platform Notes to view this additional information.

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

1.1.2 Check Oracle Technical Network

The Oracle Technical Network (OTN) contains white papers about deployment options, specific implementation scenarios, capacity planning, and extended clusters deployments, which are not addressed in this guide. You can review available papers at the following Web site:

`http://www.oracle.com/technology/products/database/clustering/index.html`

1.1.3 Review Installation Steps for Oracle RAC

Installation of Oracle RAC consists of the following steps in order:

1. Prepare servers (system, storage, and network administrators):

- Install operating system and install operating system packages and patches to the required version.
- Create required groups, users, and software homes.
- Set up domain name forwarding for Grid Naming Service (GNS) if you plan to deploy it, and set up network addresses in the DNS and on the server as needed.
- Set up required storage.
- (optional) Stage all software on one node for installation (the "local node").

2. Install Oracle grid infrastructure for a cluster, which includes Oracle Clusterware and Oracle Automatic Storage Management (system and storage administrators):
   - Install Oracle grid infrastructure for a cluster.
   - Patch Oracle Clusterware and Oracle Automatic Storage Management to the latest patchset.
3. Install Oracle RAC (database administrator):
   - Install Oracle Real Application Clusters.
   - Patch Oracle RAC to the latest patchset.
   - Complete postinstallation configuration of the Oracle RAC database.

When installing the Oracle RAC database software, it is faster to install all of the patches for the Oracle Database software before creating a new database than it is to install the patches after you have created a database. For example, after installing the Oracle software, you would patch the Oracle Grid infrastructure home, patch the Oracle Database or Oracle RAC home, and then create the new database.

1.1.4 Review How to Use Cluster Verification Utility

Oracle provides Cluster Verification Utility to perform system checks in preparation for installation, patch updates, or other system changes.

Cluster Verification Utility is incorporated into Oracle Universal Installer, so it performs its checks when you start the Oracle RAC installation. However, you can use Cluster Verification Utility to ensure that any packages or configuration required for Oracle RAC are in place before you begin your Oracle RAC installation.

Learning how to use Cluster Verification Utility can help system administrators, storage administrators, and database administrators to ensure that each has completed required system configuration and preinstallation steps, so that installations, updates, or patches complete successfully. You can obtain the latest version of Cluster Verification Utility at the following URL:

`http://www.oracle.com/technology/products/database/clustering/cvu/cvu_download_homepage.html`

If you have a vendor performing hardware or operating system configuration steps for you, then ask the vendor to complete the relevant Cluster Verification Utility check of the cluster after they complete their work to ensure that your system is configured correctly.

Database administrators should refer to the section "Confirming Cluster Readiness for Oracle RAC Installation with CVU" on page 1-15 to confirm that their system is prepared for installation before they start an Oracle RAC installation.

1.1.5 Review and Back Up Existing Oracle Installations

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 Oracle upgrade documentation before proceeding with installation, to decide how you want to proceed.

As with any system change, back up your existing database before attempting to install new software.

Note that to install Oracle RAC 11*g* release 2 (11.2), you must have Oracle Clusterware and Oracle ASM 11*g* release 2 (11.2) installed on your cluster. The Oracle Clusterware release version must be equal to or greater than the Oracle RAC version you install.

> **See Also:** *Oracle Grid Infrastructure Installation Guide for Microsoft Windows*

For the most current information and best practices about pre-upgrade, post-upgrade, compatibility, and interoperability discussions, refer to "Oracle Upgrade Companion." "Oracle Upgrade Companion" is available through Note 785351.1 on My Oracle Support:

https://support.oracle.com/

For upgrades, note the following:

- You can have only one version of Oracle Clusterware running on a cluster at a time. It must be the most recent release of any software (Oracle Clusterware, Oracle Database, Oracle RAC and Oracle Automatic Storage Management) running on the cluster. So, before upgrading your database to Oracle Database 11g release 2, all nodes in the cluster must be upgraded to Oracle Clusterware and Oracle ASM 11*g* release 2 (11.2).
- You can have multiple Oracle homes of Oracle Database software on your cluster. However, the Oracle RAC database software in these homes must be from a version that is equal to or less than the version of Oracle Clusterware that is installed; you cannot use a version of Oracle Database that was released after the version of Oracle Clusterware that you installed.

  For example:

  - If you have Oracle Clusterware 11*g* release 2 installed as your clusterware, then you can have an Oracle Database 10*g* release 2 single-instance database running on one node, and separate Oracle RAC 10*g* release 1, release 2, and Oracle RAC 11*g* release 1 or release 2 databases also running on the cluster.
  - You cannot have Oracle Clusterware 10*g* release 2 installed on your cluster, and install Oracle RAC 11*g*.
- Starting with release 10.1.0.6 and 10.2.0.3, 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, from 10.2 to 11*g*, or 11.1 to 11.2).
- For the Oracle RAC database being upgraded, DBUA must be run on a node where an Oracle RAC database instance is running.
- 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 2 nodes of the cluster, removing the third node and instance in the upgrade.

Note: 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 11*g* release 2 (11.2).

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

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

1.1.6 Review Globalization Requirements

Before you start an installation where 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 of the world. It 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 supporting 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, and Database Configuration Assistant. It also determines the globalization behavior of Oracle Database sessions created by a user application through Oracle JDBC driver, unless overridden by the application.

- The `NLS_LANG` character set 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 AL32UTF8 as the client character set in the `NLS_LANG` parameter 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. An appropriate setting for `NLS_LANG` is `AMERICAN_AMERICA.WE8MSWIN1252`.

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

1.1.7 Review Documentation

Users planning to install Oracle Real Application Clusters should review *Oracle Grid Infrastructure Installation Guide for Microsoft Windows*, particularly the preinstallation and storage chapters, to complete all required steps needed for a successful

installation. The *Oracle Grid Infrastructure Installation Guide for Microsoft Windows* also contains most tasks requiring Administrator user 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 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 Web site:

`http://www.oracle.com/pls/db112/homepage`

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 for Oracle RAC, and to access online documentation as needed. Online documentation is available in PDF and HTML formats and can be downloaded.

See Also:

- *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 Microsoft Windows* contains server and storage configuration information for Oracle RAC

1.2 Overview of Server Hardware, Network and Operating System

Oracle Clusterware must be installed successfully as part of a 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 complete. Failure to complete required preinstallation steps is the most common reason for failed installations.

As part of installing Oracle Clusterware, you should have completed installing and configuring CPUs, memory, shared storage, local disks, network cards, host bus adaptors, interconnects, and any other networking or server hardware; and you should 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 here to confirm that the vendor hardware and software is correctly configured.

During the installation of Oracle grid infrastructure for a cluster, the network administrator, or the person completing the installation, identifies the planned use for each global interface, identifying it as a **Public** interface type (used with public IP addresses and virtual IP addresses), a **Private** interface type (used with interconnects between cluster member nodes), or a **Do not use** interface type, which Oracle Clusterware and Oracle RAC should ignore. For example, an interface used as a dedicated interface for a network file system should be marked as a **Do not use** interface type.

Additional network configuration is not required during Oracle RAC configuration.

Server preparation for installation include the following:

- Review Server Hardware and Software Requirements
- Overview of Server Environment Configuration
- Overview of Oracle Base
- Overview of Configuring Internode Communication
- Overview of Browser Requirements
- Overview of Platform-Specific Server Configuration

1.2.1 Review Server Hardware and Software Requirements

This section contains a summary of server hardware and software configuration requirements and recommendations.

Required for Oracle RAC

Each node in a cluster requires the following:

- Supported server hardware, including processors and system configuration.

  Review My Oracle Support before starting installation on your existing hardware and before purchasing new hardware to ensure that the hardware is supported with Oracle Clusterware with Oracle RAC 11*g* release 2 (11.2).

  Also review the preinstallation chapters in *Oracle Grid Infrastructure Installation Guide for Microsoft Windows* for more details on 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 (servers that have different chip architectures) in the same cluster.

- Operating system updates listed in the system requirements.

  Oracle may require updates to the operating system, 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.

- A supported interconnect software protocol on each node, to support Oracle Clusterware voting disk polling, and to support Cache Fusion in Oracle RAC. Your interconnect *must* be certified by Oracle for your platform.

Recommended for Oracle RAC: System Administrator Tasks

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

- Utilizing 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 11*g* release 2 (11.2), if the network time protocol is not enabled when Oracle Clusterware is started, then the cluster time synchronization service (CTSS) is enabled.
- 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.

Additional Options: System Administrators and Vendors

After you have set up server hardware, review "Checking the Hardware Requirements" in the *Oracle Grid Infrastructure Installation Guide for Microsoft Windows* 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 the *Oracle Grid Infrastructure Installation Guide for Microsoft Windows*. 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

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

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

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

When installing the Oracle Database software, the user performing the installation is automatically added to the `ORA_DBA` group. If you use a domain user, then you must make sure the domain user on each node is a member of local Administrator group and the `ORA_DBA` group.

Members of the local `ORA_DBA` group automatically receive the SYSDBA and SYSASM privileges.

Note: If you use a domain user to perform the installation, then in some cases you must manually add the user to `ORA_DBA` group of the remote nodes after installation completes.

> **See Also:** *Oracle Database Installation Guide for Microsoft Windows* for more information about the `ORA_DBA` group

1.2.3 Overview of Oracle Base

The Oracle base directory is the location where Oracle software and configuration files are stored. By default, the Oracle software binary files are installed by version and Oracle home name in a subdirectory of the Oracle base directory.

During installation, you are prompted for the Oracle base path. Each operating system user that performs an installation of Oracle software should have their own Oracle base directory. An Oracle base directory can be used for multiple installations. You are also prompted for a software location, or the Oracle home, for this software installation.

Oracle Universal Installer (OUI) creates other paths and environment variables as necessary, in accordance with the Optimal Flexible Architecture (OFA) rules for well-structured Oracle software environments. If you install an OFA-compliant database using Oracle Universal Installer defaults, then `ORACLE_BASE` is *X*`:\app\`*`user_name`*`\` (for example, `C:\app\oracle)`, where *X* is any hard drive, and *user_name* is the name of the user performing the installation.

With Oracle Database 11*g*, Oracle recommends that you do not set an Oracle home environment variable before installation, and instead allow OUI to create the Oracle home directory. If the Oracle base path is `C:\app\oracle`, then by default, OUI creates the following Oracle home path:

```
C:\app\oracle\product\11.2.0\dbhome_n
```

where *n* is the Oracle home number. For example, the first time you create an Oracle home as the `oracle` user, the default Oracle home location is `C:\app\oracle\product\11.2.0\dbhome_1`.

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

1.2.4 Overview of Configuring Internode Communication

The Oracle software is installed on one node in the cluster and then the installer copies the software to the other nodes in the cluster. You should verify that each node in your cluster can communicate with the other nodes using the `net use` command, for example:

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

On node 2, you would use the following command:

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

1.2.5 Overview of Browser Requirements

You need a web browser to access documentation, to use Oracle Enterprise Manager and to use Oracle Application Express. Web browsers must support Java Script and the HTML 4.0 and CSS 1.0 standards. The following browsers meet these requirements:

- Netscape Navigator 7.2
- Netscape Navigator 8.1

- Mozilla version 1.7
- Microsoft Internet Explorer 6.0 SP2
- Microsoft Internet Explorer 7.0 or later
- Firefox 3.0
- Firefox 3.5

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 for Microsoft Windows* 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 chapters in *Oracle Grid Infrastructure Installation Guide for Microsoft Windows*, 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 partition where the operating system is installed. If sufficient space is not detected, then the installation fails and an error message appears. Table 1–1 lists the hard disk space requirements, including the requirement for the starter database.

Table 1–1 Hard Disk Space Requirements for Oracle RAC

Installation Type	TEMP space	SYSTEM_DRIVE:\Program Files\Oracle	Oracle Database Home	Data Files[1]	Total
Standard Edition	500 MB	100 MB	5 GB	3 GB[2]	8.6 GB
Enterprise Edition	500 MB	100 MB	5.5 GB	3 GB	9.1 GB

[1] Refers to the contents of the admin, flash_recovery_area, and oradata directories in the ORACLE_BASE directory

[2] This size can be greater, depending on the installation options selected, such as languages or additional components. If you later plan to install Oracle Database and Oracle Real Application Clusters with automated backups enabled, then include at least an additional 2 GB for data file disk space.

To install Oracle RAC, you must configure shared storage for the database files and optionally the recovery files. If you instruct Database Configuration Assistant (DBCA) to configure automatic backups, the backups require a database recovery area that must be shared.

Refer to the chapter "Configuring Oracle Real Application Clusters Storage" in *Oracle Grid Infrastructure Installation Guide for Microsoft Windows* to review storage options for

installation planning. Storage and system administrators can refer to 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

Oracle Automatic Storage Management Cluster File System (Oracle ACFS) is a new multi-platform, scalable file system, and storage management technology that extends Oracle Automatic Storage Management (Oracle ASM) functionality to support customer files maintained outside of the Oracle Database. Files supported by Oracle ACFS include database and application executables, trace files, alert logs, application reports, BFILEs, and configuration files. Oracle ACFS leverages Oracle ASM functionality that enables Oracle ACFS dynamic file system resizing, maximized performance through direct access to Oracle ASM disk group storage, balanced distribution of Oracle ACFS across Oracle ASM disk group storage for increased I/O parallelism, and data reliability through Oracle ASM mirroring protection mechanisms.

The Oracle ASM Dynamic Volume Manager (Oracle ADVM) provides volume management services and a standard disk device driver interface to clients. 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.

> **See Also :**
>
> - The Certify page on My Oracle Support for the most current information about storage options:
>
> `https://support.oracle.com`
>
> - *Oracle Database Storage Administrator's Guide* for an overview of storage configuration administration

1.3.1 General Storage Considerations for Oracle RAC

For all installations, you must choose the storage option to use for Oracle Real Application Clusters (Oracle RAC) database files. To enable automated backups during the installation, you must also choose the shared storage option to use for recovery files (the fast recovery area). 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 Automatic Storage Management (Oracle ASM) as the shared storage option for database and recovery files.
- For Standard Edition 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 disk areas to provide voting disk redundancy.
- If you intend to use Oracle ASM with Oracle RAC and you did not use Oracle ASM for the Oracle Clusterware files (OCR and voting disk), then you must configure the Oracle ASM instance with ASMCA before starting Oracle Universal Installer (OUI). All nodes in the cluster must have the Oracle Database 11*g* release 2 version of the grid infrastructure installed (Oracle Clusterware and Oracle ASM).
- If you intend to upgrade an existing Oracle RAC database, then you must ensure that your system meets the following conditions:
  - Oracle Universal Installer (OUI) and Database Configuration Assistant (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 2 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

1.3.2 Overview of Oracle Database and Recovery File Options

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

Note: Installing on raw devices (unformatted partitions) is not supported. Install on a shared file system or on Oracle ASM. If you are upgrading a database that uses raw devices, they are still supported with Oracle Database 11*g* release 2.

- **Oracle Automatic Storage Management**: 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 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:
  - **Oracle Cluster File System (OCFS) for Windows**: Note that if you intend to use OCFS for Windows for your database files, then you should create partitions large enough for the all the database and recovery files when you create partitions for use by Oracle Database.

    Note: To have a shared Oracle Database home directory for all nodes, you must use OCFS for Windows.

– **Direct Network File Systems (NFS):** You can configure Oracle Database to access NFS V3 servers directly using an Oracle internal Direct NFS client.

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, 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)	No	No
OCFS for Windows	Yes	Yes
Direct NFS	Yes	Yes
Local storage	No	No
Shared unformatted partitions	Not supported by OUI or ASMCA, but supported by the software. They can be added or removed after installation.	Not supported by OUI or ASMCA, but supported by the software. They can be added or removed after installation.

1.4 Additional Information to Prepare for Installation

This section contains additional information about Oracle Clusterware, Oracle ASM, and Oracle RAC, that may be helpful for your installation planning team in deciding how you want to configure your installation. It contains the following sections:

- Oracle ASM is Installed with Oracle Grid Infrastructure
- Shared Components of Oracle RAC Installations
- Simplified Upgrade of TIMESTAMP WITH TIME ZONE Data
- Oracle Database 11g 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 11*g* release 2 (11.2), Oracle ASM is part of an Oracle grid infrastructure installation. To upgrade an existing Oracle ASM installation, you must upgrade Oracle ASM by running an Oracle grid infrastructure upgrade.

1.4.2 Shared Components of Oracle RAC Installations

For Oracle RAC, you and your system administrator should note that all instances in Oracle RAC environments share the control file, server parameter file, redo log files, and all data files. These files must be placed on a shared file systems, and all the cluster database instances must have access to them. 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.

1.4.3 Simplified Upgrade of TIMESTAMP WITH TIME ZONE Data

As part of installation of Oracle Database 11*g* release 2 (11.2), time zone version files from 1 to 11 are installed in the path `Oracle_home\oracore\zoneinfo`. You can continue to use the current time zone version or upgrade to the latest version. Oracle recommends that you upgrade the server to the latest time zone version. Upgrading to a new time zone version may cause existing TIMESTAMP WITH TIME ZONE (TSTZ) data to become stale. Using the newly provided DBMS_DST PL/SQL packages, you can update the TSTZ data transparently with minimal manual procedures and system downtime.

Time zone version files are also installed on the clients. Starting with Oracle Database 11*g* release 2, you no longer 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 Timestamp with Time Zone data
- *Oracle Database Globalization Support Guide* for information about how to upgrade the Time Zone file and Timestamp with Time Zone data
- *Oracle Call Interface Programmer's Guide* for information about performance effects of clients and servers operating with different versions of Time Zone files

1.4.4 Oracle Database 11*g* Real Application Clusters Release Compatibility

You can install and operate different releases of Oracle Database software on the same computer when the following conditions are met:

- If you have Oracle Clusterware installed and different release versions of other Oracle software installed, then the Oracle Clusterware version must be greater than or equal to the Oracle Database software version. Oracle Clusterware and Oracle Automatic Storage Management are both upgraded with an Oracle grid infrastructure 11*g* release 2 (11.2) installation.
- If you have an existing Oracle Database home, then you can create a new Oracle Database home and install Oracle Database 11*g* release 2 (11.2) into the new Oracle home. You should ensure that Oracle Clusterware is in a separate grid infrastructure home. Oracle grid infrastructure for a cluster installations cannot be installed in the Oracle base directory for Oracle Database.
- If you use Oracle9*i* Database software, 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. Oracle Clusterware release 11*g* can be installed on the same system as Oracle9*i* Database software, but Oracle9*i* Database software cannot be supported by Oracle Clusterware 11*g*.
- If you select the Upgrade an existing database option in OUI, then, after you have completed the installation interview, the database upgrade assistant (DBUA) is started to upgrade the database. The information collected during the installation interview is passed to DBUA after the software is installed.

  If OUI detects a previous Oracle Clusterware release, then you are asked to upgrade the existing Oracle Clusterware installation. You can run only one Oracle Clusterware version on a server, and a server must be a member of only one

cluster. Oracle Clusterware must be at the same or a higher release than the Oracle Database software for Oracle RAC.

- 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 grid infrastructure for a standalone server (Oracle Restart) installed, then you must remove that installation before you can install Oracle grid infrastructure for a cluster.

  Note: Do not move Oracle executables 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 Automatic Storage Management (Oracle ASM). For example, you can use Oracle ASM release 11*g* release 2 (11.2) with an Oracle Database 10*g* release 2 (10.2) database

  Note: When using different release Oracle ASM and Oracle Database releases, the functionality of each is dependent on the functionality of the earlier software release. For example, an Oracle Database 10*g* release 10.2 database using an Oracle ASM 11*g* release 2 (11.2) instance is not able to use new features available for Oracle ASM in the 11*g* release 2 (11.2) release, but instead only Oracle ASM 10.2 features.

  See Also:

  - *Oracle Grid Infrastructure Installation Guide for Microsoft Windows* for information about using older Oracle Database versions with grid infrastructure
  - "Installing Oracle 11g Database on a System with Oracle9i Database Release 2" on page 1-17

1.5 Confirming Cluster Readiness for Oracle RAC Installation with CVU

Before you start your installation, use Cluster Verification Utility (CVU) to ensure that your system is prepared for installing Oracle RAC. If any checks fail, then fix the errors reported, either manually or by using a generated fixup script, 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 Oracle grid infrastructure for a cluster home is `C:\app\11.2.0\grid`, then the path is `C:\app\11.2.0\grid\bin`. 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 11*g* release 2 (11.2) with Oracle RAC, the following command checks for system readiness:

```
cluvfy.bat stage -pre dbinst -fixup -n node1,node2 -r 11gR2 -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 Installing Oracle RAC on Systems with Coexisting 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 must do
Upgrading from Oracle Database 10*g* release 1 (10.1) to Oracle Database 11*g* release 2 (11.2)	No additional tasks. Refer to "Installing Oracle Database 11g on a System with Oracle Database 10g" on page 1-16
Installing Oracle Database 11*g* release 2 (11.2) on a system to coexist with Oracle Database 10*g* release 1 (10.1)	No additional tasks. Refer to "Installing Oracle Database 11g on a System with Oracle Database 10g" on page 1-16
Upgrading from Oracle9*i* release 9.2 to Oracle Database 11*g* release 2 (11.2)	Shut down the Global Service Daemon, and shut down a default listener on port 1521, if present. Refer to "Installing Oracle 11g Database on a System with Oracle9i Database Release 2" on page 1-17
Installing Oracle Database 11*g* release 2 (11.2) on a system to coexist with Oracle9*i* release 9.2	Shut down a default listener on port 1521, if present, and shut down the Global Service Daemon. Refer to "Installing Oracle 11g Database on a System with Oracle9i Database Release 2" on page 1-17

1.6.1 Installing Oracle Database 11*g* on a System with Oracle Database 10*g*

If your system has an Oracle Database 10*g* installation, and you install Oracle Database 11*g* release 2 (11.2) 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 10*g* Oracle home to the Oracle Database 11*g* Oracle home.
- During an upgrade, Oracle Database Upgrade Assistant (DBUA) automatically locates the Oracle Database10*g* listener, and migrates it to Oracle Database 11*g*.

> **Note:** For Oracle Database 11*g* release 2 (11.2) to coexist with Oracle Database 10*g* release 1 (10.1) databases using Oracle ASM, the 10.1 database must be release 10.1.0.3 or later.

1.6.2 Installing Oracle 11*g* Database on a System with Oracle9*i* Database Release 2

If you are installing an Oracle Database 11*g* release 2 (11.2) on a system with an existing Oracle9*i* Database release 2 (9.2), and the Oracle Net listener process is using the *same* port or key value as the default used with the Oracle Database 11*g* release 2 (11.2) installation, port 1521, then OUI can only configure the new listener; it cannot start it. To ensure that the new listener process starts during the installation, you must shut down any existing listeners before starting OUI. To do this, refer to "Shutting Down the Listener" on page 1-17

You must shut down the Global Services Daemon (GSD), because otherwise, during Oracle Database 11*g* installation, the Oracle Database 9*i* release 2 (9.2) SRVM shared data is upgraded into an Oracle Cluster Registry that the Oracle9*i* release 2 GSD is not able to use. The Oracle grid infrastructure installation starts an 11*g* release 2 (11.2) GSD to serve the Oracle9*i* release 2 (9.2) clients. To do this, refer to "Shutting down the Global Services Daemon" on page 1-17.

> **Note:** To run an Oracle 9*i* RAC database, you must have the Oracle 9*i* Cluster Manager operational. It can run on the same server with an Oracle Grid Infrastructure installation. Oracle Clusterware does not manage Oracle9*i* RAC databases.

Shutting Down the Listener To determine if an existing Oracle Database 9*i* listener process is running and to shut it down if necessary, follow these steps:

1. Open the Services management interface:
   - On Windows Server 2003 and Windows Server 2003 R2, from the Start menu, select **Administrative Tools**, and then select **Services**.
   - On Windows Server 2008 and Windows Server 2008 R2, from the **Start** menu, select **Server Manager.** In the Server Manager console, expand Diagnostics and then select **Services**.
2. Locate any services with a name similar to Oracle*OraDb9i_home*TNSListener.
3. Select the service name. In the Action menu, click **Stop**.

Shutting down the Global Services Daemon On each node of the cluster, use the following syntax to shut down the GSD:

```
C:\> cd 92_oracle_home\bin
C:\> gsdctl stop
```

In the preceding syntax example, the variable `92_Oracle_home` is the Oracle Database 9*i* release 2 (9.2) home.

2

Installing Oracle Database 11*g* with Oracle Real Application Clusters

This chapter describes phase two of the installation procedures for installing Oracle Database 11*g* release 2 (11.2) with Oracle Real Application Clusters (Oracle RAC). Phase one is the completion of installing Oracle Clusterware, as described in *Oracle Grid Infrastructure Installation Guide for Microsoft Windows*.

> **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:

- Reviewing Oracle Application Express Requirements
- Selecting an Installation Type
- Selecting an Installation Option
- Oracle Database Configuration Type Descriptions
- Oracle Database Vault Option
- Oracle Configuration Manager Option
- Selecting a Database Name
- Selecting Database Passwords
- Database Security Options
- Actions of OUI and DBCA During Installation
- Installing Oracle Database with Other Languages
- Installing Oracle Database Vault
- Using Oracle Universal Installer to Install Oracle RAC
- Update Environment Variables on Remote Nodes

2.1 Reviewing Oracle Application Express Requirements

With the Oracle Database 11*g* release, Oracle Application Express is provided as an Oracle Database option, rather than as an Oracle Application option. If you intend to install Oracle Database after installing Oracle Clusterware, and you have an existing Oracle Database installation that you are upgrading, then review the Oracle Application Express requirements in *Oracle Application Express Installation Guide*.

2.2 Selecting an Installation Type

When you run OUI, you can select the **Typical** or the **Advanced** Install type.

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

2.3 Selecting an Installation Option

This section describes Oracle Universal Installer (OUI) features that you should understand before beginning the Oracle RAC installation process.

> **See Also:** Appendix C, "Converting to Oracle Real Application Clusters from Single-Instance Oracle Databases" for information about how to convert single-instance databases to Oracle RAC

On the Select Installation Option page, you are given 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.

  If you select the Oracle Automatic Storage Management option for storage, then you must have installed Oracle Automatic Storage Management (Oracle ASM) as part of the Grid Infrastructure installation. 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) from the Grid home to configure Oracle ASM, create an Oracle ASM instance, and create a disk group to use for your Oracle Database storage.

- Install database software only: Installs Oracle Database software; you must complete database configuration later.

- Upgrade an existing database: Upgrades an existing database to Oracle Database 11*g* Release 2 (11.2).

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 customized starter database. See "Oracle Database Configuration Type Descriptions" for more information about the different preconfigured database options.

See Also: 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 *Oracle Database Upgrade Guide* before proceeding with installation, to decide how you want to proceed.

For late-breaking updates and best practices about pre-upgrade, post-upgrade steps, compatibility, and interoperability discussions, refer to "Oracle Upgrade Companion." The "Oracle Upgrade Companion" is available through Note 785351.1 on My Oracle Support:

https://support.oracle.com/

2.4 Oracle Database Configuration Type Descriptions

When you run OUI, you can select the **General Purpose/Transaction Processing**, **Data Warehouse**, or **Advanced** database configuration type.

For the first three configuration types, you can complete additional procedures that are described later in this chapter. If you select Advanced configuration, then you can use Database Configuration Assistant (DBCA) to create the database as described in Chapter 3, "Creating Oracle Real Application Clusters Databases with Database Configuration Assistant". Oracle recommends that you use DBCA to create your database.

2.4.1 General Purpose and Transaction Processing, and Data Warehouse Configuration Types

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

During installation, if you select a preconfigured database template, then OUI starts Oracle Network 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.

If you select Advanced configuration, then you must enter specific information as described in the next section.

2.4.2 Using the Advanced Database Configuration Type

Use the Advanced database configuration type to address specific requirements, such as selecting specific components to add or remove from the installation, creating a database in a nondefault character set, or adding translation of product user interface into languages other than English. By default, the installation configures the character set of a new database based on the language of the operating system.

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

The following sections provides more detail about OUI and DBCA processing when creating an Oracle RAC database.

See Also: *Oracle Database Installation Guide for Microsoft Windows* for information about configuring globalization

2.4.3 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*

2.5 Oracle Database Vault Option

Oracle Database Vault requires the following:

- An Oracle Database Enterprise Edition installation (cannot be used with Oracle Standard Edition)
- Setting the initialization parameter `db_block_size` for the database to 4096 or higher. You can specify the initial value for this parameter during installation.
- Oracle Enterprise Manager Console
- Oracle Clusterware
- The password file authentication parameter, `REMOTE_LOGIN_PASSWORDFILE`, must have been set to `EXCLUSIVE` or `SHARED` for the database. You can specify the initial value for this parameter during installation, or in the Oracle Database initialization file.

  To create and manage password files, use the `orapwd` utility.

  See Also: *Oracle Database Administrator's Guide* for more information on creating and maintaining a password file

You can install Oracle Database Vault more than once on the same system, in different Oracle homes.

2.6 Oracle Configuration Manager Option

During installation, you are prompted to provide information needed to enable Oracle Configuration Manager. This option enables you to associate information about your Oracle RAC configuration with your My Oracle Support (formerly Oracle*Metalink*) account. In the event that you must place a service request with Oracle Support, that configuration information can help provide a more rapid resolution to the service issue.

You can enable Oracle Configuration Manager during or after installation, or choose not to enable it. To enable it during installation, you must have the following information available from your Oracle Support service agreement:

- Customer Support Identification Number (CSI) that identifies your organization
- My Oracle Support e-mail address/username
- Password
- Name of the country associated with your company

In addition, you are prompted for server proxy information, if the host system does not have a direct connection to the Internet.

Refer to My Oracle Support (https://support.oracle.com) if you encounter registration failures and are uncertain that the correct country code has been specified. You can find the country associated with your My Oracle Support account by selecting the menu option **More**, then selecting **Settings**. In the Settings menu, select **Accounts & Privileges**.

> **See Also:** *Oracle Configuration Manager Installation and Administration Guide* for further information

2.7 Selecting a Database Name

The global database name can be up to 30 characters in length, and must begin with an alphabetic character. The domain portion of the global database name can be no more than 128 characters and can contain only the characters a-z, A-Z, 0-9, the dash or minus sign (-), or a period (.). Domain names using underscores (_) are not allowed.

The system identifier (SID) for each database must begin with an alphabetic character, and is limited by the installer to 12 alphanumeric characters in length. For Oracle RAC databases, the SID prefix, which is the first 8 characters of the SID, must be unique for each database. The SID and SID prefix can only contain alphanumeric characters and cannot contain underscore (_), dollar ($), and pound (#) characters.

2.8 Selecting Database Passwords

Apply the following guidelines when specifying passwords:

- Passwords must be between 8 and 30 characters long.
- Passwords must be from the ASCII character set.
- Passwords must not start with a numeral.
- Passwords must not be the same as the user name.
- Passwords must not be Oracle reserved words.
- The `SYS` account password must not be `change_on_install`.
- The `SYSTEM` account password must not be `manager`.
- The `SYSMAN` account password must not be `sysman`.
- The `DBSNMP` account password must not be `dbsnmp`.
- If you choose to use the same password for all the accounts, then that password must not be `change_on_install`, `manager`, `sysman`, or `dbsnmp`.
- Passwords should have at least 1 alphabetic, 1 numeric, and 1 punctuation mark character
- Passwords should not be simple or obvious words, such as welcome, account, database, oracle, or user.

2.9 Database Security Options

During installation, you are prompted to select a database security configuration.The Secure Configuration option configures the database with database auditing options, and password policy and expiration settings.

For new database installations, the default configuration for Oracle Database 11*g* release 2 (11.2) includes the Secure Configuration option. To disable these enhanced security controls, check the **Disable security settings** box. Oracle Database is then

installed with default security options for Oracle Database 10*g* release 2. After installation, you can change security settings by starting DBCA and modifying the security settings. You can enable or disable auditing or password security settings, or revert to a previous security setting.

For database upgrades, the upgraded database retains your existing database security configuration to ensure compatibility with existing applications. After installation, you can use DBCA to enable or disable the Secure Configuration auditing or password security settings for testing.

Note: Oracle strongly recommends configuring your database with the Secure Configuration option either during installation, or after installation using command line DBCA.

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

2.10 Actions of OUI and DBCA During Installation

After installing the Oracle Database software, 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.

Tip: Oracle Net Configuration Assistant (NetCA) is run as part of an Oracle Grid Infrastructure installation.

The primary phases of DBCA processing are the following:

- Create the database.
- Configure the Oracle network services, if necessary.
- Start the listeners and database instances.

You can also use DBCA in standalone mode to create or delete a database, or to switch database management from Oracle Enterprise Manager Database Control to Oracle Enterprise Manager Grid Control.

See Also: *Oracle Database Net Services Administrator's Guide* if you experience problems (for example, with the listener configuration), and for further information about Lightweight Directory Access Protocol (LDAP) support

2.10.1 Managing Database Services After Installation

Note that with Oracle Database 11*g* release 1 (11.1) and later releases, you can no longer manage database services for Oracle RAC databases using DBCA. You must use `srvctl`, Oracle Enterprise Manager DB Control or Oracle Enterprise Manager Grid Control for all administration and monitoring of database services for an Oracle RAC database.

See Also: *Oracle Database 2 Day + Real Application Clusters Guide* for service management using Oracle Enterprise Manager

2.10.2 Installing Older NLS Compatibility Definition Files

In Oracle Database 10*g* and later releases, some database language and territory definition files have been updated to better reflect locale conventions used in associated locales.

If the resulting changes in default NLS parameter values render your existing applications, inoperative, then you can revert the changes by installing Oracle9*i* compatibility definition files. To install Oracle9*i* files in place of Oracle11*g* files, you must run OUI from a command line, as described in "Using Oracle Universal Installer to Install Oracle RAC" on page 2-7, and use the following statement to set the `b_cr9idata` variable to `true`:

```
setup.exe oracle.rsf.nlsrtl_rsf:b_cr9idata=true
```

> **See Also:** *Oracle Database Globalization Support Guide* for additional information about updates to the Oracle Database language and territory definition files

2.11 Installing Oracle Database Vault

To install Oracle Database Vault, you must select the Advanced installation option for Oracle Database Enterprise Edition. After the Oracle Database Vault software has been installed, you configure Oracle Database Vault using DBCA. Oracle Database Vault is not configured by default.

To install Oracle Database Vault while installing Oracle RAC:

1. Start Oracle Universal Installer, and select **Advanced installation**.
2. Select **Enterprise Edition**, and then select **Options**.
3. In addition to the default installation components, select **Oracle Label Security (OLS)** and **Oracle Database Vault**.
4. Continue the rest of the installation process as you normally would.

> **Note:** You must set the database initialization parameter `db_block_size` to 4096 or higher. You can configure this parameter during installation of Oracle RAC.

After you have installed Oracle RAC with the Oracle Database Vault option you must complete the configuration of Oracle Database Vault, as described in the *Oracle Database Vault Administrator's Guide*.

2.12 Using Oracle Universal Installer to Install Oracle RAC

Perform the following procedures to install the Oracle Database 11*g* release 2 (11.2) software with Oracle RAC using Oracle Universal Installer (OUI):

1. Login to Windows as a user with Administrative privileges.
2. Verify that you have administrative privileges on the other nodes. To do this, 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. Start the `setup.exe` command from the base directory of the Oracle Database 11*g* release 2 (11.2) 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 see the log file. The log file can also be found 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
   ```

   In the preceding syntax example, the variables *`date`* and *`time`* represents 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 during Oracle Grid Infrastructure installation. **Do not** install Oracle Database 11*g* with Oracle RAC software into the same home in which you installed Oracle Grid Infrastructure software.
>
> If you are upgrading a database, then you must use the same type of Oracle home. For example, you should not change from local Oracle homes to a shared Oracle home.
>
> Note that because Oracle ASM is part of the Grid Infrastructure home, it cannot be upgraded during an Oracle RAC installation.

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

> **Caution:** After installation is completed and you have created the database, if you decide to install additional Oracle Database 11*g* release 2 (11.2) products in the database, then you must stop *all* processes running in the Oracle home before you attempt to install the additional products. For the Oracle Universal Installer to relink certain executables and libraries, all database processes must be stopped. Refer to Appendix E, "How to Stop Processes in an Existing Oracle Real Application Clusters Database" for additional information.

The following is a list of additional information to note about installation:

- On the Select Database Management Option page, if you completed the Grid Control Management Agent installation, then you can select either Grid or Local Database control. Otherwise, only Local Database control for database management is supported for Oracle RAC. When you use the local Database Control, you can choose the e-mail option for alerts and enter the outgoing SMTP server name and e-mail address.
- If you perform an installation that does not include Oracle Enterprise Manager (for example, a customized software install without Oracle Enterprise Manager, an installation with no Oracle Enterprise Manager configuration, or a database creation with your own scripts), then you can configure Oracle Enterprise

Manager later using OUI, DBCA, or the Oracle Enterprise Manager Configuration Assistant (EMCA) utility.

2.13 Update 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 you type 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.

3

Creating Oracle Real Application Clusters Databases with Database Configuration Assistant

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
- Deleting an Oracle RAC Database with DBCA
- Configuring Database Control During Installation

> **See Also:** *Oracle Real Application Clusters Administration and Deployment Guide* for procedures on 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 the database
- Add and delete database instances
- Set up network configuration for the database and its instances
- Register the database in Oracle Enterprise Manager Grid Control or configure Database Control
- Configure options for the database, such as Oracle Database Vault
- Start the database and its instances

Note: Cluster Managed Services are no longer managed through DBCA. Instead, use the cluster managed services page in Oracle Enterprise Manager DB Control (accessible from the Cluster Database Availability Page). For more information, refer to *Oracle Real Application Clusters Administration and Deployment Guide*.

See Also:

- "Creating an Oracle RAC Database with DBCA" on page 3-4 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 further 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 the preconfigured databases created by DBCA optimize your environment for features such as password security, the server parameter file (SPFILE), and automatic undo management. If you use Oracle ASM or cluster file system storage, then DBCA also configures automated backup, which uses the Fast Recovery Area.

DBCA enables you to create both policy-managed and administrator-managed databases. At the end of database creation, DBCA starts any database instances required to support your defined configuration.

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.

3.3 Automatic Listener Migration from Earlier Releases

If your system has an Oracle Database 10*g* or 11*g* installation, and you install Oracle Database 11*g* release 2 (11.2) either to coexist with or to upgrade the Oracle Database 10.1, 10.2, or 11.1 installation, then most installation types automatically migrate the existing Oracle Database listener to the 11*g* release 2 (11.2) Oracle home. During migration, they configure and start 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 to 11*g* release 2 (11.2) 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 it was migrated automatically to the Oracle Clusterware home by NETCA as part of the Oracle Clusterware upgrade. If the database was using a nondefault listener, then DBUA migrates the nondefault listener to the Oracle Database home.

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

3.4 Verifying Requirements for DBCA

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

```
Grid_home\bin\cluvfy stage -pre dbcfg -n node_list -d Oracle_home [-verbose]
```

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 perform a check to determine if your system is prepared for an Oracle Database with Oracle RAC installation on a two-node cluster with nodes node1 and node2, with the Oracle grid infrastructure home path`C:\app\11.2.0\grid`, and with the Oracle home path `C:\app\oracle\product\11.2.0\dbhome_1`, then enter the following command:

```
C:\app\1.2.0\grid\bin> cluvfy stage -pre dbcfg -n node1,node2 \
-d C:\app\oracle\product\11.2.0\dbhome_1
```

You can select the option `-verbose` to receive progress updates as the 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.

The command `cluvfy stage -pre dbcfg` verifies the following:

- Node Reachability: All the specified nodes are reachable from the local node.
- User Equivalence: User equivalence exists on all the specified nodes.
- Total Memory: Each node specified has at least the minimum required memory configured.
- Available Memory: Each node specified has at least the minimum amount of available memory.
- Swap Space: Each node has enough swap space available.
- Free Disk Space: Each node has sufficient free disk space available in the path for the Oracle home, the Grid home, and the temporary directory.
- System Architecture: Each node must be a 64-bit system.
- Length of the value of the environment variable "PATH": The PATH environment variable is set on each node and does not contain more than 1023 characters.
- CRS Integrity: All the components of the Oracle Clusterware stack are fully operational.
- Node Application Existence: All the specified nodes have a VIP, ONS (not required), GSD (not required), EONS (not required) and NETWORK (not required) node application and whether the node application is online.
- Time Zone Consistency: All the specified nodes have the same time zone setting.

3.5 Creating an Oracle RAC Database with DBCA

To create an Oracle RAC database with DBCA without Oracle ASM or a cluster file system, you must have configured shared storage devices. In addition, you must have run the Oracle Net Configuration Assistant (NETCA) to configure your Oracle Net `listener.ora` file.

On Windows-based systems, if you plan to use Oracle ASM storage, then before you use DBCA to create a database, you must first create logical partitions without primary partitions on the same drive and delete the drive letters for these partitions on all nodes, or stamp these partitions with `asmtool`. Refer to the *Oracle Grid Infrastructure Installation Guide for Microsoft Windows* for more information on configuring disk devices for use with Oracle ASM.

To start DBCA, connect as the installation owner account (for example, `oracle`)to one of your nodes where Oracle RAC is installed, and enter the command `dbca` command from the *`Oracle_home`*`\bin` directory. On Windows-based platforms, you can also click **Start**, and select **Programs**, **Oracle - *Oracle_home name***, **Configuration and Migration Tools**, and then **Database Configuration Assistant**.

When you start DBCA, the first page it displays is the Welcome page for Oracle RAC, which includes the option to select an Oracle RAC database. DBCA displays this Oracle RAC Welcome page only if the Oracle home from which it is started was installed on a cluster. Enter information as prompted by DBCA. Click **Help** if you need assistance.

If DBCA does not display the Welcome page for Oracle RAC, then DBCA was unable to detect if the Oracle home is installed on a cluster. In this case, check that the OUI inventory is correctly located in the directory `C:\Program Files\Oracle\Inventory\oraInst.loc`, and that the inventory files are not corrupted. Also, perform clusterware diagnostics by using the following CVU command syntax:

```
cluvfy stage -post crsinst -n nodelist.
```

For example, on a cluster with nodes `node1` and `node2`, run the following command:

```
C:\app\grid\bin\cluvfy stage -post crsinst -n node1,node2
```

Note the following important information when using DBCA:

- If nodes that are part of your cluster installation do not appear on the Node Selection page, then execute the `opatch -lsinventory` command to perform inventory diagnostics and CVU to perform clusterware diagnostics.
- The global database name is of the form *`database_name.domain`*. The global database name can be up to 30 characters in length, and must begin with an alphabetic character. The domain portion of the global database name can be no more than 128 characters and can contain only alphabetic and numeric characters, and the period (.) character.
- A system identifier (SID) is used as an identifier unique to each Oracle instance. The system identifier (SID) prefix, or first 8 characters, must begin with an alphabetic character. For Oracle RAC database, the SID prefix is limited to 8 characters, and only letters and numeric digits are permitted. On some platforms, the SID is case-sensitive.

> **Note:** It is common practice to set the SID to be equal to the database name. The maximum number of characters for the database name is 8. For more information, see the discussion of the `DB_NAME` initialization parameter in *Oracle Database Reference*.

- On the Management Options page, you are provided with selections for Oracle Enterprise Manager monitoring and management interfaces.

  Database Control is always an option. If DBCA discovers Grid Control agents on the cluster, then it also provides you with the option Oracle Enterprise Manager with the Grid Control. Choose between Database Control and Grid Control interfaces.

  You can set up e-mail notification and enable daily backup operations. For e-mail notifications, you provide the outgoing mail server and e-mail address. For daily backups, you enter the backup time and operating system credentials for the user that performs backup operations.

- To use a fast recovery area, Oracle recommends that you create at least two separate Oracle ASM disk groups: one for the database data files and one for the fast recovery area. Oracle recommends that you place the database data files and the fast recovery area in separate failure groups using shared storage.

  A failure group is defined by shared hardware, such as a controller shared between two storage devices, or two disks that are on the same spindle. If two storage devices share hardware that could fail, making both storage devices unavailable, then these storage devices are said to be in the same failure group.

  If you do not use Oracle ASM, then Oracle recommends that you store the data files and the fast recovery area on shared storage outside of the Oracle home and in separate locations, similar to using separate Oracle ASM failure groups, so that a hardware failure does not affect availability.

  See Also:

  - *Oracle Database Concepts* for more information about using a fast recovery area
  - *Oracle Database Storage Administrator's Guide* for information about failure groups and best practices for high availability and recovery

- On the Oracle ASM Disk Groups page, if you do not see the storage devices to add, then click **Change Disk Discovery Path** to alter the search path used by DBCA to find available storage devices, or click **Stamp Disks** to start the `asmtoolg` GUI tool. You can select storage devices with a status of `Candidate` or `Former` (never used in an Oracle ASM disk group or no longer in a group). To add storage devices that still have Oracle ASM disk headers, but the disk group is no longer in use (a case that can occur if you are selecting storage devices after an aborted installation attempt, you attempted deinstallation without dropping the disk group, or other configuration problems), use the `Force` command.

  See Also: *Oracle Database Installation Guide for Microsoft Windows* for more information about `asmtoolg`

- On the Recovery Configuration page, if you are using Oracle ASM or cluster file system storage, then you can also select the fast recovery area and size on the Recovery Configuration page. If you are using Oracle ASM, then the fast recovery

area defaults to an Oracle ASM disk group. If you are using Oracle CFS, then the fast recovery area defaults to `Oracle_home\fast_recovery_area`.

- For all platforms, 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

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

- Starts the Oracle services if you are on a Windows-based platform
- Configures the network for the cluster database
- Migrates previous release Oracle Database listeners and related files to the Oracle Database 11*g* Oracle home
- Creates an Oracle RAC database and its instances
- Creates the Oracle RAC data dictionary views
- Configures Oracle Enterprise Manager Database Control or Grid Control
- Starts the listeners and database instances, and then starts the high availability services

Caution: After you have created the database, if you decide to install additional Oracle Database products in the database you have created, then you must stop *all* processes running in the Oracle home before you attempt to install the additional products. Refer to Appendix E, "How to Stop Processes in an Existing Oracle Real Application Clusters Database" for additional information.

3.6 Deleting an Oracle RAC Database with DBCA

This section explains how to delete an Oracle RAC database with DBCA. This process deletes a database and removes a database's initialization parameter files, instances, OFA structure, and Oracle network configuration. However, this process does not remove data files if you placed the files on raw devices or on raw partitions.

To delete a database with DBCA:

1. Start DBCA on one node:

   On Windows-based platforms, click **Start**, and select **Programs**, **Oracle - *Oracle_home name***. In the **Configuration and Migration Tools** folder select **Database Configuration Assistant**

   The DBCA Welcome page appears.

2. Select **Oracle Real Application Clusters database,** then click **Next**.

   After you click Next, DBCA displays the Operations page.

3. Select **Delete a database**, and then click **Next**.

   DBCA displays the List of Cluster Databases page.

4. 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.

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

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

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

If you clicked OK, then 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 database from the cluster
- Deleted the Oracle services for the database on Windows-based platforms
- Deleted high availability services that were assigned to the database
- Deleted the Oracle Net configuration for the database
- Deconfigured Database Control for that database
- Deleted the OFA directory structure for that database from the cluster
- Deleted the data files if the data files were not on raw devices

3.7 Configuring Database Control During Installation

If you create a database while installing Oracle RAC 11*g* release 2 (11.2), then you have the option of configuring your database so it can be managed by Oracle Enterprise Manager Grid Control Console, or by Oracle Enterprise Manager 11*g* Database Control Console.

When you configure Database Control for your Oracle RAC database, for each Oracle RAC instance on a node, the following subdirectory is created, where *`Oracle_home`* is the directory where the Oracle RAC software is installed, *`nodename`* is the name of the node in the cluster and *`DBUniqueName`* is the database unique name:

```
Oracle_home\nodename_DBUniqueName
```

To select Grid Control Console as your management option, the Oracle Management Service must be installed on a network host. In addition, the Oracle Management Agent must be installed on the host where you are installing the database. Otherwise, the Grid Control Console option is unavailable, and you must instead choose to manage your database with Database Control.

For most Oracle RAC 11*g* release 2 (11.2) installation types, you must choose either Database Control or Grid Control as your management option when you create a database during the installation. However, if you create a database using one of the following methods, then you can choose not to configure Database Control:

- Choosing the Advanced database configuration option during an Enterprise or Standard Edition installation
- Running Database Configuration Assistant (DBCA) after the installation

If you do not configure Database Control during the Oracle RAC 11*g* release 2 (11.2) installation, then no *hostname_dbuniquename* directory is created in the resulting Oracle home directory.

See Also:

- "Understanding EMCA with Oracle RAC" on page 6-2
- "Configuring Oracle Enterprise Manager Database Control" on page 6-2

4

Oracle Real Application Clusters Postinstallation Procedures

This chapter describes how to complete the postinstallation tasks after you have installed the Oracle Database 11*g* release 2 (11.2) with Oracle Real Application Clusters (Oracle RAC) software. It also describes how to use the `chopt` tool to enable or disable database features.

This chapter contains the following topics:

- Required Postinstallation Tasks
- Recommended Postinstallation Tasks
- Enabling and Disabling Database Options
- Using Older Oracle Database Versions with Grid Infrastructure
- Oracle Configuration Manager Postinstallation Configuration for Oracle RAC

Note: This chapter describes only basic configurations. Refer to:

- *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 your platform, for additional postinstallation configuration information

4.1 Required Postinstallation Tasks

You must perform the following tasks after completing your installation:

- Download and Install Patch Updates
- Configure Exceptions for the Windows Firewall
- Configure Oracle Products
- Configure Storage for External Tables, Shared Files, or Directory Objects

4.1.1 Download and Install Patch Updates

Refer to the My Oracle Support Web site for required patch updates for your installation.

> **Note:** Browsers require an Adobe Flash plug-in, version 9.0.115 or higher to use My Oracle Support. Check your browser for the correct version of Flash plug-in by going to the Adobe Flash checker page, and installing the latest version of Adobe Flash.
>
> If you do not have Flash installed, then download the latest version of the Flash Player from the Adobe Web site:
>
> http://www.adobe.com/go/getflashplayer

To download required patch updates:

1. Use a Web browser to view the My Oracle Support Web site:

   https://support.oracle.com

2. Log in to My Oracle Support.

   > **Note:** If you are not a My Oracle Support registered user, then click **Register for My Oracle Support** and register.

3. On the main My Oracle Support page, click the **Patches & Updates** tab.
4. In the Patch Search section, click **Product or Family (Advanced Search)**.
5. Specify the following information, then click **Search**:
   - In the **Product** action list, expand the entry for Oracle Database and then select your release, for example, Oracle 11.2.0.1.0. You can select multiple releases, or click **Close**.
   - In the **Release** action list, choose Oracle Database and specify the current release number.
   - If the last action list shows Platform, then use the action list to the right to specify your operating system, for example Microsoft Windows, 64-bit and Microsoft Windows Server 2003 R2. After making your choices, click **Close**.
   - On the right-hand side of the Patch Search section, above the Search button, click the **+** button to add a new filter.
   - In the new action list, change the selection to **Type**. In the action list to the right, select either Patch or Patchset, or both, then click **Close**.
6. In the Patch Search Results list, if a patch set is available for the specified release and platform, then it is listed here.

   Patch sets for Oracle databases are identified in the Description column as Oracle Database Family:Patchset *x.x.x.x* PATCH SET FOR ORACLE DATABASE SERVER.

7. Click the number of the patch set in the first column of the Patch Search Results. On the right-hand side of the patch set information page, click View Read Me to view the Patch Set Notes, or the README file, for that patch. The README page contains information about the patch set and how to apply the patches to your installation.
8. To download the patch to your local file system, click the Download button on the patch set information page.

9. Use the unzip utility provided with Oracle Database 11*g* release 2 (11.2) to uncompress the Oracle patch updates that you downloaded from My Oracle Support. The unzip utility is located in the `Oracle_home\bin` directory.

4.1.2 Configure Exceptions for the Windows Firewall

If the Windows Firewall feature is enabled on one or more of the nodes in your cluster, then virtually all 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 connections report errors.

If the Windows Firewall feature is enabled on one or more nodes of your Oracle RAC cluster, you must create exceptions for Oracle RAC applications and ports as described in *Oracle Grid Infrastructure Installation Guide for Microsoft Windows*.

4.1.3 Configure Oracle Products

Many Oracle products and options must be configured before you use them for the first time. Before using individual Oracle Database 11*g* release 2 (11.2) database products or options, refer to the manual in the product documentation library which is available in the DOC directory on the Oracle Database installation media, or on the OTN Web site.

4.1.3.1 Configuring Oracle Database Vault

If you installed Oracle Database Vault during Oracle RAC installation, then you must register Oracle Database Vault with the database and create database user accounts.

> **See Also:** *Oracle Database Vault Administrator's Guide* for more information about configuring Oracle Database Vault after installation

4.1.3.2 Configuring Oracle Database Security Settings

To enable or disable the database security configuration after installation, you must use command line DBCA options. By design, the DBCA graphic 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 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 your platform for more information about enabling and disabling the database security option

4.1.4 Configure 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), Oracle Cluster File System (OCFS) for Windows, or a supported network file system (NFS).

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 they are consistent on each node. To avoid unpredictable results, you must make sure the same file is accessed from all nodes, or make sure the same file is used on all nodes.

4.2 Recommended Postinstallation Tasks

Oracle recommends that you complete the following tasks after installing Oracle RAC:

- Recompile all PL/SQL modules
- Set Up User Accounts
- Configuring Oracle Administration Assistant for Windows
- Using Oracle9i Language and Definition Files with Oracle Database 11g

4.2.1 Recompile all PL/SQL modules

Oracle recommends that you 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. This is an optional step but Oracle recommends that you do it immediately following installation, not at a later date.

1. Start SQL*Plus, as follows:

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

2. Run the `utlrp.sql` script, where *`Oracle_home`* is the Oracle home path:

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

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

4.2.2 Set Up User Accounts

For information about setting up additional optional user accounts, refer to *Oracle Database Platform Guide for Microsoft Windows*.

When you complete these procedures, you are ready to perform the initial configuration tasks described in Chapter 5, "Configuring Server Parameter Files in Oracle RAC".

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 2.0 of MMC ships with Windows Server 2003; version 3.0 of MMC is available

with Windows Server 2003 R2, Windows Server 2008 and Windows Server 2008 R2. Oracle recommends the latest MMC version available.

> **See Also:** Microsoft documentation at:
>
> http://www.microsoft.com/

4.2.4 Using Oracle9*i* Language and Definition Files with Oracle Database 11*g*

You can use Oracle9*i* database language and territory definition files with Oracle Database 11*g* release 2 (11.2).

To enable this functionality:

1. Run the `cr9idata.pl` script, by default located in *`Oracle_home`*`\nls\data\old`.

   Alternatively, before you install Oracle Database, you can run the Oracle Universal Installer setup command with the `b_cr9idata` variable set to true, as follows:

   ```
   setup.exe oracle.rsf.nlsrtl_rsf:b_cr9idata=true
   ```

2. Set the `ORA_NLS10` environment variable to point to the directory where you installed the new language and territory definition files, which by default are in *`Oracle_home`*`\nls\data`.
3. Restart the Oracle database.

4.3 Enabling and Disabling Database Options

When you install Oracle Database, by default certain 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

If you must enable or disable a particular database feature for an Oracle home, then 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
```

The possible values for *`db_option`* are described in the following table.

Value	Description
`dm`	Oracle Data Mining RDBMS Files
`dv`	Oracle Database Vault
`lbac`	Oracle Label Security
`olap`	Oracle OLAP
`partitioning`	Oracle Partitioning
`rat`	Oracle Real Application Testing
`ode_net_2`	Oracle Database Extensions for .NET 2.0

Before you run the `chopt` tool, you should shutdown any Oracle databases running from the Oracle home being modified. For example, to enable the Oracle Label Security option in your Oracle binary files, perform the following tasks:

1. Shutdown the Oracle RAC database, and any other databases running out of the Oracle home directory, using SRVCTL.

   ```
   srvctl stop database -d myRACdb
   ```

2. Use the Windows Services console to stop the service for each Oracle database that runs from the Oracle home being modified.

   For example, if your Oracle RAC database is named `myRACdb`, then on the first node of the cluster you would stop the OracleServiceMYRACDB1 service.

3. Change directories to the *`Oracle_home`*`\bin` directory.

   ```
   cd %ORACLE_HOME%
   ```

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

   ```
   chopt enable lbac
   ```

5. Use the Windows Services console to restart the services you stopped in Step 2.
6. Use SRVCTL to restart the databases you stopped in Step 1, for example:

   ```
   srvctl start database -d myRACdb
   ```

4.4 Using Older Oracle Database Versions with Grid Infrastructure

Review the following sections for information about using older Oracle Database releases with Oracle Clusterware 11*g* release 2 (11.2) installations:

- General Restrictions for Using Older Oracle Database Versions
- Using DBCA or Applying Patches for Oracle Database Release 10.x or 11.x
- Pinning Cluster Nodes for Oracle Database Release 10.x or 11.x
- Enabling the Global Services Daemon (GSD) for Oracle Database Release 9.2

4.4.1 General Restrictions for Using Older Oracle Database Versions

You can use Oracle Database release 9.2, release 10.x and release 11.1 with Oracle Clusterware and Oracle ASM release 11.2.

If you upgrade an existing version of Oracle Clusterware and Oracle ASM to Oracle grid infrastructure release 11.2 (which includes Oracle Clusterware and Oracle ASM), and also upgrade your Oracle RAC database to release 11.2, then the required configuration of existing databases is completed automatically.

If you plan to use Oracle Clusterware and Oracle ASM release 11.2 with Oracle RAC 10.x or 11.1, then you must complete additional configuration tasks as described in the following sections. You also must apply patches to the Oracle RAC 10.x or 11.1 software installations before Oracle RAC 10.2 and 11.1 will work correctly with Oracle Clusterware 11.2 and Oracle ASM 11.2. Refer to the *Oracle Database Readme* for information about specific patches.

Note: If you are upgrading Oracle RAC or Oracle Database from releases 11.1.0.7, 11.1.0.6, or 10.2.0.4, and you have upgraded to Oracle Clusterware and Oracle ASM release 11.2, then Oracle recommends that you check for the latest recommended patches for the release you are upgrading from, and install those patches as needed before upgrading to Oracle RAC or Oracle Database release 11.2.

For more information on recommended patches, refer to "Oracle Upgrade Companion," which is available through Note 785351.1 on My Oracle Support:

https://metalink.oracle.com

You can also refer to Oracle Support Notes 756388.1 and 756671.1 for the current list of recommended patches for each release.

See Also: "Download and Install Patch Updates" on page 4-1

4.4.2 Using DBCA or Applying Patches for Oracle Database Release 10.x or 11.x

Before you use DBCA to create an Oracle RAC or Oracle Database 10.x or 11.1 database on an Oracle Clusterware and Oracle ASM release 11.2 installation, you must install patches to the Oracle RAC or Oracle Database home. Refer to the *Oracle Database Readme* for information about specific patches.

See Also: "Download and Install Patch Updates" on page 4-1

Before applying any patches to your Oracle Database 10*g* release 2 software or Oracle Database 11*g* release 1 software, you must first stop the `OracleRemExecService` Windows service on all the nodes in your cluster. If you do not stop this process before applying patches to your Oracle Database 10*g* release 2 or Oracle Database 11*g* release 1 database, then you will receive errors during the patching operation and the Oracle software will not be patched correctly.

4.4.3 Pinning Cluster Nodes for Oracle Database Release 10.x or 11.x

When Oracle Database version 10.x or 11.x is installed on a new Oracle Grid Infrastructure for a cluster configuration, it is configured for dynamic cluster configuration, in which some or all internet protocol (IP) addresses are provisionally assigned, and other cluster identification information is dynamic. This configuration is incompatible with older database releases, which require fixed addresses and configurations.

You can change the nodes where you want to run the older database to create a persistent configuration. Creating a persistent configuration for a node is called pinning a node.

To pin a node in preparation for installing an older Oracle Database version, use *`CRS_home`*`\bin\crsctl` with the following command syntax, where *`nodes`* is a space-delimited list of one or more nodes in the cluster whose configuration you want to pin:

```
crsctl pin css -n nodes
```

For example, to pin nodes `node3` and `node4`, log in as an Administrator user and enter the following command:

```
C:\> crsctl pin css -n node3 node4
```

To determine if a node is in a pinned or unpinned state, use *CRS_home*\bin\olsnodes with the following syntax:

```
olsnodes -t -n
```

For example, to list all pinned nodes, use the following command:

```
C:\> app\11.2.0\grid\bin\olsnodes -t -n
node1 1       Pinned
node2 2       Pinned
node3 3       Pinned
node4 4       Pinned
```

To list the state of a particular node use the -n option, as shown in the following example:

```
C:\> app\11.2.0\grid\bin\olsnodes -t -n node3
node3 3       Pinned
```

See Also: *Oracle Clusterware Administration and Deployment Guide* for more information about pinning and unpinning nodes

4.4.4 Enabling the Global Services Daemon (GSD) for Oracle Database Release 9.2

To install an Oracle Database version 9.2 on a cluster running Oracle Clusterware 11*g* (version 11.1 or higher), perform the following additional configuration steps to prevent permission errors:

1. Create the OracleCRSToken_*username* Windows service for the Oracle9*i* software owner on each node in the cluster. After the service is created, change the ownership for the Global Services daemon (GSD) resource to the Oracle9*i* software owner.

   Run the following commands on each node using the specified syntax, where *Grid_home* is the Oracle Grid infrastructure home, *92_user_domain* is the domain of the Oracle9*i* software owner, *92_username* is the user name of the Oracle9*i* software owner, and *nodename* is the name of the node on which the service is being configured:

   ```
   Grid_home\bin\crsctl add crs administrator 92_domain/92_username
   Grid_home\bin\crsctl setperm resource ora.nodename.gsd -o 92_username
   ```

   For example, if the Oracle Clusterware home is C:\app\11.2.0\grid, the domain is ORAUSERS, the node name is node1, and the username is ora92, then you would enter the following commands:

   ```
   C:\app\11.2.0\grid\bin> crsctl add crs administrator ORAUSERS/ora92
   C:\app\11.2.0\grid\bin> crsctl setperm resource ora.node1.gsd
    -o ORAUSERS/ora92
   ```

2. Enable and start the GSD daemon on all nodes in the cluster.

   On any node in the cluster, run commands using the following syntax, where *Grid_home* is the Oracle Grid infrastructure home:

   ```
   Grid_home\bin\srvctl enable nodeapps -g
   Grid_home\bin\srvctl start nodeapps
   ```

For example, if the Oracle Clusterware home is `C:\app\11.2.0\grid`, then enter the following commands:

```
C:\app\11.2.0\grid\bin> srvctl enable nodeapps -g
C:\app\11.2.0\grid\bin> srvctl start nodeapps
```

4.5 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, as login privileges are no longer required, the account is locked.

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

```
Oracle_home\ccr\admin\scripts\installCCRSQL.exe collectconfig -s SID -r \
SYSDBA-USER
```

The script `installCCRSQL.exe` creates an Oracle Configuration Manager user and loads the PL/SQL procedure into the database defined by the `ORACLE_SID`. 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`:

```
Oracle_home\ccr\admin\scripts\installCCRSQL.exe collectconfig -s orcl
```

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

By default, the connection to the database is through operating system authentication, "`/as sysdba`." To specify a different user and password, you can use these options:

`-r SYSDBA-USER`: The login name for the user with a `SYSDBA` role

`-p SYSDBA-PASSWORD`: The password for the user with a `SYSDBA` role

Note:

- If you specify the user without specifying the password, then you are prompted to enter the password.
- If you specify only the password without specifying the user name, then the user `SYS` is used by default.

See Also:

- *Oracle Configuration Manager Installation and Administration Guide* for further information
- *Oracle Database Vault Administrator's Guide* for additional configuration tasks

4.5.1 Additional Step for Oracle Enterprise Manager Grid Control

If the database is used as a repository for Oracle Enterprise Manager Grid Control, then you must also run the following script:

```
Oracle_home\ccr\admin\scripts\installCCRSQL.exe collectemrep
```

When you run this command, the application prompts you for the `SYSMAN` password. To automate the installation, run the `installCCRSQL` script to specify the `SYSMAN` password. For example:

```
Oracle_home\ccr\admin\scripts\installCCRSQL.exe collectemrep
   -e SYSMAN PASSWORD
```

You can add the `-s SID` command to specify the `SID` of the Oracle Enterprise Manager Grid Control Database instance. You must run this script from the *Oracle_home* in which the Oracle Enterprise Manager Grid Control database has been hosted.

If you are not using operating system authentication to connect to the database, then you must use the `-r` and `-p` parameters to specify the following:

`-r SYSDBA-USER`: The login name of the `SYSDBA` user

`-p SYSDBA-PASSWORD`: The password for the `SYSDBA` user

If you do not specify the `-p` parameter, then you are prompted to enter the password for the specified user.

5

Configuring Server Parameter Files in Oracle RAC

Oracle Database uses parameter settings in parameter files to determine how to control various database resources. You can use two types of files for parameter administration: the server parameter file (SPFILE) or one or more traditional client-side parameter files (PFILEs). Oracle recommends that you manage parameters using an SPFILE. If you use client-side parameter files, then Oracle does not preserve parameter changes made for self-tuning after shutdown.

This chapter describes server parameter file (SPFILE) placement and configuration in Oracle Real Application Clusters (Oracle RAC) environments.

This section contains the following topics:

- About the Server Parameter File
- Creating Server Parameter Files for Oracle RAC
- Storage Requirements for the Server Parameter File in Oracle RAC
- Parameter File Search Order in Oracle RAC
- Migrating to the SPFILE in Oracle RAC Environments
- Server Parameter File Errors in Oracle RAC

> **See Also:** *Oracle Real Application Clusters Administration and Deployment Guide* for more information about parameters, and for a discussion of parallel execution-related parameters in Oracle RAC data warehouse environments

5.1 About the Server Parameter File

When you create the database, Oracle Database creates an SPFILE in the file location that you specify. This location can be an Oracle ASM disk group, a cluster file system, or a shared raw device. The Oracle ASM instance also uses a SPFILE.

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.

Note: Oracle recommends that you avoid modifying the values for self-tuning parameters; overriding these settings can affect performance adversely.

With Oracle Database 11*g* release 2 and later databases, Database Agent automatically maintains the SPFILE based on the value you specify in the SRVCTL command `srvctl add/modify -d` *dbname* `-p` *spfile*, where *dbname* is the database unique name and *spfile* is the name of the SPFILE. You do not have to create or maintain `init`*ORACLE_SID*`.ora` files.

The default location of the database server parameter file (SPFILE) is in the following path:

```
Oracle_home\database\SPFILE%ORACLE_SID%.ORA
```

Using local storage as the default location of the server parameter file is inappropriate for Oracle RAC databases and Oracle ASM instances, because all instances used in a cluster database must use the same server parameter file. See "Storage Requirements for the Server Parameter File in Oracle RAC" on page 5-3.

> **See Also:** *Oracle Database Administrator's Guide* for more information about managing and modifying parameter files

5.2 Creating Server Parameter Files for Oracle RAC

To use DBCA to create your database and configure it to use a server parameter file, perform the following steps:

1. Start DBCA.
2. When the Initialization Parameters page appears, select **Create server parameter file (SPFILE)** under the File Locations tab.
3. After you have made this selection, then enter either a shared file system filename, or enter the storage path in the **Server Parameters Filename** field.

> **Note:** When you use DBCA to create the server parameter file, the default `SPFILE` file name is *Oracle_home*`\database\init%`*ORACLE_SID*`%.ora`

If you manually create your database, then Oracle recommends that you create an SPFILE from an initialization parameter file (PFILE).

If you must use local storage, then, for Windows-based platforms, Oracle recommends that you use a PFILE in this directory:

```
Oracle_home\database\init%ORACLE_SID%.ora
```

This recommended location is valid for each instance and refers to a single, non-shared initialization parameter file. Each PFILE should contain an entry for the parameter SPFILE that points to the location of the shared server parameter file to use. For example, if you use NFS for shared storage, then the local PFILE should contain an entry similar to the following:

```
SPFILE='\\.\dbname_SPFILE'
```

However, if you use a cluster file system, then use a SPFILE location similar to the following:

```
SPFILE=shared_location\dbname\spfiledbname.ora
```

In this syntax example, the variable *shared_location* is the shared storage location, and the variable *dbname* is the database name.

If you are upgrading from a previous Oracle Database release, then review the section "About the Server Parameter File" on page 5-1

5.3 Storage Requirements for the Server Parameter File in Oracle RAC

All instances in an Oracle Real Application Clusters environment must use the same server parameter file. Place the server parameter file on shared storage, such as in an Oracle ASM disk group, a cluster file system, or on a network file system (NFS). Otherwise, place the server parameter file on a shared raw device that is at least 5 MB, although this is not recommended.

5.4 Parameter File Search Order in Oracle RAC

Oracle Database searches for your parameter file in the following order:

1. `Grid Plug and Play profile`
2. *`Oracle_home`*`\database\spfile`*`sid`*`.ora`
3. *`Oracle_home`*`\database\spfile.ora`
4. *`Oracle_home`*`\database\init`*`sid`*`.ora`

5.5 Migrating to the SPFILE in Oracle RAC Environments

Migrate to the SPFILE by creating and editing the server parameter file using the procedures described in this section.

If your Oracle RAC database does not use a SPFILE, then you can migrate to the SPFILE file by completing the following procedures:

1. Combine the initialization parameter files (PFILEs) for all the instances of your Oracle RAC database into one `init`*`dbname`*`.ora` file by copying all shared `IFILE` contents *as is*. All parameters defined in your `IFILE` parameter files are global. Therefore, create them in the format *parameter=value*, without `SID` prefixes.
2. Copy all instance-specific parameter definitions from `init`*`sid`*`.ora` files using the following syntax, where the variable *`sid`* is the `SID` of the instance:

   ```
   sid.parameter=value
   ```

   For example, if your Oracle RAC database is named `sales`, and the instances have SIDs of `sales1`, `sales2`, and so on, then the parameters copied from each IFILE would have the following format:

   ```
   sales1.LICENSE_MAX_USERS=value
   sales2.LICENSE_MAX_USERS=value
   ...
   ```

3. If you are using a cluster file system, then Oracle recommends that you use the following command to define the location of the new SPFILE, where *db_unique_name* is the database unique identifier and *`spfile`* is the name of the SPFILE:

   ```
   C:\..bin> srvctl modify database -d db_unique_name -p spfile
   ```

   You can also create the server parameter file using the `CREATE SPFILE` statement as in the following example:

   ```
   SQL> CREATE SPFILE='?\database\spfile_dbname.ora'
   2>   FROM PFILE='?\database\initdbname.ora'
   ```

If you are using Oracle ASM for shared storage, then you can use the following syntax to create the server parameter file, where *disk_group_name* is the disk group name, *db_uniquename* is the database name, *dbname* is the database name, *Oracle_home* is the Oracle home path, and `init`*dbname*`.ora` is the file you created in Step 1:

```
SQL> CREATE SPFILE='+disk_group_name\db_uniquename\spfiledbname.ora'
SQL> FROM PFILE='Oracle_home\database\initdbname.ora'
```

The `CREATE SPFILE` SQL statement reads the `init`*dbname*`.ora` file that you created by merging your IFILEs, and then transfers the settings for the parameters from the merged file into your server parameter file.

4. Oracle recommends that you use the SPFILE by configuring the PFILE to point to the location of the SPFILE. Do this by including an entry for SPFILE in the local PFILE, and then running the `STARTUP` command as in the following example, where the SID variable in `init`*sid*`.ora` is the SID on the local Oracle RAC instance. For example:

```
SQL> STARTUP PFILE=Oracle_home\database\initsid.ora
```

If you use this `STARTUP` command syntax, then Oracle Database uses SPFILE parameter setting in the PFILE to obtain the server parameter file specified in the file `init`*sid*`.ora`.

Note: With Oracle ASM 11*g* release 2 and later releases, the SPFILE for the Oracle ASM instance can be stored in Oracle ASM. You can also place an Oracle ASM instance SPFILE on a shared file system, or you can use a traditional client-side parameter file for each Oracle ASM instance.

See Also: *Oracle Database Storage Administrator's Guide* for more information about administering an Oracle ASM instance

5.6 Server Parameter File Errors in Oracle RAC

Oracle Database reports errors that occur during server parameter file creation, or while reading the file during startup. If an error occurs during a parameter update, then Oracle records the error in the database alert log file, and ignores subsequent parameter updates to the file. If this happens, then do either of the following:

- Shut down the instance, recover the server parameter file, and restart the instance.
- Enable the instance to continue running without regard for subsequent parameter updates.

Oracle Database displays errors for parameter changes that you attempt when you incorrectly use the `ALTER SYSTEM SET` statement. Oracle Database does this when an error occurs while reading from or writing to the server parameter file.

See Also: *Oracle Real Application Clusters Administration and Deployment Guide* for more information about backing up the `SPFILE`

6

Configuring Server Pools and Oracle Enterprise Manager Database Control

This chapter describes server pool and Oracle Enterprise Manager Database Control configuration in Oracle Real Application Clusters (Oracle RAC) environments.

This chapter contains the following topics:

- Understanding Server Pools
- Configuring Oracle Enterprise Manager Database Control

6.1 Understanding Server Pools

Server pools are logical divisions of a cluster into pools of servers, which are allocated to host databases or other applications. Server pools are managed using `crsctl` and `srvctl` commands.

Each server pool name must be unique within the cluster. You cannot have two server pools using the same name.

There are two styles of server pool management:

- **Administrator-managed**: Database administrators define on which servers a database resource should run, and place resources manually as needed. This is the management strategy used in previous releases.
- **Policy managed**: Database administrators specify in which server pool (excluding generic or free) the database resource should run. Oracle Clusterware is responsible for placing the database resource on a server within that server pool.

  The server pool name is a required attribute. You can also provide values for the following attributes; if you do not specify them, then they are set to the default value:

  - **MIN_SIZE**: Minimum number of servers on which you want a resource to run. The default is `0`.
  - **MAX_SIZE**: Maximum number of servers on which you want a resource to run. The default is `-1`, which indicates that resources can run on all available nodes in the cluster.
  - **IMPORTANCE**: The relative importance of the server pool, used to determine how to reconfigure servers when a node joins or leaves the cluster. The default is `0`.

Note: Clients accessing Oracle Database 11*g* release 2 and later databases that are policy-managed should access the database using the single client access name (SCAN). This is recommended because policy-managed databases can run on different servers at different times.

6.1.1 Policy-based Cluster and Capacity Management

Using policy-based server pool management, database administrators define resource requirements for the workload, including the following:

- Defining the number of servers or instances preferred for the application. Oracle Clusterware automatically allocates resources up to the number specified, so long as they are physically available, and relocates a resource to another node as necessary.
- Defining the number of instances required to support the application.

Resources are no longer defined as belonging to a specific instance or node. Instead, the priority of resource requirements is defined.

See Also: *Oracle Real Application Clusters Administration and Deployment Guide* for more information about policy-based management and server pools

6.2 Configuring Oracle Enterprise Manager Database Control

You can use DBCA, which provides a graphical user interface to configure your Oracle RAC database. However, if you prefer to use a command-line interface to configure Database Control for your database, then you can use the Oracle Enterprise Manager Configuration Assistant (EMCA) utility.

The following sections describe how Oracle Enterprise Manager Database Control can be configured after installation:

- Understanding EMCA with Oracle RAC
- Using DBCA to Configuring an Existing Database to Use Database Control
- Configuring Database Control After Installation Using EMCA
- Reconfiguring Existing Database Control Configurations on Remote Nodes
- Updating Database Control Configuration When Adding and Removing Nodes
- Using an Input File for EMCA Parameters
- Specifying the Ports Used By Database Control
- EMCA Troubleshooting Tips

6.2.1 Understanding EMCA with Oracle RAC

When you use EMCA to configure Oracle Enterprise Manager Database Control for Oracle RAC, you configure Database Control for each instance in the cluster. However, by default, the Database Control console starts only on the local node. On every other node of the cluster, only the Oracle Enterprise Manager agent starts. This is because the Database Control console opens several connections to the database. If an instance of the console is running on every host in the cluster, then you may easily exceed the

maximum number of permitted open connections on a 32-node or 64-node environment.

When Database Control console is started on the local node, on every other node, the commands `emctl start dbconsole` and `emctl stop dbconsole` start and stop only the Oracle Enterprise Manager agent. Each of the remote agents upload their respective data to the Database Control console running on the local node, where you can monitor and manage all the targets in the cluster.

> **See Also:** Appendix G, "Oracle Enterprise Manager Configuration Assistant (EMCA) Reference"

6.2.2 Using DBCA to Configuring an Existing Database to Use Database Control

The primary method for configuring an existing Oracle Database 11*g* release 2 (11.2) database to be managed with Oracle Enterprise Manager Database Control is to use DBCA. You can use DBCA to create a database or to reconfigure an existing database.

> **See Also:** "Installing Oracle Software and Building the Database" in *Oracle Database 2 Day DBA* for more information about using DBCA to create a database instance, and *Oracle Database 2 Day + Real Application Clusters Guide* for Oracle RAC examples using DBCA

To use DBCA to reconfigure your database so it can be managed with Database Control:

1. Log in to the database host as an Administrator user.
2. Click **Start**, and select **Programs**, then **Oracle - *Oracle_home name***. In the **Configuration and Migration Tools**, folder select **Database Configuration Assistant**.

   The DBCA Welcome page appears.
3. Advance to the Operations page and select **Configure Database Options**.
4. Advance to the Database page and select the database you want to configure.
5. Advance to the Management Options page and select the following options:
   - **Configure the Database with Enterprise Manager**
   - **Use Database Control for Database Management**
6. Optionally, select the options for enabling e-mail notifications and enabling daily backups.

   For more information about Oracle Enterprise Manager notifications and daily backups, click **Help** on the Management Options page.
7. Advance until the Finish button is available.
8. Click **Finish** to reconfigure the database so it uses Database Control.

   After DBCA reconfigures the database, a new subdirectory appears in the Oracle home. This directory contains Database Control configuration and state files specific to the database you just configured. For Oracle RAC databases, this directory is named using the following format:

   nodename_dbuniquename

For example, node `node1` in the Oracle RAC database `myNewDB` appears as follows:

```
node1.example.com_myNewDB
```

6.2.3 Configuring Database Control After Installation Using EMCA

Oracle Enterprise Manager Configuration Assistant (EMCA) provides a command-line interface for configuring Database Control.

Caution: During configuration of Database Control using EMCA, the database may become unavailable and users may not be able to connect to the database or perform operations on the database.

To configure Database Control with EMCA:

1. Set the default Oracle home to the location of the home directory for the database you are modifying. See "Working with Multiple Oracle Home Directories on Windows" on page 7-2 for details.
2. Change directory to the *Oracle_home*\bin directory.
3. Start EMCA by entering the following command with any of the optional command-line arguments shown in Table G–1 in Appendix G:

   ```
   Oracle_home\bin> emca.bat
   ```

   Depending upon the arguments you include on the EMCA command line, EMCA prompts you for additional information required to configure Database Control.

   For example, enter the following command to configure Database Control so it performs automatic daily backups of your database:

   ```
   Oracle_home\bin> emca.bat -config dbcontrol db -backup
   ```

Note: To configure Database Console for single instance database using Oracle ASM, you do not have to include extra parameters in the EMCA command. Simply run the following command to configure the Database Console and EMCA automatically detects the Oracle ASM instance:

```
emca -config dbcontrol db -repos create
```

See Also: Appendix G, "Oracle Enterprise Manager Configuration Assistant (EMCA) Reference"

6.2.4 Reconfiguring Existing Database Control Configurations on Remote Nodes

If you upgrade an existing Oracle RAC database configured with Database Control to the current release, then the existing Database Control configuration is retained. For example, if you have an Oracle RAC 10*g* release 1 database, then the existing Database Control configuration has a Database Console running on each cluster node. If you upgrade this database to Oracle Database 11*g* release 2, then the Database Control console is still started on each individual node.

To modify the Database Control configuration on all the nodes in the cluster, use the following command:

```
emca -reconfig dbcontrol -cluster -EM_NODE nodename -EM_NODE_LIST NODE_list
```

where *nodename* is the public name of the node where the console runs and *NODE_list* is a comma-delimited list of nodes. This command reconfigures the current Database Control setup and performs the following actions in sequence:

1. Starts a Database Control Console on *nodename*, if one has not been started yet.
2. Redirects the agents monitoring the database instances on the nodes specified by *NODE_list* so that they upload their data to the console running on *nodename*. Also, agents monitoring database instances on *nodename* also upload their data to the local console. Note that if you do not enter the command options `-EM_NODE` or `-EM_NODE_LIST` at the command line, then you are prompted for them.

`-EM_NODE` defaults to the local node if not specified when prompted. `-EM_NODE_LIST` defaults to all nodes where the database is configured.

> **Caution:** If you use the command `emca -reconfig dbcontrol -cluster` to configure Database Control for Oracle RAC, then check the `TNS_ADMIN` environment variable on all cluster nodes. If you have a different `TNS_ADMIN` set for each node, then the listener for the target cannot be configured correctly. In this case, set the same `TNS_ADMIN` on all cluster nodes before running the `emca -reconfig dbcontrol -cluster` command.

You can use this command to start the console on multiple nodes. For example, on an 8-node cluster with nodes node1, node2, node3, node4, node5, node6, node7, and node8, you can run the following commands in succession:

```
emca -reconfig dbcontrol -cluster -EM_NODE node1 -EM_NODE_LIST node2,node3,node4
emca -reconfig dbcontrol -cluster -EM_NODE node5 -EM_NODE_LIST node6,node7,node8
```

In this scenario, two Database Control consoles started: one on `node1` and the other on `node5`. You can manage and monitor all targets in the cluster from either of these two consoles.

For information on the current cluster configuration, you can run the following command:

```
emca -displayConfig dbcontrol -cluster
```

This command prompts for the database unique name for the cluster database. It prints the current configuration to the screen, indicating the nodes that have consoles running on them and the consoles where each agent is uploading.

> **See Also:** Appendix G, "Oracle Enterprise Manager Configuration Assistant (EMCA) Reference"

6.2.5 Updating Database Control Configuration When Adding and Removing Nodes

On cluster policy managed databases, another common operation is the addition and deletion of cluster nodes. After you add a new node, you can run EMCA to configure Database Control or central agent management for that node using the command `emca -addNode db`. Running EMCA only configures Oracle Enterprise Manager so

that you can manage the instance in a way consistent with the rest of the cluster database instances.

When configuring Oracle Enterprise Manager for a new node, run the EMCA command only after you have added the node. Also, run the command from a node in the cluster that has Oracle Enterprise Manager configured for it, because the Oracle Enterprise Manager configuration settings on the existing node are propagated to the new node when you run the command. Because the `-addNode` option can be used only in an Oracle Real Application Clusters environment, you do not have to use the `-cluster` option on the command line.

After running the command `emca -addNode db`, enter the node name and database unique name for the node and database. For example:

```
Node name: node2
Database Unique Name: EM102
```

To deconfigure Oracle Enterprise Manager for a specific node you are deleting from the cluster, log in to a different node from the one you plan to delete, and use the command `emca -deleteNode db`. Running this command removes the Oracle Enterprise Manager configuration so that you are no longer able to manage the instance with Oracle Enterprise Manager on that node. Ensure that you run the EMCA command before you delete the actual cluster node. Because this option can be used only in an Oracle Real Application Clusters environment, you do not have to use the `-cluster` option on the command line.

> **See Also:** Appendix G, "Oracle Enterprise Manager Configuration Assistant (EMCA) Reference"

6.2.6 Using an Input File for EMCA Parameters

Instead of answering a series of prompts when you run EMCA, you can use the `-respFile` argument to specify an input file. The input file you create must be in a format similar to the following example:

```
PORT=1521
SID=DB
DBSNMP_PWD=xpE234D
SYSMAN_PWD=KDOdk432
```

After you create an EMCA input file, you can use it on the command line as follows:

```
Oracle_home\bin> emca -config dbcontrol db -respFile input_file_path
```

For example, to configure Database Control to perform daily backups and create the Database Control Management Repository, create an input file similar to the one shown in the following example:

```
PORT=1521
SID=DB
DBSNMP_PWD=dow31224
SYSMAN_PWD=squN3243
HOST_USER=johnson
HOST_USER_PWD=diTf32of
SYS_PWD=qlKj4352
BACKUP_SCHEDULE=06:30
```

When you have created the input file, then enter the following command at the operating system prompt:

```
Oracle_home\bin> emca -config dbcontrol db -repos create -backup -respFile
```

input_file_path

> **See Also:** Appendix G, "Oracle Enterprise Manager Configuration Assistant (EMCA) Reference"

6.2.7 Specifying the Ports Used By Database Control

When you initially install Oracle RAC 11*g* release 2 (11.2) or configure Database Control with EMCA, Database Control uses a set of default system ports. For example, by default, you access Database Control using port 1158 in Oracle Database 11*g* release 2 (11.2), as in:

```
http://host.domain:1158/em
```

This is the default port assigned to Database Control by the Internet Assigned Numbers Authority (IANA). Likewise, the default Database Control Agent port, as assigned by the IANA, is 3938.

To use ports other than the default ports, use the following EMCA command-line arguments when you initially configure Database Control with EMCA.

> **Note:** You can also use the following EMCA command-line arguments to configure Database Control after you have installed and configured Oracle RAC 11*g* release 2 (11.2).

The following list summarizes the EMCA command-line arguments that control the standard Database Control port assignments:

- -DBCONTROL_HTTP_PORT *port_number*

  This port number is used in the Database Control Console URL. For example, if you set this port to 5570, then you can then display the Database Control Console using the following URL:

  ```
  http://host.domain:5570/em
  ```

- -RMI_PORT *port_number*

  This port number is used by the Remote Method Invocation (RMI) system, which is part of the J2EE software required by Database Control. The default port can be changed if the user wants to configure a specific port for Database Console. When a port other than the default port (1521) is used, use the -RMI_PORT or -JMS_PORT options along with the emca reconfig command.

- -JMS_PORT *port_number*

  This port is used by the OC4J Java Message Service (JMS), which is part of the J2EE software required by Database Control. The default port can be changed if the user wants to configure a specific port for Database Console. When a port other than the default port (1521) is used, use the -RMI_PORT or -JMS_PORT options along with the emca reconfig command.

- -AGENT_PORT *port_number*

  This port is used by the Database Control Management Agent, which is monitoring and administering the database for the Database Control.

Alternatively, you can explicitly assign ports after configuring Database Control using the following command, where *arguments* refers to the command-line arguments listed previously for specifying the ports:

```
emca -reconfig ports [-cluster] [arguments]
```

See Also: Appendix G, "Oracle Enterprise Manager Configuration Assistant (EMCA) Reference"

6.2.8 EMCA Troubleshooting Tips

The following section describes some troubleshooting tips to consider when using EMCA to configure the Database Control:

- Using EMCA After Changing the Database Listener Port
- Upgrading Grid Control Agents for Oracle Database 11g Release 2
- Using EMCA After Changing the Database Host Name or IP Address
- Using EMCA When the TNS Configuration Is Changed

See Also: Appendix G, "Oracle Enterprise Manager Configuration Assistant (EMCA) Reference"

6.2.8.1 Using EMCA After Changing the Database Listener Port

If you change the listener port of the database after you have configured Database Control, then the database status appears as down. To reconfigure Database Control to use the new listener port, run the EMCA command using the `-config dbcontrol db [-cluster]` command-line arguments.

6.2.8.2 Upgrading Grid Control Agents for Oracle Database 11*g* Release 2

When upgrading an Oracle Database 10*g* release 1 database instance that was configured for Oracle Enterprise Manager (either Database Control or a Grid Control central agent) to an Oracle Database 11*g* release 2 (11.2) database, all Oracle Enterprise Manager targets for the upgraded instances are updated automatically. This is because the upgrade involves altering the Oracle home for the instance, the port numbers, or other target-associated properties.

If an upgraded target is managed by a Grid Control Agent, then it might not be updated successfully during the upgrade. To update these targets, perform the following steps:

1. Use Grid Control to access the Home page of the upgraded target.
2. On the Home page for the upgraded target, select **Monitoring Configuration**.
3. On the Monitoring Configuration page, update the properties to the correct values as needed, for example, Oracle home, listener port and so on.

6.2.8.3 Using EMCA After Changing the Database Host Name or IP Address

After changing the database host name (including the domain name) or the IP address for a node, you must deconfigure Database Console for that database and then reconfigure it using EMCA with the `-repos create` flag. For example:

```
emca -deconfig dbcontrol db -repos drop
emca -config dbcontrol db -repos create
```

or

```
emca -deconfig dbcontrol db
emca -config dbcontrol db -repos recreate
```

6.2.8.4 Using EMCA When the TNS Configuration Is Changed

When the TNS configuration is changed, set the environment variable and then run the following command:

```
emca -config dbcontrol db
```

7

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
- Working with Multiple Oracle Home Directories on Windows
- Database Components Created Using Database Configuration Assistant
- Managing Undo Tablespaces in Oracle RAC
- Initialization Parameter Files
- Oracle Database Default Audit Policy and Initialization Parameters
- Understanding Service Registration-Related Parameters
- Configuring the Listener File (listener.ora)
- Net Service Names (tnsnames.ora File)
- Net Services Profile (sqlnet.ora File)

7.1 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 in your cluster database.

Avoid changing host names after you complete the Oracle RAC installation, including adding or deleting domain qualifications. host names are created with 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 name.

7.2 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 than other Oracle products. `ORACLE_BASE` is defined in the registry (for example, in `HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE\HOME0`). `ORACLE_HOME` and `ORACLE_SID` are variables defined in the registry. Symbolic links like those on UNIX are not supported.

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

Oracle Universal Installer sets environment variables such as `ORACLE_BASE`, `ORACLE_HOME`, and `ORACLE_SID` in the registry and also the `PATH` environment variable. In Linux and UNIX systems, you must manually set these environment variables in your user session or session profile.

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

1. Run the Oracle Universal Installer (OUI), version 10.x or higher.
2. Click the **Installed Products** button.
3. Select the Environment tab at the top of the window.
4. Move the `ORACLE_HOME` that you want as your default to the top of the list.
5. Apply the changes, and exit the installer.

This procedure changes 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.

7.3 Database Components Created Using Database Configuration Assistant

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

- Tablespaces and Data files
- Control Files
- Redo Log Files

7.3.1 Tablespaces and Data files

For both single-instance and cluster database environments, an 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 7–1 shows the tablespace names used by an Oracle RAC database and the types of data they contain.

Table 7–1 Tablespace Names Used with Oracle Real Application Clusters Databases

Tablespace Name	Contents
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.
SYSAUX	An auxiliary system tablespace that contains the DRSYS (contains data for Oracle Text), CWMLITE (contains the OLAP schemas), XDB (for XML features), ODM (for Oracle Data Mining), TOOLS (contains Oracle Enterprise Manager tables), INDEX, EXAMPLE, and OEM-REPO tablespaces.
USERS	Consists of application data. As you create and enter data into tables, Oracle Database fills this space with your data.
TEMP	Contains temporary tables and indexes created during SQL statement processing. You may have to expand this tablespace if you use 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*n*	Contains undo tablespaces for each instance that DBCA creates for automatic undo management.
RBS	If you do not use automatic undo management, then Oracle Database uses the RBS tablespace for the rollback segments.

You cannot alter these tablespace names when using the preconfigured database configuration options 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. The data file names created by the preconfigured database configuration options vary by storage type such as Oracle ASM, or a file system.

Windows-based platforms use the symbolic link names for the data file and other database files shown in Table 7–2:

Table 7–2 Windows-Based Platforms Symbolic Link Names and Files

Windows-Based Platforms Symbolic Link Names	Tablespace or Other Database Files
*db_name*_system	SYSTEM
db_name_SYSAUX	SYSAUX
*db_name*_users	USERS
*db_name*_temp	TEMP
*db_name*_undotbs1	UNDOTBS1
*db_name*_undotbs2	UNDOTBS2
*db_name*_rbs	RBS (optional)
*db_name*_example	EXAMPLE
*db_name*_indx	INDX
*db_name*_spfile	SPFILE
*db_name*_control1	Control File 1
*db_name*_control2	Control File 2

Table 7–2 (Cont.) Windows-Based Platforms Symbolic Link Names and Files

Windows-Based Platforms Symbolic Link Names	Tablespace or Other Database Files
*db_name*_redo_*instance_number log_number* Where *instance_number* is the number of the instance and *log_number* is the log number (1 or 2) for the instance.	Redo Log Files Each instance must have at least two redo log files. If the database name is db, then the link names for the first instance are: db_redo1_1 db_redo1_2 The link names for the second instance's redo log files are: db_redo2_1 db_redo2_2

7.3.2 Control Files

The database is configured with two control files that are stored on shared storage.

7.3.3 Redo Log Files

Each instance is configured with at least two redo log files that are stored in the shared storage. If you use a file system, then these files are shared file system files. If you use Oracle ASM, then these files are stored on the Oracle ASM disk group.

The file names of the redo log files that are created with the preconfigured database configuration options vary by storage type. Unless you are using a cluster file system, you must enter the block or raw device names.

7.4 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 undo tablespace management mode 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 redo logs.

> **See Also:** *Oracle Real Application Clusters Administration and Deployment Guide* for more information about managing undo tablespaces

7.5 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 use the same parameter file.

> **See Also:** Chapter 5, "Configuring Server Parameter Files in Oracle RAC" for more information about the creation and use of parameter files

7.6 Oracle Database Default Audit Policy and Initialization Parameters

Oracle Database installs a baseline database auditing policy. This policy covers the access control configuration information stored in Oracle Database database tables, information stored in Oracle Catalog (rollback segments, tablespaces, and so on), the use of system privileges, and Oracle Label Security configuration.

> **See Also:** *Oracle Database Vault Administrator's Guide* for more information about the database audit policy

7.7 Understanding Service Registration-Related Parameters

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

Standalone Oracle Databases perform load balancing by distributing connections among local dispatchers.

Oracle RAC databases increase load balancing by using the Oracle Clusterware SCANs (Single Client Access Name) to balance connections among all instances in a cluster database.

Review the following sections to understand Oracle RAC load-balancing features:

- Understanding Single Client Access Name (SCAN) and Load-balancing
- Understanding Load-Balancing, Failover, and High Availability

7.7.1 Understanding Single Client Access Name (SCAN) and Load-balancing

The Single Client Access Name (SCAN) is a fully qualified name (*host name+domain-name*) that is configured to resolve to all the addresses allocated for the SCAN. The addresses resolve using Round Robin DNS either on the DNS server, or within the cluster in a GNS configuration. SCAN listeners can run on any node in the cluster.

Oracle Database 11*g* 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.

SCANs run on the cluster, not on a cluster node. SCANs provide location independence for the databases, so that client configuration does not have to depend on which nodes run a particular database. For example, if you configure policy-managed server pools in a cluster, then the SCAN allows connections to databases in these server pools regardless of which nodes are allocated to the server pool.

SCANs function like a node virtual IP (VIP) address. However, SCANs are resolved to SCAN VIPs that run on any node in the cluster, so unlike a virtual IP address for a node, clients connecting to the SCAN no longer require updated virtual IP addresses as nodes are added to or removed from the cluster. Because the SCAN addresses resolve to the cluster, rather than to a node address in the cluster, nodes can be added to or removed from the cluster without affecting the SCAN address configuration.

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

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. Oracle Clusterware routes client application requests from the SCAN to the VIP on the least loaded instance providing the service.

Clients configured to use IP addresses for Oracle Database releases prior to Oracle Database 11*g* release 2 can continue to use their existing connection addresses; using SCANs is not required. When you upgrade to Oracle Clusterware 11*g* release 2 (11.2), the SCAN becomes available, and you should use the SCAN for connections to Oracle Database 11*g* release 2 or later databases. When an earlier version of Oracle Database is upgraded, it is registered with the SCAN, and clients can start using the SCAN to connect to that database.

7.7.2 Understanding Load-Balancing, Failover, and High Availability

Connection load balancing and failover increase availability by taking advantage of the redundant resources within a cluster database.

The Database Agent (previously known as `racgimon`) configures the `LOCAL_LISTENER` initialization parameters automatically. You do not have to alter this setting. Set the `REMOTE_LISTENER` to the SCAN port and SCAN using the SQL command `ALTER SYSTEM SET REMOTE_LISTENER`. If you change the SCAN port, then you must change the `REMOTE_LISTENER` configuration.

The `LOCAL_LISTENER` parameter identifies the local listener, and the `REMOTE_LISTENER` parameter identifies the global list of listeners. The `REMOTE_LISTENER` parameter is always set to the SCAN address. For example, if the name of the cluster is `mycluster`, and the domain is `example.com`, then the SCAN address is similar to `myscan.mycluster.example.com:1521`.

By default, DBCA configures your environment with dedicated servers. However, if you select the Shared server option when using DBCA, then Oracle configures the shared server. In this case, Oracle Database uses both dedicated and shared server processing. When shared servers are configured, the `DISPATCHERS` parameter is specified as in the following example:

```
DISPATCHERS="(protocol=tcp)"
```

If the `DISPATCHERS` initialization parameter does not specify the `LISTENER` attribute as in the previous example, then the PMON process registers information for all dispatchers with the listeners specified by the `LOCAL_LISTENER` and `REMOTE_LISTENER` parameters.

However, when the `LISTENER` attribute is specified, the PMON process registers dispatcher information with the listeners specified by the `LISTENER` attribute. In this case, setting the `LISTENER` attribute overrides `REMOTE_LISTENER` settings for the specified dispatchers as in the following example:

```
DISPATCHERS="(protocol=tcp)(listener=listeners_db_name)"
```

Note: Where the notation *db_name* appears in the previous example and throughout this chapter, it refers to the database name (or Oracle SID) that you entered when prompted by DBCA, or it refers to the entry you made for the `DATABASE` keyword of the `CREATE DATABASE` statement.

See Also: *Oracle Database Net Services Administrator's Guide* for further information about cross-instance registration, shared and dedicated server configurations, and connection load balancing

7.8 Configuring the Listener File (listener.ora)

You can configure two types of listeners in the `listener.ora` file as described in the following sections:

- Grid Naming Service (GNS) and Listeners
- Local Listeners
- Multiple Listeners
- How Oracle Database Uses the Listener File (listener.ora)

7.8.1 Grid Naming Service (GNS) and Listeners

If you enable Grid Naming Service (GNS), then manual listener configuration is not required.

In a GNS configuration, there is one GNS daemon for the cluster. Service requests to the cluster domain managed by GNS are routed to the GNS virtual IP address, which routes these requests to the GNS daemon.

The GNS daemon listens for registrations. When a SCAN virtual IP comes up, it registers its addresses with GNS. When GNS receives a request from a DNS for the SCAN, it sends back the registered addresses to the DNS.

7.8.2 Local Listeners

During Oracle Database creation, the `LOCAL_LISTENER` parameter is automatically configured to point to the local listener for the database. The Database Agent sets the `LOCAL_LISTENER` parameter to a connect descriptor that does not require a TNS alias.

You can set a value manually for `LOCAL_LISTENER`. However, Oracle recommends that you leave the parameter unset so that the Database Agent can maintain it automatically.

If you set `LOCAL_LISTENER`, then the Agent does not automatically update this value. If you do not set `LOCAL_LISTENER`, then the Database Agent automatically keeps the database associated with the Grid home's node listener updated, even as the ports or IP of that listener are changed.

See Also: *Oracle Database Net Services Administrator's Guide* for information about understanding and configuring listeners

The `tnsnames.ora` file is located in the path ORACLE_HOME\network\admin. By default, the `tnsnames.ora` file is read from the grid infrastructure home, in the path *Grid_home*`\network\admin`.

The listener association no longer requires `tnsnames.ora` file entries. The `REMOTE_LISTENER` is configured by DBCA to reference the SCAN name and port, without any need for a `tnsnames.ora` entry.

The following is an example of an Oracle RAC 11*g* release 2 (11.2) `tnsnames.ora` file:

```
# tnsnames.ora Network Configuration file:
C:\app\orauser\product\11.2.0\db_1\network\admin\tnsnames.ora
# Generated by Oracle Configuration tools
RACDB =
   (DESCRIPTION =
     (ADDRESS = (PROTOCOL = TCP)(HOST = myscan.mycluster.example.com)(PORT = 1521)
)
     (CONNECT_DATA =
       (SERVER = DEDICATED)
       (SERVICE_NAME = RACDB)
      )
    )
```

7.8.3 Multiple Listeners

If DBCA detects multiple listeners on the node, then it displays a list of the listeners. You can select one or all of these listeners with which to register your database.

> **Note:** To administer Oracle Database 11*g* release 2 (11.2) local and SCAN listeners using the `lsnrctl` command, make the grid infrastructure the default Oracle home. Do not attempt to use the `lsnrctl` commands from Oracle home locations for previous releases, as they cannot be used with the new release.

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

Services coordinate their sessions by registering their load 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. That Listener either redirects the client to a Dispatcher process (if the database was configured for Shared Server), or redirects the client to a dedicated server process. Local Listeners are configured to respond to database connection requests, and to non-database connection requests, such as external procedures or XDB requests.

The Listener agent dynamically updates endpoints with the listener. With the Oracle Database 11*g* release 2 installation, the `listener.ora` file now only contains an IPC key and the following information:

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

This information refers implicitly to the local node's HOST endpoint. The `listener.ora` file is the same on every node.

Before you install Oracle RAC, during the Oracle grid infrastructure installation, Oracle Net Configuration Assistant 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 Oracle RAC installation, the Oracle RAC database uses the Oracle Clusterware listener, and configures service information about the Oracle RAC database. An Oracle Database 11*g* release 2 (11.2) database service automatically registers its information with the listener, such as its service name, instance names, and load information. This

feature, called service registration, does not require configuration in the `listener.ora` file. After listener creation, Oracle Net Configuration Assistant starts the listener.

After installation, you can modify listeners by using `srvctl` commands, or by using NetCA. Manual editing of the `listener.ora` file is not required.

The following is an example `listener.ora` file with an entry for a node named `node1`:

```
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\orauser\product\11.2.0\db_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
```

7.8.4.1 Listener Registration and PMON Discovery

When a listener starts after the Oracle instance starts, and the listener is listed for service registration, registration does not occur until the next time the Oracle Database process monitor (PMON) discovery routine starts. By default, PMON discovery occurs every 60 seconds.

To override the 60-second delay, use the SQL `ALTER SYSTEM REGISTER` statement. This statement forces the PMON process to register the service immediately.

Oracle recommends that you create a script to run this statement immediately after starting the listener. If you run this statement while the listener is up and the instance is registered, or while the listener is down, then the statement has no effect.

> **See Also:** *Oracle Database Net Services Administrator's Guide* for further information about the listener and the `listener.ora` file

7.9 Net Service Names (tnsnames.ora File)

A `tnsnames.ora` file is created on each node with net service names. A connect identifier is an identifier that maps 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` for an Oracle Database

> **Note:** The `SERVICE_NAME` parameter you use in the `tnsnames.ora` file is singular, because you can specify only one service name. There is also the `SERVICE_NAMES` parameter in the database initialization file. The `SERVICE_NAMES` parameter defaults the global database name, a name comprising the `DB_NAME` and `DB_DOMAIN` parameters in the initialization parameter file.

With Oracle Clusterware 11*g* release 2 and later, Database Configuration Agent (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. For the `REMOTE_LISTENER` parameter, Oracle Clusterware uses the EZ connect syntax *scanname*:*scanport*, so no entries are needed for the `REMOTE_LISTENER` parameter in the `tnsnames.ora` file.

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

- Net Service Names for Database Connections
- Net Service Name Instance Connections
- tnsnames.ora Example File

7.9.1 Net Service Names for Database Connections

Clients that connect to any instance of the database use the SCAN name for the database. This entry also enables Oracle Enterprise Manager to discover an Oracle RAC database.

Three SCAN addresses are configured for the cluster, and allocated to servers. If the chosen address fails, then the connection request to the SCAN name fails over to the next address. Thus, if an instance fails, then clients can still connect using another instance.

In the following example, `myscan.mycluster.example.com` is used by the client to connect to the target database, `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)
    )
```

An Easy Connect address for this database should be similar to the following:

```
myscan.mycluster.example.com/mycluster.example.com
```

7.9.2 Net Service Name Instance Connections

Clients that connect to a particular instance of the database use the SCAN name for the instance. This entry, for example, enables Oracle Enterprise Manager to discover the instances in the cluster. These entries are also used to start and stop instances.

In the following example, Oracle Enterprise Manager uses `myscan.mycluster.example.com` to connect to an instance named `mycluster1` on node1:

```
mycluster1.example.com=
 (description=
  (address=(protocol=tcp)(host=myscan.mycluster.example.com)(port=1521))
  (connect_data=
    (service_name=mycluster.example.com)
    (instance_name=mycluster1)))
```

7.9.3 tnsnames.ora Example File

This example is a sample `tnsnames.ora` file that is created during a preconfigured database configuration installation.

```
# tnsnames.ora Network Configuration File:
C:\app\orauser\product\11.2.0\db_1\network\admin\tnsnames.ora
# Generated by Oracle configuration tools.

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

See Also: *Oracle Database Net Services Administrator's Guide* for further information about the `tnsnames.ora` file

7.10 Net Services Profile (sqlnet.ora File)

Oracle Universal Installer starts Oracle Net Configuration Assistant after the database is installed, and creates the Net Services profile, or `sqlnet.ora` file.

By default, the `sqlnet.ora` file is located in the following directory:

```
ORACLE_HOME\network\admin
```

In this directory, in addition to the default `sqlnet.ora` file generated during installation, you also can find a sample `sqlnet.ora` file in the directory `sample`.

During installation, Oracle Net Configuration Assistant creates the following entries in the `sqlnet.ora` file, where *Oracle_base* is the path to the Oracle RAC installation owner's Oracle base directory:

```
SQLNET.AUTHENTICATION_SERVICES= (NTS)
NAMES.DIRECTORY_PATH=(TNSNAMES, EZCONNECT)
ADR_BASE =Oracle_base
```

The parameter `NAMES.DIRECTORY_PATH` specifies the priority order of the naming methods to use to resolve connect identifiers to connect descriptors.

The Easy Connect naming method eliminates the need for service name lookup in the `tnsnames.ora` files for TCP/IP environments. With Easy Connect, clients use a connect string for a simple TCP/IP address, consisting of a host name and optional

port and service name. If you use this method, then no naming or directory system is required.

> **See Also:** *Oracle Database Net Services Administrator's Guide* for further information about the `sqlnet.ora` file

8

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 the Deinstall Tool
- Deinstalling Oracle RAC Software

> **See Also:** The product-specific documentation if you want to remove a single product to ensure that you are aware of requirements and restrictions that apply for that product

8.1 Overview of the Deinstall Tool

The Deinstallation tool removes Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM) from your server, and Oracle Real Application Clusters (Oracle RAC) or standalone Oracle Database installations. The deinstall tool performs the follows actions when removing software from an Oracle home directory:

- Identifies all instances associated with the Oracle home
- Shuts down processes
- Removes listeners installed in the Oracle Database home
- Removes database instances
- Removes Oracle Automatic Storage Management and Oracle Clusterware

> **Note:**
>
> - You cannot remove or uninstall the Oracle Database Vault option. However, you can disable it. Refer to *Oracle Database Vault Administrator's Guide* for more details.
> - You can remove Oracle Configuration Manager. Refer to *Oracle Configuration Manager Installation and Administration Guide* for more details.
> - You cannot remove or uninstall Oracle ASM separately from Oracle Clusterware or install it in a location outside of the Grid infrastructure home with Oracle Database 11*g* release 2 (11.2).

Caution: If any cluster member node has multiple databases with the same global database name (GDN) on a server, then you cannot use the `deinstall.bat` tool to remove one database only. 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.

8.2 Deinstalling Oracle RAC Software

The following sections describe the script, and provide information about additional options to use the tool:

- About the Deinstallation Tool
- Example of Running the Deinstall Command for Oracle RAC
- Example of a Deinstallation Parameter File for Oracle RAC

8.2.1 About the Deinstallation Tool

The Deinstallation Tool (`deinstall.bat`) is available in the installation media before installation, and is available in Oracle home directories after installation in the directory `%ORACLE_HOME%\deinstall`. The Deinstallation tool is also available for download from Oracle TechNet (`http://www.oracle.com/technology`). You can download it with the complete Oracle Database 11*g* release 2 software, or as a separate archive file.

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

The Deinstallation tool stops Oracle services, instances, and processes, and removes Oracle software and configuration files on the operating system for a specific Oracle home. At the end of the deinstallation process you are prompted to run the `rootcrs.pl` script as a user that is a member of the Administrators group.

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

```
deinstall -home complete path of Oracle home [-silent] [-checkonly] [-local]
[-paramfile complete path of input parameter property file] [-params name1=value
name2=value . . .] [-o complete path of directory for saving files] [-help | -h]
```

The options are:

- `-home`

  Use this flag to indicate the home path of the Oracle home to check or deinstall. To deinstall Oracle software using the Deinstallation tool located in the Oracle home being removed, provide a parameter file a location outside the Oracle home, and do not use the `-home` flag.

  If you run deinstall 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 standalone version of the tool, then `-home` is mandatory

- `-silent`

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

You can generate a properties file to use or modify by running `deinstall.bat` with the `-checkonly` flag. The `deinstall.bat` command then discovers information from the Oracle home to deinstall and deconfigure. It generates the properties file, which you can then use with the `-silent` option

You can also modify the template file `deinstall.rsp.tmpl`, located in the `response` folder of the Deinstallation tool archive or installation.

- `-checkonly`

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

  When you run `checkonly` to generate a properties file, you are prompted to provide information about your system. You can accept the default value the tool has obtained from your Oracle installation, indicated inside brackets ([]), or you can provide different values. To accept the defaults, click **Enter**.

- `-local`

  Use this flag on a multinode environment to deconfigure Oracle software in a cluster.

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

- `-paramfile` *`complete path of input parameter property file`*

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

  The default location of the parameter file depends on the location of the Deinstallation tool:

  – From the installation media or stage location: <*Drive*> : *staging_location*\ `deinstall\response`

  – From a unzipped archive file downloaded from OTN: <*Drive*>:*ziplocation*\ `deinstall\response`, where <*Drive*>:*ziplocation* refers to the directory in which the downloaded archive file was extracted.

  – After installation, from the installed Oracle home: `%ORACLE_HOME%\ deinstall\response`

- `-params` [`name1=`*`value`* `name2=`*`value`* `name3=`*`value`* `...`]

  Use this flag with a parameter file to override one or more values in a parameter file you created.

- `-o` *`complete path of directory for saving response files`*

  Use this flag to provide a path other than the default location where the properties file (`deinstall_`*`Oracle_home_name`*`.rsp`) is saved.

  The default location of the properties file depends on the location of the Deinstallation tool:

  - From the installation media or stage location: *<Drive>*:*staging_location*\deinstall\response
  - From a unzipped archive file downloaded from OTN: *<Drive>*:*ziplocation*\response, where *<Drive>*:*ziplocation* refers to the location of the downloaded archive file
  - After installation, from the installed Oracle home: %ORACLE_HOME%\deinstall\response

- -help | -h

  Use the help option (-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, or the deinstall.bat command downloaded from Oracle TechNet (not installed in an Oracle home), then it writes log files in the C:\Program Files\Oracle\Inventory\logs directory. If, however, you are using the deinstall.bat command to removed the last Oracle home installed on the server, then the log files are written to:

- %TEMP%\OraDeinstall<*timestamp*>\logs if you use the deinstall.bat command located in the Oracle home
- *<Drive>*:*ziplocation*\deinstall\logs if you use the deinstall.bat command downloaded from Oracle TechNet

8.2.2 Example of Running the Deinstall Command for Oracle RAC

If you use the separately downloaded version of deinstall.bat, then when the deinstall.bat command runs, you are prompted to provide the home directory of the Oracle software to remove from your system. Provide additional information as prompted.

To run the deinstall.bat command located in an Oracle Database home in the path C:\app\oracle\product\11.2.0\dbhome_1, enter the following command while logged in as a member of the Administrators group:

```
C:\> cd app\oracle\product
C:\app\oracle\product> 11.2.0\dbhome_1\deinstall\deinstall.bat
```

In the following example, use the deinstall.bat command in the path C:\app\oracle\product\deinstall to deinstall the Oracle home using a parameter file in the software owner location C:\user\oracle:

```
C:\> cd app\oracle\product\deinstall
C:\deinstall> deinstall -home C:\app\oracle\product\11.2.0\dbhome_1 -paramfile
C:\user\oracle\my_db_paramfile.tmpl
```

8.2.3 Example of a Deinstallation Parameter File for Oracle RAC

The following is an example of a parameter file, in which the Oracle Database home (Oracle home) is in the path C:\app\oracle\product\11.2.0\dbhome_1, the Oracle base (where other Oracle software is installed) is C:\app\oracle, the central Oracle Inventory home (oraInventory) is C:\Program Files\Oracle\Inventory, the virtual IP address (VIP) is 192.0.2.1, the local node (the node where you run the deinstallation session from) is node1, the remote node is node2, and the database name is orcl:

```
#Copyright (c) 2005, 2009 Oracle Corporation. All rights reserved.
```

```
LOCAL_NODE=node1
HOME_TYPE=RACDB
ORACLE_BASE=C:\app\oracle
ObaseCleanupPtrLoc=C:\DOCUME~1\oracle\LOCALS~1\Temp\OraDeinstall2010-03-31_
  15-24-53\utl\orabase_cleanup.lst
DB_TYPE.orcl=RAC_DB
silent=false
ORA_CRS_HOME=C:\app\11.2.0\grid\
EMCP.CONFIG_MODE.orcl=CONFIG_DBCONTROL
EMCA_LOG.orcl=C:\app\oracle\cfgtoollogs\emca\orcl
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\11.2.0\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\11.2.0\DBHOME_1\DATABASE\DR1ORCL.DAT,C:\APP\ORACLE\PRODUCT\11.2.0\
 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=
```

A

Troubleshooting the Oracle Real Application Clusters Installation

This appendix provides troubleshooting information for installing Oracle Real Application Clusters (Oracle RAC).

> **See Also:** The Oracle Database 11*g* release 2 (11.2) Oracle Real Application Clusters documentation set included with the installation media in the Documentation directory:
>
> - *Oracle Real Application Clusters Administration and Deployment Guide*
> - *Oracle Clusterware Administration and Deployment Guide*

This appendix contains the following topics:

- General Installation Issues
- Oracle RAC Installation Error Messages
- Performing Cluster Diagnostics During Oracle RAC Installations
- Resolving Oracle RAC Installation Errors
- Troubleshooting Configuration Assistant Errors
- Silent or Noninteractive Installation Response File Error Handling
- "Cleaning Up After a Failed Installation"

A.1 General Installation Issues

The following is a list of examples of types of errors that can occur during installation. It contains the following issues:

- Nodes unavailable for selection from the OUI Node Selection screen
- Node nodename is unreachable
- 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 up and running.

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

Node *nodename* is unreachable

Cause: Unavailable IP host

Action: Attempt the following:

1. Run the command `ipconfig /all`. Compare the output of this command with the contents of the `C:\WINDOWS\system32\drivers\etc\hosts` file to ensure that the node IP is listed.
2. Run the command `nslookup` to see if the host is reachable.

Time stamp is in the future

Cause: One or more nodes has a different clock time than the local node. If this is 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 you install Oracle Database on Microsoft Windows, Oracle Universal Installer creates a Windows local group called `ORA_DBA`, and then adds your Windows username to it. Members of `ORA_DBA` automatically receive the SYSDBA privilege. However, for cluster installations, Oracle Universal Installer does not add the user to `ORA_DBA` if they have performed the installation remotely. As a result, this user cannot log in to SQL*Plus using the SYSDBA privilige.

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 Oracle RAC Installation Error Messages

Oracle Real Application Clusters Management Tools Error Messages are in *Oracle Real Application Clusters Administration and Deployment Guide*.

Note that the user performing the Oracle RAC installation must have Administrator privileges or the installation fails.

A.3 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 binary directory in your Oracle Clusterware home *CRS_home*`\bin`) and analyzing its output. Refer to Oracle Clusterware documentation if the detailed output indicates that your clusterware is not running.

In addition, use the following command syntax to check the integrity of the Cluster Manager:

```
cluvfy comp clumgr -n node_list -verbose
```

In the preceding syntax example, the variable *`node_list`* is the list of nodes in your cluster, separated by commas.

A.4 Resolving Oracle RAC Installation Errors

This section provides information on how to proceed if you encounter an error during installation of Oracle RAC.

A.4.1 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. The release notes are available on the Oracle Database installation media. You can find the latest version of the release notes on the Oracle Technology Network Web site:

  `http://www.oracle.com/technology/documentation/index.html`

A.4.2 Resolving Installation Errors

If you encounter an error during installation:

- Do not exit Oracle Universal Installer.
- 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 Oracle Universal Installer is copying or linking files, then see "Reviewing the Log of an Installation Session" on page A-3 for interactive installations or "Silent or Noninteractive Installation Response File Error Handling" on page A-5 for more information.
- If you encounter an error while a configuration assistant is running, then see the "Troubleshooting Configuration Assistant Errors" on page A-4 section.
- If you cannot resolve the problem, then remove the failed installation by following the steps listed in "Cleaning Up After a Failed Installation" on page A-5.

A.4.3 Reviewing the Log of an Installation Session

During an installation, Oracle Universal Installer 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:

```
SYSTEM_DRIVE:\> Program Files\Oracle\Inventory\logs
```

Log filenames from interactive installations take 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
```

Note: Do not delete or manually alter the `Inventory` directory or its contents. Doing so can prevent Oracle Universal Installer from locating products that you install on your system.

See Also: "Silent or Noninteractive Installation Response File Error Handling" on page A-5

A.5 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 "Reviewing the Log of an Installation Session" on page A-3.
- Review the specific configuration assistant log file located in the Oracle base directory, 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. Refer to the section "Irrecoverable Errors Reported by Configuration Assistants" on page A-4 for further instructions.

A.5.1 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 on errors related to the configuration assistant can be found in the following directory:

```
ORACLE_BASE\cfgtoollogs
```

The `ORACLE_BASE` directory is the Oracle base for the Oracle RAC installation. 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.5.2 Irrecoverable Errors Reported by Configuration Assistants

If you receive an irrecoverable error while a configuration assistant is running, then you must complete the following tasks:

1. Remove the failed installation as described in the "Cleaning Up After a Failed Installation" on page A-5 section.
2. Correct the cause of the fatal error.
3. Reinstall the Oracle software.

A.6 Silent or Noninteractive Installation Response File Error Handling

To determine whether a silent or noninteractive installation succeeds or fails, check the `silentInstallActions`*`date_time`*`.log` file, located in *`DRIVE_LETTER`*`:\Program Files\Oracle\Inventory\logs`.

If necessary, see the previous section for information about determining the location of the `Inventory` directory.

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 filled out correctly, 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`.
- Oracle Universal Installer encounters an error, such as insufficient disk space.

Oracle Universal Installer 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. Oracle Universal Installer treats values for parameters that are of the wrong context, format, or type as if no value was specified in the file.

> **See Also:** "Reviewing the Log of an Installation Session" on page A-3 for information about interactive installation log files

A.7 Cleaning Up After a Failed Installation

If an installation fails, then you must remove the Oracle home directory and remove all files that Oracle Universal Installer (OUI) created during the attempted installation. Perform the following steps to cleanup the failed installation:

1. Follow the instructions in Chapter 8, "Removing Oracle Real Application Clusters Software" to run Oracle Universal Installer 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.

B

Installing and Configuring Oracle Real Application Clusters Using Response Files

This appendix describes the steps required to install and configure an Oracle Real Application Clusters (Oracle RAC) database using scripts to perform noninteractive installations.

Note: The scripts generated by DBCA are for reference purposes 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 installation scripts

This appendix contains the following topics:

- Using DBCA to generate Installation Scripts for Oracle RAC
- Using DBCA Noninteractive (Silent) Configuration for Oracle RAC
- How Response Files Work
- Creating the inst_loc Registry Entry
- Preparing a Response File
- Running the Installer Using a Response File
- Running Net Configuration Assistant Using a Response File
- Running Configuration Assistants Using Response Files
- Postinstallation Configuration Using a Response File

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 Database Configuration Assistant (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 Real Application Clusters Databases with Database Configuration Assistant" for additional information about running a DBCA session

2. Navigate 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 issuing an `ALTER SYSTEM` command, or by uncommenting it in your `PFILE` for each instance.
5. Configure Oracle Net Services to support your new database and instances as described in Chapter 7, "Understanding the Oracle Real Application Clusters Installed Configuration".
6. Set the `remote_listener` parameter to the SCAN (using the EZ connect syntax *scanname*:*scanport*) in your `SPFILE` by issuing an `ALTER SYSTEM` command, or by removing the comment indicator for this parameter in your `PFILE` for each instance.
7. Run `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 Using 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 Clusterware installation

The following command syntax creates an Oracle RAC database on an existing Oracle ASM disk group, where the cluster nodes are `node1` and `node2`, and where the disk group name is `+ASMgrp1`, and *password* is a place holder for a password, which can be all the same password, or different passwords each time:

```
%ORACLE_HOME%\bin\dbca -silent -createDatabase -templateName General_Purpose.dbc
-gdbName %DBNAME% -sid %SID% -sysPassword password -systemPassword password
-sysmanPassword password -dbsnmpPassword password -emConfiguration LOCAL
-storageType ASM -diskGroupName +ASMgrp1 -datafileJarLocation %ORACLE_HOME%\
assistants\dbca\templates -nodeinfo node1,node2 =characterset WE8MSWIN1252
-obfuscatedPasswords false -sampleSchema false -asmSysPassword password
```

B.3 How Response Files Work

When you start the installer, you can use a response file to automate the installation and configuration of Oracle software, either fully or partially. The installer uses the values contained in the response file to provide answers to some or all installation prompts.

Typically, the installer runs in interactive mode, which means that it prompts you to provide information in graphical user interface (GUI) screens. When you use response files to provide this information, you run the installer from a command prompt using either of the following modes:

- Silent mode

  If you include responses for all of the prompts in the response file and specify the `-silent` option when starting the installer, then it runs in silent mode. During a silent mode installation, the installer does not display any screens. Instead, it displays progress information in the terminal that you used to start it.

- Response file mode

  If you include responses for some or all of the prompts in the response file and omit the `-silent` option, then the installer runs in response file mode. During a response file mode installation, the installer displays all the screens, screens for which you specify information in the response file, and also screens for which you did not specify the required information in the response file.

You define the settings for a silent or response file installation by entering values for the variables listed in the response file. For example, to specify the Oracle home name, supply the appropriate value for the `ORACLE_HOME` variable:

```
ORACLE_HOME="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=OraDBHome1" ...
```

This method is particularly useful if you do not want to embed sensitive information, such as passwords, in the response file. For example:

```
-silent "s_dlgRBOPassword=binks342" ...
```

Enclose the variable and its value in quotes.

> **See Also:** *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX* for more information about response files

B.3.1 Deciding to Use Silent Mode or Response File Mode

The following table provides use cases for running the installer in silent mode or response file mode.

Mode	Uses
Silent	Use silent mode for the following installations: ▪ Complete an unattended installation, which you schedule using operating system utilities. ▪ Complete several similar installations on multiple systems without user interaction. The installer displays progress information on the terminal that you used to start it, but it does not display any of the installer screens.
Response file	Use response file mode to complete similar Oracle software installations on multiple systems, providing default answers to some, but not all of the installer prompts. If you specified the values required for a particular installer window, then the window is displayed with the provided values; you can still change the values displayed in the window. If you do not specify information required for a particular installer screen in the response file, then the installer displays that screen with only the default values displayed.

B.3.2 General Procedure for Using Response Files

The following are the general steps to install and configure Oracle products using the installer in silent or response file mode:

> **Note:** You must complete all required preinstallation tasks on a system before running the installer in silent or response file mode.

1. Create the Registry value `inst_loc` for the `HKEY_LOCAL_MACHINE\Software\Oracle` key if it does not exist.
2. Prepare a response file.
3. Run the installer in silent or response file mode.
4. If you completed a software-only installation, then run Net Configuration Assistant and Database Configuration Assistant in silent or response file mode.

These steps are described in the following sections.

B.4 Creating the inst_loc Registry Entry

If you plan to install Oracle products using the installer in silent or suppressed mode on a node which has not had Oracle software installed on it previously, then you must manually create the `inst_loc` Registry entry. This paramter specifies the location of the Oracle Inventory directory, which is where the installer creates the central inventory of Oracle products installed on the system.

> **Note:** If Oracle software has been installed previously on the system, then the `inst_loc` Registry entry should exist. If the Registry entry `HKEY_LOCAL_MACHINE\Software\Oracle\inst_loc` exists, then you do not have to create this entry.

To create the `inst_loc` Registry entry, follow these steps:

1. Log in as a user that is a member of the local Administrators group.

2. Create a backup of the Windows registry.
3. Invoke the registry editor, for example, by clicking Start then typing `regedit` from the Run.. menu .
4. Navigate to the key `HKEY_LOCAL_MACHINE\Software\Oracle`.
5. Add the value `inst_loc` as a string vaule and populate it with the location of the Oracle Inventory directory, for example:

```
Name: inst_loc
Type: REG_SZ
Data: C:\Program Files\Oracle\Inventory
```

See Also: Microsoft Support Article ID: 310516: "How to add, modify, or delete registry subkeys and values by using a registration entries (.reg) file"

B.5 Preparing a Response File

This section describes the following methods to prepare a response file for use during silent mode or response file mode installations:

- Editing a Response File Template
- Recording a Response File

B.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, the response 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.

Table B–1 lists the response files provided with this software:

Table B–1 Response Files for Oracle Database

Response File	Description
`db_install.rsp`	Silent installation of Oracle Database 11*g*
`dbca.rsp`	Silent creation and configuration of an Oracle database using Database Configuration Assistant (DBCA)
`netca.rsp`	Silent configuration of Oracle Net using Oracle Net Configuration Assistant (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 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 software to a hard drive, then you can edit the file in the `response` directory if you prefer.

2. Open the response file in a text editor:

   Remember that you can specify sensitive information, such as passwords, at the command line rather than within the response file. The section "How Response Files Work" on page B-3 explains this method.

   See Also: *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX* for detailed information on creating response files

3. Follow the instructions in the file to edit it.

   Note: The installer or configuration assistant fails if you do not correctly configure the response file.

4. Secure the response file.

   Note: A fully specified response file for an Oracle Database installation contains the passwords for database administrative accounts and for a user who is a member of the ORA_DBA group and the Administrators group (required for automated backups). Ensure that only the Oracle software owner user can view or modify response files or consider deleting the modified response file after the installation succeeds.

B.5.2 Recording a Response File

You can use the installer in interactive mode to record a response file, which you can edit and then use to complete silent mode or response file mode installations. This method is useful for customized or software-only installations.

Starting with Oracle Database 11*g* Release 2 (11.2), you can save all the installation steps into a response file during installation by clicking **Save Response File** on the Summary page. You can use the generated response file for a silent installation later.

When you record the response file, you can either complete the installation, or you can exit from the installer on the Summary page, before it starts to copy the software to the server.

Note: Oracle Universal Installer does not record passwords in the response file.

To record a response file:

1. Complete preinstallation tasks as for a normal installation.

   When you run the installer to record a response file, it checks the system to verify that it meets the requirements to install the software. For this reason, Oracle recommends that you complete all of the required preinstallation tasks and record the response file while completing an installation.

2. Log in as a user that is a member of the local Administrators group and start the installer.

3. On each installation screen, specify the required information.

4. When the installer displays the Summary screen, perform the following:

a. Click **Save Response File**. In the pop-up window, specify a file name and location for the response file, then click **Save** to write the settings you have entered to the response 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. 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 the Installer Using a Response File

Now, you are ready to run Oracle Universal Installer at the command line, specifying the response file you created, to perform the installation. The Oracle Universal Installer executable, `setup.exe`, provides several options. For help information on the full set of these options, run the `setup.exe` command with the `-help` option, for example:

```
X:\> directory_path\setup.exe -help
```

In this command, *`directory_path`* is the path of the `database` directory on the installation media or the path of the staging directory on the hard drive.

The help information appears in your session window after some time.

To run the installer using a response file:

1. Complete the preinstallation tasks as for a normal installation
2. Log in as a user with Administrator privileges.
3. To start the installer in silent or response file mode, enter a command similar to the following:

```
X:\> directory_path\setup.exe  [-silent] [-noconfig] \
 -responseFile responsefilename
```

> **Note:** Do not specify a relative path to the response file. If you specify a relative path, then the installer fails.

In this example:

- *`directory_path`* is the path of the `database` directory on the installation media or the path of staging directory on the hard drive.
- `-silent` runs the installer in silent mode.
- `-noconfig` suppresses running the configuration assistants during installation, and a software-only installation is performed instead.
- *`responsefilename`* is the full path and file name of the installation response file that you configured.

If you use record mode during a response file mode installation, then the installer records the variable values that were specified in the original source response file into the new response file.

B.7 Running Net Configuration Assistant Using a Response File

You can run Net Configuration Assistant 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 Net Configuration Assistant in silent mode, you must copy and edit a response file template. Oracle provides a response file template named `netca.rsp` in the `response` directory in the *`Oracle_home`*`\inventory\response` directory after installation or in the `database\response` directory on the installation media.

To run Net Configuration Assistant using a response file:

1. Copy the `netca.rsp` response file template from the response file directory to a directory on your system:

   If you have copied the software to a hard drive, you can edit the file in the `response` directory if you prefer.

2. Open the response file in a text editor:
3. Follow the instructions in the file to edit it.

   Note: Net Configuration Assistant fails if you do not correctly configure the response file.

4. Log in as a user that is a member of the local Administrators group.
5. Enter a command similar to the following to run Net Configuration Assistant in silent mode:

   ```
   C:\> Oracle_home\bin\netca -silent -responsefile X:\local_dir\netca.rsp
   ```

   In this command:

   - The `/silent` option runs Net Configuration Assistant in silent mode.
   - *`X:\local_dir`* is the full path of the directory where you copied the `netca.rsp` response file template where *X* is the drive on which the file is located and *local_dir* is the folder path on that drive.

B.8 Running Configuration Assistants Using Response Files

You can run configuration assistants in response file or silent mode to configure and start Oracle software after it is installed on the system. To run configuration assistants in response file or silent mode, you must 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 *`staging_directory`*`\database\response` directory.

This section contains the following topics:

- About the Database Configuration Assistant in Response File Mode
- Running Database Configuration Assistant in Response File or Silent Mode

B.8.1 About the Database Configuration Assistant in Response File Mode

In the response file mode, Database Configuration Assistant uses values that you specify, in the response file or as command line options, to create a database. As it configures and starts the database, it displays a window that contains status messages and a progress bar. The window that it displays is the same window that is displayed when you choose to create a preconfigured database during an Enterprise Edition or Standard Edition installation.

To run Database Configuration Assistant in response file mode, you must use the `-progressOnly` flag to set the run mode to response file mode.

Oracle provides a response file template named `dbca.rsp` in the `response` directory on the installation media.

B.8.2 Running Database Configuration Assistant in Response File or Silent Mode

To run Database Configuration Assistant in response file or silent mode:

1. 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, you can edit the file in the *`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 Database Configuration Assistant. For information about the list of options supported, enter the following command:
   >
   > ```
   > C:\> Oracle_home\bin\dbca -help
   > ```

2. Open the response file in a text editor.
3. Edit the file, following the instructions in the file.

   > **Note:** Database Configuration Assistant fails if you do not correctly configure the response file.

4. Log in as a user that is a member of the local Administrators group.
5. Open a command-line window. Change directories to the location of the Oracle home directory.
6. Use the following command syntax to run Database Configuration Assistant 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 Database Configuration Assistant in silent mode.
   - The `-progressOnly` option runs Database Configuration Assistant in response file mode.
   - *`local_dir`* is the full path of the directory where the `dbca.rsp` response file is located.

B.9 Postinstallation Configuration Using a Response File

Use the following sections to create and run a response file configuration after installing Oracle software.

B.9.1 About the Postinstallation Configuration File

When you run a silent or response file installation, you provide information about your servers in a response file that you otherwise provide manually using a graphical user interface. However, the response file does not contain passwords for user accounts that configuration assistants require after software installation is complete. The configuration assistants are started with a script called `configToolAllCommands`. You can run this script in response file mode by creating and using a password response file. The script uses the passwords to run the configuration tools in succession to complete configuration.

If you keep the password file to use for clone installations, then Oracle strongly recommends that you store it in a secure location. In addition, if you have to stop an installation to fix an error, then you can run the configuration assistants using `configToolAllCommands` and a password response file.

The `configToolAllCommands` password response file consists of the following syntax options:

- *internal_component_name* is the name of the component that the configuration assistant configures
- *variable_name* is the name of the configuration file variable
- *value* is the desired value to use for configuration.

The command syntax is as follows:

internal_component_name|*variable_name=value*

For example:

```
oracle.assistants.asm|S_ASMPASSWORD=myPassWord
```

Oracle strongly recommends that you maintain security with a password response file.

B.9.2 Running Postinstallation Configuration Using a Response File

To run configuration assistants with the `configToolAllCommands` script:

1. Create a response file using the syntax *filename*.properties.
2. Open the file with a text editor, and cut and paste the password template, modifying as needed.

Example B–1 Password response file for Oracle Real Application Clusters

Oracle Database configuration requires the SYS, SYSTEM, SYSMAN, and DBSNMP passwords for use with Database Configuration Assistant (DBCA). The S_ASMSNMPPASSWORD response is necessary only if the database is using Oracle ASM for storage. Also, if you selected to configure Oracle Enterprise Manager, then you must provide the password for the Oracle software installation owner for the S_HOSTUSERPASSWORD response.

```
oracle.assistants.server|S_SYSPASSWORD=password
oracle.assistants.server|S_SYSTEMPASSWORD=password
oracle.assistants.server|S_SYSMANPASSWORD=password
oracle.assistants.server|S_DBSNMPPASSWORD=password
```

```
oracle.assistants.server|S_HOSTUSERPASSWORD=password
oracle.assistants.server|S_ASMSNMPPASSWORD=password
```

If you do not want to enable Oracle Enterprise Manager or Oracle ASM, then leave those password fields blank

3. If the file is stored on an NTFS volume, then modify the security permissions to secure the file.
4. Change directory to `Oracle_home\cfgtoollogs`.
5. Run the configuration script using the following syntax:

   configToolAllCommands RESPONSE_FILE=*path**name*.properties

   for example:

   ```
   C:\..\cfgtoollogs> configToolAllCommands RESPONSE_FILE=C:\users\oracle\db\cfg
   _db.properties
   ```

C

Converting to Oracle Real Application Clusters from Single-Instance Oracle Databases

This chapter describes the procedures for converting from Oracle Database 11*g* release 2 (11.2) single-instance databases to Oracle Real Application Clusters (Oracle RAC) databases.

If you are upgrading from Oracle Parallel Server to Oracle RAC, or from an earlier version of Oracle RAC, then use Oracle Database Upgrade Assistant (DBUA).

> **Note:** The procedures in this chapter assume that your original single-instance database and the target Oracle RAC database are using the same release, and running on the same platform.

This appendix contains the following topics:

- Administrative Issues for Converting Databases to Oracle RAC
- Converting to Oracle RAC with DBCA
- Preparing to Convert with rconfig and Oracle Enterprise Manager
- Converting Databases to Oracle RAC Using rconfig
- Example of rconfig XML Input Files for ConvertToRAC
- Post-Conversion Steps

> **Note:** You must use clustered Oracle ASM instances for Oracle RAC databases.

> **See Also:** *Oracle Database Licensing Information* for compliance requirements that apply to the license you have purchased

C.1 Administrative Issues for Converting Databases to Oracle RAC

Note the following administrative considerations before converting single-instance databases to Oracle RAC:

- A backup of your existing database should available before converting from a single-instance Oracle Database to Oracle RAC and you should be ready to take a backup of your Oracle RAC database immediately following the conversion.

- For archiving with Oracle RAC environments, the archive file format requires a thread number.
- The archived logs from all instances of an Oracle RAC database are required for media recovery. Because of this, if you archive to a file and you do not use a cluster file system, or some other means to provide shared file systems, then you require a method of accessing the archive logs from all nodes on which the cluster database has instances.
- By default, all database files are migrated to Oracle-Managed Files (OMF). This feature simplifies tablespace creation, ensures datafile location consistency and compliance with OFA rules, and reduces human error with data file management.

C.2 Converting to Oracle RAC with DBCA

You can use Database Configuration Assistant to convert from single-instance Oracle databases to Oracle RAC. DBCA automates the configuration of the control file attributes, creates the undo tablespaces and the redo logs, and makes the initialization parameter file entries for cluster-enabled environments. It also configures Oracle Net Services, Oracle Clusterware resources, and the configuration for Oracle RAC database management for use by Oracle Enterprise Manager or the SRVCTL utility.

Before you use DBCA to convert a single-instance database to an Oracle RAC database, ensure that your system meets the following conditions:

- It is a supported hardware and operating system software configuration.
- It has shared storage: either Oracle Cluster File System or Oracle ASM is available and accessible from all nodes.
- Your applications have no design characteristics that preclude their use with cluster database processing.

If your platform supports a cluster file system, then you can use it for Oracle RAC. You can also convert to Oracle RAC and use a non-shared file system. In either case, Oracle strongly recommends that you use Oracle Universal Installer (OUI) to perform an Oracle Database 11*g* release 2 (11.2) installation that sets up the Oracle home and inventory in an identical location on each of the selected nodes in your cluster.

This section describes the following scenarios:

- Converting Oracle Database 11g Installations to Oracle RAC Using DBCA
- Converting Single Instance on a Cluster to Oracle RAC using DBCA

C.2.1 Converting Oracle Database 11*g* Installations to Oracle RAC Using DBCA

To convert from a single-instance Oracle Database that is on a non-cluster computer to Oracle RAC, perform the procedures described in the following sections, and in the order shown:

- Back Up the Original Single-Instance Database
- Complete Oracle Clusterware Installation
- Validate the Cluster
- Copy the Preconfigured Database Image
- Install Oracle Database 11g Software with Oracle RAC

C.2.1.1 Back Up the Original Single-Instance Database

Use DBCA to create a preconfigured image of your single-instance database by using the following procedure:

1. Navigate to the `bin` directory in *`Oracle_home`*, and start DBCA.
2. At the Welcome page, click **Next**.
3. On the Operations page, select **Manage Templates**, and click **Next**.
4. On the Template Management page, select **Create a database template** and **From an existing database (structure as well as data)**, and click **Next**.
5. On the Source Database page, select the database name in the **Database instance** list, and click **Next**.
6. On the Template Properties page, enter a name for your template in the **Name** field. Oracle recommends that you use the database name.

   By default, the template files are generated in the directory *`Oracle_home`*`\assistants\dbca\templates`. You can enter a description of the file in the **Description** field and change the template file location in the **Template data file** field.

   When you have completed entries, click **Next**.
7. On the Location of Database Related Files page, select **Maintain the file locations**, so that you can restore the database to the current directory structure, and click **Finish**.

DBCA generates two files: a database structure file (*`template_name`*`.dbc`), and a database preconfigured image file (*`template_name`*`.dfb`).

C.2.1.2 Complete Oracle Clusterware Installation

Complete Oracle Clusterware installation, as described in *Oracle Grid Infrastructure Installation Guide* for your platform.

C.2.1.3 Validate the Cluster

Validate the cluster configuration using the Cluster Verification Utility.

C.2.1.4 Copy the Preconfigured Database Image

Copy the preconfigured database image. This includes copying the database structure `*.dbc` file and the database preconfigured image `*.dfb` file that DBCA created in the previous procedure "Back Up the Original Single-Instance Database" on page C-3 to a temporary location on the node in the cluster from which you plan to run DBCA.

C.2.1.5 Install Oracle Database 11*g* Software with Oracle RAC

1. Run OUI to perform an Oracle Database installation with Oracle RAC.
2. Select **Cluster Installation Mode** on the Specify Hardware Cluster Installation page of OUI, and select the nodes to include in your Oracle RAC database.
3. On the OUI Database Configuration Types page, select the **Advanced** install type.

   After installing the Oracle Database software, OUI runs postinstallation configuration tools, such as Network Configuration Assistant (NETCA), DBCA, and so on.

4. On the DBCA Template Selection page, use the template that you copied to a temporary location in the "Copy the Preconfigured Database Image" procedure. Use the browse option to select the template location.
5. If you selected raw storage on the OUI Storage Options page, then on the DBCA File Locations Tab on the Initialization Parameters page, replace the data files, control files, and log files, and so on, with the corresponding raw device files if you have not set up the `DBCA_RAW_CONFIG` environment variable. You must also replace default database files with raw devices on the Storage page.

   See Also: Chapter 3, "Creating Oracle Real Application Clusters Databases with Database Configuration Assistant" for more details about DBCA

6. After creating the Oracle RAC database, DBCA displays the Password Management page on which you must change the passwords for database privileged users who have `SYSDBA` and `SYSOPER` roles. When DBCA exits, the conversion process is complete.

   See Also: *Oracle Database Platform Guide for Microsoft Windows* for more information about configuring user roles

C.2.2 Converting Single Instance on a Cluster to Oracle RAC using DBCA

There are three scenarios in which a single-instance database can exist on a cluster computer:

- Scenario 1: The Oracle home from which the single-instance database is running is cluster-installed. The steps to perform a conversion to Oracle RAC in this scenario are described in "Single Instance Database on a Cluster Running from a Cluster-Enabled Oracle Home" on page C-4.
- Scenario 2: The Oracle home from which the single-instance database is running is cluster-installed, but the Oracle RAC feature is disabled.
- Scenario 3: The Oracle home from which the single-instance database is running is not cluster-installed. The procedure to convert the single-instance database to Oracle RAC in this scenario is described in "Single Instance Database on a Cluster Running from a Single-Instance Installed Oracle Home" on page C-7.

C.2.2.1 Single Instance Database on a Cluster Running from a Cluster-Enabled Oracle Home

Perform the following procedures to convert a single-instance database on a cluster running from a cluster-installed (Oracle Database 11*g* with Oracle RAC) Oracle home.

1. Use DBCA to create a preconfigured image of your single-instance database as described in the section "Back Up the Original Single-Instance Database" on page C-3. To perform the conversion manually, shut down the single-instance database.
2. To add nodes to your cluster, add and connect these nodes to the cluster as described in *Oracle Grid Infrastructure Installation Guide* for your platform. Ensure that all of these nodes can access the shared storage. Also, extend the Oracle Clusterware home to the new nodes using the procedures for "Adding and Deleting Cluster Nodes on Windows Systems" as described in *Oracle Clusterware Administration and Deployment Guide*.

3. From a newly added node, configure the listeners on the additional nodes using NETCA. Choose the same port number and protocol that you used on the existing node. If NETCA displays the existing node in the node list page, then do not select this node, because the listener is already configured on it.
4. Convert the database using one of the following procedures:
   - Automated Conversion Procedure Using DBCA
   - Manual Conversion Procedure

C.2.2.1.1 Automated Conversion Procedure Using DBCA

1. If you created the preconfigured image of the single instance database as described in the section "Back Up the Original Single-Instance Database" on page C-3, then use DBCA to complete the conversion to an Oracle RAC database.
2. Start DBCA from the initial node. Select the names of the nodes to include as part of your cluster database. On the Template Selection page, select the preconfigured template that you created in Step 1 on page C-4. Enter the database name and respond to the remaining DBCA prompts.
3. To use raw devices for the cluster database files:
   a. When the Initialization Parameters page appears, enter the raw device name for the SPFILE on the File Locations tab.
   b. On the Storage page, replace the default database file names with the raw devices for the control files, redo logs, and data files to create the cluster database.
   c. Click **Finish,** and create the database.

After creating the Oracle RAC database, DBCA displays the Password Management page on which you must change the passwords for the database privileged users who have `SYSDBA` and `SYSOPER` roles. When DBCA exits, the conversion process is complete.

C.2.2.1.2 Manual Conversion Procedure

Because you did not use DBCA to create a preconfigured image of your single-instance database in step 1 on page C-4, perform the following steps to complete the conversion:

1. Create the Optimal Flexible Architecture (OFA) directory structure on each of the nodes that you have added.

   See Also: "Directory Structures for Oracle RAC" on page D-1 for more information about OFA

2. If you are converting single-instance database files on a file system to raw devices, then copy the database data files, control files, redo logs, and server parameter file to their corresponding raw devices using the OCOPY command. Otherwise, continue to the next step.
3. Re-create the control files by running the `CREATE CONTROLFILE` SQL statement with the `REUSE` keyword and specify `MAXINSTANCES` and `MAXLOGFILES`, and so on, as needed for your Oracle RAC configuration. The `MAXINSTANCES` recommended default is 32.
4. Shut down the database instance.

5. If your single-instance database was using an SPFILE, then create a temporary PFILE from the SPFILE using the following SQL statement:

```
CREATE PFILE='pfile_name' from spfile='spfile_name'
```

6. Set the `CLUSTER_DATABASE` parameter to `TRUE`, set the `INSTANCE_NUMBER` parameter to a unique value for each instance, using a *`sid.parameter=value`* syntax.

   If you optimized memory usage on your single-instance database, then adjust the size of the system global area (SGA) to avoid swapping and paging when you convert to Oracle RAC. You should make this adjustment because Oracle RAC requires about 350 bytes for each buffer to accommodate the Global Cache Service (GCS). For example, if you have 10,000 buffers, then Oracle RAC requires about 350 multiplied by 10,000 bytes more memory. Therefore, adjust the size of the SGA by changing the `DB_CACHE_SIZE` and `DB_nK_CACHE_SIZE` parameters accordingly.

7. Start the database instance using the PFILE created in step 5.

8. If your single-instance database was using automatic undo management, then create an undo tablespace for each additional instance using the `CREATE UNDO TABLESPACE` SQL statement. If you are using raw devices, then ensure that the data file for the undo tablespace is on the raw device.

9. Create redo threads that have at least two redo logs for each additional instance. If you are using raw devices, then ensure that the redo log files are on raw devices. Enable the new redo threads by using an `ALTER DATABASE` SQL statement. Then, shut down the database instance.

10. Copy the Oracle password file from the initial node, or from the node on which you are working, to the corresponding location on the additional nodes on which the cluster database will have an instance. Replace the `ORACLE_SID` name in each password file appropriately for each additional instance.

11. Set the `REMOTE_LISTENER` parameter to the single client access name (SCAN) port and SCAN.

12. Create the SPFILE from the PFILE using the procedures in the section "Migrating to the SPFILE in Oracle RAC Environments" on page 5-3. If you are not using Oracle Automatic Storage Management (Oracle ASM) or a cluster file system, then ensure that the SPFILE is on a raw device that is accessible from every node in the cluster.

13. Create the *`Oracle_home`*`\dbs\init`*`sid`*`.ora` file that contains the following entry:

```
spfile='spfile_path_name'
```

   In this example, *`spfile_path_name`* is the complete path name of the SPFILE.

14. On the local node, run `catclust.sql`. This command creates the dictionary views needed for Oracle RAC databases. For example:

```
SQL> start Oracle_home\RDBMS\ADMIN\catclust.sql
```

15. Add the configuration for the Oracle RAC database and its instance-to-node mapping using SRVCTL.

```
srvctl add database -d db_name -o Oracle_home -p spfile_path_name
srvctl add instance -d db_name -i inst1_name -n node1_name
srvctl add instance -d db_name -i inst2_name -n node2_name
```

16. Start the Oracle RAC database using SRVCTL.

```
srvctl start database -d db_name
```

After starting the database with SRVCTL, your conversion process is complete and, for example, you can run the following SQL statement to see the status of all the instances in your Oracle RAC database:

```
SQL> select * from v$active_instances
```

C.2.2.2 Single Instance Database on a Cluster Running from a Single-Instance Installed Oracle Home

You can only install a single instance on a cluster running from a single-instance installed Oracle home if you selected the local installation option on the OUI Specify Hardware Cluster Installation page during the single-instance Oracle Database 11*g* release 2 (11.2) installation.

To convert this type of database to an Oracle RAC database, perform the procedures described in the following sections:

1. "Back Up the Original Single-Instance Database" on page C-3.
2. "Complete Oracle Clusterware Installation" on page C-3.
3. "Validate the Cluster" on page C-3.
4. "Install Oracle Database 11g Software with Oracle RAC" on page C-3. In this step, ensure that you select a new Oracle home other than the one from which the single-instance database was running.

C.3 Preparing to Convert with rconfig and Oracle Enterprise Manager

You can use `rconfig`, or Oracle Enterprise Manager to assist you with the task of converting a single-instance database installation to an Oracle RAC database. The first of these, `rconfig`, is a command line utility. Oracle Enterprise Manager Grid Control database administration option, Convert to Cluster Database, provides a GUI conversion tool. The following sections describe how to use these conversion tools:

- Prerequisites for Converting to Oracle RAC Databases
- Configuration Changes during Oracle RAC Conversion Using rconfig
- Converting Databases to Oracle RAC Using rconfig or Oracle Enterprise Manager
- Converting Databases to Oracle RAC Using Oracle Enterprise Manager

---

Note: Before you start the conversion, back up your existing database, as you should do before starting any major change to your database.

C.3.1 Prerequisites for Converting to Oracle RAC Databases

Before you convert a single-instance database to an Oracle RAC database, ensure that the following conditions are met for each cluster node that you intend to make an Oracle RAC database node:

- Oracle Clusterware 11*g* release 2 (11.2) is installed, configured, and running.
- Oracle RAC 11*g* release 2 (11.2) software is installed.

- The Oracle binary is enabled for Oracle RAC.
- Shared storage, either Oracle Cluster File System or Oracle ASM, is available and accessible from all nodes.
- User equivalence exists for the `oracle` account, or the user account used to install the Oracle software.
- If you intend to use Oracle Enterprise Manager, then all Oracle Enterprise Manager agents are configured and running, and are configured with cluster and host information.
- You have backed up your existing database.

Note: You must use clustered Oracle ASM instances for Oracle RAC databases. Oracle ASM is installed with the Oracle Grid infrastructure software.

C.3.2 Configuration Changes during Oracle RAC Conversion Using rconfig

Note the following changes that occur when you convert a single-instance database to Oracle RAC using `rconfig`:

- During the conversion, `rconfig` places the target Oracle RAC database into archive log mode, and enables archiving for the database. If you do not plan to use archivelog space, then you can disable archive logging after the conversion has completed.
- For the **Shared Storage Type** value, if you enter **CFS**, and you use a cluster file system for your single-instance database storage, then `rconfig` converts the environment to use Oracle Managed Files (OMF) for database storage, and places the datafiles in a subdirectory located under the shared storage location.
- During the conversion, `rconfig` moves database files to a specified shared location, and configures them using OMF.

  To avoid using OMF with your converted database, the single-instance database files must be located in a shared file system, and you must indicate that `rconfig` should not move the files.

C.3.3 Converting Databases to Oracle RAC Using rconfig or Oracle Enterprise Manager

The following is a list of scenarios for converting a single-instance Oracle database to an Oracle RAC database:

- Converting a single-instance Oracle Database 11*g* release 2 (11.2) to an Oracle RAC 11*g* release 2 (11.2) database, running out of the *same* Oracle home and using the same data files as the single-instance database.

  In this scenario, either use the `rconfig` utility, or use the **Convert to RAC** option on the single-instance database target of Oracle Enterprise Manager Grid Control.
- Converting a single-instance Oracle Database version prior to Oracle RAC 11*g* release 2 (11.2), running out of the same Oracle home and using the same data files as the single-instance database

  In this scenario, use OUI and Database Upgrade Assistant (DBUA) to update the single-instance database to Oracle Database 11*g* release 2 (11.2). Then use `rconfig` or the Oracle Enterprise Manager **Convert to RAC** option, as described in the preceding scenario.

- Converting a single-instance Oracle Database 11*g* release 2 (11.2) to an Oracle RAC 11*g* release 2 (11.2) database, running out of a *different* Oracle home and using the same data files as the single-instance database.

  In this scenario, either use the `rconfig` utility in the source database home (the database that you are converting), or use the **Convert to RAC** option in the single-instance database target of Oracle Enterprise Manager Grid Control. Provide the file storage location when prompted.

- Converting a single-instance Oracle Database 11*g* release 2 (11.2) to an Oracle RAC 11*g* release 2 (11.2) database, running out of a *different* Oracle home, and where the host where the single-instance database is running is *not* a node of the Oracle RAC database.

  In this scenario, create a clone image of the single-instance database, and move the clone image to a host that is a node of the cluster. Then use `rconfig` or the Oracle Enterprise Manager **Convert to RAC** option, as described in the preceding scenario.

C.3.4 Converting Databases to Oracle RAC Using Oracle Enterprise Manager

You can use Oracle Enterprise Manager Grid Control to convert a single-instance database to Oracle RAC. To use this feature, complete the following steps:

> **See Also:** *Oracle Database Upgrade Guide* for information about upgrading existing Oracle Database installations

1. Log in to Grid Control. From the Grid Control Home page, click the **Targets** tab.
2. On the Targets page, click the **Databases** secondary tab, and click the link in the Names column of the database to convert to Oracle RAC.
3. On the Database Instance Home page, click the **Change Database** secondary tab.
4. On the Administration page, in the Database Administration Change Database section, click **Convert to Cluster Database**.
5. Log in as the database user `SYS` with `SYSDBA` privileges to the database you want to convert, and click **Next**.
6. On the Convert to Cluster Database: Cluster Credentials page, provide a user name and password for the `oracle` user and password of the target database to convert. If the target database is using Oracle ASM, then also provide the `SYSASM` user and password, and click **Next**.
7. On the Hosts screen, select the host nodes in the cluster to be cluster members in the installed Oracle RAC database. When you have completed your selection, click **Next**.
8. On the Convert to Database: Options page, select whether you want to use the existing listener and port number, or specify a new listener and port number for the cluster. Also provide a prefix for cluster database instances on the cluster.

   When you have finished entering information, click **Next**, or click **Help** if you need assistance in deciding how to enter information.
9. On the Convert to Cluster Database: Shared Storage page, either select the option to use your existing shared storage area, or select the option to have your database files copied to a new shared storage location. Also, decide if you want to use your existing Fast Recovery Area or copy your Flash Recovery files to a new Fast Recovery Area using files managed by Oracle Database.

If you use Oracle ASM, then Oracle recommends that you place the database area and the recovery area in separate failure groups. If you do not use Oracle ASM, then Oracle recommends that the data files and the Fast Recovery Area are located on separate locations, as with separate Oracle ASM failure groups, so that a hardware failure does not affect availability.

> **See Also:** *Oracle Database Storage Administrator's Guide* for more information about failure groups

When you have finished entering information, click **Next**, or click **Help** if you need assistance in deciding how to enter information.

10. On the Convert to Cluster Database: Review page, review the options you have selected. Click **Submit Job** to proceed with the conversion. To change any of the options you have selected, click **Back**. To cancel the conversion, click **Cancel**.
11. On the Confirmation page, click **View Job** to check the status of the conversion.

C.4 Converting Databases to Oracle RAC Using rconfig

You can use the command line utility `rconfig` to convert a single-instance database to Oracle RAC. To use this feature, complete the following steps:

> **See Also:** *Oracle Database Upgrade Guide* for information about upgrading existing Oracle Database installations

1. As the `oracle` user, navigate to the directory *`Oracle_home`*`\assistants\rconfig\sampleXMLs`, and open the file `ConvertToRAC.xml` using a text editor.
2. Review the `ConvertToRAC.xml` file, and modify the parameters as required for your system. The XML sample file contains comment lines that provide instructions for how to configure the file.

   > **Caution:** Set the convert option `Convert verify="ONLY"` to perform a test conversion to ensure that a conversion can be completed successfully.

   When you have completed making changes, save the file with the syntax *`filename`*`.xml`. Make a note of the name you select.
3. Navigate to the directory *`Oracle_home`*`\bin`, and use the following syntax to run the command `rconfig`:

   ```
   rconfig input.xml
   ```

   where *`input.xml`* is the name of the XML input file you configured in Step 2.

   For example, if you create an input XML file called `convert.xml`, then enter the following command

   ```
   C:\...\bin> rconfig.bat convert.xml
   ```

Note: The `Convert verify` option in the `ConvertToRAC.xml` file has three options:

- `Convert verify="YES"`: `rconfig` performs checks to ensure that the prerequisites for single-instance to Oracle RAC conversion have been met before it starts conversion
- `Convert verify="NO"`: `rconfig` does not perform prerequisite checks, and starts conversion
- `Convert verify="ONLY"` `rconfig` only performs prerequisite checks; it does not start conversion after completing prerequisite checks

If performing the conversion fails, then use the following procedure to recover and reattempt the conversion:

1. Attempt to delete the database using the DBCA delete database option.
2. Restore the source database.
3. Review the conversion log, and fix any problems reported by `rconfig` that may have caused the conversion failure. The `rconfig` log files are under the `rconfig` directory in %ORACLE_BASE%\cfgtoollogs.
4. Reattempt the conversion.

C.5 Example of rconfig XML Input Files for ConvertToRAC

The following are two examples of an XML `ConvertToRAC` input file for the `rconfig` utility. Example C–1 is an XML input file to convert a single-instance database with Oracle ASM to a policy-managed Oracle RAC database (using server pools) on Oracle ASM storage. Example C–2 is an XML input file to convert a single-instance database with Oracle ASM to an administrator-managed Oracle RAC database.

Example C–1 rconfig ConvertToRAC for Policy-Managed Database

```
<?xml version="1.0" encoding="UTF-8"?>
<n:RConfig xmlns:n="http://www.oracle.com/rconfig"
           xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
           xsi:schemaLocation="http://www.oracle.com/rconfig">
    <n:ConvertToRAC>
<!-- Verify does a precheck to ensure all pre-requisites are met, before the
conversion is attempted. Allowable values are: YES|NO|ONLY -->
<n:Convert verify="YES">
<!--Specify current OracleHome of non-rac database for SourceDBHome -->
      <n:SourceDBHome>C:\app\oracle\product\11.2.0\db_1</n:SourceDBHome>
<!--Specify OracleHome where the rac database should be configured. It can be same
as SourceDBHome -->
      <n:TargetDBHome>C:\app\oracle\product\11.2.0\db_1</n:TargetDBHome>
<!--Specify SID of non-rac database and credential. User with sysdba role is
required to perform conversion -->
              <n:SourceDBInfo SID="sales">
        <n:Credentials>
          <n:User>sys</n:User>
          <n:Password>oracle</n:Password>
          <n:Role>sysdba</n:Role>
        </n:Credentials>
```

```
      </n:SourceDBInfo>
<!--Specify the list of existing or new server pools which are used by the Policy
Managed Cluster Database. -->
              <n:ServerPoolList>
                <n:ExistingServerPool name="custom"/>
                <n:NewServerPool name="newpool" cardinality="2"/>
              </n:ServerPoolList>
<!--InstancePrefix is not required for Policy Managed database. If specified, it
will be ignored. Instance names are generated automatically based on db_unique_
name for Policy Managed dababase.-->
<!-- Listener details are no longer needed starting 11.2. Database is registered
with default listener and SCAN listener running from Oracle Grid Infrastructure
home. -->
<!--Specify the type of storage to be used by rac database. Allowable values are
CFS|ASM. The non-rac database should have same storage type. ASM credentials are
no needed for conversion. -->
      <n:SharedStorage type="ASM">
<!--Specify Database Area Location to be configured for rac database.If this field
is left empty, current storage will be used for rac database. For CFS, this field
will have directory path. -->
        <n:TargetDatabaseArea>+ASMDG</n:TargetDatabaseArea>
<!--Specify Flash Recovery Area to be configured for rac database. If this field
is left empty, current recovery area of non-rac database will be configured for
rac database. If current database is not using recovery Area, the resulting rac
database will not have a recovery area. -->
        <n:TargetFlashRecoveryArea>+ASMDG</n:TargetFlashRecoveryArea>
      </n:SharedStorage>
        </n:Convert>
    </n:ConvertToRAC>
</n:RConfig>
```

Example C–2 rconfig ConvertToRAC for Administrator-Managed Database

```
<?xml version="1.0" encoding="UTF-8"?>
<n:RConfig xmlns:n="http://www.oracle.com/rconfig"
           xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
           xsi:schemaLocation="http://www.oracle.com/rconfig">
    <n:ConvertToRAC>
<!-- Verify does a precheck to ensure all pre-requisites are met, before the
conversion is attempted. Allowable values are: YES|NO|ONLY -->
<n:Convert verify="YES">
<!--Specify current OracleHome of non-rac database for SourceDBHome -->
      <n:SourceDBHome>C:\app\oracle\product\11.2.0\db_1</n:SourceDBHome>
<!--Specify OracleHome where the rac database should be configured. It can be same
as SourceDBHome -->
      <n:TargetDBHome>C:\app\oracle\product\11.2.0\db_1</n:TargetDBHome>
<!--Specify SID of non-rac database and credential. User with sysdba role is
required to perform conversion -->
              <n:SourceDBInfo SID="sales">
        <n:Credentials>
          <n:User>sys</n:User>
          <n:Password>oracle</n:Password>
          <n:Role>sysdba</n:Role>
        </n:Credentials>
      </n:SourceDBInfo>
<!--Specify the list of nodes that should have rac instances running for the Admin
Managed Cluster Database. LocalNode should be the first node in this nodelist. -->
      <n:NodeList>
        <n:Node name="node1"/>
        <n:Node name="node2"/>
```

```
      </n:NodeList>
<!--Instance Prefix tag is optional starting with 11.2. If left empty, it is
derived from db_unique_name.-->
      <n:InstancePrefix>sales</n:InstancePrefix>
<!-- Listener details are no longer needed starting 11.2. Database is registered
with default listener and SCAN listener running from Oracle Grid Infrastructure
home. -->
<!--Specify the type of storage to be used by rac database. Allowable values are
CFS|ASM. The non-rac database should have same storage type. ASM credentials are
no needed for conversion. -->
      <n:SharedStorage type="ASM">
<!--Specify Database Area Location to be configured for rac database.If this field
is left empty, current storage will be used for rac database. For CFS, this field
will have directory path. -->
        <n:TargetDatabaseArea>+ASMDG</n:TargetDatabaseArea>
<!--Specify Flash Recovery Area to be configured for rac database. If this field
is left empty, current recovery area of non-rac database will be configured for
rac database. If current database is not using recovery Area, the resulting rac
database will not have a recovery area. -->
        <n:TargetFlashRecoveryArea>+ASMDG</n:TargetFlashRecoveryArea>
      </n:SharedStorage>
        </n:Convert>
    </n:ConvertToRAC>
</n:RConfig>
```

C.6 Post-Conversion Steps

After completing the conversion, note the following recommendations for Oracle RAC environments, as described in the Oracle RAC documentation:

- Follow the recommendations for using load balancing and transparent application failover, as described in *Oracle Real Application Clusters Administration and Deployment Guide*
- Use locally managed tablespaces instead of dictionary managed tablespaces to reduce contention and manage sequences in Oracle RAC as described in *Oracle Real Application Clusters Administration and Deployment Guide*
- Follow the guidelines for using automatic segment space management as described in *Oracle Real Application Clusters Administration and Deployment Guide*

The buffer cache and shared pool capacity requirements in Oracle RAC are slightly greater than the requirements for single-instance Oracle databases. Therefore, you should increase the size of the buffer cache by about 10%, and the size of the shared pool by about 15%.

D

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

D.1 Understanding the Oracle RAC Directory Structure

When you install Oracle Database 11*g* release 2 (11.2) with Oracle RAC, all subdirectories except for the Oracle Inventory directory and the Oracle Clusterware home, are under a top-level `ORACLE_BASE` directory. The `ORACLE_HOME` and `ADMIN` directories are also located under `ORACLE_BASE`.

> **See Also:** *Oracle Real Application Clusters Administration and Deployment Guide* for further information about the `ORACLE_HOME` and `ADMIN` directories

D.2 Directory Structures for Oracle RAC

Table D–1 shows the hierarchical directory tree of a sample optimal flexible architecture (OFA)-compliant database for Oracle RAC:

Table D–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.
	`ORACLE_HOME`			`C:\app\oracle\product\11.2.0\` The default name of the Oracle home. Note that the Oracle database home is under the Oracle base directory path. An Oracle Clusterware directory must *not* be under the Oracle base directory path where the database binaries are located.
		`installation_type`		Type of installation under the Oracle base directory. You can also choose to add a counter, if you intend to have multiple installations of the software. For example, with an Oracle database installation, where the database is the second database, the path is as follows: `C:\app\oracle\product\11.2.0\db_2`

Table D–1 (Cont.) Directory Structure for A Sample OFA-Compliant Environment

Root	Second-level	Third-level	Fourth-level	Description
	admin			The administrative directory. Note that with Oracle Database 11*g*, bdump, cdump, and udump files are relocated to the directory 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: C:\app\oracle\admin\sales
			/hdump /pfile	The dump destinations for 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 Data 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)				C:\app\grid\11.2.0\ An OFA-compliant path for the Oracle Clusterware home. 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 binaries.
	network			The subtree for Oracle Net.

See Also: *Oracle Database Platform Guide for Microsoft Windows* for further information about the ORACLE_HOME and admin directories

E

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:

- Back Up the Oracle RAC Database
- Shut Down Oracle RAC Databases
- Stop All Oracle Processes

E.1 Back 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.

E.2 Shut 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 SRVCTL 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.

E.3 Stop 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.

This section contains the following topics:

- Stopping Oracle Database Processes Before Adding Products or Upgrading
- Stopping Oracle Clusterware or Cluster Ready Services Processes

E.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 11*g* release 2 (11.2). 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 Grid Control, set a blackout in Grid 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.

   For example:

   ```
   C:\> Oracle_home\bin\emctl stop dbconsole
   ```

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\srvctl stop database -d db_name
   ```

E.3.2 Stopping Oracle Clusterware or Cluster Ready Services Processes

If you are modifying an Oracle Clusterware or Oracle ASM installation, then shut down the following Oracle Database services.

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, Oracle Enterprise Manager Database Control.

   Note: Before you shut down any processes that are monitored by Oracle Enterprise Manager Grid Control, set a blackout in Grid 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 -d db_name
   ```

3. Stop all node applications on all nodes. To stop node applications running on a node, enter the following command, where `C:\app\grid\11.2.0` is the grid infrastructure home, and *node* is the name of the node where the applications run.

   ```
   C:\> app\grid\11.2.0\bin\srvctl stop nodeapps -n node
   ```

4. Shut down the Oracle Clusterware (or CRS processes) and Oracle ASM instance 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 is used to stop Oracle High Availability services for single-instance databases.

5. Shut down the Oracle Clusterware or CRS 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.

F

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 Enterprise Management Agent Port
- Changing the Oracle Enterprise Manager Database Console Ports
- Changing the Oracle XML DB Ports

F.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 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 host.

Most port numbers are assigned during installation or at execution time. Every component and service has an allotted port range, which is the set of port numbers Oracle Real Application Clusters attempts to use when assigning a port. Oracle Real Application Clusters starts with the lowest number in the range and performs the following checks:

- Is the port used by another Oracle Database installation on the host?

  The installation may be up or down 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 Real Application Clusters moves to the next highest port in the allotted port range and continues checking until it finds a free port.

F.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, then it is not updated in the `portlist.ini` file, so you can only rely on this file immediately after installation. To find or change a port number, use the methods described in this appendix.

F.3 Port Numbers and Protocols of Oracle Components

The following table 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 F–1 Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol
Oracle SQL*Net Listener Allows Oracle client connections to the database over Oracle's SQL*Net protocol. You can configure it during installation. To reconfigure this port, use Net Configuration Assistant.	1521	1024-65535	TCP
Oracle Data Guard Shares the SQL*Net port and is configured during installation. To reconfigure this port, use Net Configuration Assistant to reconfigure the Oracle SQL*Net listener.	1521 (same value as the listener)	1521	TCP
Oracle Connection Manager Listening port for Oracle client connections to Oracle Connection Manager. You can configure Oracle Connection Manager after installation using Net Configuration Assistant.	1630	1630	TCP
Oracle Enterprise Manager Database Control Agent HTTP port for Oracle Management Agent, which is part of Oracle Enterprise Manager. It is configured during installation. "Changing the Oracle Enterprise Management Agent Port" on page F-4 explains how to modify its port number	3938	1830–1849	HTTP
Oracle Enterprise Manager Database Console HTTP port for Oracle Enterprise Manager Database Control. It is configured during installation. "Changing the Oracle Enterprise Manager Database Console Ports" on page F-4 explains how to modify its port number.	1158	5500–5519	TCP/HTTP
Oracle Enterprise Manager Database Console RMI port for Oracle Enterprise Manager Database Control. It is configured during installation."Changing the Oracle Enterprise Manager Database Console Ports" on page F-4 explains how to modify its port number.	5520	5520–5539	TCP

Table F–1 (Cont.) Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol
Oracle Enterprise Manager Database Console JMS port for Oracle Enterprise Manager Database Control. It is configured during installation. "Changing the Oracle Enterprise Manager Database Console Ports" on page F-4 explains how to modify its port number.	5540	5540–5559	TCP
Oracle XML DB The Oracle XML DB HTTP port is used if Web-based applications must access an Oracle database from an HTTP listener. It is configured during installation, but you cannot view it afterward. "Changing the Oracle XML DB Ports" explains how to change its port number.	0	Dynamic	HTTP
Oracle XML DB The Oracle XML DB FTP is used when applications must access an Oracle database from an FTP listener. It is configured during installation, but you cannot view it afterward. "Changing the Oracle XML DB Ports"explains how to change its port number.	0	Dynamic	FTP
Oracle Real Application Clusters The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	UDP
Oracle Clusterware CRS daemon (Oracle Cluster Ready Services Daemon) internode connection. The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	TCP
Cluster Synchronization Service (CSS) CSS daemon internode connection for the GM layer. The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	TCP
Oracle Cluster Registry The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	TCP

Table F–1 (Cont.) Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol
Oracle Event Manager The port number is assigned automatically during installation. You cannot view or modify it afterward.	49897	49897–49898	TCP
Cluster Manager The port number is assigned automatically during installation. You cannot view or modify it afterward.	Dynamic	Dynamic	TCP
Oracle Services for Microsoft Transaction Server The port number for Microsoft Transaction Server is configured when you enter its value in Oracle Universal Installer the first time you install it on a particular computer. If you install it in multiple Oracle homes on the same computer, then Oracle Universal Installer uses the same port number that you specified during the first installation. In most cases, you do not have to reconfigure the port number. If you must use a different port number, you can edit its value in the `HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE\OracleMTSRecoveryService\Protid_0` Registry Editor key.	2030	2030	TCP

F.4 Changing the Oracle Enterprise Management Agent Port

To find the current setting for the Oracle Management agent port, search for `EMD_URL` in the *`Oracle_home`*`\`*`host_sid`*`\sysman\config\emd.properties` file.

To change the Oracle Management Agent HTTP port, use the `emca -reconfig` ports command:

```
emca -reconfig ports -AGENT_PORT 1831
```

F.5 Changing the Oracle Enterprise Manager Database Console Ports

To find the current HTTP, RMI, and JMS port settings, search in the following files:

- **HTTP port**: Search for `REPOSITORY_URL` in the *`ORACLE_HOME`*`\`*`host_sid`*`\sysman\config\emd.properties` file.
- **RMI port**: Search for the `port` attribute in the `rmi-server` tag in the *`ORACLE_HOME`*`\oc4j\j2ee\OC4J_DBConsole_`*`host_sid`*`\config\rmi.xml` file.
- **JMS port**: Search for the `port` attribute in the `jms-server` tag in the *`ORACLE_HOME`*`\oc4j\j2ee\OC4J_DBConsole_`*`host_sid`*`\config\ jms.xml`file.

To change the Oracle Enterprise Manager Database Console ports, use the `emca -reconfig` ports command:

```
emca -reconfig ports option setting
```

where *`option`* can be:

- `DBCONTROL_HTTP_PORT`: Sets the HTTP port, for example:

  ```
  emca -reconfig ports -DBCONTROL_HTTP_PORT 1820
  ```

- `RMI_PORT`: Sets the RMI port, for example:

  ```
  emca -reconfig ports -RMI_PORT 5520
  ```

- `JMS_PORT`: Sets the JMS port, for example:

  ```
  emca -reconfig ports -JMS_PORT 5521
  ```

You can enter multiple `-reconfig port` settings in one line, for example:

```
emca -reconfig ports -DBCONTROL_HTTP_PORT 1820 -AGENT_PORT 1821 -RMI_PORT 5520
```

F.6 Changing the Oracle XML DB Ports

By default, the FTP and HTTP (including HTTPS) ports for Oracle XML DB are set to 0, which disables FTP or HTTP access to the Oracle XML DB.

To change the Oracle XML FTP and HTTP ports, you must run the `catxdbdbca.sql` script, which in a default installation is located in Oracle_home*`rdbms\admin`*.

To change the Oracle XML DB ports:

1. Check that the Oracle listener is running. In the Windows Services Control Manager, ensure that the Oracle TNS Listener service (for example, OracleOraDb11g_home1TNSListener) is set to Started.

   If you cannot start the listener, then refer to *Oracle Database Net Services Administrator's Guide*.

2. Log in to SQL*Plus as the `SYS` or `XDB` user using the `SYSDBA` role.

   For example, to log in to SQL*Plus as `SYS`:

   ```
   SQL> sqlplus sys/ as sysdba
   ```

3. Run the `catxdbdbca.sql` script.

   For example, to use `2200` for the FTP port and `8200` for the HTTP port, and assuming your Oracle home is in the following location, enter the following command:

   ```
   SQL> C:\app\oracle\product\11.2.0\db_1\rdbms\admin/
   catxdbdbca.sql 2200 8200
   ```

4. Exit SQL*Plus.

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

G

Oracle Enterprise Manager Configuration Assistant (EMCA) Reference

This appendix contains the following topics:

- About EMCA
  - Overview
  - Operational Notes
- EMCA Command Reference

See Also: "Configuring Oracle Enterprise Manager Database Control" on page 6-2 for more information using EMCA

About EMCA

This section contains topics which relate to using the EMCA command-line interface.

- Overview
- Operational Notes

Overview

Oracle Enterprise Manager Configuration Assistant (EMCA) provides a command-line interface for configuring Database Control. The primary method for configuring an existing Oracle Database 11*g* release 2 (11.2) database to be managed with Oracle Enterprise Manager Database Control is to use DBCA, but EMCA can be used if a non-graphical user interface is preferred.

WARNING: During the database configuration using EMCA, the database is unavailable and users cannot connect to the database or perform operations on the database.

Operational Notes

Usage Information

Every EMCA command can be used in Oracle RAC environments, and certain commands are applicable only in cluster setups. To perform cluster commands using EMCA, use the `-cluster` flag that is available in almost every EMCA operational mode.

EMCA commands are of the form:

```
emca [operation] [mode] [flags] [parameters]
```

For information on the current cluster configuration, you can run the following command:

```
emca -displayConfig dbcontrol -cluster
```

EMCA Parameters

Depending upon the parameters you include on the EMCA command line, EMCA prompts you for additional information required to configure Database Control.

Each EMCA command can include optional parameters to specify the additional information required by EMCA. Parameters used with EMCA are of the form [-*parameterName parameterValue*]. Multiple parameters can be used in combination at the command line. Table G–1 lists the optional parameters that can be used with EMCA:

Note: You can view a list of the available parameters by entering `emca -help` at the command line.

Table G–1 EMCA Optional Command-Line Parameters

Parameter	Description
`-respFile`	Specifies the path of an input file listing parameters for EMCA to use while performing its configuration operation. For more information, refer to "Using an Input File for EMCA Parameters" on page 6-6.
`-SID`	Database system identifier
`-PORT`	Port number for the listener servicing the database
`-ORACLE_HOME`	Database Oracle home, as an absolute path
`-LISTENER_OH`	Oracle home from where the listener is running. If the listener is running from an Oracle home other than the one on which the database is running, then the parameter LISTENER_OH must be specified.
`-HOST_USER`	Host computer user name (for automatic backup)
`-HOST_USER_PWD`	Host computer user password (for automatic backup)
`-BACKUP_SCHEDULE`	Schedule in the form of "HH:MM" (for daily automatic backups)
`-EMAIL_ADDRESS`	E-mail address for notifications
`-MAIL_SERVER_NAME`	Outgoing Mail (SMTP) server for notifications
`-ASM_OH`	Oracle Automatic Storage Management Oracle home

Table G–1 (Cont.) EMCA Optional Command-Line Parameters

Parameter	Description
-ASM_SID	System identifier for Oracle ASM instance
-ASM_PORT	Port number for the listener servicing the Oracle ASM instance
-ASM_USER_ROLE	User role for connecting to the Oracle ASM instance
-ASM_USER_NAME	User name for connecting to the Oracle ASM instance
-ASM_USER_PWD	Password for connecting to the Oracle ASM instance
-DBSNMP_PWD	Password for DBSNMP user
-SYSMAN_PWD	Password for SYSMAN user
-SYS_PWD	Password for SYS user
-SRC_OH	Oracle home of the database with Oracle Enterprise Manager configuration to be upgraded or restored
-DBCONTROL_HTTP_PORT	Use this parameter to specify the port you use to display the Database Control Console in your Web browser. For more information, refer to "Specifying the Ports Used By Database Control" on page 6-7.
-AGENT_PORT	Use this parameter to specify the Management Agent port for Database Control. For more information, refer to "Specifying the Ports Used By Database Control" on page 6-7.
-RMI_PORT	Use this parameter to specify the RMI port for Database Control. For more information, refer to "Specifying the Ports Used By Database Control" on page 6-7.
-JMS_PORT	Use this parameter to specify the JMS port for Database Control. For more information, refer to "Specifying the Ports Used By Database Control" on page 6-7.
-CLUSTER_NAME	Cluster name (for cluster databases)
-DB_UNIQUE_NAME	Database unique name (for cluster databases)
-SERVICE_NAME	Database service name (for cluster databases)
-EM_NODE	Node from which Database Control console is to be run (for cluster databases). For more information, refer to "Reconfiguring Existing Database Control Configurations on Remote Nodes" on page 6-4.
-EM_NODE_LIST	Comma-separated list of nodes for agent-only configurations, uploading data to –EM_NODE. For more information, refer to "Reconfiguring Existing Database Control Configurations on Remote Nodes" on page 6-4.

Using Tool/Utility Help

To see a list of EMCA options, start EMCA using any of the following commands:

```
emca -h
emca --h
emca -help
emca --help
```

These commands display the Help message for the EMCA utility. It also lists the command arguments described in Table G–2, and the optional parameters described in Table G–1.

EMCA Command Reference

Table G–2 EMCA Commands

Command	Description
addInst on page G-7	Configures Oracle Enterprise Manager for a new cluster instance of a database or Oracle ASM storage.
addNode on page G-8	Configures Oracle Enterprise Manager for a new cluster instance of a database or Oracle ASM storage
config all db on page G-9	Configures both Database Control and central agent management for a database.
config centralAgent on page G-10	Configures central agent management for a database or an Oracle Automatic Storage Management (Oracle ASM) instance.
config dbcontrol db on page G-11	Configures Database Control for a database.
deconfig all db on page G-13	Deconfigures both Database Control and central agent management for a database.
deconfig centralAgent on page G-14	Deconfigures central agent management for a database or an Oracle ASM instance.
deconfig dbcontrol db on page G-15	Deconfigures Database Control for a database.
deleteInst on page G-16	Deconfigures Oracle Enterprise Manager for a specific instance of a cluster database or Oracle ASM storage.
deleteNode on page G-17	Deconfigures Oracle Enterprise Manager for a node getting deleted.
displayConfig dbcontrol on page G-18	Displays information about the current deployment configuration of Database Control in a cluster environment.
reconfig dbcontrol on page G-19	Reconfigures Database Control deployment for a cluster database.
reconfig ports on page G-20	Explicitly reassigns Database Control ports.
restore on page G-21	Restores the current version of Oracle Enterprise Manager configuration to an earlier version.
upgrade on page G-22	Upgrades the configuration of an earlier version of Oracle Enterprise Manager to the current version.
version on page G-23	Prints the version information associated with EMCA

addInst

Use this command to configure Oracle Enterprise Manager for a new cluster instance of a database or Oracle ASM.

Syntax

```
emca -addInst (db | asm) [-silent] [parameters]
```

Parameters

Table G–3 addInst Options

Parameter	Description
`db`	Performs the operation for a database (including cluster databases). Use this option for databases that use Oracle Automatic Storage Management (Oracle ASM) to store the data files. If a database is using Oracle ASM, then all the EMCA configuration commands (except for "-upgrade" and "-restore") detect this automatically and apply the changes to both the database and Oracle ASM instance(s).
`asm`	Performs the operation for an Oracle ASM-only instance (including cluster Oracle ASM instances)
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

addNode

Use this command to configure Oracle Enterprise Manager for a new cluster instance of a database or Oracle ASM.

For more information, refer to "Understanding EMCA with Oracle RAC" on page 6-2.

Syntax

```
emca -addNode (db | asm) [-silent] [parameters]
```

Parameters

Table G–4 addNode Options

Parameter	Description
`db`	Performs the operation for a database (including cluster databases). Use this option for databases that use Oracle Automatic Storage Management (Oracle ASM) to store the data files. If a database is using Oracle ASM, then all the EMCA configuration commands (except for "-upgrade" and "-restore") detect this automatically and apply the changes to both the database and Oracle ASM instance(s).
`asm`	Performs the operation for an Oracle ASM-only instance (including cluster Oracle ASM instances)
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

Examples

This command is discussed further in the section "Updating Database Control Configuration When Adding and Removing Nodes" on page 6-5.

config all db

Use this command to configure both Database Control and central agent management for a database. Options include creating (or recreating) the Database Control repository, configuring automatic backups, and performing these operations on a cluster database.

This operation configures the database so that it can be centrally managed by the Oracle Enterprise Manager 10*g* Grid Control Console. To use this option, you must have previously installed the Oracle Management Service component of Oracle Enterprise Manager on a network host. In addition, the Oracle Management Agent must be installed on the host where you run the database.

Syntax

```
emca -config all db [-repos (create | recreate)] [-cluster] [-silent]
     [-backup] [parameters]
```

Parameters

Table G–5 config all db Options

Parameter	Description
`-repos create`	Creates a new Database Control management repository
`-repos recreate`	Drops the current Database Control management repository and then re-creates a new one
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
parameters	See Table G–1, " EMCA Optional Command-Line Parameters"

config centralAgent

Use this command to configure a central agent management for a database or an Oracle Automatic Storage Management (Oracle ASM) instance. Options include performing this operation on a cluster environment.

This operation configures the database so that it can be centrally managed by the Oracle Enterprise Manager 10*g* Grid Control Console. To use this option, you must have previously installed the Oracle Management Service component of Oracle Enterprise Manager on a network host. In addition, the Oracle Management Agent must be installed on the host where you run the database.

Syntax

```
emca -config centralAgent (db | asm) [-cluster] [-silent] [parameters]
```

Parameters

Table G–6 config centralAgent Options

Parameter	Description
`db`	Performs the operation for a database (including cluster databases). Use this option for databases that use Oracle Automatic Storage Management (Oracle ASM) to store the data files. If a database is using Oracle ASM, then all the EMCA configuration commands (except for "-upgrade" and "-restore") detect this automatically and apply the changes to both the database and Oracle ASM instance(s).
`asm`	Performs the operation for an Oracle ASM-only instance (including cluster Oracle ASM instances)
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

config dbcontrol db

Use this command to configure Enterprise Management Database Control for a database. Options include creating (or recreating) Database Control repository, configuring automatic backups, and performing these operations on a cluster database.

Syntax

```
emca -config dbcontrol db [-repos (create | recreate)] [-cluster] [-silent]
     [-backup] [parameters]
```

Options

Table G–7 config dbcontrol Options

Parameter	Description
`-repos create`	Creates a new Database Control management repository
`-repos recreate`	Drops the current Database Control management repository and then re-creates a new one
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`-backup`	Configures automatic backup for a database. EMCA prompts for daily automatic backup options. The default Oracle Enterprise Manager settings are used to backup the database files. If you use this option, then EMCA uses the value of the `db_recovery_file_dest` initialization parameter to identify the flashback recovery area for the automated backups. If that parameter is not set, then EMCA generates an error. You can modify these settings later using the Maintenance page in Database Control.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

Examples

Example 1 Configuring Database Control for a single Oracle ASM instance

To configure Database Console for single instance database using Oracle ASM, simply run the following command to configure the Database Console and automatically detect the Oracle ASM instance:

```
emca -config dbcontrol db -repos create
```

Example 2 Configuring automatic backups of your database

Enter the following command to configure Database Control so it performs automatic daily backups of your database:

```
emca -config dbcontrol db -backup
```

deconfig all db

Deconfigures both Database Control and central agent management for a database. Options include dropping the Database Control repository and performing these operations on a cluster database.

Syntax

```
emca -deconfig all db [-repos drop] [-cluster] [-silent] [parameters]
```

Parameters

Table G–8 deconfig all db Options

Parameter	Description
`-repos drop`	Drops the current Database Control management repository.
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

deconfig centralAgent

Use this command to deconfigure the central agent management for a database or an Oracle ASM instance. Options include performing this operation on a cluster environment.

For example, you might use this command to remove the central agent management configuration from a database you are planning to delete. In such a scenario, remove the central agent management configuration before physically deleting the database. This operation does not remove the actual database or its data files.

Syntax

```
emca -deconfig centralAgent (db | asm) [-cluster] [-silent] [parameters]
```

Parameters

Table G–9 deconfig centralAgent Options

Parameter	Description
`db`	Performs the operation for a database (including cluster databases). Use this option for databases that use Oracle Automatic Storage Management (Oracle ASM) to store the data files. If a database is using Oracle ASM, then all the EMCA configuration commands (except for "-upgrade" and "-restore") detect this automatically and apply the changes to both the database and Oracle ASM instance(s).
`asm`	Performs the operation for an Oracle ASM-only instance (including cluster Oracle ASM instances)
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

Examples

Example 1 Removing the central agent management configuration from a database being deleted

If you are planning to delete the `testdb` database, then you would use a command similar to the following to remove the central agent management configuration before physically deleting the database:

```
emca -deconfig centralAgent db -ORACLE_HOME /u01/app/oracle/10.2/db1
-SID testdb
```

deconfig dbcontrol db

Use this command to deconfigure Database Control for a database. Options include dropping the Database Control repository and performing these operations on a cluster database.

This operation does not remove the actual database or its data files

Syntax

```
emca -deconfig dbcontrol db [-repos drop] [-cluster] [-silent] [parameters]
```

Parameters

Table G–10 deconfig dbcontrol db Options

Parameter	Description
`-repos drop`	Drops the current Database Control management repository.
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

Examples

Example 1 Removing the Database Control configuration from a database being deleted

If you are planning to delete the `testdb` database, then you would use a command similar to the following to remove the Database Control configuration before physically deleting the database:

```
emca -deconfig dbcontrol db -repos drop -ORACLE_HOME /u01/app/oracle/10.2/db1
-SID testdb
```

deleteInst

Use this command to deconfigure Oracle Enterprise Manager for a specific instance of a cluster database or Oracle ASM.

Syntax

```
emca -deleteInst (db | asm) [-silent] [parameters]
```

Parameters

Table G–11 deleteInst Options

Parameter	Description
`db`	Performs the operation for a database (including cluster databases). Use this option for databases that use Oracle Automatic Storage Management (Oracle ASM) to store the data files. If a database is using Oracle ASM, then all the EMCA configuration commands (except for "-upgrade" and "-restore") detect this automatically and apply the changes to both the database and Oracle ASM instance(s).
`asm`	Performs the operation for an Oracle ASM-only instance (including cluster Oracle ASM instances)
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

deleteNode

Use this command to deconfigure Oracle Enterprise Manager for a node being deleted. For more information, refer to "Understanding EMCA with Oracle RAC" on page 6-2.

Syntax

```
emca -deleteNode (db | asm) [-silent] [parameters]
```

Parameters

Table G–12 deleteNode Options

Parameter	Description
`db`	Performs the operation for a database (including cluster databases). Use this option for databases that use Oracle Automatic Storage Management (Oracle ASM) to store the data files. If a database is using Oracle ASM, then all the EMCA configuration commands (except for "-upgrade" and "-restore") detect this automatically and apply the changes to both the database and Oracle ASM instance(s).
`asm`	Performs the operation for an Oracle ASM-only instance (including cluster Oracle ASM instances)
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

Examples

This command is discussed further in the section "Updating Database Control Configuration When Adding and Removing Nodes" on page 6-5.

displayConfig dbcontrol

Use this command to display information about the current deployment configuration of Database Control in a cluster environment. This command must be used with the `-cluster` option.

Syntax

```
emca -displayConfig dbcontrol -cluster [-silent] [parameters]
```

Parameters

Table G–13 displayConfig dbcontrol Options

Parameter	Description
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

reconfig dbcontrol

Use this command to reconfigure Database Control deployment for a cluster database. This command must be used with the `-cluster` option.

Syntax

```
emca -reconfig dbcontrol -cluster [-silent] [parameters]
```

Parameters

Table G–14 reconfig dbcontrol Options

Parameter	Description
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

Examples

This command is discussed further in the section "Reconfiguring Existing Database Control Configurations on Remote Nodes" on page 6-4.

reconfig ports

Use this command to explicitly reassign Database Control ports. Options include performing this operation on a cluster environment.

Syntax

```
emca -reconfig ports [-cluster] [parameters]
```

Parameters

Table G–15 reconfig ports Options

Parameter	Description
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

Examples

This command is discussed further in the section "Specifying the Ports Used By Database Control" on page 6-7.

restore

Use this command to restore the current version of Oracle Enterprise Manager configuration to an earlier version. This is the inverse of the `-upgrade` command. Executing this command reverses any changes that resulted from an `-upgrade` operation. This operation can be performed for database, Oracle ASM, or database and Oracle ASM instances simultaneously.

Syntax

```
emca -restore (db | asm | db_asm) [-cluster] [-silent] [parameters]
```

Parameters

Table G–16 restore Options

Parameter	Description
`db`	Performs the operation for a database (including cluster databases).
`asm`	Performs the operation for an Oracle ASM-only instance (including cluster Oracle ASM instances)
`db_asm`	Performs the restore operation for a database and an Oracle ASM instance. Restoring an Oracle ASM instance does not require restoring the database instances it services. Therefore, the Oracle Enterprise Manager configuration can be restored separately for a database and its respective Oracle ASM instance.
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

upgrade

Use this command to upgrade the configuration of an earlier version of Oracle Enterprise Manager to the current version. This operation can be performed for database, Oracle ASM, or database and Oracle ASM instances simultaneously.

This command does not upgrade the actual database or Oracle ASM instances, nor does it upgrade the Oracle Enterprise Manager software. Instead, it upgrades the configuration files for the specified instance so that they are compatible with the current version of the Oracle Enterprise Manager software. EMCA attempts to upgrade all instances of the specified database or Oracle ASM target on the host, across all Oracle homes (because it is likely that certain target properties, such as listener port or Oracle home, have changed).

Syntax

```
emca -upgrade (db | asm | db_asm) [-cluster] [-silent] [parameters]
```

Parameters

Table G–17 upgrade Options

Parameter	Description
`db`	Performs the operation for a database (including cluster databases).
`asm`	Performs the operation for an Oracle ASM-only instance (including cluster Oracle ASM instances)
`db_asm`	Performs the upgrade operation for a database and an Oracle ASM instance. Upgrading an Oracle ASM instance does not require upgrading the database instances it services. Therefore, the Oracle Enterprise Manager configuration can be upgraded separately for a database and its respective Oracle ASM instance.
`-cluster`	Performs the operation for a cluster database or Oracle ASM instance
`-silent`	Performs the operation without prompting for additional information. If this mode is specified, then all the required parameters must be entered at the command line or specified in an input file using the `-respFile` argument. See "Using an Input File for EMCA Parameters" on page 6-6 for more information.
`parameters`	See Table G–1, " EMCA Optional Command-Line Parameters"

version

Use this command to print the version information associated with EMCA.

Syntax

```
emca -version
```

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