

Oracle® Real Application Clusters

Installation Guide

11g Release 2 (11.2) for Linux and UNIX

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Oracle Real Application Clusters Installation Guide, 11g Release 2 (11.2) for Linux and UNIX

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Preface

Oracle Real Application Clusters Installation Guide for Linux and UNIX explains how to install and configure Oracle Real Application Clusters (Oracle RAC). Before you use this guide, you must first complete an installation of Oracle Clusterware, as described in the *Oracle Grid Infrastructure Installation Guide* for your platform.

This preface contains the following topics:

- [Intended Audience](#)
- [Documentation Accessibility](#)
- [Related Documents](#)
- [Conventions](#)

Intended Audience

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

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at <http://www.oracle.com/us/corporate/accessibility/index.html>.

Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/support/contact.html> or visit <http://www.oracle.com/accessibility/support.html> if you are hearing impaired.

Related Documents

For more information, refer to the following Oracle resources:

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.

Installation Guides

- *Oracle Diagnostics Pack Installation Guide*
- *Oracle Grid Infrastructure Installation Guide* for your platform

Operating System-Specific Administrative Guides

- *Oracle Clusterware Administration and Deployment Guide*
- *Oracle Database Administrator's Reference, 11g Release 2 (11.2) for UNIX Systems*
- *Oracle Database Platform Guide for Microsoft Windows*

Oracle Database 11g Release 2 (11.2) Real Application Clusters Management

- *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 New Features Guide*
- *Oracle Database Net Services Administrator's Guide*
- *Oracle Database Concepts*
- *Oracle Database Reference*

Printed documentation is available for sale in the Oracle Store at the following Web site:

<https://shop.oracle.com>

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://www.oracle.com/technology/membership/index.html>

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

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

Oracle error message documentation is available only in HTML. You can browse the error messages by range in the Documentation directory of the installation media. When you find a range, use your browser's search feature to locate a specific message. When connected to the Internet, you can search for a specific error message using the error message search feature of the Oracle online documentation.

Conventions

The following text conventions are used in this document:

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

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 Release 2 \(11.2.0.2\)](#)
- [New Features for Release 2 \(11.2\)](#)
- [New Features for Release 1\(11.1\)](#)

New Features for Release 2 (11.2.0.2)

The following is a list of new features for Release 2 (11.2.0.2):

Enhanced Patch Set Installation

Starting with the release of the 11.2.0.2 patch set for Oracle Database 11g Release 2, Oracle Database patch sets are full installations of the Oracle Database software. Note the following changes with the new patch set packaging:

- Direct upgrades from previous releases (11.x, 10.x) to the most recent patch set are supported.
- Out-of-place patch set upgrades, in which you install the patch set into a new, separate Oracle home, are the best practices recommendation. In-place upgrades are supported, but not recommended.
- New installations consist of installing the most recent patch set, rather than installing a base release and then upgrading to a patch release.

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

<https://support.oracle.com>

New Software Updates Option

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

Oracle Real Application Clusters One Node (Oracle RAC One Node)

Oracle RAC One Node is a single instance of Oracle RAC running on one node in a cluster. You can use Oracle RAC One Node to consolidate many databases onto a single cluster with minimal overhead, and still provide the high availability benefits of failover protection, online rolling patch application, as well as rolling upgrades for the operating system and for Oracle Clusterware. With Oracle RAC One Node you can standardize all Oracle Database deployments across your enterprise.

You can use Oracle Database and Oracle Grid Infrastructure configuration assistants, such as Oracle Database Configuration Assistant (DBCA) and RCONFIG, to configure Oracle RAC One Node databases.

Oracle RAC One Node is a single Oracle RAC database instance. You can use a planned online relocation to start a second Oracle RAC One Node instance temporarily on a new target node, so that you can migrate the current Oracle RAC One Node instance to this new target node. After the migration, the source node instance is shut down. Oracle RAC One Node databases can also fail over to another cluster node within its hosting server pool if their current node fails.

Oracle RAC One Node is not supported if you use a third-party clusterware software, such as Veritas, SFRAC, IBMPowerHA, or HP Serviceguard. Sun Solaris Cluster is not supported at this time. Oracle RAC One Node is not supported with Oracle Data Guard.

With Oracle Database release 2 (11.2.0.2), Oracle RAC One Node is supported on all platforms where Oracle Real Application Clusters (Oracle RAC) is certified.

Redundant Interconnect Usage

In previous releases, to make use of redundant networks for the interconnect, bonding, trunking, teaming, or similar technology was required. Oracle Grid Infrastructure and Oracle RAC can now make use of redundant network interconnects, without the use of other network technology, to enhance optimal communication in the cluster. This functionality is available starting with Oracle Database 11g Release 2 (11.2.0.2).

Redundant Interconnect Usage enables load-balancing and high availability across multiple (up to four) private networks (also known as interconnects).

New Features for Release 2 (11.2)

The following is a list of new features for Release 2 (11.2)

Oracle Automatic Storage Management and Oracle Clusterware Installation

With Oracle Clusterware 11g release 2 (11.2), Oracle Automatic Storage Management (Oracle ASM) is part of the Oracle Grid Infrastructure installation. In an Oracle Clusterware and Oracle RAC installation, Oracle ASM is installed in the Oracle Clusterware home. In addition, Oracle ASM can be configured to require separate administrative privileges, so that membership in OSDBA may no longer provide administrator access to both the database and the storage tiers.

Oracle Automatic Storage Management Cluster File System (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 storage, and provides storage reliability through Oracle ASM's mirroring and parity protection.

Oracle ACFS is available for Linux. It is not available for UNIX platforms at the time of this release.

Cluster Verification Utility Fixup Scripts and Grid Infrastructure Checks

Cluster Verification Utility (CVU) has the following new features:

- CVU can generate shell scripts (Fixup scripts) that perform the system configuration that is required for a successful installation, in addition to identifying system issues that can cause installation failures.
- CVU provides additional checks to address install, configuration and operational issues.
- CVU is automatically called by OUI to verify prerequisites, and will prompt you to create fixup scripts to correct many system configuration issues that prevent installation.

Database Agent and Listeners

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 Name (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 will continue to register with all node listeners, and additionally with the SCAN listeners.

Daylight Savings Time Upgrade of Timestamp with Timezone Data Type

When time zone version files are updated due to Daylight Saving Time changes, 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 carry out extensive manual procedures to update the TSTZ data.

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

Enterprise Manager Database Control Provisioning

Database Control 11g provides the capability to automatically provision Oracle Clusterware and Oracle RAC installations on new nodes, and then extend the existing Oracle Clusterware 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

Enterprise Manager Clusterware Resource Management

You can use Enterprise Manager Cluster Home page to perform full administrative and monitoring support for High Availability Application and Oracle Clusterware resource management. Such administrative tasks include creating and modifying server pools.

Grid Plug and Play

In the past, adding or removing servers in a cluster required extensive manual preparation. Grid Plug and Play reduces the costs of installing, configuring, and managing server nodes by using a grid naming service within the cluster to enable each node to perform the following tasks dynamically:

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

As servers perform these tasks dynamically, adding and removing nodes simply requires an administrator to connect the server to the cluster, and to enable 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. In addition, configuration assistants validate configurations, and provide scripts to fix issues, which you can choose to use, or reject. If you accept the fix scripts, then configuration issues will be fixed automatically.

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

SCAN Addresses for Simplified Client Access

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 three IP addresses, either in the domain name service (DNS) or the Grid Naming Service (GNS). SCANS eliminate the need to change clients when nodes are added to or removed from the cluster. Clients using SCANS can also access the cluster using Easy Connect.

Zero Downtime Patching for Oracle RAC

Opatch now can apply patches in multi-node, multi-patch fashion, and will not start up 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*

Deprecated Options with Oracle RAC 11g 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, unless the operating system OSDBA group for the database is the same group that is designated as the OSASM group for Oracle Automatic Storage Management.
- If separate Oracle ASM access privileges are enabled, and database administrators are not members of the OSASM group, then database administrators must be a member of the OSDBA for Oracle ASM group to be able to access Oracle ASM files. You can designate the OSDBA group for the Oracle RAC database as the OSDBA group for the Oracle ASM instance.

New Features for Release 1(11.1)

The following is a list of new features for Oracle RAC 11g release 1 (11.1):

Note: Some features in this list have been superseded by changes in the 11.2 release, particularly those listed for Oracle ASM.

Changes in Installation Documentation

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

Oracle Database 2 Day + Real Application Clusters Guide

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

Oracle Grid Infrastructure Installation Guide

This platform-specific 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, and cloning Oracle Clusterware.

Oracle Real Application Clusters Administration and Deployment Guide

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

Changes in the Install Options

The following are installation option changes for Oracle Database 11g:

- **Oracle Application Express:** This feature is installed with Oracle Database 11g. 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. 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.
- **Oracle Data Mining:** The Enterprise Edition installation type selects Oracle Database Mining option by default. In Oracle Database 11g, the Data Mining metadata is created with *SYS* metadata when you select the **Create Database** option.
- **Oracle Database:** This feature is integrated with Oracle Universal Installer. However, it is an optional component for database 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, Runtime, and Advanced 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 Ultra Search:** Starting with Oracle Database 11g, Oracle Ultra Search is integrated with Oracle Database. In the previous releases, this product was available as a Companion CD component.
- **Oracle XML DB:** Starting with Oracle Database 11g, 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 11g:

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

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

See Also: *Oracle Application Express Application Builder User's Guide* for more information about Oracle Application Express

- **Oracle Configuration Manager:** This feature is offered during Advanced 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 Database Vault:** This feature is an optional component for database installation.

See Also: *Oracle Database Vault Administrator's Guide* for more information about Oracle Database

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

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

- **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, Runtime, and Advanced installations.

See Also: *Oracle Database SQL Developer User's Guide* for more information about Oracle SQL Developer

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

Note: With Standard Edition and Enterprise Edition versions of Oracle Database 11g release 2 (11.2), Oracle Warehouse Builder with basic features is installed. However, with Enterprise Edition, you can purchase options that extend Oracle Warehouse Builder.

See Also: *Oracle Warehouse Builder Sources and Targets Guide* for more information about Oracle Warehouse Builder

Enhancements and New Features for Installation

The following is a list of enhancements and new features for Oracle Database 11g release 2 (11.2):

Automatic Diagnostic Repository

The Automatic Diagnostic Repository is a feature added to Oracle Database 11g. 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 11g 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 that is available to all the nodes.

Oracle Clusterware continues to store diagnostic data in the directory `Grid_home/log`, where `Grid_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 as long as 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, Deinstallation, and Other Configuration Assistant Enhancements

ASM Configuration Assistant (ASMCA) is a new configuration tool that can run from the Oracle Grid Infrastructure for a cluster home. ASMCA configures ASM instances, diskgroups, volumes, and file systems. ASMCA is run during installation, and can be used as an administration configuration tool, like DBCA.

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

DBCA DBCA is enhanced with the following feature:

- Provides the option to switch from a database configured for Oracle Enterprise Manager Database Control to Oracle Enterprise Manager Grid Control.

DBUA DBUA is enhanced with the following features:

- 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.
- Update for Oracle Database 11g release 11.2: Also provides upgrades for 11.1. Only out-of-place upgrades are supported.
- Starts any services running prior to upgrades

Deinstallation Tool Includes a deinstallation tool (`deinstall`), which is available in the installation media before installation, and is available in Oracle home directories after installation. It is located in the path `$ORACLE_HOME/deinstall`. The script stops Oracle software, and removes Oracle software and configuration files on the operating system.

New SYSASM Privilege and OSASM group 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.

OSASM is a new operating system group that is used exclusively for Oracle ASM. Members of the OSASM group can connect as `SYSASM` using operating system authentication and have full access to Oracle ASM.

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), and can be configured 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 11g release 1 (11.1) and later. In other words, you must already have Oracle Database 11g 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*

Data Mining Schema Creation Option

In Oracle Database 11g, 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 Database

kernel. This change enables monitoring of NFS status using the ODM interface. The Oracle Database kernel driver tunes itself to obtain optimal use of available resources.

This feature provides the following:

- Ease of tuning, and diagnosability, by providing the Oracle kernel 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 network file system layer for user tasks, reserving the operating system kernel network file system layer for network communication.
- 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.
- Oracle RAC aware NFS performance. 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 filesystem cache by storing file attributes locally. ODM NFS automatically recognizes Oracle RAC instances, and performs appropriate operations for datafiles without requiring additional reconfiguration from users, system administrators, or DBAs. If you store the Oracle Clusterware voting disks or Oracle Cluster Registry (OCR) files on NFS, then you must continue to require mounting voting disks with the `noac` option.

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 11g release 2 (11.2) 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 more than one Oracle home directory in a common location, and separates software units for simplified administration.
- 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 a number of 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$diag_info`.
- The default Fast Recovery Area (formerly known as Flash Recovery Area) is moved from `$ORACLE_HOME/.. /recovery_area` to `$ORACLE_BASE/recovery_area`.
- The default data file location is moved from `$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 Fast 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 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 (formerly Oracle *Metalink*). 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:

- My Oracle Support e-mail address/username
- Password

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, if you want to change the

configuration from Database to Grid control, this requires significant work. With Oracle Database 11g, 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.

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

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

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

Preinstallation Checklist

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

This chapter is intended for database administrators to use in consultation with system and storage administrators to coordinate the installation and plan the tasks for Oracle Clusterware, in preparation for completing an installation of Oracle 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](#)
- [Stopping Existing Oracle Processes for Upgrades or Coexisting Databases](#)

1.1 Before You Start: Planning Your Installation

This section provides a list of tasks that Oracle recommends you complete before starting Oracle Clusterware and Oracle RAC installation. Whether your location is a 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 proceeds smoothly.

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 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](#)
- [Consider Using Software Updates Option](#)
- [Check Oracle Technology Network](#)
- [Review Installation Steps for Oracle RAC](#)
- [Review How to Use Cluster Verification Utility \(CVU\)](#)
- [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 11g 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 **Certify** tab. Check the Certification Matrix for Oracle RAC for the operating system platform on which you intend to install, to ensure that your hardware configuration is supported for use with Oracle Clusterware and Oracle RAC. You can receive guidance about supported hardware options that can assist you with your purchasing decisions.

To access to the Certification Matrix:

1. Log on to My Oracle Support.
2. Click the **More** tab.
3. Select **Certifications**.
4. Provide information about your platform to obtain certification information.

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 or Oracle Clusterware with Oracle RAC 11g release 2 (11.2) installation, including important information about vendor clusterware and other configuration issues.

Contact your Oracle Sales Representative if you do not have a My Oracle Support account.

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

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

The Oracle RAC Technologies Certification Matrix provides details about supported technology that you can use to deploy Oracle RAC.

1.1.2 Consider Using Software Updates Option

OUI can install critical patch updates, system requirement updates for supported operating systems, and other significant updates that can ensure that your installation succeeds. Oracle recommends that you enable the Software Updates option during installation.

If you choose to enable the Software Updates option, then during installation you must provide a valid My Oracle Support user name and password, so that OUI can download the latest updates, or you must provide a path to the location of a Software Updates option package that you have downloaded previously.

If you plan to run the installation in a secured data center, then you can download updates before starting the installation by starting OUI on a system that has Internet access. To start OUI to download updates only, enter the following command:

```
$ ./runInstaller -downloadUpdates
```

Provide the My Oracle Support user name and password, and provide proxy settings if needed. After you download updates, transfer the update file to a directory on the server where you plan to run the installation.

1.1.3 Check Oracle Technology Network

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

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

1.1.4 Review Installation Steps for Oracle RAC

Installing Oracle RAC consists of the following steps:

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

Note: During Oracle Grid Infrastructure installation, you can select multiple interconnects for private network use. This feature is called Redundant Interconnect Usage.

This functionality is available starting with Oracle Database 11g Release 2 (11.2.0.2).

With Redundant Interconnect Usage, Oracle Clusterware can define multiple interfaces to use for the cluster interconnect network, without the need of using bonding or other technologies.

When you define multiple interconnects, either during the installation interview or afterward using the Oracle Interface Configuration (OIFCFG) command line utility, Oracle Clusterware creates from one to four highly available IP (HAIP) addresses. Oracle RAC and Oracle ASM instances use these interconnect addresses to ensure highly available, load-balanced interconnect communication between nodes.

See Also: *Oracle Clusterware Administration and Deployment Guide* for more information about using OIFCFG to modify interconnects

2. Install Oracle Grid Infrastructure for a cluster, which includes Oracle Clusterware and Oracle Automatic Storage Management (system and storage administration):
 - Install Oracle Grid Infrastructure for a cluster. During installation, Fixup scripts perform additional configuration of operating system parameters, secure shell (SSH) for installation and user environment variables.
 - Patch Oracle Clusterware and Oracle Automatic Storage Management to the latest patchset.
3. Install Oracle RAC (database administration):
 - Install Oracle Real Application Clusters.
 - Patch Oracle RAC to the latest patchset.
 - Complete the postinstallation configuration of the Oracle RAC database.

1.1.5 Review How to Use Cluster Verification Utility (CVU)

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

Oracle provides CVU to perform system checks in preparation for an installation, patch updates, or other system changes. In addition, CVU can generate fixup scripts, which are scripts run by the `root` user that can change many kernel parameters to at least the minimum settings required for a successful installation.

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

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

If you have a vendor who is performing hardware or operating system configuration steps, then ask the vendor to complete the relevant CVU 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 1-18 to confirm that their system is prepared for installation before they start an Oracle RAC installation.

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

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

See Also: *Oracle Grid Infrastructure Installation Guide*

For late-breaking updates 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. The Oracle Clusterware version must be the most recent release of any software (Oracle Clusterware, Oracle Database, Oracle RAC and Oracle Automatic Storage Management) running on the cluster.
- You can have multiple Oracle homes of Oracle Databases on your cluster. However, the Oracle RAC database software in these homes must be from a version that is equal to or prior to the version of Oracle Clusterware that is installed; you cannot have a version of Oracle Database running on Oracle Clusterware that was released after the version of Oracle Clusterware that you are running.

For example:

If you have Oracle Clusterware 11g release 2 installed as your clusterware, then you can have an Oracle Database 10g release 1 single-instance database running on one node, and separate Oracle RAC 10g release 1, release 2, and Oracle RAC 11g release 1 or release 2 databases also running on the cluster.

However, you cannot have Oracle Clusterware 10g release 2 installed on your cluster, and install Oracle RAC 11g.

- 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 10.1 to 10.2, or 10.2 to 11g).
- You cannot change the owner of the Oracle Database home during an upgrade. You must use the same Oracle software owner that owns the existing Oracle Database home.
- As with any system change, back up your existing database before installing new software.

See Also: *Oracle Database Upgrade Guide*

1.1.7 Review Globalization Requirements

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

Note the following:

- Oracle recommends that you use Unicode AL32UTF8 as the database character set. Unicode is the universal character set that supports most of the currently spoken languages. Unicode also supports many historical scripts (alphabets). Unicode is the native encoding of many technologies, including Java, XML, XHTML, ECMAScript, and LDAP. Unicode is ideally suited for databases that support 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. The locale setting 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` environment variable determines the language of the user interface and the globalization behavior for components such as SQL*Plus, `exp`, and `imp`. This variable also sets the language and territory used by the client application and the database. The variable also declares the character set for entering and displaying data by the client application.

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

1.1.8 Review Documentation

Before installing Oracle Clusterware, review the *Oracle Grid Infrastructure Installation Guide* for your operating system platform, particularly the Preinstallation, and the Storage chapters, to complete all of the required steps needed for an installation.

The *Oracle Grid Infrastructure Installation Guide* also contains most tasks requiring root privileges or storage administrator privileges that need to 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 check to make sure that you have the most current version of this document; Oracle Documentation is updated after release.

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

Note: Refer to *Oracle Database Concepts* for an overview of Oracle Database, and *Oracle Real Application Clusters Administration and Deployment Guide* for additional information about Oracle Clusterware or Oracle RAC configuration and deployment. The *Oracle Grid Infrastructure Installation Guide* for your platform 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 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.

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

During Oracle Grid Infrastructure for a Cluster installation, the person completing the installation identifies the planned use for each global interface, identifying each interface 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 a Oracle RAC configuration.

Server and network preparation for installation include the following:

- [Review Server Hardware and Software Requirements](#)
- [Overview of Server Environment Configuration](#)
- [Overview of Oracle Base](#)
- [Overview of Network Connection Requirements](#)
- [Overview of Secure Shell \(SSH\) Configuration](#)
- [Overview of Browser Requirement](#)
- [Overview of Platform-Specific Server Configuration](#)

1.2.1 Review Server Hardware and Software Requirements

The following is a summary of server hardware and software configuration.

Oracle Requires

Each node in a cluster requires the following:

- Supported server hardware, including processors and system configuration.

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

Note: You must use the same operating system on each node in the cluster. In addition, Oracle strongly recommends that you use the same software configurations on each node of the cluster.

- Operating system packages listed in system requirements.
Customized operating system package installations are not supported, because they may not include required packages. You can add additional packages as needed, but if you subtract packages from the default packages set, then you may encounter what are called *failed dependencies* errors for required software packages.

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

Oracle Recommends: System Administrator Tasks

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

- Utilizing a time protocol that ensures all nodes in the cluster use the same reference time. With Oracle Clusterware 11g release 2 (11.2), if the network time protocol is not enabled at installation, then the Oracle Clusterware installation enables the cluster time synchronization service.
- Configuring redundant switches, for all cluster sizes.
- Using identical server hardware on each node, to simplify server maintenance.

Additional Options: System Administrators and Vendors

- Though you do not need to use vendor clusterware with Oracle Clusterware, Oracle supports the use of many vendor clusterware options. However, you must install Oracle Clusterware to use Oracle RAC. Be aware that when you use vendor clusterware, Oracle Clusterware defers to the vendor clusterware for some tasks, such as node membership decisions.
- You may require third-party vendor clusterware if you use a non-ethernet interconnect.

After you have set up server hardware, review "Checking Hardware Requirements" in the preinstallation chapter to ensure that your system has enough RAM, that the `TMP` and `TEMP_DIR` locations have enough available space for the installation, and that your system meets other hardware requirements.

1.2.2 Overview of Server Environment Configuration

Configure the Oracle software groups and users, and configure user environments, as described in the *The Oracle Grid Infrastructure Installation Guide* for your platform preinstallation chapters. These include the following:

- Creating and configuring the Oracle RAC installation owner (typically `oracle`); this is the user account that you should use for installation.
- Creating an OSDBA operating system group whose members are granted the SYSDBA privilege through operating system authentication (typically `dba`).
- Creating binary and storage installation paths.

See Also: *The Oracle Grid Infrastructure Installation Guide* for your platform

1.2.3 Overview of Oracle Base

The Oracle base location is the location where Oracle Database binaries are stored. During installation, you are prompted for the Oracle base path. Typically, an Oracle base path for the database is created during an Oracle Grid Infrastructure installation.

Every Oracle home can have its own Oracle base. Typically, the Oracle base path is based on the installation owner name. If you have separate installation owners for the Oracle Grid Infrastructure installation and the Oracle RAC installation, then you have two Oracle base paths that are in accordance with Optimal Flexible Architecture (OFA)

guidelines. For example, if the user `grid` is the installation owner of the Oracle Grid infrastructure installation, and the user `oracle` is the installation owner of the Oracle Database installation, then you have two Oracle base directories:

- `/u01/app/grid`--the Oracle base for the user `grid`, which owns the Oracle Grid Infrastructure binaries
- `/u01/app/oracle`--the Oracle base for the user `oracle`, which owns the Oracle Database binaries

In preparation for installation, Oracle recommends that you only set the `ORACLE_BASE` environment variable to define paths for Oracle binaries and configuration files. 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.

For example, with Oracle Database 11g, Oracle recommends that you do not set an Oracle home environment variable, and instead enable OUI to create it. If the Oracle base path is `/u01/app/oracle`, then by default, OUI creates the following Oracle home path:

```
/u01/app/oracle/product/11.2.0/dbhome_1
```

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

Note: If you are upgrading from 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 11g 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.

1.2.4 Overview of Network Connection Requirements

The following is an overview of network configuration requirements for Grid Naming Service (GNS) in a Grid Plug and Play configuration, and in a manual network configuration. Network administrators and system administrators can refer to the Preinstallation chapter in the *Oracle Grid Infrastructure Installation Guide* for your platform for detailed configuration information.

The network configuration for Oracle Clusterware and Oracle RAC requires several addresses. The following is a list of those addresses:

- **GNS virtual IP address (GNS installations only):** A static IP address configured in the GNS. The GNS virtual IP listener forwards queries to nodes in the subdomain on the cluster managed by GNS.

Within the subdomain, the GNS uses multicast Domain Name Service (mDNS) to enable the cluster to map hostnames and IP addresses dynamically as nodes are added and removed from the cluster, without requiring additional host configuration in the DNS.

To enable GNS, you must have your network administrator provide a set of IP addresses for a subdomain that is assigned to the cluster (for example,

grid.example.com), and forward DNS requests for that subdomain to the GNS virtual IP address for the cluster, which GNS will serve.

- **Single Client Access Name (SCAN):** A domain name that resolves to all the addresses allocated for the SCAN. Oracle recommends that you allocate three addresses to the SCAN. During Oracle Grid Infrastructure installation, listeners are created for each of the SCAN addresses, and Oracle Clusterware controls which server responds to a SCAN address request.

For high availability, you should provide at least three IP addresses in the DNS to use for SCAN mapping. A SCAN domain name must be unique within your corporate network.

- **Virtual IP address:** A public internet protocol (IP) address for each node, to be used as the Virtual IP address (VIP) for client connections. If a node fails, then Oracle Clusterware fails over the VIP address to an available node.

During installation, if you do not use Grid Naming Service (which provides the VIP automatically), then you provide VIP addresses. The VIP for each node is associated with the same interface name on every node that is part of your cluster. If you have a domain name server (DNS), then your network administrator should register the host names for the VIP with the DNS, so that the DNS is resolvable from any client, as well as the cluster nodes. The VIP should not be in use at the time of the installation, because this is an IP address that Oracle Clusterware manages.

- **Public IP address:** A public host name address for each node, assigned by GNS, or assigned by the system administrator during initial system configuration for manual configurations. The public IP address name must be resolvable to the hostname. Register both the public IP and the VIP address with the DNS. If you do not have a DNS, then you must make sure that both public IP addresses are in the node `/etc/hosts` file (for all cluster nodes).
- **Private IP address:** A private IP address for each node to serve as the private interconnect address, dedicated exclusively to internode cluster communication. GNS configures the address automatically. If you select manual configuration, then you must ensure that the following is true for each private IP address. The private IP address must be:
 - Separate from the public network
 - Accessible on the same network interface on each node
 - Connected to a network switch between the nodes for the private network; crosscable interconnects are not supported

The private interconnect is used for internode communication by both Oracle Clusterware and Oracle RAC. If you use manual configuration, then the private IP address must be available in each node's `/etc/hosts` file. Oracle recommends that the private network interconnects are configured on dedicated switches that are not connected to anything other than the nodes in the same cluster.

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

Table 1–1 and the content following provides an overview of IP address requirements for manual network connections.

If you choose not to use GNS, then before installation your network administrator must configure SCAN, public, virtual, and private IP addresses. Your network administrator also must reconfigure the network when nodes are added or removed from the cluster.

For example, with a two node cluster where each node has one public and one private interface, and you have defined a SCAN domain address to resolve on your DNS to one of three IP addresses, you might have the configuration shown in the following table for your network interfaces:

Table 1–1 Manual Network Configuration Example

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

¹ Node hostnames may resolve to multiple addresses.

1.2.5 Overview of Secure Shell (SSH) Configuration

Secure Shell (SSH) configuration is required for Oracle Clusterware and Oracle RAC.

System administrators can follow the procedure described in "Configuring SSH on All Cluster Nodes" in the Preinstallation chapter of *Oracle Grid Infrastructure Installation Guide* for your operating system, to configure SSH access for each node on the cluster to all other nodes of the cluster.

Oracle recommends that you ask your system administrator to permit SSH connections on all cluster member nodes for the user account that will own the Oracle RAC installation. When this is enabled, you can use a script within the Oracle Universal Installer to set up SSH configuration for installation. If this script is not able to run because of environment restrictions for the user account you use for installation,

then you or your system administrator will need to set up SSH manually for installation.

In addition, note that any messages displayed to the terminal, such as a "message of the day," can disable SSH configuration. Ask your system administrator to review the SSH section in the *Oracle Grid Infrastructure Installation Guide* for your platform.

1.2.6 Overview of Browser Requirement

You need a web browser to access documentation, and to use Oracle Enterprise Manager and 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 8.1
- Netscape Navigator 9.0
- Microsoft Internet Explorer 6.0 SP2
- Microsoft Internet Explorer 7.0 SP1
- Microsoft Internet Explorer 8.0 and later
- Firefox 2.0
- Firefox 3.5
- Firefox 3.6
- Safari 3.1
- Safari 4.0.x
- Google Chrome 3.0
- Google Chrome 4.0

1.2.7 Overview of Platform-Specific Server Configuration

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

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

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

1.3 Overview of Oracle RAC Storage

To install Oracle RAC, you need to have configured shared storage for the database files. Review the following sections for storage planning:

- [Where to Review Storage System Requirements](#)

- [Overview of Oracle Automatic Storage Management Cluster File System](#)
- [Overview of Oracle Database and Recovery File Options](#)
- [General Storage Considerations for Oracle RAC](#)
- [Using Logical Volume Managers with Oracle Grid Infrastructure and Oracle RAC](#)

1.3.1 Where to Review Storage System Requirements

Refer to the "Configuring Storage for Grid Infrastructure for a Cluster and Oracle Real Application Clusters (Oracle RAC)" chapter in *Oracle Grid Infrastructure Installation Guide* for your operating system to review storage options for installation planning. Storage and system administrators can refer to this chapter to configure storage for Oracle Database files on Oracle RAC. Note that when Database Configuration Assistant (DBCA) configures automatic disk backup, DBCA uses a database recovery area that must be shared.

1.3.2 Overview of Oracle Automatic Storage Management Cluster File System

With Oracle Database and Oracle Grid Infrastructure release 11.2 and later, Oracle Automatic Storage Management (Oracle ASM) has been extended to include a general purpose file system (Oracle Automatic Storage Management File System, or ACFS), which can be used for any files that you cannot place directly on Oracle ASM, such as database homes, or application files. At the time of this release, this feature is available on Linux, but not available on UNIX platforms.

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

1.3.3 Overview of Oracle Database and Recovery File Options

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

Note: Installing files on raw or block devices is not supported. Install files on a shared file system or on Oracle ASM. Upgrading existing raw or block devices is supported.

- **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:
 - A supported cluster file system: Note that if you intend to use a cluster file system for your data files, then you should create partitions large enough for the database files when you create partitions for Oracle Clusterware.

See Also: The Certify page on My Oracle Support for supported cluster file systems

- **NAS Network File System (NFS) listed on Oracle Certify:** Note that if you intend to use NFS for your data files, then you should create partitions large enough for the database files when you create partitions for Oracle Clusterware.

See Also: The Certify page on My Oracle Support for supported Network Attached Storage (NAS) devices, and supported cluster file systems

Note: Oracle RAC software can be installed on OCFS2. However, it cannot be installed on Oracle Cluster File System (OCFS). Oracle RAC and Oracle Grid Infrastructure software can be installed on network-attached storage (NAS).

For OCFS2 certification status, refer to the Certify page on My Oracle Support.

1.3.4 General Storage Considerations for Oracle RAC

For all installations, you must choose the storage option that you want to use for Oracle Database files, or for Oracle Clusterware with Oracle RAC (Oracle RAC). If you want to enable automated backups during the installation, then you must also choose the storage option that you want to use for recovery files (the Fast Recovery Area). You do not have to use the same storage option for each file type.

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.

Note: For up-to-date information about supported storage options for Oracle RAC installations, refer to the Certify pages on the My Oracle Support Web site:

<https://support.oracle.com>

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

Storage Option	File Types Supported	
	Database	Recovery
Oracle Automatic Storage Management	Yes	Yes
OCFS2	Yes	Yes
Local storage	No	No
NFS file system	Yes	Yes
Note: Requires a certified NAS device		
Shared raw devices being used with existing installation	Yes	No
	for upgrades only, or as a manual configuration	

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

Storage Option	File Types Supported	
	Database	Recovery
Shared block devices being used with existing installations	Yes for upgrades only, or as a manual configuration	No

Use the following guidelines when choosing the storage options that you want to use for each file type:

- You can choose any combination of the supported storage options for each file type if you satisfy all requirements listed for the chosen storage options.
- Oracle recommends that you choose Oracle Automatic Storage Management (Oracle ASM) as the storage option for database and recovery files.
- For Standard Edition Oracle RAC installations, Oracle ASM is the only supported storage option for database or recovery files.
- If you intend to upgrade an existing Oracle RAC database, or an Oracle RAC database with Oracle ASM instances, 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 or Oracle RAC database with Oracle ASM instance is located.
 - The Oracle RAC database or Oracle RAC database with an Oracle ASM instance is running on the *same* nodes that you intend to make members of the new cluster installation. For example, if you have an existing Oracle RAC database running on a three-node cluster, then you must install the upgrade on all three nodes. You cannot upgrade only two nodes of the cluster, removing the third node in the upgrade.

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

1.3.5 Using Logical Volume Managers with Oracle Grid Infrastructure and Oracle RAC

Oracle Grid Infrastructure and Oracle RAC only support cluster-aware volume managers. To confirm that a volume manager you want to use is supported, look under the Certifications tab on My Oracle Support, which is available at the following URL:

<https://support.oracle.com>

1.4 Additional Information to Prepare for Installation

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

- [Oracle ASM is Installed with Oracle Grid Infrastructure](#)
- [Obtain the Oracle ASM ASMSNMP Password for Oracle Enterprise Manager](#)
- [Oracle Clusterware and Vendor Clusterware](#)
- [Shared Components of Oracle RAC Installations](#)
- [Simplified Upgrade of TIMESTAMP WITH TIME ZONE Data](#)
- [Ensure an External Jobs User Is Created for HP-UX](#)
- [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 11g release 2 (11.2), Oracle ASM is part of an Oracle Grid Infrastructure installation. If you want to upgrade an existing Oracle ASM installation, then you must upgrade Oracle ASM by running an Oracle Grid Infrastructure upgrade.

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

1.4.2 Obtain the Oracle ASM ASMSNMP Password for Oracle Enterprise Manager

Obtain the ASMSNMP from the Oracle Grid Infrastructure administrator.

During Oracle Grid Infrastructure for a cluster installation, the ASMSNMP account is created and its status is set to OPEN. It is granted the SYSDBA for ASM privilege. Oracle Enterprise Manager requires access to the ASMSNMP account to monitor Oracle ASM instances and retrieve data from ASM-related data dictionary views.

See Also: *Oracle Database Storage Administrator's Guide* for additional information about the ASMSNMP account

1.4.3 Oracle Clusterware and Vendor Clusterware

Oracle Clusterware provides clustering services. You do not require vendor clusterware when you use Oracle Clusterware. If you intend to install Oracle RAC, then you must install Oracle Clusterware.

1.4.4 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.

1.4.5 Simplified Upgrade of TIMESTAMP WITH TIME ZONE Data

As part of an installation of Oracle Database 11g 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.

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

```
srvctl setenv database -T 'TZ=time zone'
```

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

1.4.6 Ensure an External Jobs User Is Created for HP-UX

If you are installing Oracle Real Application Clusters on HP-UX, then ensure that there is a low-privileged user created to own external jobs, and be aware that you must set this user as the external jobs user by logging in as the root user and modifying `$ORACLE_HOME/rdbms/admin/externaljob.ora` after installation. Only the root user can modify this file.

1.4.7 Oracle Database 11g Real Application Clusters Release Compatibility

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

- When you have Oracle Clusterware installed with different release versions of Oracle software, 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 11g release 2 (11.2) installation.
- If you have an existing Oracle home, then you can create a new Oracle home and install Oracle Database 11g release 2 (11.2) into the new Oracle home. You should ensure that Oracle Clusterware is in a separate Oracle Grid Infrastructure home. Oracle Grid Infrastructure for a Cluster installations cannot be installed in the Oracle base directory for Oracle Database.
- If you are running the Oracle9i release of Oracle RAC, and you want to continue to use that release, then you must run cluster software that is compatible with that release, such as Oracle Cluster Manager or a third party cluster software. Oracle

Clusterware release 11g can be installed on the same system as Oracle9i database software, but Oracle9i software cannot be supported by Oracle Clusterware 11g.

Note: If you want to remove third party cluster software after upgrading your database to Oracle Database 10g or Oracle Database 11g, then you must first remove the third party cluster software, and then re-install Oracle Clusterware.

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

If OUI detects a previous Oracle Clusterware release, then you are asked to upgrade the existing Oracle Clusterware installation. Only one Oracle Clusterware version can exist on a server, and servers must be members of one cluster only.

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

Note: Do not move Oracle binaries from the Oracle home to another location. Doing so can cause dynamic link failures.

1.5 Confirming Cluster Readiness for Oracle RAC Installation with CVU

Before you start your installation, use CVU to ensure that your system is prepared for Oracle RAC installation. 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 `/u01/crs`, then the path is `/u01/crs/bin`. To start CVU, navigate to the Grid home `bin` directory, and use a command similar to the following:

```
cluvfy stage -pre dbinst -fixup -n nodelist -r release -osdba OSDBA -verbose
```

In the preceding command, `-fixup` and `-osdba` are optional flags.

For example, for a two node cluster with `nodeA` and `nodeB`, where you are testing the cluster to prepare to install Oracle Database 11g with Oracle RAC, and your OSDBA group is `dba`, the following command checks for system readiness:

```
$ ./cluvfy stage -pre dbinst -fixup -n nodea,nodeb -osdba dba -verbose
```

For more information about CVU commands, enter `./cluvfy -help`.

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

1.6 Stopping Existing Oracle Processes for Upgrades or 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 need to do if you have an existing Oracle Database installation. Review the table, and perform tasks as required.

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

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

Installation Scenario	What you need to do
Upgrading from Oracle Database 10g release 1 (10.1) to 11g release 2 (11.2)	No additional tasks. Refer to Installing Oracle Database 11g on a System with Oracle Database 10g on page 1-20
Installing Oracle Database 11g release 2 (11.2) on a system to coexist with Oracle Database 10g release 1 (10.1)	No additional tasks. Refer to Installing Oracle Database 11g on a System with Oracle Database 10g on page 1-20
Upgrading from Oracle9i Database release 9.2 to Oracle Database 11g 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 1-20
Installing Oracle Database 11g release 2 (11.2) on a system to co-exist with Oracle9i 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 1-20

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

If your system has an Oracle Database 10g installation, and you install Oracle Database 11g 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 10g Oracle home to the Oracle Database 11g Oracle home.
- During an upgrade, Oracle Database Upgrade Assistant (DBUA) automatically locates the Oracle Database10g listener, and migrates the listener to Oracle Database 11g.

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

Installing Oracle 11g Database on a System with Oracle9i Database Release 2

Explanation of Tasks If you are installing an Oracle Database 11g release 2 (11.2) on a system with an existing Oracle9i 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 11g 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 1-20

You must shut down the Global Services Daemon (GSD), because otherwise, during Oracle Database 11g installation, the Oracle Database 9i release 9.2 SRVM shared data is upgraded into an Oracle Cluster Registry that the 9.2 GSD will not be able to use. The Oracle Grid Infrastructure installation starts an 11g release 2 (11.2) GSD to serve the Oracle9i 9.2 clients. To do this, refer to ["Shutting down the Global Services Daemon"](#) on page 1-21

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

1. Switch user to the software owner user. For example:

```
# su - oracle
```

2. Enter the following command to determine if an Oracle Database 9i listener process is running and to identify its name and the Oracle home directory in which it is installed:

```
$ ps -ef | grep tnslnsr
```

This command displays information about the Oracle Net listeners running on the system:

```
... oracle_home1/bin/tnslnsr LISTENER -inherit
```

In this example, *oracle_home1* is the Oracle home directory where the listener is installed and LISTENER is the listener name.

3. Set the ORACLE_HOME environment variable to specify the appropriate Oracle home directory for the listener:

- Bourne, Bash, or Korn shell:

```
$ ORACLE_HOME=oracle_home1  
$ export ORACLE_HOME
```

- C or tcsh shell:

```
% setenv ORACLE_HOME oracle_home1
```

4. Enter the following command to identify the TCP/IP port number and IPC key value that the listener is using:

```
$ $ORACLE_HOME/bin/lsnrctl status listenername
```

Note: If the listener uses the default name LISTENER, then you do not have to specify the listener name in this command.

5. Enter a command similar to the following to stop the listener process:

```
$ $ORACLE_HOME/bin/lsnrctl stop listenername
```

6. Repeat this procedure to stop all listeners running on this system and on all other nodes in the cluster.

Shutting down the Global Services Daemon As the database installation software owner (for example, `oracle`), on each node of the cluster, use the following syntax to shut down the GSD:

```
$ cd 92_Oracle_home
$ bin/gsdctl stop
```

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

Installing Oracle Database 11g with Oracle Real Application Clusters

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

See Also: *Oracle Database Installation Guide* for your platform for additional information, such as how to open compressed 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 a Configuration Option](#)
- [Oracle Database Vault Installation and Configuration](#)
- [Oracle Database Configuration Type Descriptions](#)
- [Oracle Configuration Manager Option](#)
- [Database Security Options](#)
- [Selecting Database Passwords](#)
- [Actions of OUI and DBCA During Installation](#)
- [Installing Oracle Database with Other Languages](#)
- [Selecting a Database Name](#)
- [Using Oracle Universal Installer to Install Oracle RAC](#)
- [Using Oracle Universal Installer to Install Oracle RAC One Node](#)
- [Using DBCA to Configure Oracle RAC One Node](#)

2.1 Reviewing Oracle Application Express Requirements

With Oracle Database 11g 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 following Oracle Application Express requirements:

- [Browser Requirements for Oracle Application Express](#)
- [Installing with Existing Oracle HTML Server Installations](#)
- [Oracle Text Requirement for Oracle Application Express](#)
- [Oracle XML DB Requirement for Oracle Application Express](#)

2.1.1 Browser Requirements for Oracle Application Express

To view or develop Oracle Application Express applications, Web browsers must support Java Script, and the HTML 4.0 and CSS 1.0 standards. The following browsers meet this requirement:

- Mozilla 1.7 or a later version
- Firefox 1.0.4 or a later version

2.1.2 Installing with Existing Oracle HTML Server Installations

Oracle Application Express must have access to Oracle HTTP Server and `mod_plsql` to run. The following products include the versions of HTTP Server and `mod_plsql` that meet this requirement:

- Oracle 9i Database release 2 (9.2) or a later version
- Oracle 9i Application Server release 1 (1.0.2.2) or a later version

2.1.3 Oracle Text Requirement for Oracle Application Express

Oracle Text must be installed so that you can use the searchable online Help in Oracle Application Express. By default, Oracle Text is installed as part of Oracle Database.

See Also: *Oracle Text Application Developer's Guide* for more information about Oracle Text

2.1.4 Oracle XML DB Requirement for Oracle Application Express

To upgrade to Oracle Database 11g release 2 (11.2), Oracle XML DB must be installed in the Oracle database that you want to upgrade. If you are using a preconfigured database created either during an installation or by Database Configuration Assistant (DBCA), then Oracle XML DB is already installed and configured.

See Also: *Oracle XML DB Developer's Guide* for more information about manually adding Oracle XML DB to an existing database

2.2 Selecting a Configuration Option

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

See Also: [Appendix C, "Converting to Oracle RAC and Oracle RAC One Node 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.
- **Install database software only:** Installs Oracle Database software; you must complete the database configuration later.
- **Upgrade an existing database:** Upgrades an existing database.

If you are installing Oracle Database software, then Oracle recommends that you use one of the preconfigured database options, or select the **Advanced** option on the Select Configuration page, and configure a custom starter database.

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

For late-breaking updates and best practices about preupgrade, 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/>

2.3 Oracle Database Vault Installation and Configuration

Review the following information if you want to install Oracle Database Vault:

- [Oracle Database Vault Requirements](#)
- [Oracle Database Vault Accounts](#)
- [Multiple Oracle Database Vault Homes](#)
- [Starting the Listener with Oracle Database Vault Installations](#)
- [Installing Oracle Database Vault](#)

2.3.1 Oracle Database Vault Requirements

Oracle Database Vault requires the following:

- An Oracle Database Enterprise Edition installation (single-instance or Oracle RAC)
- Setting the initialization parameter `db_block_size` to 4096 or higher
- Oracle Enterprise Manager Console
- Oracle Clusterware running (for installation in an Oracle RAC environment)

Note: You must have `root` access to start Oracle Clusterware.

The command `crsctl start crs` also starts the database. Before you start OUI to install Oracle Database Vault, shut down the database.

See Also: [Section E.3.1, "Stopping Oracle Database Processes Before Adding Products or Upgrading"](#)

- A listener configured for the database into which you are installing Oracle Database Vault. To ensure that the new listener process starts during the installation, you must shut down existing listeners before starting Oracle Universal Installer.
- Oracle Database Vault installation owner write access to the Oratab file (AIX: /etc/oratab; Solaris, HP-UX: /var/opt/oracle/oratab) and to the oraInst.loc file (AIX: /etc/oraInst.loc; Solaris, HP-UX: /var/opt/oracle/oraInst.loc). This access is provided either by using the same installation owner as you use with the Oracle Database installation, or another user with oinstall group membership.
- An existing password file for Oracle Database. In addition, the password file authentication parameter, REMOTE_LOGIN_PASSWORDFILE, must have been set to EXCLUSIVE or SHARED.

You can set the REMOTE_LOGIN_PASSWORDFILE parameter in the Oracle Database initialization file. Use the orapwd utility to create and manage password files.

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

2.3.2 Oracle Database Vault Accounts

Oracle Database Vault prompts for two accounts that you can create during installation. These are the Oracle Database Vault Owner and the Oracle Database Vault Account Manager accounts. You must supply an account name and password for the Database Vault Owner during installation. Creating an Oracle Database Vault Account Manager is optional.

2.3.2.1 Oracle Database Vault Owner

The Oracle Database Vault Owner account is granted the DV_OWNER role. This account can manage Oracle Database Vault roles and configuration.

The Oracle Database Vault Owner user name can be a minimum of 2, and a maximum of 30 characters long. The account password can be a minimum of 8, and a maximum of 30 characters.

The password that you choose for the Oracle Database Vault Owner account must be secure. The following password restrictions are enforced:

- The password must include at least one alphabet, one digit, and one nonalphanumeric character (symbol).
- The password cannot be the same as the account name.
- The password cannot contain any consecutive repeating characters.

2.3.2.2 Oracle Database Vault Account Manager

The Oracle Database Vault Account Manager is granted the DV_ACCTMGR role. This account is used to manage database user accounts. The Oracle Database Vault Account Manager is created to facilitate separation of duties. If you do not choose to create the Oracle Database Vault Account Manager account, then the DV_ACCTMGR role is granted to the Oracle Database Vault Owner account by default.

The Oracle Database Vault Account Manager user name can be a minimum of 2, and a maximum of 30 characters long. The account password can be a minimum of 8, and a maximum of 30 characters.

The same password restrictions that apply to Oracle Database Vault Owner are applicable to Oracle Database Vault Account Manager as well.

2.3.3 Multiple Oracle Database Vault Homes

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

2.3.4 Starting the Listener with Oracle Database Vault Installations

You need to start the listener and database on all Oracle RAC nodes other than the one on which the installation is performed. You must use the Server Control (`srvctl`) utility to start and stop Oracle Database Vault Oracle RAC instances. Do not use `SQL*Plus` to start and stop Oracle RAC instances.

For example:

```
$ORACLE_HOME/bin/lsnrctl start listener_name
$ORACLE_HOME/bin/srvctl start instance -d database_name -i instance_name
```

2.3.5 Installing Oracle Database Vault

Oracle Database Vault is installed with the Advanced Install option. You can configure Oracle Database Vault after installation using DBCA, or choose not to configure Oracle Database Vault.

2.3.5.1 Configuring Oracle Database Vault During Oracle RAC Installation

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. After installation, proceed with creating the database.
5. After you create the database, start DBCA.
6. Select the option to configure the database.
7. Select the OLS and Oracle Database Vault to configure to the database.
8. Provide the required Oracle Database Vault user IDs and passwords to proceed with configuration. If you want to enable a separate Oracle Database Vault administrator, then you can choose to configure the DV_ACCTMGR user.

2.3.5.2 Configuring Oracle Database Vault After Oracle RAC Installation

To configure Oracle Database Vault after installing Oracle RAC:

1. Install the Oracle RAC Enterprise Edition database.
2. Stop all database processes.
3. Enter the following commands:


```
$ make -f $ORACLE_HOME/rdbms/lib/ins_rdbms.mk dv_on
$ make -f $ORACLE_HOME/rdbms/lib/ins_rdbms.mk ioracle
```
4. Start up all Oracle RAC processes.

5. Start DBCA, and select the option Configure Database.
6. In the component list, select Oracle Label Security and Oracle Database Vault.
7. Provide the required administrative user accounts and passwords, and proceed with configuration.

2.4 Oracle Database Configuration Type Descriptions

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 requiring different passwords for the SYS, SYSMAN, SYSTEM and DBSNMP accounts, or using a different database character set than is in use on your servers, changing product languages, or other nonstandard configurations.

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

See Also: *Oracle Database High Availability Overview* for information about Oracle RAC One Node

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, 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 Install Type

Use the Advanced Install 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 section provides more detail about OUI and DBCA processing when creating an Oracle RAC database.

See Also: *Oracle Database Installation Guide* for your platform for information about configuring globalization

2.5 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 need to place a service request with Oracle Support, that configuration information can help to provide a more rapid resolution to the service issue.

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

- My Oracle Support e-mail address/username
- Password

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

2.6 Database Security Options

During installation, you are prompted to select 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 11g release 2 (11.2) includes the **Secure Configuration** option. If you want to disable these enhanced security controls, then you can check the **Disable security settings** box. Oracle Database is then installed with default options for Oracle Database 10g release 2. After installation, you can change security settings by starting DBCA and modifying 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.

To enable or disable secure configuration after installation, you must use command line DBCA options. By design, The DBCA 11g release 2 and later graphic user interface does not have the option to enable or disable secure configuration.

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

2.7 Selecting Database Passwords

Apply the following guidelines when specifying passwords:

- Passwords must be between 8 and 30 characters long.
- 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`.
- To use the same password for all the accounts, that password must not be `change_on_install`, `manager`, `sysman`, or `dbsnmp`.
- Passwords should have at least 1 alphabetic, 1 numeric, and 1 punctuation character
- Passwords should not be simple or obvious words, such as `welcome`, `account`, `database`, and `user`.

2.8 Actions of OUI and DBCA During Installation

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

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.

Note that with Oracle Database release 11.1 and later releases, service management is no longer performed for Oracle RAC databases using DBCA. Use `srvctl`, Oracle Enterprise Manager DB Control or Grid Control for all administration and monitoring of services. Oracle Net Configuration Assistant (NetCA) is run as part of an Oracle Grid Infrastructure installation".

See Also: The following documents for further information:

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

In Oracle Database 10g 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 adversely affect your existing applications, then you can revert the changes by installing Oracle9i compatibility definition files. To install Oracle9i files in place of Oracle11g files, you must run OUI from a command line, as described in "[Using Oracle Universal Installer to Install Oracle RAC](#)" on page 2-10, and use the following statement to set the `b_cr9idata` variable to `true`:

```
./runInstaller oracle.rsfnlsrtl_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

2.9 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 type.

See Also: *Oracle Database Globalization Support Guide*

2.10 Selecting a Database Name

The database name input field is used to set the following Oracle initialization parameter values:

- `DB_NAME`
- `DB_UNIQUE_NAME`
- `DB_DOMAIN`

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

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

For example, if your database has a global database name of `or1$racprod2551.example.com`, which you supplied during installation, then the following values are used for initialization parameters:

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

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

For an Oracle RAC database, each instance has a unique identifier, `ORACLE_SID`, which consists of the SID prefix and an instance number. The `ORACLE_SID` for Oracle RAC database instances is generated differently, depending on how you choose to manage the database. If you select a policy-managed database, then Oracle generates the SID in the format `name_#`, where `name` is the first eight alphanumeric characters of `DB_UNIQUE_NAME`, and `#` is the instance number. If you select an admin-managed database, then DBCA generates the SID for the instance names in advance, and the SID is in the format `name#`.

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

Database or Instance Type	Value used for <code>ORACLE_SID</code>
Single-instance Oracle database	orlracpr
Policy-managed Oracle RAC instance	orlracpr_1
Admin-managed Oracle RAC instance	orlracpr1

2.11 Using Oracle Universal Installer to Install Oracle RAC

To install Oracle Database software with Oracle RAC:

1. Ensure that you can access other nodes with SSH. OUI requires that the user account running the Oracle RAC installation is permitted to set up passwordless SSH. OUI can set this up for you automatically, or your system administrator can set this up for you before installation is started.
2. Open the terminal from which you intend to run OUI, and log in as the user account that you want to own the Oracle Database installation (for example, `oracle`).

If you are not able to turn off `stty` commands, or have other restrictions that would prevent automatic SSH configuration from within OUI, then you must ensure that SSH is configured and enabled before you proceed to start the Installer.

3. Ensure that you have `su` or `sudo` credentials, because you will be prompted to run a script as the `root` user during installation.

To use the Software Updates option to obtain the most current system requirement updates, critical patch updates, and other recommended updates for installation, use a valid My Oracle Support username and password, or provide the path to a downloaded Software Updates option package when prompted.

4. Start the `runInstaller` command from the Disk1 on the Oracle Database 11g release 2 (11.2) installation media or install binary download area. For example, where the software binary download area is `/home/oracle/oraclesw`, enter the following commands:

```
$ cd /home/oracle/oraclesw/Disk1
$ ./runInstaller
```

5. Provide information or run scripts as `root` when prompted by OUI. If you need assistance during installation, click **Help**. Click **Details** to see the log file.

Note: You can run the `root.sh` script simultaneously on all nodes in the cluster for Oracle RAC installations or upgrades.

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

```
OraInventory/logs/installActionsdate_time.log
```

Caution: The Oracle home name and path that you provide during database installation *must be different* from the home that you used during the Oracle Grid Infrastructure installation in phase one. You *must not* install Oracle Database 11g with Oracle RAC software into the same home in which you installed the Oracle Grid Infrastructure for a cluster 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 Oracle 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 that you want to install additional Oracle Database 11g 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 have already 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 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, an Advanced Installation 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.

2.12 Using Oracle Universal Installer to Install Oracle RAC One Node

To install Oracle RAC One Node:

1. Open the terminal from which you intend to run OUI, and log in as the user account that you want to own the Oracle Database installation (for example, `oracle`).

If you are not able to turn off `stty` commands, or have other restrictions that would prevent automatic SSH configuration from within OUI, then you must ensure that SSH is configured and enabled before you proceed to start the Installer.

2. Ensure that you have `su` or `sudo` credentials, because you will be prompted to run a script as the `root` user during installation.
3. Start the `runInstaller` command from the Disk1 on the Oracle Database 11g release 2 (11.2) installation media or install binary download area. For example, where the software binary download area is `/home/oracle/oraclesw`, enter the following commands:

```
$ cd /home/oracle/oraclesw/Disk1
$ ./runInstaller
```

4. Select to configure an Oracle RAC One Node database, and select to and install Oracle RAC on all nodes where Oracle RAC One Node will run.
5. Provide information or run scripts as `root` when prompted by OUI. If you need assistance during installation, click **Help**. Click **Details** to see the log file.

Note: You can run the `root.sh` script simultaneously on all nodes in the cluster for Oracle RAC installations or upgrades.

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

```
OraInventory/logs/installActionsdate_time.log
```

Caution: The Oracle home name and path that you provide during database installation *must be different* from the home that you used during the Oracle Grid Infrastructure installation in phase one. You *must not* install Oracle Database 11g with Oracle RAC software into the same home in which you installed the Oracle Grid Infrastructure for a cluster 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 Oracle Grid Infrastructure home, it cannot be upgraded during an Oracle RAC installation.

2.13 Using DBCA to Configure Oracle RAC One Node

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

After installation, start up DBCA, and on the Welcome page, select **Oracle RAC One Node database**. DBCA starts on only one node of the set of nodes you select. You can add additional nodes to the cluster later.

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

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

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

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

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

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](#)
- [Setting Environment Variables for Enterprise Manager DB Control](#)
- [Verifying Requirements for DBCA](#)
- [Creating an Oracle RAC Database with DBCA](#)
- [Deleting an Oracle RAC Database with DBCA](#)

3.1 Using Database Configuration Assistant with Oracle RAC

DBCA has the following primary database functions:

- Create and delete databases
- Add and delete database instances
- Set up network configurations for databases and their instances
- Register databases in Oracle Enterprise Manager Grid Control or configure Database Control
- Configure database options, such as Oracle Database Vault
- Start up databases and their 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 the *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
- The *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
- The *Oracle Database 2 Day + Real Application Clusters Guide* for more information about using Oracle Enterprise Manager

3.2 Benefits of Using Database Configuration Assistant

Oracle recommends that you use DBCA to create your Oracle RAC database, because preconfigured databases optimize your environment for features such as the server parameter file (SPFILE), and automatic undo management. 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. With DBCA, you can also create site-specific tablespaces as part of database creation. If you have data file requirements that differ from those offered by DBCA templates, then create your database with DBCA and modify the data files later. You can also run user-specified scripts as part of your database creation process.

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

3.3 Automatic Listener Migration from Earlier Releases

If your system has an Oracle Database 10g or 11g installation, and you install Oracle Database 11g 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 11g 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, 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 is 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 Setting Environment Variables for Enterprise Manager DB Control

In previous releases of Oracle Database, you were required to set environment variables for *ORACLE_HOME* and *ORACLE_SID* to start, stop, and check the status of

Enterprise Manager. With Oracle Database 11g release 2 (11.2) and later, you need to set the environment variables `ORACLE_HOME` and `ORACLE_UNQNAME` to use Enterprise Manager. For example, on each node, enter commands similar to the following to set these values for the `oracle` user with the Bourne shell as the default shell, where the Oracle home is `/u01/app/oracle`, and where the database unique name is `sales`:

```
$ export ORACLE_HOME=/u01/app/oracle/product/11.2/dbhome1
$ export ORACLE_UNQNAME=sales
```

Place these environment variables in the `oracle` user profile file on each cluster member node to ensure that the environment variable settings are available after system restarts.

3.5 Verifying Requirements for DBCA

To use 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 -fixup -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. The `-fixup` flag generates a fixup script that can be run as root to resolve many operating system configuration tasks if they were not completed before you run the check.

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 `/u01/app/grid/11.2.0`, and with the Oracle home path `/u01/app/oracle/product/11/db1`, enter the following command:

```
$ /u01/app/grid/11.2.0/bin/cluvfy stage -pre dbcfg -fixup -n node1,node2 -d\
/u01/app/oracle/product/11/db1
```

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, and you cannot resolve these issues by running the fixup script, then review and correct the relevant system configuration steps, and run the test again.

The command `cluvfy.sh 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.
- **Node Connectivity:** Connectivity exists between all the specified nodes through the available public and private network interfaces.
- **Administrative Privileges:** The `oracle` user has proper administrative privileges on the specified nodes for creating an Oracle RAC database.
- **Oracle Clusterware Integrity:** All the components of the Oracle Clusterware stack are fully operational.

3.6 Creating an Oracle RAC Database with DBCA

To create a database with DBCA in standalone mode 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. To run DBCA, you no longer need to set operating system environment variables `ORACLE_HOME` to the Oracle RAC database home, or `ORACLE_UNQNAME` to the database unique name.

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

Oracle ships templates for the following two workload types:

- General purpose or transaction processing
- Data warehouse

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

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

To start DBCA, connect as the installation owner account (for example, `oracle`) to one of your nodes where Oracle RAC is installed, load SSH keys into memory, and enter the command `dbca` from the `$ORACLE_HOME/bin` directory.

Note: In an Oracle RAC environment, you must load SSH keys into memory for the terminal session where you start DBCA. If you do not do this, then you receive user equivalency errors when you attempt to start DBCA. If you use a pass phrase on your system for SSH, then you must provide the pass phrase to load the SSH keys.

Use the following commands to load SSH keys:

```
$ exec /usr/bin/ssh-agent $SHELL
$ /usr/bin/ssh-add
```

If needed, provide the pass phrase when prompted. You can then start DBCA.

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.

If the Oracle RAC Welcome page opens, then provide 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 `/etc/oraInst.loc`, and that the `oraInventory` file is not corrupted. Also, perform clusterware diagnostics by using the following CVU command syntax:

```
/Grid_home/bin/cluvfy/cluvfy.sh stage -post crsinst -n nodelist.
```

For example, with the mountpoint `/u01/app/grid/11.2.0`, and nodes `node1` and `node2`, run the following command:

```
$ /u01/app/grid/11.2.0/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 run `Opatch lsinventory` to perform inventory diagnostics and `CVU` to perform clusterware diagnostics.
- 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, as well as the period (`.`) character.
- The `SID` prefix must begin with an alphabetic character.
- The maximum number of characters you can use for the `SID` prefix is 8 characters. DBCA uses the `SID` prefix to generate a unique value for the variable `ORACLE_SID` for each instance.
- 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 **Enterprise Manager with the Grid Control**. Choose between Database Control and Grid Control interfaces.

You can enable daily backup operations. For daily backups, you enter the backup time and operating system credentials for the user that performs backup operations.

You can no longer set up e-mail notification either from DBCA or OUI with Oracle RAC 11g release 11.2.0.2 and later.

- Note that with Oracle RAC 11g release 2 and later, the storage administration role, `SYSASM`, requires membership in the `OSASM` group. This group may not be the same as `OSDBA`, whose members are granted the `SYSDBA` privilege. Tasks that require the `SYSASM` privilege in this list are marked with **SYSASM Privilege**.
- **SYSASM Privilege:** To use a Fast Recovery Area, Oracle recommends that you create at least two separate Oracle ASM disk groups: one for the database area and one for the recovery area. Oracle recommends that you place the database area and the recovery area in separate failure groups. If you have divided administrative privileges, then ask your storage administrator to set up the Fast Recovery Area.

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 the data files and the Fast Recovery Area are located outside of the Oracle home, in separate locations, as with 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, and *Oracle Database Storage Administrator's Guide* for information about failure groups and best practices for high availability and recovery

- **SYSASM Privilege:** On the Oracle ASM Disk Groups page, if you do not see the storage devices that you want to add, then click **Change Disk Discovery Path** to alter the search path used by DBCA to find available storage devices. 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) by selecting the box. If you want 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 install, you attempted deinstallation without dropping the disk group, or other configuration problems), then use the `Force` command.
- 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 the Oracle ASM Disk Group. If you are using OCFS2, then the Fast Recovery Area defaults to `$ORACLE_BASE/flash_recovery_area`.
- On the Initialization Parameters page, if you are installing on a Linux system, note that **Memory Size (SGA and PGA)**, which sets the initialization parameter `MEMORY_TARGET` or `MEMORY_MAX_TARGET`, cannot be greater than the shared memory filesystem on your operating system.

For example, if the shared memory filesystem allocation on your system is 1 GB, but you set Memory Size (`MEMORY_TARGET`) to 2 GB, then you receive the following error during database startup:

```
ORA-00845: MEMORY_TARGET not supported on this system
ORA-01078: Failure in processing system parameters
```

This issue is not relevant for other platforms.

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 Reference for Linux and UNIX-Based Operating Systems* for information about initialization parameters

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

- Creates an operative Oracle RAC database and its instances
- Creates the Oracle RAC data dictionary views
- Configures the network for the cluster database

- Migrates previous release Oracle Database listeners and related files to the Oracle Database 11g Oracle home
- Starts the listeners and database instances, and then starts the high availability services
- Configures Oracle Enterprise Manager Database Control or Grid Control

Caution: After you have created the database, if you decide that you want 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, so that Oracle Universal Installer can relink certain executables and libraries. Refer to [Appendix E, "How to Stop Processes in an Existing Oracle Real Application Clusters Database"](#) for additional information.

3.7 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 an 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 of the nodes:.
 - Run the `dbca` command from the `$ORACLE_HOME/bin` directory.

The DBCA Welcome page appears.
2. Select **Oracle Real Application Clusters**, and click **Next**.
After you click **Next**, DBCA displays the Operations page.
3. Select **Delete a database**, and 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.

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

At this point, you have accomplished the following:

- Deleted the selected database from the cluster
- 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

Oracle Real Application Clusters Postinstallation Procedures

This chapter describes how to complete the postinstallation tasks after you have installed the Oracle Database 11g release 2 (11.2) with Oracle Real Application Clusters (Oracle RAC) software. This chapter contains the following topics:

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

Note: This chapter describes only basic configurations. Refer to the *Oracle Database 11g Administrator's Guide for UNIX Systems*, and the product administration and tuning guides for more detailed configuration and tuning information. Refer also to *Oracle Database Installation Guide* for your platform for additional postinstallation configuration information.

4.1 Required Postinstallation Tasks

Perform the following tasks after completing your installation:

- [Download and Install Patch Updates](#)
- [Set External Jobs Ownership for Installations on HP-UX](#)
- [Configure Oracle Products](#)
- [Relocate Instance-Related Memory-Mapped files from OCFS2 Using Symbolic Links](#)

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 **Patches & Updates**.
4. In the Patches section, click **Simple Search**.
5. Specify the following information, then click **Go**:
 - In the **Search By** field, select **Product or Family**, and then specify RDBMS Server.
 - In the **Release** field, specify the current release number.
 - In the **Patch Type** field, specify Patchset/Minipack.
 - In the **Platform or Language** field, select your platform.
6. In the Results list, find the latest patch set for Oracle Database.
Patch sets for Oracle databases are identified in the Description column as *Product:Patchset x.x.x.x PATCH SET FOR ORACLE DATABASE SERVER*.
7. In the Patch column, click the number of the patch that you want to download.
8. On the Patch Set page, click **View README** and read the page that appears. The README page contains information about the patch set and how to apply the patches to your installation.
9. Return to the Patch Set page, click **Download**, and save the file on your system.
10. Use the unzip utility provided with Oracle Database 11g 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 Set External Jobs Ownership for Installations on HP-UX

On HP-UX platforms only, complete the following procedure to set external jobs ownership to the low-privilege user `extjob`:

1. Log on as root.
2. Change directory to the Oracle Database Oracle home:

```
# cd $ORACLE_HOME/rdbms/admin/
```


3. Open `externaljob.ora` with a text editor, and find the parameters `run_user` and `run_group`.
4. Set `run_user` to the external jobs user (`extjob`), and set `run_group` to a low-privileged group, such as `other`. For example:

```
run_user=extproc
run_group=other
```

5. Save the file.

Note: Modify `externaljob.ora` only as `root`.

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 11g 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.

4.1.4 Relocate Instance-Related Memory-Mapped files from OCFS2 Using Symbolic Links

If you install Oracle RAC on a standard local file system, then you do not need to read this section.

On Linux, if your Oracle RAC installation is created on OCFS2, and the version of OCFS2 that you are using is earlier than 1.4.1, then you must complete the following task to continue to use that version.

On OCFS2 versions earlier than 1.4.1, you must relocate the healthcheck files (`*.dat`) that typically reside in `$ORACLE_HOME/dbs` to a local file system, and create symbolic links to it from the original path. This is required because these OCFS2 versions for Linux do not support shared writable map access that the Oracle software uses to manipulate the healthcheck files.

To relocate the files:

1. Stop the Oracle Database instance.
2. Move the `$ORACLE_HOME/dbs/*.dat` files to a directory on a local file system.
3. Create symbolic links from the `$ORACLE_HOME/dbs` directory to the `*.dat` files on the local file system.
4. Restart the Oracle Database instance.

4.2 Recommended Postinstallation Tasks

This section explains the tasks that Oracle recommends you perform after completing an installation.

- [Recommended Database Postinstallation Tasks](#)

4.2.1 Recommended Database Postinstallation Tasks

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

- [Back Up the root.sh Script](#)
- [Set the Oracle User Environment Variables](#)
- [Recompile all PL/SQL modules](#)
- [Set Up User Accounts](#)

4.2.1.1 Back Up the root.sh Script

Oracle recommends that you back up the `root.sh` script after you complete an installation. If you install other products in the same Oracle home directory, then the Oracle Universal Installer (OUI) updates the contents of the existing `root.sh` script during the installation. If you require information contained in the original `root.sh` script, then you can recover it from the `root.sh` file copy.

4.2.1.2 Set the Oracle User Environment Variables

On each node, in the installation owner user profile file (in this example, `oracle`), set the environment variables `ORACLE_BASE` and `ORACLE_HOME`, and `ORACLE_SID`; also add `ORACLE_HOME/bin` to the path environment variable.

For example:

```
export ORACLE_BASE=/u01/app/oracle
export ORACLE_HOME=/u01/app/oracle/11.2.0/dbhome_1
export PATH=$PATH:$ORACLE_HOME/bin
export ORACLE_SID=sales1
```

If the environment variables `ORACLE_HOME` and `ORACLE_SID` are not set, and you try to use SQL*Plus or other tools, then you receive an error message requesting that you set these variables.

4.2.1.3 Recompile all PL/SQL modules

Oracle recommends that you run the `utlrbp.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. Complete setting up the Oracle software owner user account environment (for example, `oracle`), as described in "[Set the Oracle User Environment Variables](#)" in the preceding section.

2. Start SQL*Plus, as follows:

```
$ sqlplus "/ AS SYSDBA"
```

3. Run the `utlrbp.sql` script, where `Oracle_home` is the Oracle home path:

```
SQL> @Oracle_home/rdbms/admin/utlrbp.sql
```

4.2.1.4 Set Up User Accounts

For information about setting up additional optional user accounts, refer to *Oracle Database 11g Administrator's Guide for UNIX Systems*.

When you complete these procedures, you are ready to perform the initial configuration tasks described in [Chapter 5, "Configuring the Server Parameter File in Oracle Real Application Clusters Environments"](#).

4.3 Oracle Configuration Manager Postinstallation Configuration for Oracle RAC

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

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

```
$ORACLE_HOME/ccr/admin/scripts/installCCRSQL.sh collectconfig -s SID -r\  
SYSDBA-USER -p SYSDBA-PASSWORD
```

The script `installCCRSQL.sh` 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.sh 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 the installation. However, Oracle Configuration Manager must be installed in all instance homes.

See Also:

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

4.4 Enabling and Disabling Database Options After Installation

When you install Oracle Database, some options are enabled and others are disabled. To enable or disable a particular database feature for an Oracle home, shut down the database and use the `chopt` tool.

The `chopt` tool is a command-line utility that is located in the directory `ORACLE_HOME/bin`. It uses the following syntax, where `db_option` is the option whose status you want to modify:

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

The possible values for `db_option` are described in [Table 4–1](#):

Table 4–1 Chopt Tool Command Options for Database Options

Value	Description
dm	Oracle Data Mining Database Files
dv	Oracle Database Vault
lbac	Oracle Label Security
olap	Oracle OLAP
partitioning	Oracle Partitioning

Table 4–1 (Cont.) Chopt Tool Command Options for Database Options

Value	Description
rat	Oracle Real Application Testing
ode_net	Oracle Database Extensions for .NET 1.x
ode_net_2	Oracle Database Extensions for .NET 2.0

Example 4–1 How to Enable a Database Option Using Chopt

In this example, the `chopt` tool is used to enable Oracle Label Security in the database `oradb1`:

```
$ cd $ORACLE_HOME/bin
$ srvctl stop database -d oradb1
$ chopt enable lbac
$ srvctl start database -d oradb1
```

Configuring the Server Parameter File in Oracle Real Application Clusters Environments

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

- [Parameter Files and Oracle RAC](#)
- [Using Server Parameter Files with 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: The *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 Parameter Files and 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.

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.

5.2 Using Server Parameter Files with Oracle RAC

By default, Oracle Database creates the `init` parameter file (PFILE) for each node based on one SPFILE. You can change parameter settings in the SPFILE file by using only Oracle Enterprise Manager or `ALTER SYSTEM SET SQL` statements, because the server parameter file is a binary file. Do not try to edit this file manually.

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

If you are upgrading from a previous Oracle Database release, then review the following section about the server parameter file for Oracle RAC.

5.2.1 About the Server Parameter File

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

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

```
$ORACLE_HOME/dbs/spfile$ORACLE_SID.ora
```

The default location of the server parameter file is inappropriate for Oracle RAC databases and Oracle ASM instances if you use storage on a node, because all instances must use the same server parameter file.

Instead, Oracle recommends that you use a PFILE in this directory:

```
$ORACLE_HOME/dbs/init$ORACLE_SID.ora
```

This path is valid for each instance and it refers to a single, shared initialization parameter file. For example, if you use NFS storage, then on a Linux or UNIX system, the file should contain an entry similar to the following:

```
SPFILE= '/nfs/db/oracle_dg/dbspfile'
```

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

On Linux and UNIX-based systems:

```
SPFILE= '/shared_mount/dbname/spfiledbname.ora'
```

In this syntax example, the variable *shared_mount* is the shared mount point, and the variable *dbname* is the database name.

To use DBCA to create your database, and to use the server parameter file, start DBCA. When the Initialization Parameters page appears, select **Create server parameter file (SPFILE)** under the File Locations tab. When 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 `$ORACLE_HOME/dbs/init$ORACLE_SID.ora`

5.3 Parameter File Search Order in Oracle RAC

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

1. `$ORACLE_HOME/dbs/spfilesid.ora`
2. `$ORACLE_HOME/dbs/spfile.ora`
3. `$ORACLE_HOME/dbs/initsid.ora`

5.4 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. This section contains the following topics:

- [Server Parameter File Placement in Oracle RAC](#)
- [Procedures for Migrating to the Server Parameter File](#)

5.4.1 Server Parameter File Placement in Oracle RAC

For single-node cluster-enabled configurations, or if you are using Oracle ASM disk groups or a cluster file system, place the server parameter file in an Oracle ASM disk group or on a file system. Otherwise, place the server parameter file on a shared raw device that is at least 5 MB in size.

5.4.2 Procedures for Migrating to the Server Parameter File

Migrate to the SPFILE file by completing the following procedures:

1. Combine the initialization parameter files for all instances into one `initdbname.ora` file, where `dbname` is the name of the database, 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 `initsid.ora` files using the following syntax, where the variable `sid` is the `SID` of the instance:

```
sid.parameter=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 `spfile` is the name of the SPFILE:

```
srvctl modify database -p spfile
```

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

```
CREATE SPFILE='?/dbs/spfile_dbname.ora'
FROM PFILE='?/dbs/initdbname.ora'
```

If you use Oracle ASM, 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, and `Oracle_home` is the Oracle home path:

```
CREATE SPFILE='+disk_group_name/db_uniquename/spfiledbname.ora'
FROM PFILE='Oracle_home/dbs/initdbname.ora'
```

These statements read your combined `initdbname.ora` file that you created by merging your `IFILEs`, and then transfer the settings for the parameters from the merged file into your server parameter file.

4. Oracle recommends that you use the SPFILE by using the PFILE as a pointer to the SPFILE. Do this by running the `STARTUP` command as in the following example, where the `SID` variable `sid` in the file `initsid.ora` is the `SID` that you use in the SPFILE entry from Step 3. For example:

```
STARTUP PFILE=$ORACLE_HOME/dbs/initsid.ora
```

If you use this `STARTUP` command syntax, then Oracle Database uses the server parameter file entry specified in the file `initsid.ora`.

Note: With Oracle ASM 11g 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 file system, or you can use a traditional client-side parameter file for each Oracle ASM instance.

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

5.5 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 your `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: The *Oracle Real Application Clusters Administration and Deployment Guide* for more information about backing up the `SPFILE`

Configuring Server Pools and Enterprise Manager Database Control

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

- [Understanding Server Pools](#)
- [Configuring Database Control During and After Installation](#)

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. Two server pools cannot use the same name.

There are two types of server pool management:

- **Administrator-managed:** Database administrators define the servers on which databases resource 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 will run. Oracle Clusterware is responsible for placing the database resource on a server.

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 resource pool, used to determine how to reconfigure servers when a node joins or leaves the cluster. The default is 0.

Note: Clients using Oracle Database 11g release 2 and later databases using policy-managed server pools must access the database using the Single Client Access Name (SCAN). This is required because policy-managed databases can run on different servers at different times, so connecting to a particular node virtual IP address for a policy-managed database is not possible

6.1.1 Oracle RAC One Node and Server Pools

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

- Oracle RAC One Node runs only in one server pool. This server pool is treated the same as any other server pool.
- Online relocation of an Oracle RAC One Node database instances permits planned migrations of an Oracle RAC One Node database from one node to another node. Relocations must always be within a server pool.
- With WLM integration, online relocation of Oracle RAC One Node database instance operations do not take a server away from a server pool with its importance set to a lower value, because the target server must already be in the server pool, or in Free.
- An Oracle RAC One Node database can be a Data Guard physical standby.

6.1.2 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: *The Oracle Real Application Clusters Administration and Deployment Guide*

6.2 Configuring Database Control During and After Installation

The following sections describe how Oracle Enterprise Manager Database Control is configured during the Oracle RAC installation, and how you can configure Database Control after installation:

- [Understanding Using EMCA with Oracle RAC](#)
- [Configuring Database Control During Installation](#)
- [Configuring Database Control with DBCA](#)
- [Configuring Database Control After Installation Using EMCA](#)
- [Using an Input File for EMCA Parameters](#)
- [Specifying the Ports Used by Database Control](#)

- [EMCA Troubleshooting Tips](#)

6.2.1 Understanding Using EMCA with Oracle RAC

Each EMCA command can be used in Oracle RAC environments, and certain commands are only applicable in cluster configurations. To perform EMCA cluster commands, use the `-cluster` flag that is available in almost every EMCA operational mode.

When you use EMCA to configure Database Control for Oracle RAC, you configure the Database Control for each instance in the cluster. However, by default, the Database Control Console will only start on the local node. On every other node of the cluster, only the Enterprise Manager agent will start. This is because the Database Control Console opens a number of connections to the database. If an instance of the console is running on every host in the cluster, then you can 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` only start and stop the agent. Each of the remote agents upload their respective data to the console running on the local node, where you can monitor and manage all the targets in the cluster. On each instance of the Oracle RAC database, the following subdirectories will be created, where *nodename* is the name of a node in the cluster, and *DBUniqueName* is the database unique name.

```
$ORACLE_HOME/nodename_DBUniqueName
$ORACLE_HOME/nodename_DBUniqueName
```

However, note that if you upgrade an existing Oracle RAC 10g release 1 database configured with Database Control to the current release, then the existing Database Control configuration is retained. The existing Database Control has a Database Console running on each cluster node. The console will still be started on each individual node.

If you want to modify the existing configuration, then 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, 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 in *NODE_list* so that they upload their data to the console running on *nodename*. Also, agents monitoring database instances on *nodename* will 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, you will be prompted for them.

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

Use this command to start the console on more than one node. For instance, on an eight-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, there are two Database Control consoles running, one on `node1` and the other on `node5`. From either of these consoles, you can manage and monitor all of the targets in the cluster.

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

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

Caution: If you use the command `emca -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 -cluster` command.

To configure Enterprise Manager for a newly added node of a cluster, use the following command:

```
$ emca -addNode db
```

On 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 Enterprise Manager so that you can manage the instance in a way that is consistent with the rest of the cluster database instances.

When configuring 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 already has Enterprise Manager configured for it, because the 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 RAC environment, you do not need 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 Enterprise Manager for a specific node you are deleting from the cluster, log into a different node from the node that you plan to delete, and use the command `emca -deleteNode db`. Running this command removes the Enterprise Manager configuration so that you will no longer be able to manage the instance with Enterprise Manager on that node. Ensure that you run the EMCA command before you delete the cluster node. Because this option can be used only in an Oracle RAC environment, you do not need to use the `-cluster` option on the command line.

6.2.2 Configuring Database Control During Installation

If you create a database while installing Oracle RAC 11g release 2 (11.2), you have the option of configuring your database so it can be managed by Oracle Enterprise Manager 10g Grid Control Console or by Oracle Enterprise Manager 11g Database Control Console.

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 manage your database with Database Control.

For most of the Oracle RAC 11g 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 11g release 2 (11.2) installation, no `hostname_dbunique` directory is created in the resulting Oracle home directory.

6.2.3 Configuring Database Control with DBCA

The primary method for configuring an existing Oracle Database 11g release 2 (11.2) database so it can be managed with Database Control is to use DBCA. You can use DBCA to create a new 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 new 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 into the database host as a member of the administrative group that is authorized to install Oracle software and create and run the database.
2. Start DBCA and change directory to the `ORACLE_HOME/bin` directory and enter the following command:

```
$ ./dbca
```

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 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 is named using the following format and contains Database Control configuration and state files specific to the database you just configured:

```
hostname_dbuniquename
```

Note that for cluster databases, the directories are named nodename_dbuniquename. For example:

```
mycluster1.example.com_myNewDB
```

6.2.4 Configuring Database Control After Installation Using EMCA

When you use DBCA to configure Oracle RAC 11g release 2 (11.2), DBCA provides a graphical user interface to help you select Database Control options and to configure other aspects of your database. However, if you want to use the operating system command line to configure Database Control, then you can use the Enterprise Manager Configuration Assistant (EMCA).

Caution: During the 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 `ORACLE_HOME` environment variable to identify the Oracle home for the database you want to manage:
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 6-1](#):

```
$ ./emca
```

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

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

```
$ ./emca -config dbcontrol db -backup
```

EMCA commands are of the form:

```
emca [operation] [mode] [flags] [parameters]
```

Note: To configure Database Console for a single-instance database that uses Oracle ASM, you do not need to provide extra parameters with the EMCA command. Run the following command to configure the Database Console which will automatically detect the Oracle ASM instance:

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

Table 6–1 describes the valid execution operations and modes, and lists the optional parameters in brackets. Table 6–2 discusses the flags and their behavior, while Table 6–3 defines the optional parameters in detail. EMCA parameters are of the form [-parameterName parameterValue]. Multiple parameters can be used in combination at the command line.

Table 6–1 EMCA Command-Line Operations

Command	Description
emca -h --h -help --help	Use this option to display the Help message for the EMCA utility. The options described in Table 6–1, Table 6–2, and Table 6–3, and the valid parameters you may include are listed.
emca --version	Prints the version information associated with EMCA.
emca -config dbcontrol db [-repos (create recreate)] [-cluster] [-silent] [-backup] [parameters]	Configures Database Control for a database. Options include creating (or recreating) Database Control repository, configuring automatic backups, and performing these operations on a cluster database.
emca -config centralAgent (db asm) [-cluster] [-silent] [parameters]	Configures central agent management for a database or an Oracle Automatic Storage Management (ASM) instance. Options include performing this operation on a cluster environment. This operation will configure the database so that it can be centrally managed by the Oracle Enterprise Manager 10g Grid Control Console. To use this option, you must have previously installed the Oracle Management Service component of Enterprise Manager on a network host. In addition, the Oracle Management Agent must be installed on the host where you are running the database.
emca -config all db [-repos (create recreate)] [-cluster] [-silent] [-backup] [parameters]	Configures both Database Control and central agent management for a database. The possible configuration options are similar to those described above.
emca -deconfig dbcontrol db [-repos drop] [-cluster] [-silent] [parameters]	Deconfigures Database Control for a database. Options include dropping the Database Control repository and performing these operations on a cluster database. For example, you might use this command to remove the Database Control configuration from a database you are planning to delete. In such a scenario, remove the Database Control configuration before physically deleting the database. This operation does not remove the actual database or its data files.
emca -deconfig centralAgent (db asm) [-cluster] [-silent] [parameters]	Deconfigures 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.
emca -deconfig all db [-repos drop] [-cluster] [-silent] [parameters]	Deconfigures both Database Control and central agent management for a database. The possible deconfiguration options are similar to those described above.
emca -addNode (db asm) [-silent] [parameters]	Configures Enterprise Manager for a new cluster instance of a database or ASM storage. For more information, refer to " Understanding Using EMCA with Oracle RAC " on page 6-3.

Table 6–1 (Cont.) EMCA Command-Line Operations

Command	Description
emca -deleteNode (db asm) [-silent] [parameters]	Deconfigures Enterprise Manager for a node getting deleted. This is discussed further below, in "Understanding Using EMCA with Oracle RAC". For more information, refer to "Understanding Using EMCA with Oracle RAC" on page 6-3.
emca -addInst (db asm) [-silent] [parameters]	Configures Enterprise Manager for a new cluster instance of a database or Oracle ASM storage. For more information, refer to "Understanding Using EMCA with Oracle RAC" on page 6-3.
emca -deleteInst (db asm) [-silent] [parameters]	Deconfigures Enterprise Manager for a specific instance of a cluster database or Oracle ASM storage. This is discussed further below, in "Understanding Using EMCA with Oracle RAC" on page 6-3.
emca -reconfig ports [-cluster] [parameters]	Explicitly reassigns Database Control ports. Options include performing this operation on a cluster environment. For more information, refer to "Specifying the Ports Used by Database Control" on page 6-11.
emca -reconfig dbcontrol [-cluster] [-silent] [parameters]	Reconfigures Database Control deployment for a cluster database. Note that this command must be used with the "-cluster" option. For more information, refer to "Understanding Using EMCA with Oracle RAC" on page 6-3.
emca -displayConfig dbcontrol [-cluster] [-silent] [parameters]	Displays information about the current deployment configuration of Database Control in a cluster environment. Note that this command must be used with the "-cluster" option. For more information, refer to "Understanding Using EMCA with Oracle RAC" on page 6-3.
emca -upgrade (db asm db_asm) [-cluster] [-silent] [parameters]	Upgrades the configuration of an earlier version of Enterprise Manager to the current version. This operation can be performed for database, Oracle ASM, or database and Oracle ASM instances together simultaneously. This does not upgrade the actual database or Oracle ASM instances, nor does it upgrade the Enterprise Manager software. Instead, it upgrades the configuration files for the specified instance so that they are compatible with the current version of the Enterprise Manager software. EMCA will attempt to upgrade all instances of the specified database and/or Oracle ASM target on the host, across all Oracle Homes (since it is likely that certain target properties, such as listener port or Oracle Home, have changed).
emca -restore (db asm db_asm) [-cluster] [-silent] [parameters]	Restores the current version of Enterprise Manager configuration to an earlier version. This is the inverse of the "-upgrade" option (and will reverse any changes that result from an "-upgrade" operation), and as such, the options are similar.

Table 6–2 EMCA Command-Line Flags

Flag	Description
db	Performs the operation for a database (including cluster databases). Use this option for databases that use Oracle Automatic Storage Management (ASM) to store the data files. If a database is using Oracle ASM, then all of the configuration operations and modes described here (except for <code>-upgrade</code> and <code>-restore</code>) detect this automatically and apply the changes to both the database and Oracle ASM instance(s).
asm	Performs the operation only for Oracle ASM instances (including cluster Oracle ASM instances).

Table 6–2 (Cont.) EMCA Command-Line Flags

Flag	Description
db_asm	This flag can only be used in <code>-upgrade</code> and <code>-restore</code> mode. Performs the upgrade/restore operation for a database and an Oracle ASM instance together. Database and Oracle ASM instances may be upgraded or restored separately (that is, upgrading an Oracle ASM instance does not require upgrading the database instances it services). Therefore, the Enterprise Manager configuration can be upgraded or restored separately for a database and its respective Oracle ASM instance.
-repos create	Creates a new Database Control management repository.
-repos drop	Drops the current Database Control management repository.
-repos recreate	Drops the current Database Control management repository and then recreates 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 <code>-respFile</code> argument. You can view a list of the available parameters by entering <code>emca -help</code> at the command line.
-backup	Configures automatic backup for a database. EMCA will prompt for daily automatic backup options. The default Enterprise Manager settings will be used to backup the database files. Note: If you use this option, EMCA will use the value of the <code>db_recovery_file_dest</code> initialization parameter to identify the recovery area for the automated backups. If that parameter is not set, EMCA will generate an error. You can modify these settings later using the Maintenance page in Database Control. For more information, see the Database Control online Help.

Table 6–3 EMCA Command-Line Parameters

Parameter	Description
-respFile	Specifies the path of an input file listing parameters for EMCA to use while performing its configuration operation.
-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, the parameter <code>LISTENER_OH</code> must be specified.
-HOST_USER	Host machine user name (for automatic backup)
-HOST_USER_PWD	Host machine 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 6–3 (Cont.) EMCA 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 Enterprise Manager configuration to be upgraded/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 6-11.
-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 6-11.
-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 6-11.
-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 6-11.
-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 "Understanding Using EMCA with Oracle RAC" on page 6-3.
-EM_NODE_LIST	Comma-separated list of nodes for agent-only configurations, uploading data to -EM_NODE. For more information, refer to "Understanding Using EMCA with Oracle RAC" on page 6-3.

6.2.5 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 that you create must be in a format similar to the following example:

```
PORT=1521
SID=DB
DBSNMP_PWD=xpE234D
SYSMAN_PWD=KD0dk432
```

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

```
$ ./emca -config dbcontrol db -respFile input_file_path
```

For example, to configure the 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=q1Kj4352
BACKUP_SCHEDULE=06:30
```

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

```
$ ./emca -config dbcontrol db -repos create -backup -respFile input_file_path
```

6.2.6 Specifying the Ports Used by Database Control

When you initially install Oracle RAC 11g 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 11g Release 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 the Database Control with EMCA. Alternatively, you can explicitly assign ports after configuring Database Control using the following command:

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

Note: You can also use the following EMCA command-line arguments to configure Database Control after you have installed and configured Oracle RAC 11g 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, 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 you want 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 you want 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.

6.2.7 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 11g Release 2 Grid Control Agents](#)
- [Using EMCA When Database Host Name or IP Address Changes](#)
- [Using EMCA When the TNS Configuration Is Changed](#)

6.2.7.1 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 so it uses the new listener port, run the EMCA command using the `-config dbcontrol db [-cluster]` command-line arguments.

6.2.7.2 Upgrading 11g Release 2 Grid Control Agents

When upgrading an Oracle Database 10g Release 1 database and Oracle ASM instance that was configured for Oracle Enterprise Manager (either Database Control or a Grid Control central agent) to an Oracle Database 11g release 2 (11.2) database, all Enterprise Manager targets on the relevant hosts referring to the upgraded instances are updated automatically. This is because the upgrade involves altering the instance Oracle Home, port, or other target-associated properties. However, some of these targets on the hosts are not updated successfully during the upgrade if they are managed by an Oracle Database 11g release 2 (11.2) Grid Control Agent. To update these targets, in the Home page for the upgraded database (or Oracle ASM) target, click the **Monitoring Configuration**. On the Monitoring Configuration page, you can update properties such as Oracle Home, listener port and so on to the correct values.

6.2.7.3 Using EMCA When Database Host Name or IP Address Changes

When the database host name (including the domain name) or the IP address changes, deconfigure and then reconfigure the Database Console with the `-repos create` flag for the `emca` command. 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
```

6.2.7.4 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
```

Understanding the Oracle Real Application Clusters Installed Configuration

This chapter describes the Oracle Real Application Clusters (Oracle RAC) installed configuration. This chapter contains the following topics:

- [Understanding the Configured Environment in Oracle RAC](#)
- [Understanding Time Zone Settings on Cluster Nodes](#)
- [Oratab Configuration for Oracle RAC](#)
- [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 your Oracle RAC installation, including adding or deleting domain qualifications. Hostnames are created during an Oracle Clusterware installation and are used extensively with database processes. Nodes with changed host names must be deleted from the cluster and added back with the new name.

7.2 Understanding Time Zone Settings on Cluster Nodes

Oracle RAC requires that all cluster nodes have the same time zone setting. During an Oracle Clusterware installation, the installation process determines the time zone setting of the Grid installation owner on the node where Oracle Universal Installer (OUI) runs, and uses that time zone value on all of the nodes as the default time zone setting for all processes that Oracle Clusterware manages. This default setting is used for databases, Oracle ASM, and any other managed processes. However, if you start an instance with SQL*Plus, you must ensure that the time zone value that Oracle RAC uses is the same as the Oracle Clusterware time zone. You can change the time zone that Oracle Clusterware uses for a database by running the command `srvctl setenv database -T 'TZ=time zone'`.

7.3 Oratab Configuration for Oracle RAC

Oracle creates an entry for each Oracle RAC database in the `oratab` configuration file. The `oratab` file is created by the `root.sh` script during installation, and it is updated by the Database Configuration Assistant when creating or deleting a database. The `oratab` file entry is also created automatically by the Database Agent when a database is first started on a node where it has not run previously. Oracle ASM Agent creates Oracle ASM `oratab` entries.

Oracle Enterprise Manager uses the `oratab` file during service discovery to determine the name of the Oracle RAC database, and to determine if the database should be started automatically when the system is restarted.

The database entry has the following syntax:

```
$DB_UNIQUE_NAME:$ORACLE_HOME:N
```

A colon (:) is used as the field terminator. A new line terminates the entry. Lines beginning with a pound sign (#) are comments. Because all the instances of an Oracle RAC database have the same `DB_UNIQUE_NAME`, but each instance has its own `ORACLE_SID`, use the `$DB_UNIQUE_NAME` environment variable in the `oratab` file as the database entry.

The `$DB_UNIQUE_NAME` identifier for your Oracle RAC database must be unique across your enterprise. `$ORACLE_HOME` is the directory path to the database, and `N` indicates that the database should not be started at restart time. The following is an example entry for a database named `sales`:

```
sales:/u01/app/oracle/sales:N
```

7.4 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](#)

7.4.1 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 <code>DRSYS</code> (contains data for Oracle Text), <code>CWMLITE</code> (contains the OLAP schemas), <code>XDB</code> (for XML features), <code>ODM</code> (for Oracle Data Mining), <code>TOOLS</code> (contains Oracle Enterprise Manager tables), <code>INDEX</code> , <code>EXAMPLE</code> , and <code>OEM-REPO</code> 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 need to expand this tablespace if you are running a SQL statement that involves significant sorting, such as <code>ANALYZE COMPUTE STATISTICS</code> on a very large table, or the constructs <code>GROUP BY</code> , <code>ORDER BY</code> , or <code>DISTINCT</code> .
UNDOTBS <i>n</i>	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.

7.4.2 Control Files

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

7.4.3 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.

7.5 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, will have 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

7.6 Initialization Parameter Files

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

See Also: [Chapter 5, "Configuring the Server Parameter File in Oracle Real Application Clusters Environments"](#) for more information about the creation and use of parameter files

7.7 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

7.8 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 the Oracle RAC load-balancing features:

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

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

The Single Client Access Name (SCAN) is a fully qualified name (hostname+domain) 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 11g release 2 and later instances only register with SCAN listeners as remote listeners. Upgraded databases register with SCAN listeners as remote listeners, and also continue to register with all node listeners.

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 are running a particular database. For example, if you configure

policy managed server pools in a cluster, then the SCAN enables 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 11g release 2 can continue to use their existing connection addresses; using SCANs is not required. When an earlier version of Oracle Database is upgraded, it registers with the SCAN listeners, and clients can start using the SCAN to connect to that database. The database registers with the SCAN listener through the remote listener parameter in the `init.ora` file. The `REMOTE_LISTENER` parameter must be set to `SCAN:PORT`. Do not set it to a `TNSNAMES` alias with a single address with the SCAN as `HOST=SCAN`.

See Also: The *Oracle Grid Infrastructure Installation Guide* for detailed information about SCANs and their configuration

7.8.2 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 need 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 need to 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 will be 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: *The Oracle Database Net Services Administrator's Guide* for further information about cross-instance registration, shared and dedicated server configurations, and connection load balancing

7.9 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](#)
- [About Local Listeners](#)
- [About Multiple Listeners](#)
- [How Oracle Database Uses the Listener File \(listener.ora\)](#)

7.9.1 Grid Naming Service (GNS) and Listeners

If you enable Grid Naming Service (GNS), then you do not have to manually configure the listener. In GNS configurations, there is one GNS daemon for the cluster. Service requests to the cluster domain that GNS manages 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 starts, it registers its addresses with GNS. When GNS receives a request from a DNS for the SCAN, it returns the registered addresses to the DNS.

7.9.2 About 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.

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

```
> alter system set local_listener='(DESCRIPTION=
(ADDRESS_LIST=(ADDRESS=(PROTOCOL=TCP) (HOST=192.168.0.61) (PORT=1521))
(ADDRESS=(PROTOCOL=TCP) (HOST=192.168.0.61) (PORT=2011)))'
scope=BOTH SID='OCRL1';
```

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 Oracle 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 11g release 2 (11.2) `tnsnames.ora` file:

```
# tnsnames.ora Network Configuration file:
/u01/app/oracle/product/11.2.0/dbhome_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)
  )
)
```

7.9.3 About Multiple Listeners

If DBCA detects more than one listener 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 11g release 2 (11.2) local and scan listeners using the `lsnrctl` command, set your `ORACLE_HOME` environment variable to the path for the Oracle Grid Infrastructure home (Grid home). Do not attempt to use the `lsnrctl` commands from Oracle home locations for previous releases, because they cannot be used with the new release.

7.9.4 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 11g 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 11g 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:
/u01/app/oracle/11.2.0/dbhome_1/network/admin/listener.ora.mycluster
# Generated by Oracle configuration tools.

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

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

7.9.4.1 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 already registered, or while the listener is down, then the statement has no effect.

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

7.10 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 that 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 11g 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, unless you explicitly set the `LOCAL_LISTENER` parameter, using the command `ALTER SYSTEM SET LOCAL_LISTENER` to set the `LOCAL_LISTENER` parameter manually. Listener *alias* entries are no longer needed in the `tnsnames.ora` file.

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

```
> alter system set local_listener='(DESCRIPTION=
(AADDRESS_LIST=(ADDRESS=(PROTOCOL=TCP) (HOST=192.168.0.61) (PORT=1521))
(ADDRESS=(PROTOCOL=TCP) (HOST=192.168.0.61) (PORT=2011))))'
scope=BOTH SID='OCRL1';
```

See Also: *Oracle Database Administrator's Guide*

For the `REMOTE_LISTENER` parameter, Oracle Clusterware uses the EZ connect syntax `scanname:scanport`, so that 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:

Review the following sections for information about net service names:

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

- [tnsnames.ora Example File](#)

7.10.1 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
```

7.10.2 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)))
```

7.10.3 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: /u01/app/oracle/11.2.0/dbhome_
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: *The Oracle Database Net Services Administrator's Guide* for further information about the `tnsnames.ora` file

7.11 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:

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

Removing Oracle Real Application Clusters Software

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

This chapter contains the following topics:

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

See Also: The product-specific documentation 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 Deinstallation Procedures

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

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

Note: You cannot remove or uninstall the Oracle Database Vault option. However, you can disable it. Refer to the *Oracle Database Vault Administrator's Guide* for more details.

You can remove Oracle Configuration Manager. Refer to the *Oracle Configuration Manager Installation and Administration Guide* for more details.

With release 11.2 and later, Oracle Automatic Storage Management and Oracle Clusterware comprise the Oracle Grid Infrastructure installation. These components are installed and removed together.

Caution: If any cluster member node has more than one database with the same global database name (GDN) on a server, then you cannot use the deinstall 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 Identifying All Instances On a Cluster

To identify all instances associated with the Oracle home that you want to remove, enter the following command:

AIX, HP-UX, or Linux:

```
$ more /etc/oratab
```

Solaris

```
$ more /var/opt/oracle/oratab
```

The output of this command contains entries similar to the following:

```
+ASM1:/u01/app/grid/11.2.0:N  
CUST:/u01/app/oracle/product/11.2.0/dbhome_1:N
```

These entries show that the +ASM Oracle Automatic Storage Management instance in the Oracle Grid Infrastructure for a cluster home (`/u01/app/grid/11.2.0`) and the CUST Oracle database instance are associated with the Oracle home directory `/u01/app/oracle/product/11.2.0/dbhome_1`.

8.3 Deinstalling Oracle RAC Software

The Deinstallation Tool removes Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM) from your server, as well as Oracle Real Application Clusters (Oracle RAC) or standalone Oracle Database installations. 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](#)

8.3.1 About the Deinstallation Tool

The Deinstallation Tool (`deinstall`) stops Oracle software, and removes Oracle software and configuration files on the operating system. It is available in the installation media before installation, and is available in Oracle home directories after installation. It is located in the path `$ORACLE_HOME/deinstall`.

Caution: When you run the deinstall command, if the central inventory (oraInventory) contains no other registered homes besides the home that you are deconfiguring and removing, then the deinstall command removes the following files and directory contents in the Oracle base directory of the Oracle RAC installation owner:

- admin
- cfgtoollogs
- checkpoints
- diag
- oradata
- flash_recovery_area

Oracle strongly recommends that you configure your installations using an Optimal Flexible Architecture (OFA) configuration, and that you reserve Oracle base and Oracle home paths for exclusive use of Oracle software. If you have any user data in these locations in the Oracle base that is owned by the user account that owns the Oracle software, then the deinstall command deletes this data.

The `deinstall` command stops Oracle software, and removes Oracle software and configuration files on the operating system. The 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 default method for running the deinstall tool is from the deinstall directory in the Oracle home. For example:

```
$ cd $ORACLE_HOME/deinstall
$ ./deinstall
```

In addition, you can run the deinstall tool from other locations, or with a parameter file, or select other options to run the tool.

The options are:

- `-home`

Use this flag to indicate the home path of the Oracle home that you want to check or deinstall. If you want to deinstall Oracle software using the `deinstall` command in the same Oracle home you plan to deinstall, then provide a parameter file in another location, and do not use the `-home` flag.

- `-silent`

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

To create a properties file and provide the required parameters, refer to the template file `deinstall.rsp.tmpl`, located in the `response` folder of the Deinstallation tool home or the Oracle home.

If you have a working system, then instead of using the template file, you can generate a properties file by running the `deinstall` command using the `-checkonly` flag. The `deinstall` command then discovers information from the Oracle home that you want to deinstall and deconfigure. It generates the properties file, which you can then use with the `-silent` option.

- `-checkonly`

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

When you run `checkonly` to generate a parameter file, you are prompted to provide information about your system. You can accept the default value the tool has obtained from your Oracle installation, that is displayed 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` with this flag, it deconfigures and deinstalls the Oracle software on the local node (the node where `deinstall` is run). On remote nodes, it deconfigures Oracle software, but does not deinstall the Oracle software.

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

Use this flag to run `deinstall` with a parameter file in a location other than the default. When you use this flag, provide the complete path where the parameter file is located. If you are running the `deinstall` command from the Oracle home that you plan to deinstall, then you do not need to use the `-paramfile` option.

The default location of the parameter file depends on the location of `deinstall`:

- From the installation media or stage location: `$ORACLE_HOME/inventory/response`.
- From a unzipped archive file from OTN: `/ziplocation/response`.
- After installation from the installed Oracle home: `$ORACLE_HOME/deinstall/response`.

- `-params` [`name1=value name 2=value name3=value ...`]

Use this flag with a parameter file to override one or more values that you want to change in a parameter file you have already created.

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

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

The default location of the parameter file depends on the location of `deinstall`:

- From the installation media or stage location before installation: `$ORACLE_HOME/`
- From a unzipped archive file from OTN: `/ziplocation/response/`.
- After installation from the installed Oracle home: `$ORACLE_HOME/deinstall/response`.

- `-help`

Use the help option (`-help`) to obtain additional information about the command option flags.

8.3.2 Example of Running the Deinstall Command for Oracle RAC

As the `deinstall` command runs, you are prompted to provide the home directory of the Oracle software that you want to remove from your system. Provide additional information as prompted.

If you enter the `deinstall` command outside of the `$ORACLE_HOME/deinstall` folder, then help is displayed, unless you enter a `-home` flag and provide a path. If you run the `deinstall` command from the `$ORACLE_HOME/deinstall` folder, then deinstallation starts without prompting you for a home address.

Use the optional flag `-paramfile` to provide a path to a parameter file.

In the following example, the `deinstall` command is in the path `/u01/app/oracle/product/11.2.0/dbhome_1/deinstall`:

```
$ cd /u01/app/oracle/product/11.2.0/dbhome_1/deinstall
$ ./deinstall
```

8.3.3 Example of a Deinstallation Parameter File for Oracle RAC

You can run the `deinstall` command with the `-paramfile` option to use the values you specify in the parameter file. The following is an example of a parameter file, in which the Oracle Database binary owner is `oracle`, the Oracle Database home (Oracle home) is in the path `/u01/app/oracle/product/11.2.0/dbhome_1/`, the Oracle base (where other Oracle software is installed) is `/u01/app/oracle/`, the central Oracle Inventory home (`oraInventory`) is `/u01/app/oraInventory`, the virtual IP address (VIP) is `192.0.2.1`, the local node (the node where you are running the deinstallation session from) is `node1`, the remote node is `node2`, and the OSDBA group is `dba`:

```
#Copyright (c) 2005, 2006 Oracle Corporation. All rights reserved.
#Wed Feb 11 16:30:21 PST 2009
DISK_GROUPS.typi=
REMOTE_NODES=node2
ORACLE_BASE.typi=/u01/app/oracle
STORAGE_TYPE.typi=FS
ASM_HOME=
ASM_LOCAL_SID=
FLASH_RECOVERY_LOC.typi=
LOGDIR=/u01/app/oraInventory/logs/
DB_TYPE.typi=RAC_DB
ORACLE_BASE=/u01/app/oracle
INVENTORY_LOCATION=/u01/app/oraInventory
NODE_LIST.typi=node1,node2
ARCHIVE_LOG_DESTINATION_LOC.typi=
ASM_FILES.typi=
LOCAL_SID.typi=typi1
CLUSTER_NODES=node1,node2
DB_UNIQUE_NAME_LIST=typi
RAW_MAPPING_FILE.typi=
ORA_CRS_HOME=/u01/app/grid/11.2.0/
HOME_TYPE=RACDB
CRS_HOME=false
SID_LIST.typi=typi1,typi2
DATAFILE_LOC.typi=/oradbocfs/storage/database/oradata/typi
ORACLE_BINARY_OK=true
```

```
local=false
LOCAL_NODE=node1
CREATION_MODE.typi=y
CONFIGFILE_LOC.typi=/oradbocfs/storage/database/oradata/typi/control01.ctl,
/oradbocfs/storage/database/oradata/typi/control02.ctl,
/oradbocfs/storage/database/
oradata/typi/control03.ctl,/u01/app/oracle/product/11.2.0/dbhome
_1/dbs/dr1typi.dat,/u01/app/oracle/product/11.2.0/dbhome_1/dbs/d
r2typi.dat
DIAG_DEST.typi=/u01/app/oracle/diag/rdbms/typi
SPFILE_LOC.typi=/oradbocfs/storage/database/oradata/typi/spfiletypi.ora
silent=true
ORACLE_HOME=/u01/app/oracle/product/11.2.0/dbhome_1
```

Troubleshooting Oracle Real Application Clusters Installations

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

See Also: The Oracle Database 11g 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*

A.1 Troubleshooting Oracle Real Application Clusters Installations

This section contains the following topics:

- [General Installation Issues](#)
- [Oracle RAC Installation Error Messages](#)
- [Performing Cluster Diagnostics During Oracle Clusterware Installations](#)
- [Reviewing the Log of an Installation Session](#)
- [Configuration Assistant Errors](#)

A.1.1 General Installation Issues

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

- [An error occurred while trying to get the disks](#)
- [Failed to connect to server, Connection refused by server, or Can't open display](#)
- [Nodes unavailable for selection from the OUI Node Selection screen](#)
- [Node nodename is unreachable](#)
- [PROT-8: Failed to import data from specified file to the cluster registry](#)
- [PRKP-1001: Error starting instance](#)
- [Time stamp is in the future](#)
- [YPBINDPROC_DOMAIN: Domain not bound](#)

An error occurred while trying to get the disks

Cause: There is an entry in `/etc/oratab` pointing to a non-existent Oracle home. The OUI error file should show the following error:

```
"java.io.IOException: /home/oracle/OraHome//bin/kfod: not found"
```

Action: Remove the entry in `/etc/oratab` pointing to a non-existing Oracle home.

Failed to connect to server, Connection refused by server, or Can't open display

Cause: These are typical of X Window display errors on Windows or UNIX systems, where `xhost` is not properly configured.

Action: In a local terminal window, log in as the user that started the X Window session, and enter the following command:

```
$ xhost fully_qualified_remote_host_name
```

For example:

```
$ xhost somehost.example.com
```

Then, enter the following commands, where `workstation_name` is the host name or IP address of your workstation.

Bourne, Bash, or Korn shell:

```
$ DISPLAY=workstation_name:0.0
$ export DISPLAY
```

To determine if X Window applications display correctly on the local system, enter the following command:

```
$ xclock
```

The X clock should appear on your monitor. If this fails, then use of the `xhost` command may be restricted on the server.

If you are using a VNC client to access the server, then ensure that you are accessing the visual that is assigned to the user that you are trying to use for the installation. For example, if you used the `su` command to become the installation owner on another user visual, and the `xhost` command use is restricted, then you cannot use the `xhost` command to change the display. If you use the visual assigned to the installation owner, then the correct display will be available, and entering the `xclock` command will display the X clock.

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 `ifconfig -a`. Compare the output of this command with the contents of the `/etc/hosts` file to ensure that the node IP is listed.
2. Run the command `nslookup` to see if the host is reachable.

3. As the `oracle` user, attempt to connect to the node with `ssh` or `rsh`. If you are prompted for a password, then user equivalence is not set up properly. Contact your system administrator, or consult *The Oracle Grid Infrastructure Installation Guide* for your platform to complete SSH configuration.

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

Cause: Insufficient space in an existing Oracle Cluster Registry raw device partition, which causes a migration failure while running `rootupgrade.sh`. To confirm, look for the error "utopen:12:Not enough space in the backing store" in the log file `$ORA_CRS_HOME/log/hostname/client/ocrconfig_pid.log`.

Action: Identify a raw device that has 280 MB or more available space. Locate the existing raw device name from `/etc/oracle/srvConfig.loc` (AIX, HP-UX, Linux) or `/var/opt/oracle/srvConfig.loc` (Solaris), and copy the contents of this raw device to the new device using the command `dd`.

PRKP-1001: Error starting instance

Cause: Missing ODBC Driver Manager. Associated message is **CRS-0215: Could not start resource**.

Action: Clean up installation, download and install the ODBC driver from <http://www.unixodbc.org>, and restart the installation. This is a requirement for Oracle RAC databases, documented in system requirements in the *Oracle Grid Infrastructure* installation guide for your platform.

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 2005-04-04 14:49:49 is 106 s in the future
```

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

YPBINDPROC_DOMAIN: Domain not bound

Cause: This error can occur during postinstallation testing when a node public network interconnect is pulled out, and the VIP does not fail over. Instead, the node hangs, and users are unable to log in to the system. This error occurs when the Oracle home, `listener.ora`, Oracle log files, or any action scripts are located on an NAS device or NFS mount, and the name service cache daemon `nscd` has not been activated.

Action: Enter the following command on all nodes in the cluster to start the `nscd` service:

```
/sbin/service nscd start
```

A.1.2 Oracle RAC Installation Error Messages

Note that the user performing the Oracle RAC installation must have membership both in the `oinstall` group and the `OSDBA` group (typically `oinstall` and `dba`). If this is not the case, then the installation will fail

A.1.3 Performing Cluster Diagnostics During Oracle Clusterware Installations

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 (`Grid_home/bin` on Linux and

UNIX-based systems, and analyzing its output. Refer to your 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.1.4 Reviewing the Log of an Installation Session

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

To view the log file, follow these steps:

1. If necessary, enter the following command to determine the location of the oraInventory directory:

```
$ cat /opt/oracle/oraInst.loc
$ cat /var/opt/oracle/oraInst.loc
```

2. Enter the following command to determine the name of the log file:

```
$ ls -ltr
```

This command lists the files in the order of creation, with the most recent file shown last. Installer log files have names similar to the following, where *date_time* indicates the date and time that the installation started:

```
installActionsdate_time.log
```

To view the most recent entries in the log file, where information about a problem is most likely to appear, enter a command similar to the following:

```
$ tail -50 installActions2007-07-20_09-53-22AM.log | more
```

This command displays the last 50 lines in the log file, and enables you to page through them.

If the error displayed by Oracle Universal Installer or listed in the log file indicates a relinking problem, then refer to the following file for more information:

```
$ORACLE_HOME/install/make.log
```

A.1.5 Configuration Assistant Errors

To troubleshoot an installation error that occurs when a configuration assistant is running:

Review the installation log files listed in the section "[Reviewing the Log of an Installation Session](#)" on page A-4.

Review the specific configuration assistant log file located in the Oracle RAC installation owner 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 "[Fatal Errors](#)" on page A-5 for further instructions.

This section contains the following topics:

- [Configuration Assistant Failures](#)
- [Fatal Errors](#)

A.1.5.1 Configuration Assistant Failures

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:

```
oraInventory_location/logs/installActionsdate_time.log
```

More details about 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 owner. Completion status codes are listed in the following table:

```
Status Result Code
Configuration assistant succeeded 0
Configuration assistant failed 1
Configuration assistant cancelled -1
```

A.1.5.2 Fatal Errors

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

1. Deinstall Oracle software.
2. Correct the cause of the fatal error.
3. Reinstall the Oracle software.

Using Scripts or Response Files to Create Oracle Real Application Clusters Databases

This appendix describes the steps for noninteractive installations during which you can create Oracle Real Application Clusters (Oracle RAC) databases using scripts.

Note: The scripts generated by Database Configuration Assistant (DBCA) are for reference only. Oracle strongly recommends that you use DBCA to create a database.

See Also: *Oracle Universal Installer and OPatch User's Guide for Windows and UNIX* for detailed information about generating scripts

This appendix contains the following topics:

- [Using DBCA to generate Installation Scripts for Oracle RAC](#)
- [About DBCA Noninteractive \(Silent\) Configuration for Oracle RAC](#)
- [Using DBCA Noninteractive \(Silent\) Configuration for Oracle RAC](#)
- [How Response Files Work](#)
- [Preparing Response Files](#)
- [Running Oracle Universal Installer Using a Response File](#)
- [Running Net Configuration Assistant Using Response Files](#)
- [Running Configuration Assistants Using Response Files](#)
- [Postinstallation Configuration Using Response Files](#)

B.1 Using DBCA to generate Installation Scripts for Oracle RAC

To generate scripts to create an Oracle RAC database, create a database using the scripts, and prepare the database for use, complete the following steps:

1. Start DBCA and select your preferred options to build the Oracle RAC database.

On the Creation Options page of your DBCA session, deselect Create Database and select **Generate Database Creation Scripts** before you click **Finish**. You can accept the default destination directory for the scripts, or browse for a different location. In either case, you should note the path name for use in the next step.

See Also: [Chapter 3, "Creating Oracle 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.sh`, 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 running 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 `local_listener` and `remote_listener` parameters in your SPFILE by issuing an `ALTER SYSTEM` command, or by uncommenting it 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: *The 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 Oracle Universal Installer (OUI)

B.2 About DBCA Noninteractive (Silent) Configuration for Oracle RAC

You can perform a noninteractive, or *silent* configuration of Oracle RAC using DBCA. To perform a silent configuration, you must have completed an Oracle Grid Infrastructure (Oracle Clusterware and Oracle ASM) installation, run the `root.sh` script from the Oracle Database home, and defined the Oracle home directory environment variable.

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

Oracle provides templates for the following two workload types:

- General purpose or transaction processing
- Data warehouse

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

B.3 Using DBCA Noninteractive (Silent) Configuration for Oracle RAC

The following command syntax creates an Oracle RAC database in an existing Oracle ASM disk group, where the cluster nodes are `node1` and `node2`, and where the disk

group name is ASMgrp1, the passwords are *my_password*, and the ASM SYS password is *My_ASM_Password*:

```
# su oracle -c "$ORACLE_HOME/bin/dbca -silent -createDatabase -templateName
General_Purpose.dbc -gdbName $DBNAME -sid $SID -sysPassword my_password
-sysPassword my_password -sysmanPassword my_password -dbsnmpPassword my_
password -emConfiguration LOCAL -storageType ASM -diskGroupName ASMgrp1
-datafileJarLocation $ORACLE_HOME/assistants/dbca/templates -nodeinfo
node1,node2 -characterset WE8ISO8859P1 -obfuscatedPasswords false -sampleSchema
false -asmSysPassword My_ASM_password"
```

B.4 How Response Files Work

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

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

- Silent 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" ...
```

In this command, *directory_path* is the path of the database directory on the DVD or the path of the `Disk1` directory on the hard drive.

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_dlgRB0Password=binks342" ...
```

Enclose the variable and its setting in double quotes.

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

B.4.1 Reasons for Using Silent Mode or Response File Mode

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

Mode	Uses
Silent	<p>Use silent mode for the following installations:</p> <ul style="list-style-type: none"> ■ Complete an unattended installation, which you schedule using operating system utilities such as <code>at</code>. ■ Complete several similar installations on multiple systems without user interaction. ■ Install the software on a system that does not have X Window System software installed on it. <p>The installer displays progress information on the terminal that you used to start it, but it does not display any of the installer screens.</p>
Response file	<p>Use response file mode if you want to complete similar Oracle software installations on more than one system, providing default answers to some, but not all of the installer prompts.</p> <p>If you do not specify information required for a particular installer screen in the response file, then the installer displays that screen. It suppresses screens for which you have provided all of the required information.</p>

B.4.2 Creating a Database Using Oracle ASM for Database Files

Before you create a database that uses Oracle Automatic Storage Management (Oracle ASM), you must run the `root.sh` script. For this reason, you cannot create a database using Oracle ASM as the storage option for database files during a silent-mode installation. Instead, you can complete a software-only installation using silent-mode, and then run the Oracle Net Configuration Assistant and DBCA in silent mode after you have completed the software-only installation and you have run the `root.sh` script.

Note: This limitation applies only to databases that use Oracle Automatic Storage Management as the storage option for database files. You can create a database that uses the file system option during a silent-mode installation.

B.4.3 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 `oraInst.loc` file if it is not present on the server.
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 DBCA in silent or response file mode.

These steps are described in the following sections.

B.5 Preparing Response Files

This section describes the following methods to prepare response files for use during silent mode or response file mode installations:

- [Editing a Response File Template](#)
- [Recording Response Files](#)

B.5.1 Editing a Response File Template

Oracle provides response file templates for each product and installation type and for each configuration tool. These files are located at `database/response` directory on the installation media.

Note: If you copied the software to a hard disk, then the response files are located in the directory `/Disk1/response`.

[Table B-1](#) lists the response files provided with this software:

Table B-1 *Response Files for Oracle Database*

Response File	Description
<code>db_install.rsp</code>	Silent installation of Oracle Database 11g
<code>dbca.rsp</code>	Silent installation of DBCA
<code>netca.rsp</code>	Silent installation of Oracle Net Configuration Assistant

Caution: When you modify a response file template and save a file for use, the response file may contain plain text passwords. Ownership of the response file should be given to the Oracle software installation owner only, and permissions on the response file should be changed to 600. 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:

```
$ cp /directory_path/response/response_file.rsp local_directory
```

In this example, `directory_path` is the path to the `database` directory on the installation media. 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:

```
$ vi /local_dir/response_file.rsp
```

Remember that you can specify sensitive information, such as passwords, at the command line rather than within the response file. ["How Response Files Work"](#) on page B-3 explains this method.

See Also: *The 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. Change the permissions on the file to 600:

```
$ chmod 600 /local_dir/response_file.rsp
```

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 OSDBA group (required for automated backups). Ensure that only the Oracle software owner user can view or modify response files or consider deleting them after the installation succeeds.

B.5.2 Recording Response Files

You can use OUI in interactive mode to record response files, which you can edit and then use to complete silent mode or response file mode installations. This method is useful for Advanced or software-only installations.

Starting with Oracle Database 11g Release 2 (11.2), you can save all of 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 system.

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.

Note: You cannot save passwords while recording 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. Ensure that the Oracle software owner user (typically `oracle`) has permissions to create or write to the Oracle home path that you will specify when you run the installer.
3. On each installation screen, specify the required information.
4. When the installer displays the Summary screen, perform the following:

- a. Click **Save Response File** and specify a file name and location to save the values for the response file.
 - b. Click **Finish** to create the response file and continue with the installation.
Click **Cancel** if you do not want to continue with the installation. The installation stops, but the recorded response file is retained.
5. If you do not complete the installation, then delete the Oracle home directory that the installer created using the path you specified in the Specify File Locations screen.
 6. Before you use the saved response file on another system, edit the file and make any required changes.
Use the instructions in the file as a guide when editing it.

B.6 Running Oracle Universal Installer Using a Response File

Now, you are ready to run OUI at the command line, specifying the response file you created, to perform the installation. The OUI executable, `runInstaller`, provides several options. For help information on the full set of these options, run the `runInstaller` command with the `-help` option, for example:

```
$ directory_path/runInstaller -help
```

The help appears in a 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 the software installation owner user.
3. If you are completing a response file mode installation, set the `DISPLAY` environment variable.

Note: You do not have to set the `DISPLAY` environment variable if you are completing a silent mode installation.

4. To start the installer in silent or response file mode, enter a command similar to the following:

```
$ /directory_path/runInstaller [-silent] [-noconfig] \  
-responseFile responsefilename
```

Note: Do not specify a relative path for 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 DVD or the path of the `Disk1` directory on the hard drive.
- `-silent` indicates that you want to run 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.

Note: For more information about other options for the `runInstaller` command, enter the following command:

```
$ /directory_path/runInstaller -help
```

5. When the installation completes, log in as the `root` user and run the `root.sh` script:

```
$ sudo sh
password:
# /oracle_home_path/root.sh
```

B.7 Running Net Configuration Assistant Using Response Files

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.resp` in the `response` directory in the `database/response` directory on the DVD.

Note: If you copied the software to a hard disk, then the response file template is located in the `database/response` directory.

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:

```
$ cp /directory_path/response/netca.rsp local_directory
```

In this example, *directory_path* is the path of the `database` directory on the DVD. 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:

```
$ vi /local_dir/netca.rsp
```

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 the Oracle software owner user, and set the `ORACLE_HOME` environment variable to specify the correct Oracle home directory.
5. Enter a command similar to the following to run Net Configuration Assistant in silent mode:

```
$ $ORACLE_HOME/bin/netca /silent /responsefile /local_dir/netca.rsp
```

In this command:

- The `/silent` option indicates to run Net Configuration Assistant in silent mode.
- `local_dir` is the full path of the directory where you copied the `netca.rsp` response file template.

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 `Disk1/response` directory.

This section contains the following topics:

- [About Database Configuration Assistant in Response File Mode](#)
- [Running Database Configuration Assistant in Response File or Silent Mode](#)
- [About the Postinstallation Configuration File](#)
- [Running Postinstallation Configuration Using a Response File](#)

B.8.1 About Database Configuration Assistant in Response File Mode

In the response file mode, DBCA 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 create a preconfigured database during an Enterprise Edition or Standard Edition installation.

To run DBCA in response file mode, use a graphical display and set the `DISPLAY` environment variable. Use `-progressOnly` flag to set the run mode to response file.

Oracle provides a response file template named `dbca.rsp` in the `/Disk1/response` directory on the DVD.

B.8.2 Running Database Configuration Assistant in Response File or Silent Mode

To run DBCA 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:

```
$ cp /directory_path/response/dbca.rsp local_directory
```

In this example, `directory_path` is the path of the `database` directory on the DVD. If you have copied the software to a hard drive, you can edit the file in the `response` directory if you prefer.

Note: As an alternative to editing the response file template, you can also create a database by specifying all required information as command line options when you run DBCA. For information about the list of options supported, enter the following command:

```
$ $ORACLE_HOME/bin/dbca -help
```

2. Open the response file in a text editor:

```
$ vi /local_dir/dbca.rsp
```

3. Edit the file, following the instructions in the file.

Note: DBCA fails if you do not correctly configure the response file.

4. Log in as the Oracle software owner user, and set the `ORACLE_HOME` environment variable to specify the correct Oracle home directory.
5. To run DBCA in response file mode, set the `DISPLAY` environment variable.
6. Use the following command syntax to run DBCA in silent or response file mode using a response file:

```
$ORACLE_HOME/bin/dbca {-progressOnly | -silent} -responseFile \  
/local_dir/dbca.rsp
```

In this example:

- The `-silent` option indicates that you want to run DBCA in silent mode.
- The `-progressOnly` option indicates that you want to run DBCA in response file mode.
- `local_dir` is the full path of the directory where you copied the `dbca.rsp` response file template.

B.9 Postinstallation Configuration Using Response Files

The following sections explain how to create and run a response file configuration after installing Oracle software. The topics in this section are:

- [About the Postinstallation Configuration File](#)
- [Running Postinstallation Configuration Using a Response File](#)

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 during a graphical user interface installation. 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 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 the password file 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 has 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:

- Permissions on the response file should be set to 600.
- The owner of the response file should be the installation owner user, with the group set to the central inventory (oraInventory) group.

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`. For example:

```
$ touch cfgrsp.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 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. Change permissions to secure the file. For example:

```
$ ls -al cfgrsp.properties
-rw----- 1 oracle oinstall 0 Apr 30 17:30 cfgrsp.properties
```

4. Change directory to `$ORACLE_BASE/cfgtoollogs`

Run the configuration script using the following syntax:

```
configToolAllCommands RESPONSE_FILE=/path/name.properties
```

For example:

```
$ ./configToolAllCommands RESPONSE_FILE=/home/oracle/cfgrsp.properties
```

Converting to Oracle RAC and Oracle RAC One Node from Single-Instance Oracle Databases

This appendix describes the procedures for converting from Oracle Database 11g release 2 (11.2) single-instance databases to Oracle Real Application Clusters (Oracle RAC) and Oracle RAC One Node databases. This appendix contains the following topics:

- [Administrative Issues for Converting Databases to Oracle RAC](#)
- [Converting to Oracle RAC and Oracle RAC One Node 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](#)

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).

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.

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:

- Backup procedures should be available before converting from a single-instance Oracle Database to Oracle RAC.
- 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 and Oracle RAC One Node with DBCA

You can use Database Configuration Assistant (DBCA) to convert from single-instance Oracle databases to Oracle RAC, or Oracle RAC One Node. 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. DBCA 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 (SRVCTL).

Before you use DBCA to convert a single-instance database to an Oracle RAC or an Oracle RAC One Node 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. On Linux on POWER systems, ensure that GPFS 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 11g 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 11g 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`. If you choose to do so, 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 the 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 the *Oracle Grid Infrastructure Installation Guide* for your platform.

C.2.1.3 Validate the Cluster

Validate the cluster configuration using the Cluster Verification Utility (CVU).

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 11g 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.

Select the option that you want to deploy. Your choices are the following: Oracle RAC database; Oracle RAC One Node database; or Oracle single instance database.
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.

C.2.2 Converting Single Instance on a Cluster to Oracle RAC One Node Using DBCA

Use DBCA to convert a single-instance Oracle Database to Oracle RAC One Node by using the following procedure:

1. Change directory to `$ORACLE_HOME/bin`
2. Start DBCA:

```
$ dbca
```
3. From the Welcome window, select **Oracle Real Application Clusters** database.
4. Use the template that you selected to deploy in [Section C.2.1.5, "Install Oracle Database 11g Software with Oracle RAC."](#)

C.2.3 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 on a Cluster Running from a Cluster-Enabled Oracle Home"](#) on page C-5.
- Scenario 2: The Oracle home from which the single-instance database is running is cluster-installed, but the Oracle RAC feature is disabled. Refer to ["Single Instance on a Cluster Running from an Oracle RAC-Disabled Oracle Home"](#) on page C-7 for instructions on how to convert the database to Oracle RAC in this environment.
- 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 on a Cluster Running from a Single-Instance Installed Oracle Home"](#) on page C-7.

C.2.3.1 Single Instance 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 11g 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 the *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 "Extending Clusterware and Oracle Software to New Nodes" as described in *Oracle Clusterware Administration and Deployment Guide*.
3. From the existing Oracle home, extend this home to the new nodes using the procedure "Adding Nodes at the Oracle RAC Database Layer" as described in *Oracle Clusterware Administration and Deployment Guide*.
4. From one of the newly added nodes, 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.
5. Convert the database using one of the following procedures:
 - [Automated Conversion Procedure Using DBCA](#)
 - [Manual Conversion Procedure](#)

C.2.3.1.1 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-5. Enter the database name and respond to the remaining DBCA prompts.
3. To use raw devices for the cluster database files: When the Initialization Parameters page appears, enter the raw device name for the SPFILE on the File Locations tab. 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. 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.2.3.1.2 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-5, 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 `dd` 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 up 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 from 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. Add `REMOTE_LISTENER=LISTENER_DB_NAME` and `sid.LOCAL_LISTENER=LISTENER_SID` parameters to the PFILE.
12. Configure the net service entries for the database and instances, and address entries for the `LOCAL_LISTENER` for each instance and for the `REMOTE_LISTENER` in the `tnsnames.ora` file. When you have done this, copy these to all nodes.
13. Create the SPFILE from the PFILE using the procedures in the section ["Procedures for Migrating to the Server Parameter File"](#) on page 5-3. If you are not using a cluster file system, then ensure that the SPFILE is on a raw device.

14. Create the `$ORACLE_HOME/dbs/init sid .ora` file that contains the following entry:

```
spfile='spfile_path_name'
```

The variable `spfile_path_name` is the complete path name of the SPFILE.

15. On the local node, run `catclust.sql`. This command creates the dictionary views needed for Oracle RAC databases. For example:

```
SQL> start ?/rdbms/admin/catclust.sql
```

16. Add the configuration for the Oracle RAC or Oracle RAC One Node database and its instance-to-node mapping using `SRVCTL`.
17. Start the database using `SRVCTL`.

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.2.3.2 Single Instance on a Cluster Running from an Oracle RAC-Disabled Oracle Home

You can install a single instance on a cluster running from an Oracle RAC Oracle home that is disabled if you performed a one-node cluster (with Oracle RAC) installation, but later disabled the Oracle RAC feature by unlinking it from the `oracle` binary before creating the single instance database. (However, you can also select the **local** and **non-cluster** selection on the Node Selection Page to create a single-instance home on a cluster with Oracle RAC disabled.) Perform the following procedures to convert this type of single-instance database to an Oracle RAC database:

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. Change the directory to the `lib` subdirectory in the `rdbms` directory under the Oracle home.
3. Relink the `oracle` binary by running the following commands:

```
make -f ins_rdbms.mk rac_on
make -f ins_rdbms.mk ioracle
```

4. Continue with step 2 on page C-5.

C.2.3.3 Single Instance 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 11g 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, make sure that you select a new Oracle home other than the one from which the single-instance database was running.

C.2.4 Converting Oracle RAC One Node to Oracle RAC

You can convert an Oracle RAC One Node database to an Oracle RAC database by logging in as the Oracle RAC One Node database owner and entering the following SRVCTL command:

```
$ srvctl convert database -c RAC
```

After you run this command, you must create server pools for each service that the database has, in addition to the database server pool. The values for `SERVER_NAMES` of the service server pools must be set to the node that you converted from an Oracle RAC One Node to an Oracle RAC node.

Converting an administrator-managed Oracle RAC One Node database to an Oracle RAC database sets all database services so that the single instance is preferred. After you convert the database, you can add instances by running the `SRVCTL add instance` command.

Converting a policy-managed Oracle RAC One Node database to an Oracle RAC database sets all database services to UNIFORM cardinality. It also results in reusing the server pool in which the database currently runs. The conversion reconfigures the database to run on all of the nodes in the server pool. The command does not start any additional instances but running the `SRVCTL start database` command starts the database on all of the nodes in the server pool.

See Also: *The Oracle Real Application Clusters Administration and Deployment Guide* for more information

C.3 Preparing to Convert with rconfig and Oracle Enterprise Manager

You can use `rconfig`, or Oracle Enterprise Manager to assist with 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, as is always true before you start any major change to your database, always back up your existing 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 11g release 2 (11.2) is installed, configured, and running.
- Oracle RAC 11g 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.
- 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.

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 archive log 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.

If you want to avoid using OMF with your converted database, then the single-instance database files must already 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 11g release 2 (11.2) to an Oracle 11g release 2 (11.2) Oracle RAC database, running out of the *same* Oracle home and using the same data files as the single-instance database.

In this scenario, run the `rconfig` utility from the Oracle RAC database home, 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 previous to Oracle Database 11g 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 11g 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 11g release 2 (11.2) to an Oracle 11g release 2 (11.2) Oracle RAC database, running out of a *different* Oracle home and using the same data files as the single-instance database.

In this scenario, run the `rconfig` utility in the target database home, 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 11g release 2 (11.2) to an 11g release 2 (11.2) Oracle RAC database, running out of a *different* Oracle home, and where the host where the single-instance database is running is *not* one of the nodes 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 one of the nodes 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: The *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 that you want 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 that you want to convert. If the target database is using Oracle ASM, then also provide the ASM `SYS` user and password, and click **Next**.
7. On the Hosts screen, select the host nodes in the cluster that you want to be cluster members in the Oracle RAC database installed. 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 if you want to copy your 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. A failure group is defined by shared hardware, such as a controller shared between two disks, or two disks that are on the same spindle. If two disks share hardware that could fail, making both disks unavailable, then these disks are said to be in the same failure group. 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.

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** if you want to proceed to conversion. If you want to change 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, or to convert it to Oracle RAC One Node, depending on the values you provide in the `ConvertToRAC.xml` file. To use this feature, complete the following steps:

See Also: The *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, such as `vi`.
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

```
$ ./rconfig 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 it reports 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 an Oracle RAC database using Policy Managed 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 Oracle RAC database using Administrator Managed server pools.

Example C-1 RConfig ConvertToRAC for Policy Managed Databases

```
<?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>/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>/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 will be used by the
Policy Managed Cluster Database. -->
    <n:ServerPoolList>
      <n:ExistingServerPool name="custom"/>
      <n:NewServerPool name="newpool" cardinality="2"/>
    </n:ServerPoolList>
<!--Specify RacOneNode along with servicename to convert database to RACOne Node
-->
    <!--n:RacOneNode servicename="salesrac1service"/-->
<!--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 Fast 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 Databases

```

<?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 rconfig.xsd">
  <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>/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>/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>
<!--Specify RacOneNode along with servicename to convert database to RACOne Node
-->
<!--n:RacOneNode servicename="salesrac1service"/-->
<!--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 Fast 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 the *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 the *Oracle Real Application Clusters Administration and Deployment Guide*
- Follow the guidelines for using automatic segment space management as described in the *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%.

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 11g release 2 (11.2) with Oracle RAC, all subdirectories except for `oraInventory`, the Oracle Automatic Storage Management home (if applicable), and the Oracle Clusterware home, are under a top-level `ORACLE_BASE` directory. The `ORACLE_HOME` and `ADMIN` directories are also located under `ORACLE_BASE`.

See Also: *The 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
<code>\$ORACLE_BASE</code>				<code>/u01/app/oracle</code> The default <code>ORACLE_BASE</code> directory, where the software owner is the <code>oracle</code> user.
	<code>ORACLE_HOME</code>			<code>/u01/app/oracle/11.2.0/</code> 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 <i>not</i> be under the Oracle base directory path where the database binaries are located.
		<code>installation_type</code>		Type of installation under the Oracle base directory. You can also choose to add a counter, if you intend to have more than one installation of the software. For example, with an Oracle database installation, where the database is the second database, the path is as follows: <code>/u01/app/oracle/11.2.0/dbhome_2</code>

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 11g, <code>bdump</code> , <code>cdump</code> , and <code>udump</code> files are relocated to the directory <code>\$ADR_BASE</code> .
		/db_unique_name		The database unique name; this is the same as <code>dbname</code> when the database name is 8 or fewer characters in length.
			/hdump /pfile	The dump destinations for database server.
<code>\$ADR_BASE</code>			/bdump /cdump /udump	Automatic Diagnostic Repository dump destination trace files. Note that this directory path is set by the initialization parameter <code>DIAGNOSTIC_DEST</code> , 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: <code>\$ORACLE_BASE/diag/</code>
Oracle Grid Infrastructure for a cluster home (Grid home)				<code>/u01/app/grid/11.2.0/</code> 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. The <code>root.sh</code> script changes permissions of all of the parent directories of the Oracle Clusterware home directory to grant write access only to the root user. Because of this, the Oracle Clusterware home directory must not be a subdirectory of the Oracle base directory.
		/bin		The subtree for Oracle binaries.
		/network		The subtree for Oracle Net.

See Also: *Oracle Database Administrator's Reference for Linux and UNIX-Based Operating Systems* for further information about the `$ORACLE_HOME` and `/admin` directories

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 Cluster Ready Services, then you must shut down all Oracle Database instances on all of the 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 that are 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 and Oracle ASM Instances](#)

E.3.1 Stopping Oracle Database Processes Before Adding Products or Upgrading

This section provides an overview of what needs to be done before adding additional products to Oracle Database 11g 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 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:

```
$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:

```
$ oracle_home/bin/srvctl stop database -d db_name
```

E.3.2 Stopping Oracle Clusterware and Oracle ASM Instances

If you are modifying an Oracle Clusterware or Oracle Cluster Ready Services (CRS) 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 *u01/app/grid/11.2.0* is the Oracle Grid Infrastructure home, and *node* is the name of the node where the applications are running

```
$ u01/app/grid/11.2.0/bin/srvctl stop nodeapps -n node
```

4. Shut down the Oracle Clusterware or CRS process by entering the following command on all nodes as the *root* user

```
# 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 Restart services for single-instance databases.

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 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 Clusterware components and services use ports. As an administrator, it is important to know the port numbers used by these services, and to make sure that the same port number is not used by two services on your host.

Most port numbers are assigned during installation. Every component and service has an allotted port range, which is the set of port numbers Oracle Clusterware attempts to use when assigning a port. Oracle Clusterware 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 Clusterware 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, 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

Table F-1 lists the port numbers and protocols used by components that are configured during the installation. By default, the first port in the range is assigned to the component, if it is available.

Table F-1 Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol	Used Only On Interconnect
<p>Cluster Manager</p> <p>The port number is assigned automatically during installation. You cannot view or modify it afterward.</p> <p>This port is used exclusively with the cluster interconnect, which is private network that is physically separated from the public network, and which uses dedicated hardware for the interconnect.</p>	Dynamic	Dynamic	TCP	Yes
<p>Cluster Synchronization Service (CSS)</p> <p>Node restart advisory messages fixed port.</p> <p>This port is used on all interfaces that have broadcast capability. Broadcast occurs only when a node eviction restart is imminent.</p>	39748	39748	UDP	No
<p>Oracle Data Guard</p> <p>Shares the Oracle Net port and is configured during installation. To reconfigure this port, use Net Configuration Assistant to reconfigure the Oracle Net listener.</p>	1521 (same value as the listener)	1521	TCP	No
<p>Oracle Connection Manager</p> <p>Listening port for Oracle client connections to Oracle Connection Manager. You can configure Oracle Connection Manager after installation using Net Configuration Assistant.</p>	1630	1630	TCP	No
<p>Oracle Clusterware</p> <p>CRS daemon (Oracle Cluster Ready Services Daemon) internode connection. The port number is assigned automatically during installation. You cannot view or modify it afterward.</p> <p>This port is used exclusively with the cluster interconnect, which is private network that is physically separated from the public network, and which uses dedicated hardware for the interconnect.</p>	49896	49896	TCP	Yes

Table F-1 (Cont.) Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol	Used Only On Interconnect
<p>Oracle Cluster Registry</p> <p>The port number is assigned automatically during installation. You cannot view or modify it afterward.</p> <p>This port is used exclusively with the cluster interconnect, which is private network that is physically separated from the public network, and which uses dedicated hardware for the interconnect.</p>	Dynamic	Dynamic	TCP	Yes
<p>Oracle Event Manager (EVM)</p> <p>The port number is assigned automatically during installation. You cannot view or modify it afterward.</p> <p>This port is used exclusively with the cluster interconnect, which is private network that is physically separated from the public network, and which uses dedicated hardware for the interconnect.</p>	49897	49897–49898	TCP	Yes
<p>Oracle Enterprise Manager Database Console</p> <p>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.</p>	1158	5500–5519	TCP/HTTP	No
<p>Oracle Enterprise Manager Database Console</p> <p>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.</p>	5520	5520–5539	TCP	No
<p>Oracle Enterprise Manager Database Console</p> <p>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.</p>	5540	5540–5559	TCP	No
<p>Oracle Management Agent</p> <p>HTTP port for Oracle Management Agent, which is part of Oracle Enterprise Manager. It is configured during installation.</p> <p>"Changing the Oracle Management Agent Port" on page F-4 explains how to modify its port number</p>	3938	1830–1849	HTTP	No
<p>Oracle Notification Services (ONS)</p> <p>Port for ONS, used to publish and subscribe service for communicating information about all Fast Application Notification (FAN) events. The FAN notification process uses system events that Oracle publishes when cluster servers become unreachable or if network interfaces fail.</p>				

Table F-1 (Cont.) Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol	Used Only On Interconnect
Oracle Real Application Clusters The port number is assigned automatically during installation. You cannot view or modify it afterward. This port is used exclusively with the cluster interconnect, which is private network that is physically separated from the public network, and which uses dedicated hardware for the interconnect.	Dynamic	Dynamic	UDP	Yes
Oracle Net Listener Allows Oracle client connections to the database over the protocol for Oracle Net. You can configure it during installation. To reconfigure this port, use Net Configuration Assistant.	1521	1521	TCP	No
Oracle XML DB The Oracle XML DB HTTP port is used if Web-based applications need to 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	Configured manually	HTTP	No
Oracle XML DB The Oracle XML DB FTP is used when applications need to 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	Configured manually	FTP	No

F.4 Changing the Oracle 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:

```
ORACLE_HOME/bin> emca -reconfig ports option setting
```

In the previous example, *option* specifies one or more of the following ports and *setting* is the new port value:

Option	Description	Example
DBCONTROL_HTTP_PORT	Sets the HTTP port	emca -reconfig ports -DBCONTROL_HTTP_PORT 1820
RMI_PORT	Sets the RMI port	emca -reconfig ports -RMI_PORT 5520
JMS_PORT	Sets the JMS port	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 Oracle XML DB.

To change the Oracle XML FTP and HTTP ports, you need to 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.
If you cannot start the listener, then refer to *Oracle Database Net Services Administrator's Guide*.
2. log in to SQL*Plus as SYS or XDB using the SYSDBA role.
For example, to log in to SQL*Plus as SYS:

```
SQL> sqlplus 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> /u01/app/oracle/product/11.2.0/dbhome_1/rdbms/admin/catxdbdbca.sql 2200 8200
```
4. Exit SQL*Plus.

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