Oracle® Database

Database Installation Guide

21c for Microsoft Windows

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Oracle Database Database Installation Guide, 21c for Microsoft Windows

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Preface

Learn how to install and configure Oracle Database, perform postinstallation tasks, and how to remove the database software.

The following topics are covered:

- Audience
- Documentation Accessibility
- Diversity and Inclusion
- Set Up Java Access Bridge to Implement Java Accessibility
  Install Java Access Bridge so that assistive technologies on Microsoft Windows systems can use the Java Accessibility API.
- Conventions

Audience

This guide is intended for anyone responsible for installing Oracle Database 21c.

To use this document, you need the following:

- A supported Microsoft Windows operating system installed and tested on your computer system
- Administrative privileges on the computer where you are installing the Oracle Database software
- Familiarity with object-relational database management concepts

Additional installation guides for Oracle Database, Oracle Real Application Clusters, Oracle Clusterware, Oracle Database Examples, and Oracle Enterprise Manager Cloud Control are available at the following URL:

`http://docs.oracle.com`

Documentation Accessibility

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

Access to Oracle Support

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

Diversity and Inclusion

Oracle is fully committed to diversity and inclusion. Oracle respects and values having a diverse workforce that increases thought leadership and innovation. As part of our initiative to build a more inclusive culture that positively impacts our employees, customers, and partners, we are working to remove insensitive terms from our products and documentation. We are also mindful of the necessity to maintain compatibility with our customers' existing technologies and the need to ensure continuity of service as Oracle's offerings and industry standards evolve. Because of these technical constraints, our effort to remove insensitive terms is ongoing and will take time and external cooperation.

Conventions

The following text conventions are used in this document:

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

Set Up Java Access Bridge to Implement Java Accessibility

Install Java Access Bridge so that assistive technologies on Microsoft Windows systems can use the Java Accessibility API.

Java Access Bridge is a technology that enables Java applications and applets that implement the Java Accessibility API to be visible to assistive technologies on Microsoft Windows systems.

Refer to *Java Platform, Standard Edition Accessibility Guide* for information about the minimum supported versions of assistive technologies required to use Java Access Bridge. Also refer to this guide to obtain installation and testing instructions, and instructions for how to use Java Access Bridge.

Related Topics

- *Java Platform, Standard Edition Java Accessibility Guide*

1

Oracle Database Installation Checklist

Use checklists to review system requirements, and to plan and carry out Oracle Database installation.

Oracle recommends that you use checklists as part of your installation planning process. Using a checklist ensures that your server hardware and configuration meets minimum requirements for this release, and enables you to carry out a successful installation.

- Server Hardware Checklist for Oracle Database Installation
  Use this checklist to check hardware requirements for Oracle Database.
- Operating System Checklist for Oracle Database Installation on Microsoft Windows
  Use this checklist to check minimum operating system requirements for Oracle Database.
- Server Configuration Checklist for Oracle Database Installation
  Use this checklist to check minimum server configuration requirements for Oracle Database installations.
- Oracle User Environment Configuration Checklist for Oracle Database Installation
  Use this checklist to plan operating system users, groups, and environments for Oracle Database management.
- Storage Checklist for Oracle Database Installation
  Use this checklist to review storage minimum requirements and assist with configuration planning.
- Installer Planning Checklist for Oracle Database Installation
  Use the checklist to assist you to be prepared before starting Oracle Universal Installer.
- Deployment Checklist for Oracle Database
  Use this checklist to decide the deployment method for a single-instance Oracle Database.

Server Hardware Checklist for Oracle Database Installation

Use this checklist to check hardware requirements for Oracle Database.

Table 1-1 Server Hardware Checklist for Oracle Database Installation

Check	Task
Server Make and Architecture	Confirm that server make, model, core architecture, and host bus adaptors (HBA) or network interface controllers (NIC) are supported to run with Oracle Database and Oracle Grid Infrastructure.
Minimum RAM	At least 1 GB RAM for Oracle Database installations. 2 GB RAM recommended.
Minimum network connectivity	Server is connected to a network
Video Adapter	256 colors
Server Display Cards	At least 1024 x 768 display resolution, which Oracle Universal Installer requires.

Operating System Checklist for Oracle Database Installation on Microsoft Windows

Use this checklist to check minimum operating system requirements for Oracle Database.

Table 1-2 Operating System General Checklist for Oracle Database on Microsoft Windows

Item	Task
Operating system general requirements	Oracle Database for Windows x64 is supported on the following operating system versions: • Windows 10 x64 - Pro, Pro for Workstations, Enterprise, and Education editions • Windows 11 x64 - Pro, Enterprise, and Education editions • Windows Server 2012 R2 x64 - Standard, Datacenter, Essentials, and Foundation editions • Windows Server 2016 x64 - Standard, Datacenter, and Essentials editions • Windows Server 2019 x64 - Standard, Datacenter, and Essentials editions • Windows Server 2022 x64 - Standard, Datacenter, and Essentials editions **Note:** Windows 11 x64 - Pro, Enterprise, and Education editions and Windows Server 2022 x64 - Standard, Datacenter, and Essentials editions are supported starting with Oracle Database 21c Release Update (21.4) or later.

Related Topics

- Oracle Database Software Requirements
  The following table lists the software requirements for Oracle Database on Windows x64:

Server Configuration Checklist for Oracle Database Installation

Use this checklist to check minimum server configuration requirements for Oracle Database installations.

Table 1-3 Server Configuration Checklist for Oracle Database

Check	Task
Disk space allocated to the temporary file system	At least 1 GB of space in the temporary directory. Oracle recommends 2 GB or more At least 4 GB of space in the temporary directory for Oracle Restart

Table 1-3 (Cont.) Server Configuration Checklist for Oracle Database

Check	Task
Swap space allocation relative to RAM	• If physical memory is between 2 GB and 16 GB, then set virtual memory to 1 times the size of the RAM • If physical memory is more than 16 GB, then set virtual memory to 16 GB
Oracle Inventory and ORA_INSTALL Group Requirements	The Oracle Inventory directory is the central inventory of Oracle software installed on your system. You do not need to create the Oracle central inventory or the ORA_INSTALL group as Oracle Universal Installer creates it for you.
Groups and Users	Oracle recommends that you create groups and user accounts required for your security plans before starting installation. Installation owners have resource limits settings and other requirements. Group and user names must use only ASCII characters.
Mount point paths for the software binaries	Oracle recommends that you create an Optimal Flexible Architecture configuration as described in this guide.
Ensure that the Oracle home (the Oracle home path that you select for Oracle Database) uses only ASCII characters.	The ASCII character restriction includes installation owner user names, which are used as a default for some home paths, as well as other directory names you must select for paths.
Set locale (if needed)	Specify the language and the territory, or locale, in which you want to use Oracle components. A locale is a linguistic and cultural environment in which a system or program is running. National Language Support (NLS) parameters determine the locale-specific behavior on both servers and clients. The locale setting of a component determines the language of the user interface of the component, and the globalization behavior, such as date and number formatting.
Host name	Ensure that your server host name is less than 15 characters.

Oracle User Environment Configuration Checklist for Oracle Database Installation

Use this checklist to plan operating system users, groups, and environments for Oracle Database management.

Table 1-4 User Environment Configuration for Oracle Database

Check	Task
Create operating system groups and users for standard or role-allocated system privileges	Create operating system groups and users depending on your security requirements, as described in this install guide. Set resource limits settings and other requirements for Oracle software installation owners. Group and user names must use only ASCII characters.
Unset Oracle Software Environment Variables	If you have had an existing installation on your system, and you are using the same user account to install this installation, then unset the ORACLE_HOME, ORACLE_BASE, ORACLE_SID, TNS_ADMIN environment variables and any other environment variable set for the Oracle installation user that is connected with Oracle software homes.

Table 1-4 (Cont.) User Environment Configuration for Oracle Database

Check	Task
Configure the Oracle Software Owner Environment	Set the `TEMP` environment variable.
Manage User Account Control	If you have enabled the User Account Control security feature, then Oracle Universal Installer prompts you for either your consent or your credentials when installing Oracle Database. Provide either the consent or your Windows Administrator credentials as appropriate.

Storage Checklist for Oracle Database Installation

Use this checklist to review storage minimum requirements and assist with configuration planning.

Table 1-5 Storage Checklist for Oracle Database

Check	Task
Minimum local disk storage space for Oracle software	At least 6.5 GB for Oracle Database Enterprise Edition At least 6.0 GB for Oracle Database Standard Edition 2 At least 7.0 GB for an Oracle Restart installation **Note:** Oracle recommends that you allocate approximately 100 GB to allow additional space for applying any future patches on top of the existing Oracle home. For specific patch-related disk space requirements, please refer to your patch documentation.
Recommended file system	Ensure that you have one of the following storage options available: • Oracle Automatic Storage Management (Oracle ASM) • NTFS File System or Resilient File System (ReFS)

Table 1-5 (Cont.) Storage Checklist for Oracle Database

Check	Task
Select Database File Storage Option	Ensure that you have one of the following storage options available: • File System Oracle recommends that the file system be separate from the file systems used by the operating system or the Oracle software. The file system can be any of the following: - A file system on a disk that is physically attached to the system - A file system on a logical volume manager (LVM) volume or a redundant array of independent disks (RAID) device • Oracle Automatic Storage Management (Oracle ASM) Oracle ASM is installed as part of an Oracle Grid Infrastructure installation. If you plan to use Oracle ASM, then you must install Oracle Grid Infrastructure before you install and create the database. • Starting with Oracle Database 21c, the name of Oracle Automatic Storage Management Cluster File System (Oracle ACFS) is changed to Oracle Advanced Cluster File System (Oracle ACFS). • Starting with Oracle Database 21c, the Oracle Grid Infrastructure feature Oracle Advanced Cluster File System (Oracle ACFS) is desupported with Microsoft Windows. **Caution:** Oracle ACFS and Oracle Automatic Storage Management Dynamic Volume Manager (Oracle ADVM) will not be accessible after you install or upgrade to Oracle Grid Infrastructure 21c.
Determine your recovery plan	Review the storage configuration sections of this document for more information about configuring recovery.

Installer Planning Checklist for Oracle Database Installation

Use the checklist to assist you to be prepared before starting Oracle Universal Installer.

Table 1-6 Oracle Universal Installer Planning Checklist for Oracle Database Installation

Check	Task
Review the Documentation	• Review the Oracle Database Release Notes, which is available at the following location: *Oracle Database Release Notes* • Be familiar with the installation steps for Oracle RAC software and creating an Oracle RAC database.
Review the Licensing Information	You are permitted to use only those components in the Oracle Database for which you have purchased licenses. For more information about licenses, refer to the following URL: *Oracle Database Licensing Information*

Table 1-6 (Cont.) Oracle Universal Installer Planning Checklist for Oracle Database Installation

Check	Task
Obtain your My Oracle Support account information.	During installation, you require a My Oracle Support user name and password to configure security updates, download software updates, and other installation tasks. You can register for My Oracle Support at the following URL: https://support.oracle.com/
Review Oracle Support Certification Matrix	New platforms and operating system software versions can be certified after this guide is published, review the certification matrix on the My Oracle Support website for the most up-to-date list of certified hardware platforms and operating system versions: https://support.oracle.com/ You must register online before using My Oracle Support. After logging in, from the menu options, select the Certifications tab. On the Certifications page, use the Certification Search options to search by Product, Release, and Platform. You can also search using the Certification Quick Link options such as Product Delivery, and Lifetime Support.
Review online information to assist with installation	• Log on to My Oracle Support to access certifications for your installation for your platform. • 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 at http://www.oracle.com/goto/rac
Run Oracle Universal Installer (OUI) with CVU and use fixup scripts	Oracle Universal Installer is fully integrated with Cluster Verification Utility (CVU), automating many CVU prerequisite checks. Oracle Universal Installer runs all prerequisite checks and creates fixup scripts when you run the installer. You can run OUI up to the Summary screen without starting the installation. • Obtain the latest version of CVU at the following URL: https://www.oracle.com/database/technologies/cvu-downloads.html • You can also run CVU commands manually to check that your system is prepared for installation before you start an Oracle RAC installation. If you have vendors performing hardware or operating system configuration steps, then ask the vendors to complete the relevant CVU checks of the cluster after they complete their work to ensure that your system is configured correctly. • Run OUI and DBCA from a node where an Oracle RAC Oracle database instance is located. • In case of an upgrade failure, follow common industry standards for data recovery planning, including backing up your existing database.

Table 1-6 (Cont.) Oracle Universal Installer Planning Checklist for Oracle Database Installation

Check	Task

Download and run Oracle ORAchk for runtime and upgrade checks, or runtime health checks	The Oracle ORAchk utility provides system checks that can help to prevent issues before and after installation. These checks include kernel requirements, operating system resource allocations, and other system requirements.
	Use the Oracle ORAchk Upgrade Readiness Assessment to obtain an automated upgrade-specific system health check for upgrades. For example:
	• Before you perform a fresh database installation:
	`%ORACLE-HOME%\suptools\orachk>orachk.bat -profile preinstall`
	• To upgrade your existing database to a higher version or release:
	`%ORACLE-HOME%\suptools\orachk>orachk.bat -o pre`
	The Oracle ORAchk Upgrade Readiness Assessment automates many of the manual pre- and post-upgrade checks described in Oracle upgrade documentation. For more information refer to the following URL:
	https://support.oracle.com/rs?type=doc&id=1268927.1

Verify if Oracle Grid Infrastructure is installed	• If you want to use Oracle ASM or Oracle Restart, then install Oracle Grid Infrastructure for a standalone server before you install and create the database. Otherwise, to use Oracle ASM, you must complete an Oracle Grid Infrastructure installation, and then manually register the database with Oracle Restart. • To install Oracle Real Applications Cluster (Oracle RAC), you must have Oracle Grid Infrastructure (Oracle Clusterware and Oracle ASM) installed on your cluster. The Oracle Clusterware version must be equal to or greater than the Oracle RAC version that you plan to install. • Currently, there are no supported clusterware products other than Oracle Clusterware for the Microsoft Windows platforms. If you intend to install Oracle RAC, then you must first install Oracle Grid Infrastructure for a cluster, which includes Oracle Clusterware.
Check running Oracle processes, and shut down if necessary	• On a standalone database not using Oracle ASM: You do not need to shut down the database while you install Oracle Grid Infrastructure. • On a standalone database using Oracle ASM: Stop the existing Oracle ASM instances. The Oracle ASM instances are restarted during installation. • On an Oracle RAC Database node: This installation requires an upgrade of Oracle Clusterware, as Oracle Clusterware is required to run Oracle RAC. As part of the upgrade, you must shut down the database one node at a time as the rolling upgrade proceeds from node to node.
Ensure Task Scheduler jobs do not run during installation	If the installer is running when daily scheduled jobs start, then you may encounter unexplained installation problems if your scheduled job is performing cleanup, and temporary files are deleted before the installation is finished. Oracle recommends that you complete installation before daily scheduled jobs are run, or disable daily scheduled jobs that perform cleanup until after the installation is completed.

Table 1-6 (Cont.) Oracle Universal Installer Planning Checklist for Oracle Database Installation

Check	Task
Decide on an Oracle Database management tool	By default, Oracle Database is managed by Oracle Enterprise Manager Database Express. If you have an existing Oracle Management Agent, and decide to use Oracle Enterprise Manager Cloud Control to centrally manage your database, then obtain the following information to enter during the database installation: • OMS host • OMS port • EM admin username • EM admin password • Specify password of ASMSNMP user You need a web browser to access documentation, to use Oracle Enterprise Manager Database Express, and to use Oracle Application Express. Web browsers must support JavaScript and the HTML 4.0 and Cascading Style Sheets (CSS) 1.0 standards.
Review memory allocation and Automatic Memory Management feature	You can enable automatic memory management either during, or after Oracle Database installation. If you enable automatic memory management after installation, then you must shut down and restart the database. With Automatic Memory Management, Oracle Database instances automatically manage and tune memory. You choose a memory target, and the instance automatically distributes memory between the system global area (SGA) and the instance program global area (instance PGA). As memory requirements change, the instance dynamically redistributes memory between the SGA and instance PGA.
Unzip utility	Unzip 6.0 or later. Unzip is required to extract the image files for Oracle Database and Oracle Grid Infrastructure installations.

Related Topics

- *Oracle Grid Infrastructure Installation and Upgrade Guide for Microsoft Windows x64 (64-Bit)*
- *Oracle Enterprise Manager Cloud Control Administrator's Guide*
- *Oracle Database Administrator’s Guide*
- *Oracle Clusterware Administration and Deployment Guide*

Deployment Checklist for Oracle Database

Use this checklist to decide the deployment method for a single-instance Oracle Database.

Table 1-7 Deployment Checklist for Oracle Database (single-instance)

Item	Task
To deploy single-instance Oracle Database software	Use one of the following deployment methods: • Install Oracle Database software using Oracle Universal Installer (OUI). • Provision Oracle Database software using Oracle Fleet Patching and Provisioning. • Clone Oracle Database.
To deploy single-instance Oracle Database software and create databases	Use one of the following deployment methods: • Install Oracle Database software using Oracle Universal Installer (OUI). • Provision Oracle Database software using Oracle Fleet Patching and Provisioning. • Clone Oracle Database.
To create single-instance Oracle Database in an already-installed Oracle home	• Use Oracle Database Configuration Assistant (Oracle DBCA). • Use Oracle Fleet Patching and Provisioning

Related Topics

- *Oracle Database Administrator's Guide*

> **See Also:**
>
> *Oracle Clusterware Administration and Deployment Guide* for more information about Oracle Fleet Patching and Provisioning

2

Checking and Configuring Server Hardware for Oracle Database

Verify that servers where you install Oracle Database meet the minimum requirements for installation.

This section provides minimum server requirements to complete installation of Oracle Database. It does not provide system resource guidelines, or other tuning guidelines for particular workloads.

- Installing with Minimum Memory Requirements
  Installations of Oracle Database on computers with RAM and virtual memory lesser than the minimum required have the following limitations:
- Oracle Database Minimum Hardware Requirements
  Learn about the hardware component and hard disk space requirements.

Installing with Minimum Memory Requirements

Installations of Oracle Database on computers with RAM and virtual memory lesser than the minimum required have the following limitations:

- Computers cannot run Oracle Database Upgrade Assistant, Oracle Database Configuration Assistant, or Oracle Net Services Configuration Assistant during an Oracle Universal Installer installation session.
- Depending on how many applications run on the computer, you must further increase the paging file size or reduce the size of the System Global Area (SGA) if you run out of virtual memory. If temporary files and the paging file are both stored on the same physical drive, the space requirements for one can limit the size of the other. If your system has limited free space, first install the Oracle Database software. After the installation is finished, create a database with Oracle Database Configuration Assistant.

> **Note:**
>
> Do not install the database on computer systems that barely meet the minimum memory and virtual memory requirements of 1 GB.

You can install only the database software by selecting the Install Database Software only option provided on the Select Installation Option screen.

After installation, run the appropriate configuration assistant for your needs:

- To create a new database, run Oracle Database Configuration Assistant. From the **Start** menu, select **All Programs**, then **Oracle - *HOMENAME***, then **Configuration and Migration Tools**, then **Database Configuration Assistant**.

- To upgrade an existing database, run Oracle Database Upgrade Assistant. From the **Start** menu, select **All Programs**, then **Oracle - *HOMENAME***, then **Configuration and Migration Tools**, then **Database Upgrade Assistant**.

Oracle Database Minimum Hardware Requirements

Learn about the hardware component and hard disk space requirements.

- Hardware Component Requirements for Windows x64
  The following table lists the hardware components that are required for Oracle Database on Windows x64.
- Hard Disk Space Requirements
  Learn about the system requirements for Windows platforms that use the NT File System (NTFS).
- Verifying Hardware Requirements
  Use this procedure to gather information about your server configuration.

Hardware Component Requirements for Windows x64

The following table lists the hardware components that are required for Oracle Database on Windows x64.

Windows x64 Minimum Hardware Requirements

Requirement	Value
System Architecture	Processor: AMD64 and Intel EM64T
Physical memory (RAM)	2 GB minimum
Virtual memory (swap)	• If physical memory is between 2 GB and 16 GB, then set virtual memory to 1 times the size of the RAM • If physical memory is more than 16 GB, then set virtual memory to 16 GB
Disk space	• Typical Install Type total: 10 GB • Advanced Install Types total: 10 GB
Video adapter	256 colors
Screen Resolution	1024 X 768 minimum

Hard Disk Space Requirements

Learn about the system requirements for Windows platforms that use the NT File System (NTFS).

Oracle strongly recommends that you install the Oracle database home (Oracle database binaries, trace files, and so on) on NTFS.

The database files can be placed on NTFS. Use Oracle ASM or NTFS to ensure security of these files.

The NTFS system requirements are accurate than the hard disk values reported by the Oracle Universal Installer Summary window. The Summary window does not include accurate values for disk space, the space required to create a database, or the size of compressed files that are expanded on the hard drive.

The hard disk requirements for Oracle Database components include 32 MB to install Java Runtime Environment (JRE) and Oracle Universal Installer on the partition where the operating system is installed. If sufficient space is not detected, then the installation fails and an error message appears.

The following table lists the disk space requirements on NTFS for Windows x64. The starter database requires 720 MB of disk space.

The values in this table include the starter database.

Table 2-1 Windows x64 Minimum Disk Space Requirements on NTFS

Installation Type	TEMP Space	*SYSTEM_DRIVE*:\ Program Files\Oracle\Inventory	Oracle Home	Data Files *	Total
Enterprise Edition	595 MB	53.00 MB	6.50 GB	4.38 GB **	10.88 GB **
Standard Edition 2	595 MB	53.00 MB	6.00 GB	4.24 GB **	10.24 GB **

* Refers to the contents of the `admin`, `cfgtoollogs`, `flash_recovery_area`, and `oradata` directories in the *`ORACLE_BASE`* directory.

** This size can be higher depending on the installation options selected, such as languages or additional components. If you choose to install Oracle Database with customized backups enabled, then include at least 2 GB extra for data file disk space.

Verifying Hardware Requirements

Use this procedure to gather information about your server configuration.

To ensure that the system meets these requirements, follow these steps:

1. Determine the physical RAM size.

   For example, on a computer running Windows Server 2012 R2, click **System and Security**, then click **System**.

   If the size of the physical RAM installed in the system is less than the required size, then you must install more memory before continuing.

2. Determine the size of the configured virtual memory (also known as paging file size).

   For example, on a computer running Windows Server 2012 R2, click **System and Security**, then click **System**, click **Advanced System Settings**, click the **Advanced** tab on System Properties page, and then click **Settings** in the Performance section. Then select the **Advanced** tab on Performance Options page.

   The virtual memory is listed in the Virtual Memory section.

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

3. Determine the amount of free disk space on the system.

   For example, on a computer running Windows Server 2012 R2, right-click **My Computer** and click **Open**.

4. Determine the amount of disk space available in the `temp` directory. This is equivalent to the total amount of free disk space, minus what is required for the Oracle software to be installed.

On Windows x64, if there is less than 125 MB of disk space available in the `temp` directory, then delete all unnecessary files. If the temp disk space is still less than 125 MB, then set the `TEMP` or `TMP` environment variable to point to a different hard drive location.

For example, to change the environment variables on a computer running Windows Server 2012 R2, click **System and Security**, then click **System**, click **Advanced System Settings**, click the **Advanced** tab on System Properties page, and then click **Environment Variables**.

3

Configuring Operating Systems for Oracle Database on Microsoft Windows

Complete operating system configuration requirements and checks for Microsoft Windows operating systems before you start installation.

- Oracle Database Software Requirements
  The following table lists the software requirements for Oracle Database on Windows x64:
- Creating Directories for Oracle Data Files or Recovery Files
  If you decide to place the Oracle Database files on a file system, then use the following guidelines when deciding where to place them:
- Windows Certification and Web Browser Support
  Review the Windows Certification and Web Browser Support information.
- Reviewing Operating System Security Common Practices
  Secure operating systems are an important basis for general system security.
- Oracle-Managed Files Requirements
  If you choose the Advanced database creation option, then you can use the Oracle-managed files feature with the new database.

Oracle Database Software Requirements

The following table lists the software requirements for Oracle Database on Windows x64:

Windows x64 Software Requirements

Requirement	Value
Operating System	Oracle Database for Windows x64 is supported on the following operating systems: • Windows 10 x64 - Pro, Pro for Workstations, Enterprise, and Education editions • Windows 11 x64 - Pro, Enterprise, and Education editions • Windows Server 2012 R2 x64 - Standard, Datacenter, Essentials, and Foundation editions • Windows Server 2016 x64 - Standard, Datacenter, and Essentials editions • Windows Server 2019 x64 - Standard, Datacenter, and Essentials editions • Windows Server 2022 x64 - Standard, Datacenter, and Essentials editions **Note:** • Windows Multilingual User Interface Pack is supported. • The Server Core option is not supported. • Windows 11 x64 - Pro, Enterprise, and Education editions and Windows Server 2022 x64 - Standard, Datacenter, and Essentials editions are supported starting with Oracle Database 21c Release Update (21.4) or later.

Requirement	Value
Virtualization	Oracle certifies the following virtualization technologies with Oracle Database on Windows: • Oracle VM Server • Microsoft Hyper-V For more detailed information on certified Oracle VM Server combinations, check My Oracle Support note 464754.1. For more information on certified Hyper-V combinations, you can visit: https://www.oracle.com/database/technologies/virtualization-matrix.html
Compiler and SDK	The following components are supported with the compilers based on Microsoft Visual C++ 2019 Update 7 (Version 16.7.8) or later and Intel 19.0 C Update 8 (Version 19.0.8), and Microsoft Visual C++ 2019 Update 7 (Version 16.7.8) or later SDK: • Oracle Call Interface (OCI) • External callouts • Pro*C/C++ • Oracle XML Developer's Kit (XDK) • Oracle C++ Call Interface (OCCI) Pro*COBOL supports: • Micro Focus Visual COBOL (Version 6)
Network Protocol	The Oracle Net foundation layer uses Oracle protocol support to communicate with the following industry-standard network protocols: • TCP/IP • TCP/IP with SSL • Named Pipes
Oracle Database Client	To connect to Oracle Database 21c, the following are required: • Oracle Database Client is version 11.2.0.4 or later. • If the earlier Oracle Database Client is running on the same computer as Oracle Database 21c, then you cannot use a bequeath connection. Oracle recommends upgrading Oracle Database Client to the latest patchset (11.2.0.4 or later). You can download the patchset from the Patches and Updates section of My Oracle Support at `https://support.oracle.com`

Creating Directories for Oracle Data Files or Recovery Files

If you decide to place the Oracle Database files on a file system, then use the following guidelines when deciding where to place them:

- Guidelines for Placing Oracle Database Files on a File System or Logical Volume
  Review the guidelines for placing Oracle Database files on a file system or logical volume.
- Guidelines for Placing Oracle Recovery Files on a File System
  Use the guidelines listed in this section to place Oracle recovery files on a file system.
- Creating Required Directories
  Use this procedure to create the required directories.

Guidelines for Placing Oracle Database Files on a File System or Logical Volume

Review the guidelines for placing Oracle Database files on a file system or logical volume.

- Oracle Universal Installer indicates that the default path for the database file directory is a subdirectory of the Oracle base directory.
- You can choose either a single file system or more than one file system to store the database files:
  - If you want to use a single file system, then choose a file system on a physical device that is dedicated to the database.

    For best performance and reliability, choose a RAID device or a logical volume on multiple physical devices and implement a stripe-and-mirror everything (SAME) storage policy.
  - If you want to use more than one file system, then choose file systems on separate physical devices that are dedicated to the database.

    This method enables you to distribute physical input-output operations and create separate control files on different devices for increased reliability. It also enables you to fully implement Oracle Optimal Flexible Architecture (OFA) guidelines. Choose the Advanced database creation option to implement this method.
- If you intend to create a preconfigured database during the installation, then the file system (or file systems) that you choose must have at least 2 GB of free disk space.

  For production databases, you must estimate the disk space requirement depending on the use of the database.
- For optimum performance, the file systems that you choose must be on physical devices that are used only by the database.
- The Oracle user running the Oracle Database installation must have write permissions to create the files in the path that you specify.

Guidelines for Placing Oracle Recovery Files on a File System

Use the guidelines listed in this section to place Oracle recovery files on a file system.

> **Note:**
>
> You must choose a location for recovery files only if you intend to enable automated backups during the installation.

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

- To prevent disk failure from making both the data files and the recovery files unavailable, place the recovery files in a file system on a different physical disk from the data files.

> **Note:**
>
> Alternatively, for both data files and recovery files, use an Oracle Automatic Storage Management disk group.

- The file system that you choose must have at least 2 GB of free disk space.

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

  If you choose the Advanced database configuration option, you can specify a different disk quota value. After you create the database, you can also use Oracle Enterprise Manager Cloud Control or Oracle Enterprise Manager Database Express to specify a different value.
- Oracle Universal Installer suggests that the default location for the database file directory is a subdirectory of the Oracle base directory. However, this default location is not recommended for production databases.

Related Topics

- *Oracle Database Backup and Recovery User's Guide*

Creating Required Directories

Use this procedure to create the required directories.

> **Note:**
>
> You must complete this procedure only to place the Oracle database or recovery files on a separate file system from the Oracle base directory.

To create directories for the Oracle database or recovery files on separate file systems from the Oracle base directory, follow these steps:

1. Use Windows Explorer to determine the free disk space on the file system.
2. From the display, identify the file systems to use:

File Type	File System Requirements
Data files	Select one of the following: • A single file system with at least 950 MB of free disk space • Two or more file systems with at least 950 MB of free disk space in total
Recovery files	Choose a file system with at least 2 GB of free disk space.

   If you are using the same file system for multiple types of files, then add the disk space requirements for each type to determine the total disk space requirement.
3. Note the names of the directories for the file systems that you identified.

Windows Certification and Web Browser Support

Review the Windows Certification and Web Browser Support information.

- Remote Desktop Services
  Oracle supports installing, configuring, and running Oracle Database through Remote Desktop Services on Windows.
- Microsoft Windows Servicing Options
  On Microsoft Windows 10 systems, new servicing options are available.
- Installation Requirements for Web Browsers
  Web browsers are required only if you intend to use Oracle Enterprise Manager Database Express and Oracle Enterprise Manager Cloud Control. Web browsers must support JavaScript, and the HTML 4.0 and CSS 1.0 standards.
- Default Share Configuration Requirement
  The prerequisite checks during Oracle Database installation require that the system drive on your computer has default share configured on it.

Remote Desktop Services

Oracle supports installing, configuring, and running Oracle Database through Remote Desktop Services on Windows.

To install Oracle Database, Oracle recommends that you start all configuration tools from the Remote Desktop console session of the server.

Platform-specific support information is as follows:

- Windows client operating systems: The Remote Desktop is only available in Single User Mode.
- Windows server operating systems: You can have multiple Remote Desktop sessions.

Related Topics

- http://www.microsoft.com/
- https://support.oracle.com/

Microsoft Windows Servicing Options

On Microsoft Windows 10 systems, new servicing options are available.

Oracle Database supports the following servicing options:

- Semi-Annual Channel
- Long-Term Servicing Channel

Other servicing options, such as Semi-Annual Channel (Targeted) are not supported. Oracle previously supported the former Windows servicing options, such as the Current Branch for Business (CBB) and Long-Term Servicing Branch (LTSB).

> **Note:**
>
> Oracle supports its database products on these channel releases that become generally available for as long as Microsoft supports the channel version. Once Microsoft support ends for a specific channel version, Oracle's support ends for that version as well. Oracle may recommend that customers wait until relevant Oracle patches have been released before upgrading to a particular channel version. Oracle may recommend or discourage the installation of a specific channel version if it significantly affects the operation of Oracle software, either positively or negatively. If such a statement is deemed necessary, Oracle will disseminate this statement on My Oracle Support.

Installation Requirements for Web Browsers

Web browsers are required only if you intend to use Oracle Enterprise Manager Database Express and Oracle Enterprise Manager Cloud Control. Web browsers must support JavaScript, and the HTML 4.0 and CSS 1.0 standards.

https://support.oracle.com

Related Topics

- *Oracle Enterprise Manager Cloud Control Basic Installation Guide*

Default Share Configuration Requirement

The prerequisite checks during Oracle Database installation require that the system drive on your computer has default share configured on it.

Use the `net use` command to verify, for example:

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

Reviewing Operating System Security Common Practices

Secure operating systems are an important basis for general system security.

Ensure that your operating system deployment is in compliance with common security practices as described in your operating system vendor security guide.

Ensure that you meet the hardware and software requirements so that you can use strong authentication (Kerberos, PKI) with Oracle Database.

Oracle-Managed Files Requirements

If you choose the Advanced database creation option, then you can use the Oracle-managed files feature with the new database.

If you use this feature, then specify only the database object name instead of file names when creating or deleting database files. You require configuration procedures to enable Oracle Managed Files.

Related Topics

- *Oracle Database Administrator's Guide*

4

Configuring Users, Groups and Environments for Oracle Database

Learn about the users, groups, and environment settings to complete before you install Oracle Database and Grid Infrastructure for a standalone server.

- Creating Required Operating System Groups and Users
  If you are installing Oracle software for the first time and on the products that you are installing, create several operating system groups and users.
- Stopping Existing Oracle Services
  Learn how to stop all processes, including the listener and database, running in the Oracle home.
- Overview of Installation Directories for Oracle Database
  Both an Oracle Base directory and an Oracle Home directory are used for every installation of Oracle Database software.
- Configuring User Accounts
  During installation, you can specify an Oracle Home User.

Related Topics

- *Oracle Database Administrator's Reference for Microsoft Windows*

Creating Required Operating System Groups and Users

If you are installing Oracle software for the first time and on the products that you are installing, create several operating system groups and users.

You can choose to create one administrative user and use one group for operating system authentication for all system privileges on the storage and database tiers. For example, you can designate the `oracle` user to be the Oracle Installation user for all Oracle software and use only the `ORA_DBA` group for authentication. You can also create custom configuration groups and users based on job role separation that divide access privileges.

Log in as an Administrator user, and use the following instructions to create the Oracle Installation user for Oracle Database.

- About the Oracle Installation User
  To install Oracle Restart or Oracle Database software, you must use either a local or a domain user that is also a member of the Administrators group.
- Creating Oracle Home User
  During Oracle Database installation, you can specify an optional Oracle home user associated with the Oracle home.
- Understanding the Oracle Inventory Directory and the Oracle Inventory Group
  The Oracle Inventory directory is the central inventory location for all Oracle software installed on a server.

- Operating System Groups Created During Oracle Database Installation
  During installation, the user groups listed in the following table are created, if they do not already exist.
- Operating System Groups and Users for Job Role Separation
  A job role separation configuration of Oracle Database and Oracle ASM is a configuration with groups and users to provide separate groups for operating system authentication.

Related Topics

- *Oracle Database Administrator's Guide for Microsoft Windows*

About the Oracle Installation User

To install Oracle Restart or Oracle Database software, you must use either a local or a domain user that is also a member of the Administrators group.

This user is the Oracle Installation User. The Oracle Installation User can be either a local user or a domain user.

Creating Oracle Home User

During Oracle Database installation, you can specify an optional Oracle home user associated with the Oracle home.

For example, assume that you use an Administrator user named `OraSys` to install the software (Oracle Installation user), then you can specify the `ORADOMAIN\OraDb` domain user as the Oracle home user for this installation. The specified Oracle home domain user must exist before you install the Oracle Database software.

Oracle home user can be a Windows Built-in Account (LocalSystem for Server and LocalService for Client), Virtual Account, or a regular (not an administrator) Windows account. If you specify an existing user as the Oracle home user, then the Windows User Account you specify can either be a Windows Domain User or a Windows Local User.

A Windows User Account need not be created by the Administrator if a Virtual Account or a Windows Built-in Account is used during installation.

If you specify a non-existing user as the Oracle home user, then the Windows User Account you specify must be a Windows Local User. The installer creates this account automatically to run the Windows services for the Oracle home. Do not log in using this account to perform administrative tasks.

The Group Managed Services Account (gMSA) and Virtual Accounts enables you to install Oracle Database, create, and manage Database services without passwords. The gMSA is a domain level account that can be used by multiple servers in a domain to run the services using this account. Windows User Account can be a Windows Local User, Windows Domain User, Managed Services Account (MSA), or Group Managed Services Account (gMSA).

If you want to create a new user during installation, then it can only be a Windows Local User. It cannot be a Windows Domain User, an MSA, or a gMSA. The new user that is created is denied interactive logon privileges to the Windows computer. However, a Windows administrator can manage this account like any other Windows account. Oracle recommends that you use Virtual Account or a standard Windows User Account (instead of Windows Built-in Account) as the Oracle Home User for enhanced security.

> **Note:**
>
> You cannot change the Oracle Home User after the installation is complete. If you must change the Oracle Home User, then you must reinstall the Oracle Database software.

When you specify an Oracle Home user, the installer configures that user as the Oracle Service user for all software services that run from the Oracle home. The Oracle Service user is the operating system user that the Oracle software services run as, or the user from which the services inherit privileges.

Silent installation is enhanced to support password prompt for the Oracle home user. So, customers and independent software vendors (ISV) can use response files without hard coding the password into the source code.

Oracle recommends using Virtual Account or a standard Windows User Account (not an Administrator account) as the Oracle Home User for typical installation, software-only installation, and cloning.

If an existing Windows User Account is used as the Oracle home user for software-only installation, then a password is not required. Thus, you can perform a silent, software-only installation using Windows User Account.

If you use a Windows User Account as the Oracle home user for cloning individual Oracle Database installations, then a password is not required.

Virtual Account is the Oracle home user for Oracle Database Single Instance database installation. The account enables you to install Oracle Database, create, and manage Database services without passwords. The gMSA is a domain level account that can be used by multiple servers in a domain to run the services using this account. The gMSA is a low privilege user account.

Understanding the Oracle Inventory Directory and the Oracle Inventory Group

The Oracle Inventory directory is the central inventory location for all Oracle software installed on a server.

By default, the location of the Oracle Inventory directory is `C:\Program Files\Oracle\Inventory`.

When you install Oracle software on the system for the first time, Oracle Universal Installer creates the directories for the Oracle central inventory and the Oracle Inventory group, `ORA_INSTALL`. The `ORA_INSTALL` group contains all the Oracle Home Users for all Oracle homes on the server.

Whether you are performing the first installation of Oracle software on this server, or are performing an installation of additional Oracle software on the server, you do not need to create the Oracle central inventory or the `ORA_INSTALL` group; the Oracle Universal Installer creates them automatically. You cannot change the name of the Oracle Inventory group - it is always `ORA_INSTALL`.

Operating System Groups Created During Oracle Database Installation

During installation, the user groups listed in the following table are created, if they do not already exist.

The *HOMENAME* variable refers to the generated *HOMENAME* for a software installation, which is of the form Ora*productmajorVersion*Home*number*. For example, OraDB21cHome1.

Table 4-1 User Groups Created During Oracle Database Installation

Operating System Group Name	Related System Privilege	Description
ORA_DBA	SYSDBA system privileges for all Oracle Database installations on the server	A special OSDBA group for the Windows operating system. Members of this group are granted SYSDBA system privileges for all Oracle Databases installed on the server.
ORA_OPER	SYSOPER system privileges for all Oracle databases installed on the server	A special OSOPER group for the Windows operating system. Members of this group are granted SYSOPER system privileges all Oracle Databases installed on the server. This group does not have any members after installation, but you can manually add users to this group after the installation completes.
ORA_ASMADMIN	SYSASM system privileges for Oracle ASM administration	The OSASM group for the Oracle ASM instance. Using this group and the SYSASM system privileges enables the separation of SYSDBA database administration privileges from Oracle ASM storage administration privileges. Members of the OSASM group are authorized to connect using the SYSASM privilege and have full access to Oracle ASM, including administrative access to all disk groups that the Oracle ASM instance manages.
ORA_ASMDBA	SYSDBA system privileges on the Oracle ASM instance	The OSDBA group for the Oracle ASM instance. This group grants access for the database to connect to Oracle ASM. During installation, the Oracle Installation Users are configured as members of this group. After you create an Oracle Database, this group contains the Oracle Home Users of those database homes.
ORA_ASMOPER	SYSOPER for ASM system privileges	The OSOPER group for the Oracle ASM instance. Members of this group are granted SYSOPER system privileges on the Oracle ASM instance, which permits a user to perform operations such as startup, shutdown, mount, dismount, and check disk group. This group has a subset of the privileges of the OSASM group. Similar to the ORA_*HOMENAME*_OPER group, this group does not have any members after installation, but you can manually add users to this group after the installation completes.

Table 4-1 (Cont.) User Groups Created During Oracle Database Installation

Operating System Group Name	Related System Privilege	Description
ORA_*HOMENAME*_DBA	SYSDBA system privileges for all instances that run from the Oracle home with the name *HOMENAME*	An OSDBA group for a specific Oracle home with a name of *HOMENAME*. Members of this group can use operating system authentication to gain SYSDBA system privileges for any database that runs from the specific Oracle home. If you specified an Oracle Home User during installation, the user is added to this group during installation.
ORA_*HOMENAME*_OPER	SYSOPER system privileges for all instances that run from the Oracle home with a name *HOMENAME*	An OSDBA group for the Oracle home with a name of *HOMENAME*. Members of this group can use operating system authentication to gain SYSOPER system privileges for any database that runs from the specific Oracle home. This group does not have any members after installation, but you can manually add users to this group after the installation completes.
ORA_*HOMENAME*_SYSBACKUP	SYSBACKUP system privileges for all instances that run from the Oracle home with a name of *HOMENAME*	OSBACKUPDBA group for a specific Oracle home with a name of *HOMENAME*. Members of this group have privileges necessary for performing database backup and recovery tasks on all database instances that run from the specified Oracle home directory.
ORA_*HOMENAME*_SYSDG	SYSDG system privileges for all instances that run from the Oracle home with a name of *HOMENAME*	OSDGDBA group for a specific Oracle home with a name of *HOMENAME*. Members of this group have privileges necessary for performing Data Guard administrative tasks on all database instances that run from the specified Oracle home directory.
ORA_*HOMENAME*_SYSKM	SYSKM system privileges for all instances that run from the Oracle home with a name of *HOMENAME*.	OSKMDBA group for a specific Oracle home with a name of *HOMENAME*. Members of this group have privileges necessary for performing encryption key management tasks on all database instances that run from the specified Oracle home directory.
ORA_*HOMENAME*_SYSRAC	SYSRAC system privileges for all instances that run from the Oracle home with a name of *HOMENAME*.	OSRACDBA group for a specific Oracle home with a name of *HOMENAME*. Members of this group have privileges necessary for performing a limited set of Oracle Real Application Clusters administrative tasks to create a separate group of operating system users.

Table 4-1 (Cont.) User Groups Created During Oracle Database Installation

Operating System Group Name	Related System Privilege	Description
ORA_*HOMENAME*_SVCACCTS	Contains Virtual Accounts for all Oracle Database Windows Services that run from Oracle home with a name of *HOMENAME*.	SVCACCTS group specific to a Oracle home. It contains virtual accounts for all the services running under that virtual account based *HOMENAME*.
ORA_DBSVCACCTS	Contains Virtual Accounts for all Oracle Database Windows Services that run for all Virtual Accounts based Oracle homes.	DBSVCACCTS system-wide group that contains virtual accounts for all the database services for all Virtual Accounts based Oracle homes.

During the installation of Oracle Database, all groups mentioned in the table are populated for proper operation of Oracle products. You must not remove any group member populated by Oracle. However, if you want to assign specific database privileges to new Windows operating system users, then you can manually add users to these groups after the installation completes.

Oracle creates other groups, such as, ORA_INSTALL, ORA_CLIENT_LISTENERS, ORA_GRID_LISTENERS, ORA_*HOMENAME*_SVCSIDS, ORA_HOMENAME_SVCACCTS, and ORA_DBSVCACCTS during installation and you must not change these groups, memberships, and ACLs associated with various Oracle created groups.

Related Topics

- *Oracle Database Administrator's Guide*
- *Oracle Automatic Storage Management Administrator's Guide*

Operating System Groups and Users for Job Role Separation

A job role separation configuration of Oracle Database and Oracle ASM is a configuration with groups and users to provide separate groups for operating system authentication.

- About Job Role Separation Operating System Privileges Groups and Users
  During the Oracle Database installation, the ORA_DBA, ORA_OPER, ORA_HOMENAME_DBA, ORA_HOMENAME_OPER, ORA_HOMENAME_SYSBACKUP, ORA_HOMENAME_SYSDG, ORA_HOMENAME_SYSKM, and ORA_HOMENAME_SYSRAC groups are created and users assigned to these groups.
- Oracle Software Owner for Each Oracle Software Product
  You can create a single user (for example, oracle) to own both Oracle Database, and Oracle Restart installations.

- Standard Oracle Database Groups for Job Role Separation
  Review the standard Oracle Database groups.
- Extended Oracle Database Groups for Job Role Separation
  In addition to the SYSOPER privilege to start up and shut down the database, you can create new administrative privileges that are more task-specific and less privileged than the `ORA_DBA`/SYSDBA system privileges to support specific administrative privileges tasks required for everyday database operation.
- Oracle Automatic Storage Management Groups for Job Role Separation
  Review the operating system groups.
- Windows Group Managed Service Accounts and Virtual Accounts
  Group Managed Services Account (gMSA) and Virtual Accounts are now supported and enable you to create and manage Database services without passwords.
- Microsoft Hyper-V Requirements
  Microsoft Hyper-V enables you to create and manage a virtualized computing environment by running multiple operating systems simultaneously on a single computer and isolate operating systems from each other.

About Job Role Separation Operating System Privileges Groups and Users

During the Oracle Database installation, the `ORA_DBA`, `ORA_OPER`, `ORA_HOMENAME_DBA`, `ORA_HOMENAME_OPER`, `ORA_HOMENAME_SYSBACKUP`, `ORA_HOMENAME_SYSDG`, `ORA_HOMENAME_SYSKM`, and `ORA_HOMENAME_SYSRAC` groups are created and users assigned to these groups.

Members of these groups are granted operating system authentication for the set of database system privileges each group authorizes. Oracle recommends that you use different operating system groups for each set of system privileges.

Oracle Software Owner for Each Oracle Software Product

You can create a single user (for example, `oracle`) to own both Oracle Database, and Oracle Restart installations.

However, Oracle recommends that you create one software owner to own each Oracle software installation (typically, `oracle`, for the database software and `grid` for the Oracle Restart owner user).

You must create at least one software owner the first time you install Oracle software on the system.

> **Note:**
>
> In Oracle documentation, a user created to own only Oracle Grid Infrastructure software installations is called the `grid` user. A user created to own either all Oracle installations, or only Oracle database installations, is called the `oracle` user.

Standard Oracle Database Groups for Job Role Separation

Review the standard Oracle Database groups.

The following is a list of standard Oracle Database groups. These groups provide operating system authentication for database administration system privileges:

> **Note:**
>
> All these groups are automatically created as a part of Oracle Database installation on Windows.

- The OSDBA group (`ORA_DBA`)

  Use this group the first time you install Oracle Database software on the system. This group identifies operating system user accounts that have database administrative privileges (the SYSDBA privilege) for all database instances running on the server.

  Members of the `ORA_DBA` group do not have SYSASM privileges on Oracle ASM instances, which are needed for mounting and dismounting disk groups.

- The OSOPER group for Oracle Database (`ORA_OPER`)

  Use this group if you want a separate group of operating system users to have a limited set of database administrative privileges for starting up and shutting down the database (the SYSOPER privilege).

- The OSDBA group for a particular Oracle home (`ORA_`*`HOMENAME`*`_DBA`)

  This group is created the first time you install Oracle Database software into a new Oracle home. This group identifies operating system user accounts that have database administrative privileges (the SYSDBA privilege) for the database instances that run from that Oracle home.

- The OSOPER group for a particular Oracle home (`ORA_`*`HOMENAME`*`_OPER`)

  Use this group if you want a separate group of operating system users to have a limited set of database administrative privileges for starting up and shutting down the database instances that run from a particular Oracle home (the SYSOPER privilege).

Extended Oracle Database Groups for Job Role Separation

In addition to the SYSOPER privilege to start up and shut down the database, you can create new administrative privileges that are more task-specific and less privileged than the `ORA_DBA`/ SYSDBA system privileges to support specific administrative privileges tasks required for everyday database operation.

Users granted these system privileges are also authenticated through operating system group membership.

During installation, you are prompted to provide operating system groups whose members are granted access to these system privileges. You can assign the same group to provide authentication for these privileges (for example, `ORA_DBA`), but Oracle recommends that you provide a unique group to designate each privilege.

The OSDBA subset job role separation privileges and groups consist of the following:

- The OSBACKUPDBA group for Oracle Database (`ORA_`*`HOMENAME`*`_SYSBACKUP`)

  Use this group if you want a separate group of operating system users to have a limited set of database backup and recovery related administrative privileges (the SYSBACKUP privilege).

- The OSDGDBA group for Oracle Data Guard (`ORA_`*`HOMENAME`*`_SYSDG`)

  Use this group if you want a separate group of operating system users to have a limited set of privileges to administer and monitor Oracle Data Guard (the SYSDG privilege).

- The OSKMDBA group for encryption key management (`ORA_HOMENAME_SYSKM`)

  Use this group if you want a separate group of operating system users to have a limited set of privileges for encryption key management such as Oracle Wallet Manager management (the SYSKM privilege).

- The OSRACDBA group for Oracle Real Application Clusters Administration (`ORA_HOMENAME_SYSRAC`)

  Use this group if you want a separate group of operating system users to have a limited set of Oracle Real Application Clusters (RAC) administrative privileges (the SYSRAC privilege). To use this privilege:

  – Add the Oracle Database installation owners as members of this group.

> **Note:**
>
> Oracle Wallet Manager (OWM) is deprecated with Oracle Database 21c.

> **Note:**
>
> All these groups, `ORA_HOMENAME_SYSBACKUP`, `ORA_HOMENAME_SYSDG`, `ORA_HOMENAME_SYSKM`, and `ORA_HOMENAME_SYSRAC` are applicable only to the database instances running from that particular Oracle home.

Oracle Automatic Storage Management Groups for Job Role Separation

Review the operating system groups.

Create the following operating system groups if you are installing Oracle Grid Infrastructure:

- The OSDBA group for Oracle ASM (`ORA_ASMDBA`)

  This group grants access for the database to connect to Oracle ASM. During installation, the Oracle Installation Users are configured as members of this group. After you create an Oracle Database, this group contains the Oracle Home Users of those database homes. Any client of Oracle ASM that needs to access storage managed by Oracle ASM needs to be in this group.

- The OSASM group for Oracle ASM Administration (`ORA_ASMADMIN`)

  Use this separate group to have separate administration privilege groups for Oracle ASM and Oracle Database administrators. Members of this group are granted the SYSASM system privilege to administer Oracle ASM. In Oracle documentation, the operating system group whose members are granted privileges is called the OSASM group. During installation, the Oracle Installation User for Oracle Grid Infrastructure and Oracle Database Service IDs are configured as members of this group. Membership in this group also grants database access to the Oracle ASM disks.

  Members of the OSASM group can use SQL to connect to an Oracle ASM instance as SYSASM using operating system authentication. The SYSASM privilege permits mounting and dismounting disk groups, and other storage administration tasks. SYSASM system privileges do not grant access privileges on an Oracle Database instance.

- The OSOPER group for Oracle ASM (`ORA_ASMOPER`)

This is an optional group. Create this group if you want a separate group of operating system users to have a limited set of Oracle ASM instance administrative privileges (the SYSOPER for ASM privilege), including starting up and stopping the Oracle ASM instance. By default, members of the OSASM group also have all privileges granted by the SYSOPER for ASM privilege.

To use the Oracle ASM Operator group to create an Oracle ASM administrator with fewer privileges than those granted by the SYSASM system privilege you must assign the user to this group after installation.

Related Topics

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

Windows Group Managed Service Accounts and Virtual Accounts

Group Managed Services Account (gMSA) and Virtual Accounts are now supported and enable you to create and manage Database services without passwords.

Microsoft Hyper-V Requirements

Microsoft Hyper-V enables you to create and manage a virtualized computing environment by running multiple operating systems simultaneously on a single computer and isolate operating systems from each other.

Microsoft Hyper-V enables built-in integration services for supported guest operating systems to improve the integration between a computer and a virtual machine.

Oracle Database supports Hyper-V Dynamic Memory.

Related Topics

- Microsoft Hyper-V

Stopping Existing Oracle Services

Learn how to stop all processes, including the listener and database, running in the Oracle home.

Consider the following before you install Oracle Restart or Oracle Database:

- If you intend to use Oracle Restart, then you must install the Oracle Restart before you install and create the database. When you perform a database installation, the database must use the same listener created during the Oracle Restart installation, thereafter you do not have to perform the steps listed in this section.

  The default listener and any additional listeners must run from the Oracle Grid Infrastructure home.

- If you have an existing Oracle Database 21c running on Oracle ASM, then stop any existing Oracle ASM instances. After you finish installing Oracle Restart, start the Oracle ASM instance again.

If you choose to create a database during the installation, then most installation types configure and start a default Oracle Net listener using TCP/IP port `1521` and the IPC key value `EXTPROC`. However, if an existing Oracle Net listener process is using the same port or key value, Oracle Universal Installer looks for the next available port (for example, `1522`) and configures and starts the new listener on this available port.

> **Caution:**
>
> If you are installing additional Oracle Database 21c products in an existing Oracle home, then stop *all* processes, including the listener and database, running in the Oracle home. You cannot install into an existing Oracle home other than 21c. You must complete this task to enable Oracle Universal Installer to relink certain executables and libraries.

Overview of Installation Directories for Oracle Database

Both an Oracle Base directory and an Oracle Home directory are used for every installation of Oracle Database software.

Additionally, on the Windows operating system, Oracle provides a home name for each Oracle Home directory.

- Overview of Oracle Base Directories
  The Oracle base directory is the location where Oracle software and configuration files are stored.
- Overview of Oracle Home Directories
  The Oracle home directory is located under the Oracle base directory.

Overview of Oracle Base Directories

The Oracle base directory is the location where Oracle software and configuration files are stored.

By default, Oracle Universal Installer (OUI) installs the Oracle Database software binary files by version and Oracle Home Name in a subdirectory of the Oracle base directory. An Oracle base directory can be used for multiple installations of software by a given installation owner. A separate Oracle base directory is created for each Oracle Home user you specify during Oracle Database software installation.

The Oracle Home User has complete control over the Oracle base directory. For reasons of security, different Windows User Accounts used as Oracle Home Users for different Oracle home directories are not allowed to share the same Oracle base directory.

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

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

> **Caution:**
>
> Do not install older versions of Oracle Databases that share the same Oracle base directory. During installation of older releases, the ACLs are reset on Oracle base, so the newer release services may not be able to access the Oracle base directory and files.

Overview of Oracle Home Directories

The Oracle home directory is located under the Oracle base directory.

In a default Windows installation, if you name the Oracle home directory `dbhome_1`, it appears in the Oracle base directory as follows, where *username* is the Oracle Installation user if you do not choose Windows security, or it is the Oracle Home user if one is specified:

```
DRIVE_LETTER:\app\username\product\21.0.0\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 some Oracle software directory paths use installation user names by default, this ASCII character restriction applies to user names, file names, and directory names.

Configuring User Accounts

During installation, you can specify an Oracle Home User.

Before starting the installation, perform the following checks for the Oracle Installation users to ensure the installation succeeds:

- Configuring Environment Variables for the Software Installation Owner
  Before starting the Oracle Database installation, ensure that the `TEMP` environment variable is set correctly.
- Managing User Accounts with User Account Control
  To ensure that only trusted applications run on your computer, the Windows operating systems that support Oracle Database, provide User Account Control.

Configuring Environment Variables for the Software Installation Owner

Before starting the Oracle Database installation, ensure that the `TEMP` environment variable is set correctly.

Managing User Accounts with User Account Control

To ensure that only trusted applications run on your computer, the Windows operating systems that support Oracle Database, provide User Account Control.

If you have enabled this security feature, then, depending on the configuration, Oracle Universal Installer prompts you for either your consent or your credentials when installing Oracle Database.

You must have Administrator privileges to run Oracle tools, such as Database Configuration Assistant, Net Configuration Assistant, and OPatch, or to run any tool or application that writes to any directory within the Oracle home. If User Account Control is enabled, and you are logged in as the local Administrator, then you can successfully run each of these commands. However, if you are logged in as a member of the Administrator group, then you must explicitly start these tasks with Windows Administrator privileges. All the Oracle shortcuts that require Administrator privileges start as Administrator by default when you click the shortcuts. However, if you run the above tools from a Windows command prompt, you must run them from an Administrator command prompt. OPatch does not have a shortcut and has to be run from an Administrator command prompt.

To start a command prompt window with Windows Administrator privileges:

1. On your desktop, create a shortcut for the command prompt window. An icon for that shortcut appears on the desktop.
2. Right-click the icon for the newly created shortcut, and specify **Run as administrator**.

When you open this window, the title bar reads Administrator: Command Prompt. Run commands from within this window using Administrator privileges.

Related Topics

- *Oracle Administrator's Reference for Microsoft Windows*

5

Configuring Networks for Oracle Database

If you install Oracle Databases on servers with multiple Oracle homes, multiple aliases, or without a static IP address, then review these network configuration topics.

If you are installing Oracle Database on a server with a static host name and IP address and at least one network interface, then no special network configuration is required.

- About Oracle Database Network Configuration Options
  You can enable database clients to connect to servers associated with multiple IP addresses, and you can install Oracle Database on servers with no network connections, and set up database services after installation.
- About Assigning Global Database Names During Installation
  The database name input field is used to set the `DB_NAME`, `DB_UNIQUE_NAME`, and `DB_DOMAIN` Oracle initialization parameter values.
- Installing Oracle Database on Computers with Multiple IP Addresses
  Use this procedure to set the `ORACLE_HOSTNAME` environment variable.
- Installing Oracle Database on Computers with Multiple Aliases
  A computer with multiple aliases is registered with the naming service under a single IP address but with multiple aliases.
- Installing Oracle Database on Nonnetworked Computers
  You can install Oracle Database on non-networked computers.
- Installing a Loopback Adapter
  A loopback adapter is required if you are installing on a non-networked computer to connect the computer to a network after the installation.
- Confirming Host Name Resolution
  Before you start installation, use the ping command to ensure that your computer hostname is resolvable. Typically, the computer on which you want to install Oracle Database is connected to a network.

About Oracle Database Network Configuration Options

You can enable database clients to connect to servers associated with multiple IP addresses, and you can install Oracle Database on servers with no network connections, and set up database services after installation.

Typically, the computer on which you want to install Oracle Database is a server running a single database instance, with a single host name that is resolvable on a network. Oracle Universal Installer uses the host name and Oracle Database instance information to set up network services automatically. The database provides database services to clients using a connect descriptor that resolves to the host name where the database instance is running.

However, you can configure Oracle Database on servers with the following nonstandard configurations:

- **Multihomed Computers**: Servers with multiple Oracle Database installations

- **Multiple Alias Computers**: Servers with multiple aliases, so that more than one host name resolves to the computer
- **Non-Networked computers**: Servers that do not have network connectivity at the time of installation

About Assigning Global Database Names During Installation

The database name input field is used to set the `DB_NAME`, `DB_UNIQUE_NAME`, and `DB_DOMAIN` Oracle initialization parameter values.

The Oracle Database software identifies a database by its global database name. A global database name consists of the database name and database domain. Usually, the database domain is the same as the network domain, but it need not be. The global database name uniquely distinguishes a database from any other database in the same network. You specify the global database name when you create a database during the installation or using the Oracle Database Configuration Assistant.

```
sales.us.example.com
```

Here:

- `sales.us` is the name of the database. The database name, `DB_UNIQUE_NAME`, portion is a string of no more than 30 characters that can contain alphanumeric characters, underscore (_), dollar sign ($), and pound sign (#) but must begin with an alphabetic character. No other special characters are permitted in a database name.
- `sales.us` is also the `DB_NAME`. The `DB_NAME` initialization parameter specifies a database identifier of up to eight characters.
- `example.com` is the database domain in which the database is located. In this example, the database domain equals the network domain. Together, the database name and the database domain make the global database name unique. The domain portion is a string of no more than 128 characters that can contain alphanumeric characters, underscore (_), and pound sign (#). The `DB_DOMAIN` initialization parameter specifies the database domain name.

However, the `DB_NAME` parameter need not necessarily be the first eight characters of `DB_UNIQUE_NAME`.

The `DB_NAME` parameter and the `DB_DOMAIN` parameter combine to create the global database name value.

The system identifier (SID) identifies a specific database instance. The SID uniquely distinguishes the instance from any other instance on the same computer. Each database instance requires a unique SID and database name. In most cases, the SID equals the database name portion of the global database name.

Related Topics

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

Installing Oracle Database on Computers with Multiple IP Addresses

Use this procedure to set the `ORACLE_HOSTNAME` environment variable.

Clients must be able to access the computer using its host name, or using aliases for its host name. To check access, ping the host name from the client computers using the short name (host name only) and the fully qualified domain name (FQDN, host name and domain name). Both must work.

1. Display **System** in the Windows Control Panel.
2. In the System Properties dialog box, click **Advanced**.
3. In the **Advanced** tab, click **Environment Variables**.
4. In the Environment Variables dialog box, under System Variables, click **New**.
5. In the New System Variable dialog box, enter the following information:
   - **Variable name**: `ORACLE_HOSTNAME`
   - **Variable value**: The host name of the computer to use.
6. Click **OK**, then in the Environment Variables dialog box, click **OK**.
7. Click **OK** in the Environment Variables dialog box, then in the System Properties dialog box, click **OK**.

Installing Oracle Database on Computers with Multiple Aliases

A computer with multiple aliases is registered with the naming service under a single IP address but with multiple aliases.

The naming service resolves any of those aliases to the same computer. Before installing Oracle Database on such a computer, set the `ORACLE_HOSTNAME` environment variable to the computer whose host name you want to use.

Installing Oracle Database on Nonnetworked Computers

You can install Oracle Database on non-networked computers.

If the computer, such as a laptop, is configured for DHCP and you plan to connect the computer to the network after the Oracle Database installation.

Perform these steps before you install Oracle Database on the non-networked computer:

1. Install a loopback adapter on the computer.

   The loopback adapter and the local IP address simulate a networked computer. If you connect the computer to the network, Oracle Database still uses the local IP address and host name.
2. Ping the computer from itself, using only the host name and using the fully qualified name, which is in the *`DRIVE_LETTER:`*`\system32\drivers\etc\hosts` file.

For example, if you installed a loopback adapter on a computer called `mycomputer` on the `us.example.com` domain, check the following:

```
DRIVE_LETTER:\>ping mycomputer                Ping itself using just the hostname.

Reply from 10.10.10.10                    Returns local IP.
DRIVE_LETTER:\>ping mycomputer.us.example.com   Ping using a fully qualified name.
Reply from 10.10.10.10                    Returns local IP.
```

> **Note:**
>
> When you ping a computer from itself, the `ping` command must return the local IP address (the IP address of the loopback adapter).

If the `ping` command fails, contact your network administrator.

If you connect the computer to a network after installation, the Oracle Database instance on your computer can work with other instances on the network. Remember that you must have installed a loopback adapter on your computer. Your computer can use a static IP or DHCP, depending on the network to which you are connected.

Installing a Loopback Adapter

A loopback adapter is required if you are installing on a non-networked computer to connect the computer to a network after the installation.

- Checking if a Loopback Adapter is Installed on Your Computer
  Review this section to verify if a loopback adapter is installed on your computer by running the `ipconfig /all` command.
- Installing a Loopback Adapter
  Use this procedure to install a Loopback Adapter or a Microsoft KM-TEST Loopback Adapter on different Windows versions.
- Removing a Loopback Adapter
  Use this procedure to remove a Loopback Adapter or a Microsoft KM-TEST Loopback Adapter on different Windows versions.

Checking if a Loopback Adapter is Installed on Your Computer

Review this section to verify if a loopback adapter is installed on your computer by running the `ipconfig /all` command.

To check if a loopback adapter is installed on your computer, run the `ipconfig /all` command:

```
DRIVE_LETTER:\>ipconfig /all
```

> **Note:**
>
> Loopback Adapter installed on the computer must be the Primary Network Adapter.

If there is a loopback adapter installed, you see a section that lists the values for the loopback adapter. For example:

```
Ethernet adapter Local Area Connection 2:
Connection-specific DNS Suffix  . :
Description . . . . . . . . . . . : Microsoft Loopback Adapter
Physical Address. . . . . . . . . : 02-00-4C-4F-4F-50
DHCP Enabled. . . . . . . . . . . : No
IP Address. . . . . . . . . . . . : 10.10.10.10
Subnet Mask . . . . . . . . . . . : 255.255.0.0
```

Installing a Loopback Adapter

Use this procedure to install a Loopback Adapter or a Microsoft KM-TEST Loopback Adapter on different Windows versions.

The Microsoft Loopback Adapter in Microsoft Windows 7 is renamed to Microsoft KM-TEST Loopback Adapter in Microsoft Windows 8.1 and later releases.

To install a Loopback Adapter on Microsoft Windows 7 or to install Microsoft KM-Test Loopback Adapter on Microsoft Windows 8.1, Microsoft Windows Server 2012, Microsoft Windows Server 2012 R2, and Microsoft Windows Server 2016 perform the following steps:

1. Click **Start** and enter `hdwwiz` in the Search box. Click **hdwwiz** to start the Add Hardware wizard.

   For Microsoft Windows 8.1 and later releases, open the Windows Control Panel and double-click **Add Hardware** to start the Add Hardware wizard.
2. In the Welcome window, click **Next**.
3. In the The wizard can help you install other hardware window, select **Install the hardware that I manually select from a list**, and click **Next**.
4. From the list of hardware types, select the type of hardware you are installing, select **Network adapters**, and click **Next**.
5. In the Select Network Adapter window, make the following selections:
   - **Manufacturer**: Select **Microsoft**.
   - **Network Adapter**: Select **Microsoft Loopback Adapter** for Microsoft Windows 7 and **Microsoft KM-TEST Loopback Adapter** for Microsoft Windows Server 8.1 and later releases.
6. Click **Next**.
7. In the The wizard is ready to install your hardware window, click **Next**.
8. In the Completing the Add Hardware Wizard window, click **Finish**.
9. Click **Manage Network Connections**. This displays the Network Connections Control Panel item.
10. Right-click the connection that was just created. This is usually named "Local Area Connection 2". Choose **Properties**.
11. On the **General** tab, select **Internet Protocol (TCP/IP)**, and click **Properties**.
12. In the Properties dialog box, click **Use the following IP address** and do the following:
    a. **IP Address**: Enter a non-routable IP for the loopback adapter. Oracle recommends the following non-routable addresses:
       - `192.168.x.x` (*x* is any value between 0 and 255)
       - `10.10.10.10`
    b. **Subnet mask**: Enter `255.255.255.0`.

c. Record the values you entered, which you need later in this procedure.

d. Leave all other fields empty.

e. Click **OK**.

13. Click **Close**.
14. Close **Network Connections**.
15. Restart the computer.
16. Add a line to the *DRIVE_LETTER*: \WINDOWS\system32\drivers\etc\hosts file with the following format, after the `localhost` line:

    ```
    IP_address    hostname.domainname    hostname
    ```

    where:

    - *IP_address* is the non-routable IP address.
    - *hostname* is the name of the computer.
    - *domainname* is the name of the domain.

    For example:

    ```
    10.10.10.10    mycomputer.us.example.com    mycomputer
    ```

17. Check the network configuration:

    a. Open **System** in the Control Panel, and verify that **Full computer name** displays the host name and the domain name, for example, `sales.us.example.com`.

    b. Click **Change**. In **Computer name**, you must see the host name, and in **Full computer name**, you must see the host name and domain name. Using the previous example, the host name must be `sales` and the domain must be `us.example.com`.

    c. Click **More**. In **Primary DNS suffix of this computer**, you must see the domain name, for example, `us.example.com`.

Removing a Loopback Adapter

Use this procedure to remove a Loopback Adapter or a Microsoft KM-TEST Loopback Adapter on different Windows versions.

To remove a Loopback Adapter on Microsoft Windows 7 or to remove Microsoft KM-Test Loopback Adapter on Microsoft Windows 8.1, Microsoft Windows Server 2012, Microsoft Windows Server 2012 R2, and Microsoft Windows Server 2016, perform the following steps:

1. Display **System** in the Windows Control Panel.
2. In the Hardware tab, click **Device Manager**.
3. For Microsoft Windows 7, in the Device Manager window, expand **Network adapters**. You must see **Microsoft Loopback Adapter**. For Microsoft Windows 8.1 and later releases, you must see **Microsoft KM-TEST Loopback Adapter**.
4. For Microsoft Windows 7, right-click **Microsoft Loopback Adapter** and select **Uninstall**. For Microsoft Windows 8.1 and later releases, right-click **Microsoft KM-TEST Loopback Adapter** and select **Uninstall**.
5. Click **OK**.
6. Restart the computer.

7. Remove the line from the *DRIVE_LETTER:*\WINDOWS\system32\drivers\etc\hosts file, added after the localhost line while installing the loopback adapter on other Windows operating systems.

Confirming Host Name Resolution

Before you start installation, use the ping command to ensure that your computer hostname is resolvable. Typically, the computer on which you want to install Oracle Database is connected to a network.

Ensure that the computer host name is resolvable through a Domain Name System (DNS), a network information service (NIS), or a centrally-maintained TCP/IP host file, such as `/etc/hosts`. Use the `ping` command to ensure that your computer host name is resolvable. If your computer host name does not resolve, then contact your System Administrator.

For example:

```
ping myhostname
pinging myhostname.example.com [192.0.2.2] with 32 bytes of data:
Reply from 192.0.2.2: bytes=32 time=138ms TTL=56
```

6

Supported Storage Options for Oracle Database and Oracle Grid Infrastructure

Review supported storage options as part of your installation planning process.

- Supported Storage Options for Oracle Database
  The following table shows the storage options supported for Oracle Database binaries and files:
- Choosing a Storage Option for Oracle Database and Recovery Files
  Oracle Database files include data files, control files, redo log files, the server parameter file, and the password file.
- About Oracle Grid Infrastructure for a Standalone Server
  If you plan to use Oracle Automatic Storage Management (Oracle ASM), then you must install Oracle Restart before installing your database.
- File System Options for Oracle Database
  If you install Oracle Database files on a file system, then Oracle Database Configuration Assistant creates the database files in a directory on a file system mounted on the computer.
- Guidelines for Placing Oracle Database Files On a File System or Logical Volume
  If you choose to place the Oracle Database files on a file system, then use the following guidelines when deciding where to place them:
- About Direct NFS Client Storage
  With Oracle Database, you can store data files on a supported NFS system. You can configure Oracle Database to access NFS servers directly using an Oracle internal Direct NFS Client.
- About the Oranfstab File for Direct NFS Client
  To enable the Direct NFS Client, you must add an `oranfstab` file to *`ORACLE_BASE_HOME`*`\dbs`.
- About NFS Storage for Data Files
  Review this section for NFS storage configuration guidelines.
- About Direct NFS Client Mounts to NFS Storage Devices
  Direct NFS Client integrates the NFS client functionality directly in the Oracle software to optimize the I/O path between Oracle and the NFS server. This integration can provide significant performance improvements.

Supported Storage Options for Oracle Database

The following table shows the storage options supported for Oracle Database binaries and files:

Table 6-1 Supported Storage Options for Oracle Database

Storage Option	Oracle Database Binaries	Oracle Database Data Files	Oracle Database Recovery Files
Oracle Automatic Storage Management (Oracle ASM)	No	Yes	Yes
Local file system	Yes	Yes, but not recommended	Yes, but not recommended
Network file system (NFS) on a certified network-attached storage (NAS) filer	Yes	Yes	Yes

Guidelines for Storage Options

Use the following guidelines when choosing storage options:

- Oracle strongly recommends that you use a dedicated set of disks for Oracle ASM.
- Loopback devices are not supported for use with Oracle ASM.
- You can choose any combination of the supported storage options for each file type provided that you satisfy all requirements listed for the chosen storage options.
- You can use Oracle ASM to store Oracle Clusterware files.
- Direct use of raw or block devices is not supported. You can only use raw or block devices under Oracle ASM.

Starting with Oracle Database 21c, the Oracle Grid Infrastructure feature Oracle Advanced Cluster File System (Oracle ACFS) is desupported with Microsoft Windows.

> **Caution:**
>
> Oracle ACFS and Oracle Automatic Storage Management Dynamic Volume Manager (Oracle ADVM) will not be accessible after you install or upgrade to Oracle Grid Infrastructure 21c.

Related Topics

- *Oracle Database Upgrade Guide*

Choosing a Storage Option for Oracle Database and Recovery Files

Oracle Database files include data files, control files, redo log files, the server parameter file, and the password file.

For all installations, you must choose the storage option to use for Oracle Database files. During the database installation, you must choose the storage option to use for recovery files (the fast recovery area). You do not have to use the same storage option for each file type.

> **Note:**
>
> Database files and recovery files are supported on file systems and Oracle ASM.

The storage option that you choose for recovery files can be the same as or different to the option you choose for the data files. The recovery files can be placed on NTFS.

About Oracle Grid Infrastructure for a Standalone Server

If you plan to use Oracle Automatic Storage Management (Oracle ASM), then you must install Oracle Restart before installing your database.

Oracle Grid Infrastructure for a standalone server is a version of Oracle Grid Infrastructure that supports single instance databases. This support includes volume management, file system, and automatic restart capabilities. Oracle Grid Infrastructure for a standalone server includes Oracle Restart and Oracle Automatic Storage Management. Oracle combined the two infrastructure products into a single set of binaries that is installed into an Oracle Restart home.

Oracle Restart is a feature provided as part of Oracle Grid Infrastructure. Oracle Restart monitors and can restart Oracle Database instances, Oracle Net Listeners, and Oracle ASM instances. Oracle Restart is currently restricted to manage single instance Oracle Databases and Oracle ASM instances only.

Oracle Automatic Storage Management is a volume manager and a file system for Oracle Database files that supports single-instance Oracle Database and Oracle Real Application Clusters (Oracle RAC) configurations. Oracle Automatic Storage Management also supports a general purpose file system for your application needs, including Oracle Database binaries. Oracle Automatic Storage Management is Oracle's recommended storage management solution that provides an alternative to conventional volume managers, and file systems.

Oracle Restart improves the availability of your Oracle database by providing the following services:

- When there is a hardware or a software failure, Oracle Restart automatically starts all Oracle components, including the Oracle database instance, Oracle Net Listener, database services, and Oracle ASM.
- Oracle Restart starts components in the proper order when the database host is restarted.
- Oracle Restart runs periodic checks to monitor the status of Oracle components. If a check operation fails for a component, then the component is shut down and restarted.

Note the following restrictions for using Oracle Restart:

- You can neither install Oracle Restart on an Oracle Grid Infrastructure cluster member node, nor add an Oracle Restart server to an Oracle Grid Infrastructure cluster member node. Oracle Restart supports single-instance databases on one server, while Oracle Grid Infrastructure for a Cluster supports single-instance or Oracle RAC databases on a cluster.
- If you want to use Oracle ASM or Oracle Restart, then you should install Oracle Grid Infrastructure for a standalone server before you install and create the database. Otherwise, you must install Oracle Restart, and then manually register the database with Oracle Restart.
- You can use the Oracle Restart implementation of Oracle Grid Infrastructure only in single-instance (nonclustered) environments. Use Oracle Grid Infrastructure with Oracle Clusterware for clustered environments.

File System Options for Oracle Database

If you install Oracle Database files on a file system, then Oracle Database Configuration Assistant creates the database files in a directory on a file system mounted on the computer.

Oracle recommends that the file system be separate from the file systems used by the operating system or the Oracle Database software.

The file system can be any of the following:

Standard Oracle Database Creation Options

- A file system on a disk that is physically attached to the system.

  If you are creating a database on basic disks that are not logical volumes or RAID devices, then Oracle recommends that you follow the Optimal Flexible Architecture (OFA) recommendations and distribute the database files over many disks.
- A file system on a logical volume manager (LVM) volume or a RAID device.

  If you are using multiple disks in an LVM or RAID configuration, then Oracle recommends that you use the Stripe and Mirror Everything (S.A.M.E) methodology to increase performance and reliability. Using this methodology, you do not have to specify multiple file system mount points for the database storage.
- A network file system (NFS) mounted from a certified network-attached storage (NAS) device. You also have the option to use Direct NFS Client, which simplifies the administration of NFS configurations and also improves performance.

Advanced Oracle Database Creation Options

- The three file system options available to standard Oracle Database installations.
- With Oracle Managed Files, you specify file system directories in which the database automatically creates, names, and manages files at the database object level.

  If you use the Oracle Managed Files feature, then you must specify only the database object name instead of file names when creating or deleting database files.

Related Topics

- Oracle RAC Technologies Matrix for Linux Platforms
- *Oracle Database Administrator's Guide*

Guidelines for Placing Oracle Database Files On a File System or Logical Volume

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

- The default path suggested by Oracle Universal Installer for the database file directory is a subdirectory of the Oracle base directory.
- You can choose either a single file system or more than one file system to store the database files:
  - If you want to use a single file system, then choose a file system on a physical device that is dedicated to the database.

For best performance and reliability, choose a RAID device or a logical volume on more than one physical device, and implement a stripe-and-mirror-everything (SAME) storage policy.

  - If you want to use more than one file system, then choose file systems on separate physical devices that are dedicated to the database.

    This method enables you to distribute physical input-output operations and create separate control files on different devices for increased reliability. It also enables you to fully implement Oracle Optimal Flexible Architecture (OFA) guidelines. Choose the `Advanced` database creation option to implement this method.

- If you intend to create a preconfigured database during the installation, then the file system (or file systems) that you choose must have at least 2 GB of free disk space.

  For production databases, you must estimate the disk space requirement depending on the use of the database.
- For optimum performance, the file systems that you choose must be on physical devices that are used only by the database.
- The Oracle user running the Oracle Database installation must have write permissions to create the files in the path that you specify.

About Direct NFS Client Storage

With Oracle Database, you can store data files on a supported NFS system. You can configure Oracle Database to access NFS servers directly using an Oracle internal Direct NFS Client.

Direct NFS Client supports NFSv3, NFSv4, NFSv4.1, and pNFS protocols to access the NFS server. If Oracle Database cannot open an NFS server using Direct NFS Client, then an informational message is logged into the Oracle alert and trace files indicating that Direct NFS Client could not be established.

Starting with Oracle Database 12*c* Release 2, when you enable Direct NFS, you can access Direct NFS dispatcher. The Direct NFS dispatcher consolidates the number of TCP connections that are created from a database instance to the NFS server. In large database deployments, using Direct NFS dispatcher improves scalability and network performance. Parallel NFS deployments also require a large number of connections. Hence, the Direct NFS dispatcher is recommended with Parallel NFS deployments too.

Direct NFS Client supports Dispatcher or the Input/Output (I/O) infrastructure. Dispatcher enables database processes to use I/O slave processes to perform I/O operations. This limits the number of sockets and Transmission Control Protocol (TCP) connections that the Direct NFS Client requires to connect to the NFS server.

Starting with Oracle Database 12*c* Release 2 (12.2), Windows Direct NFS Client supports all widely accepted NFS path formats including UNIX-style NFS paths, NFS version 4, and NFS version 4.1 protocols.

The Oracle database files resident on the NFS server that are served by the Direct NFS Client can also be accessed through a third party NFS client. The volume must be mounted through CIFS or kernel NFS to enable regular windows utilities and commands, such as copy, and so on, access the database files in the remote location. Volumes mounted through CIFS cannot be used for database file storage without configuring Direct NFS Client. The atomic write requirements required for database access are not guaranteed by CIFS protocol. Consequently, CIFS can only be used for the operating system level commands, such as copy, move, and so on.

Some NFS file servers require NFS clients to connect using reserved ports. If your filer is running with reserved port checking, then you must disable it for Direct NFS Client to operate. To disable reserved port checking, consult your NFS file server documentation.

Related Topics

- *Oracle Database Reference*
- *Oracle Database Performance Tuning Guide*
- *Oracle Database Administrator's Guide*

About the Oranfstab File for Direct NFS Client

To enable the Direct NFS Client, you must add an `oranfstab` file to *`ORACLE_BASE_HOME`*`\dbs`.

When `oranfstab` is placed in this directory, the entries in this file are specific to a single database.

About NFS Storage for Data Files

Review this section for NFS storage configuration guidelines.

Network-Attached Storage and NFS Protocol

Network-attached storage (NAS) systems use the network file system (NFS) protocol to to access files over a network, which enables client servers to access files over networks as easily as to storage devices attached directly to the servers. You can store data files on supported NFS systems. NFS is a shared file system protocol, so NFS can support both single instance and Oracle Real Application Clusters databases.

> **Note:**
>
> The performance of Oracle software and databases stored on NAS devices depends on the performance of the network connection between the servers and the network-attached storage devices.For better performance, Oracle recommends that you connect servers to NAS devices using private dedicated network connections. NFS network connections should use Gigabit Ethernet or better.

Refer to your vendor documentation to complete NFS configuration and mounting.

Requirements for Using NFS Storage

Before you start installation, NFS file systems must be mounted and available to servers.

About Direct NFS Client Mounts to NFS Storage Devices

Direct NFS Client integrates the NFS client functionality directly in the Oracle software to optimize the I/O path between Oracle and the NFS server. This integration can provide significant performance improvements.

Direct NFS Client supports NFSv3, NFSv4, NFSv4.1, and pNFS protocols to access the NFS server. Direct NFS Client also simplifies, and in many cases automates, the performance optimization of the NFS client configuration for database workloads.

Starting with Oracle Database 12c Release 2, when you enable Direct NFS, you can also enable the Direct NFS dispatcher. The Direct NFS dispatcher consolidates the number of TCP connections that are created from a database instance to the NFS server. In large database deployments, using Direct NFS dispatcher improves scalability and network performance. Parallel NFS deployments also require a large number of connections. Hence, the Direct NFS dispatcher is recommended with Parallel NFS deployments too.

Direct NFS Client can obtain NFS mount points either from the operating system mount entries, or from the `oranfstab` file.

Direct NFS Client Requirements

- NFS servers must have write size values (`wtmax`) of 32768 or greater to work with Direct NFS Client.
- NFS mount points must be mounted both by the operating system kernel NFS client and Direct NFS Client, even though you configure Direct NFS Client to provide file service.

  If Oracle Database cannot connect to an NFS server using Direct NFS Client, then Oracle Database connects to the NFS server using the operating system kernel NFS client. When Oracle Database fails to connect to NAS storage though Direct NFS Client, it logs an informational message about the Direct NFS Client connect error in the Oracle alert and trace files.
- Follow standard guidelines for maintaining integrity of Oracle Database files mounted by both operating system NFS and by Direct NFS Client.

Direct NFS Mount Point Search Order

Direct NFS Client searches for mount entries in the following order:

1. `ORACLE_BASE_HOME/dbs/oranfstab`
2. `ORACLE_BASE_CONFIG/dbs/oranfstab`
3. `/etc/oranfstab`
4. `/etc/mtab`

Direct NFS Client uses the first matching entry as the mount point.

> **Note:**
>
> You can have only one active NFS Client implementation for each instance. Enabling Direct NFS Client on an instance prevents you from using another NFS Client implementation, such as kernel NFS Client.

- To print the ORACLE_BASE_HOME path, run:

```
$ setenv ORACLE_HOME /u01/app/oracle/product/21.0.0/dbhome_1
$ cd $ORACLE_HOME/bin
$ ./orabasehome
```

- To print the ORACLE_BASE_CONFIG path, run:

```
$ setenv ORACLE_HOME /u01/app/oracle/product/21.0.0/dbhome_1
$ cd $ORACLE_HOME/bin
$ ./orabaseconfig
```

Related Topics

- *Oracle Database Reference*
- *Oracle Database Performance Tuning Guide*
- *Oracle Automatic Storage Management Administrator's Guide*

7

Configuring Storage for Oracle Grid Infrastructure for a Standalone Server

Complete these procedures to use Oracle Grid Infrastructure for a standalone server, which includes Oracle Automatic Storage Management (Oracle ASM).

- Oracle Automatic Storage Management Storage Configuration
  Review the following sections for information on Oracle Automatic Storage Management (Oracle ASM) storage configuration:
- Managing Oracle Automatic Storage Management
  Describes about starting and stopping Oracle Automatic Storage Management.

Oracle Automatic Storage Management Storage Configuration

Review the following sections for information on Oracle Automatic Storage Management (Oracle ASM) storage configuration:

- Configuring Direct NFS Client
  Direct NFS Client is an alternative to using kernel-managed NFS.
- Oracle Automatic Storage Management Installation Considerations
  In previous releases, Oracle Automatic Storage Management (Oracle ASM) was installed as part of the Oracle Database installation. Starting with Oracle Database 11*g* Release 2 (11.2), Oracle Automatic Storage Management is part of an Oracle Grid Infrastructure installation, either for a cluster, or for a standalone server.
- Configuring Storage for Oracle Automatic Storage Management
  Identify storage requirements and ASM disk group options.
- Configuring Oracle Automatic Storage Management Disk Groups Manually Using Oracle ASMCA
  The Oracle Automatic Storage Management Configuration Assistant utility creates a new Oracle Automatic Storage Management instance if there is no Oracle Automatic Storage Management instance currently configured on this computer.

Configuring Direct NFS Client

Direct NFS Client is an alternative to using kernel-managed NFS.

- Mounting NFS Storage Devices with Direct NFS Client
  Direct NFS Client determines the mount point settings for the NFS storage devices based on the configuration information in `oranfstab`.
- Specifying Network Paths for a NFS Server
  Direct NFS Client can use up to four network paths defined in the oranfstab file for an NFS server.
- Creating an oranfstab File for Direct NFS Client
  Direct NFS uses a configuration file, `oranfstab`, to determine the available mount points.

- Performing Basic File Operations Using the ORADNFS Utility
  ORADNFS is a utility which enables the database administrators to perform basic file operations over Direct NFS Client on Microsoft Windows platforms.
- Monitoring Direct NFS Client Usage
  Use the following views for Direct NFS Client management:
- Enabling Direct NFS Client
  You enable Direct NFS Client by running the `enable_dnfs.bat` command.
- Disabling Direct NFS Client
  You disable Direct NFS Client by running the `disable_dnfs.bat` command.
- Enabling HCC on Direct NFS Client
  To enable Hybrid Columnar Compression (HCC) on Direct NFS Client, perform the following steps:

Mounting NFS Storage Devices with Direct NFS Client

Direct NFS Client determines the mount point settings for the NFS storage devices based on the configuration information in `oranfstab`.

Direct NFS Client looks for the mount point entries in *`ORACLE_BASE_HOME`*`\dbs\oranfstab`. It uses the first matched entry as the mount point.

Specifying Network Paths for a NFS Server

Direct NFS Client can use up to four network paths defined in the oranfstab file for an NFS server.

The Direct NFS Client performs load balancing across all specified paths. If a specified path fails, then Direct NFS Client reissues I/O commands over any remaining paths.

Direct NFS Client requires an NFS server supporting NFS read/write buffers of at least 16384 bytes.

Direct NFS Client issues writes at `wtmax` granularity to the NFS server. Direct NFS Client does not serve an NFS server with a `wtmax` less than 16384. Oracle recommends that you use the value 32768.

For NFS servers that restrict port range, you can use the `insecure` option to enable clients other than `root` to connect to the NFS server. Alternatively, you can disable Direct NFS Client.

> **Note:**
>
> Use NFS servers supported for Oracle Database. See the My Oracle Support website for support information:
>
> `https://support.oracle.com`

Creating an oranfstab File for Direct NFS Client

Direct NFS uses a configuration file, `oranfstab`, to determine the available mount points.

Create an `oranfstab` file with the following attributes for each NFS server that you want to access using Direct NFS Client:

- `server`

  The NFS server name.

  For NFS setup with Kerberos authentication, the `server` attribute name must be the fully-qualified name of the NFS server. This `server` attribute name is used to create service principal for Ticket Granting Service (TGS) request from the Kerberos server. If you are configuring external storage snapshot cloning, then the NFS `server` name should be a valid host name. For all other scenarios, the NFS `server` name can be any unique name.

- `local`

  Up to four paths on the database host, specified by IP address or by name, as displayed using the `ipconfig` command run on the database host.

- `path`

  Up to four network paths to the NFS server, specified either by IP address, or by name, as displayed using the `ipconfig` command on the NFS server.

- `export`

  The exported path from the NFS server. Use UNIX-style path.

- `mount`

  The corresponding local mount point for the exported volume. Use WINDOWS-style path.

- `Dontroute`

  Specifies that the outgoing messages must not be routed by the operating system, but sent using the IP address to which they are bound.

- `mnt_timeout`

  Specifies (in seconds) the time Direct NFS Client should wait for a successful mount before timing out. This parameter is optional. The default timeout is 10 minutes (600).

- `uid (Optional)`

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

- `gid (Optional)`

  The UNIX group ID to be used by Direct NFS Client to access all the NFS servers listed in `oranfstab`. The default value is `gid:65534`, which corresponds to `group:nogroup` on the NFS server.

- `nfs_version`

  Specifies the NFS protocol version used by Direct NFS Client. Acceptable values are nfsv3, nfsv4, nfsv4.1, and pnfs. The default version is nfsv3. If you select nfsv4.x, then you must configure the value in `oranfstab` for `nfs_version`.

- `security_default (Optional)`

  Specifies the default security mode applicable for all the exported NFS server paths for a server entry. The default value is `sys` . See the description of the `security` parameter for the supported security levels for the `security_default` parameter.

- `security (Optional)`

  Specifies the security level, to enable security using Kerberos authentication protocol with Direct NFS Client. Specify `security` per export-mount pair. The supported security levels for the `security_default` and `security` parameters are:

`sys`: UNIX level security AUTH_UNIX authentication based on user identifier (UID) and group identifier (GID) values. This is the default value for security parameters.
`krb5`: Direct NFS runs with plain Kerberos authentication. Server is authenticated as the real server which it claims to be.
`krb5i`: Direct NFS runs with Kerberos authentication and NFS integrity. Server is authenticated and each of the message transfers is checked for integrity.
`krb5p`: Direct NFS runs with Kerberos authentication and NFS privacy. Server is authenticated, and all data is completely encrypted.

The `security` parameter, if specified, takes precedence over the `security_default` parameter. If neither of these parameters are specified, then `sys` is the default authentication.

For NFS server Kerberos security setup, review the relevant NFS server documentation. For Kerberos client setup, review the relevant operating system documentation.

- `management`

  Enables Direct NFS Client to use the management interface for SNMP queries. You can use this parameter if SNMP is running on separate management interfaces on the NFS server. The default value is the server parameter value.

- `community`

  Specifies the community string for use in SNMP queries. Default value is `public`.

The following examples show three possible NFS server entries in `oranfstab`. A single `oranfstab` can have multiple NFS server entries.

Example 7-1 Using Local and Path NFS Server Entries

The following example uses both local and path. Because they are in different subnets, you do not have to specify `dontroute`.

```
server: MyDataServer1
local: 192.0.2.0
path: 192.0.2.1
local: 192.0.100.0
path: 192.0.100.1
export: /vol/oradata1 mount: C:\APP\ORACLE\ORADATA\ORCL
```

Example 7-2 Using Names in Place of IP Addresses, with Multiple Exports, management and community

```
server: MyDataServer2
local: LocalPath1
path: NfsPath1
local: LocalPath2
path: NfsPath2
local: LocalPath3
path: NfsPath3
local: LocalPath4
path: NfsPath4
nfs_version: nfsv3
dontroute
export: /vol/oradata2 mount: C:\APP\ORACLE\ORADATA\ORCL2
export: /vol/oradata3 mount: C:\APP\ORACLE\ORADATA\ORCL3
export: /vol/oradata4 mount: C:\APP\ORACLE\ORADATA\ORCL4
```

```
export: /vol/oradata5 mount: C:\APP\ORACLE\ORADATA\ORCL5
management: MgmtPath1
community: private
```

Example 7-3 Using Kerberos Authentication with Direct NFS Export

The `security` parameter overrides `security_default`:

```
server:  nfsserver
 local: 192.0.2.0
 path: 192.0.2.2
 local: 192.0.2.3
 path: 192.0.2.4
 export: /vol/oradata2 mount: C:\APP\ORACLE\ORADATA\ORCL2 security: krb5
 export: /vol/oradata3 mount: C:\APP\ORACLE\ORADATA\ORCL3 security: krb5p
 export: /vol/oradata3 mount: C:\APP\ORACLE\ORADATA\ORCL4 security: sys
 export: /vol/oradata3 mount: C:\APP\ORACLE\ORADATA\ORCL5
security_default: krb5i
```

Performing Basic File Operations Using the ORADNFS Utility

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

ORADNFS is a multi-call binary, a single binary that acts like several utilities. This allows ORADNFS to be smaller since all the built-in commands can leverage DNFS code for many common operations. ORADNFS is run by issuing a command as an argument on the command line.

For example, `C:\> ORADNFS help` causes ORADNFS to print a list of built-in commands, and `C:\> ORADNFS ls C:\ORACLE\ORADATA\ORCL` causes ORADNFS to behave as an `ls` command of `C:\ORACLE\ORADATA\ORCL` remote directory, where `C:\ORACLE\ORADATA` is a DNFS virtual mount point specified in the `oranfstab` configuration file.

> **Note:**
>
> - A valid copy of the `oranfstab` configuration file must be present in *`ORACLE_BASE_HOME`*`\dbs` directory for ORADNFS to operate.
> - The user must be a member of the local `ORA_DBA` group to execute ORADNFS.

Monitoring Direct NFS Client Usage

Use the following views for Direct NFS Client management:

- **v$dnfs_servers:** Shows a table of servers accessed using Direct NFS Client.
- **v$dnfs_files:** Shows a table of files currently open using Direct NFS Client.
- **v$dnfs_channels:** Shows a table of open network paths (or channels) to servers for which Direct NFS Client is providing files.
- **v$dnfs_stats:** Shows a table of performance statistics for Direct NFS Client.

Enabling Direct NFS Client

You enable Direct NFS Client by running the `enable_dnfs.bat` command.

1. Shut down the Oracle Database instance.
2. Create and configure an `oranfstab` file in *ORACLE_BASE_HOME*`\dbs`.
3. Set *ORACLE_HOME* to Oracle home for which the Direct NFS Client must be enabled.
4. Change directory to *ORACLE_HOME*`\bin`.
5. Run the batch file `enable_dnfs.bat`.
6. Restart the Oracle Database instance.

For Oracle RAC, repeat the above procedure on all nodes in the cluster.

Disabling Direct NFS Client

You disable Direct NFS Client by running the `disable_dnfs.bat` command.

1. Shut down the Oracle Database instance.
2. Remove the `oranfstab` configuration file from `ORACLE_BASE_HOME\dbs`.
3. Set *ORACLE_HOME* to Oracle home for which the Direct NFS Client must be disabled.
4. Change directory to *ORACLE_HOME*`\bin`.
5. Run the batch file, `disable_dnfs.bat`.
6. Restart the Oracle Database instance.

For Oracle RAC, repeat the above procedure on all nodes in the cluster.

Enabling HCC on Direct NFS Client

To enable Hybrid Columnar Compression (HCC) on Direct NFS Client, perform the following steps:

1. Ensure that SNMP is enabled on the ZFS storage server. For example:

```
C:\>snmpget -v1 -c public server_name .1.3.6.1.4.1.42.2.225.1.4.2.0
SNMPv2-SMI::enterprises.42.2.225.1.4.2.0 = STRING: "Sun Storage 7410"
```

2. If SNMP is enabled on an interface other than the NFS server, then configure `oranfstab` using the `management` parameter.
3. If SNMP is configured using a community string other than `public`, then configure the `oranfstab` file using the `community` parameter.
4. Ensure that `Wsnmp32.dll` and `snmpapi.dll` are installed by checking if `snmpget` is available.

Oracle Automatic Storage Management Installation Considerations

In previous releases, Oracle Automatic Storage Management (Oracle ASM) was installed as part of the Oracle Database installation. Starting with Oracle Database 11*g* Release 2 (11.2), Oracle Automatic Storage Management is part of an Oracle Grid Infrastructure installation, either for a cluster, or for a standalone server.

If you want to upgrade an existing Oracle Automatic Storage Management installation, then you must upgrade Oracle Automatic Storage Management by running an Oracle Grid Infrastructure upgrade (upgrades of existing Oracle Automatic Storage Management installations). If you do not have Oracle Automatic Storage Management installed and you want to use Oracle Automatic Storage Management as your storage option, then you must complete an Oracle Restart installation before you start your Oracle Database installation.

You must run Oracle Automatic Storage Management Configuration Assistant for installing and configuring Oracle ASM instances, disk groups, and volumes. In addition, you can use the ASMCA command-line interface.

Apply the following guidelines when you install Oracle Automatic Storage Management:

- You must complete the steps listed under the *Configuring Storage for Oracle Automatic Storage Management* section to prepare a disk partition to use for the Oracle Automatic Storage Management disk groups.
- Ensure that at least one disk is configured appropriately in an Oracle ASM disk group before beginning the installation.
- When you install Oracle Automatic Storage Management, Oracle Automatic Storage Management Configuration Assistant creates a separate server parameter file (`SPFILE`) and password file for the Oracle Automatic Storage Management instance. As soon as Oracle Automatic Storage Management is installed, `ASMSNMP` schema and user are created.
- The Oracle Automatic Storage Management instance that manages the existing disk group runs in the Oracle Grid Infrastructure home directory.

Related Topics

- *Oracle Automatic Storage Management Administrator's Guide*
- *Oracle Automatic Storage Management Administrator's Guide*

Configuring Storage for Oracle Automatic Storage Management

Identify storage requirements and ASM disk group options.

- Identifying Storage Requirements for Oracle Automatic Storage Management
  To identify the storage requirements for using Oracle ASM, you must determine the number of devices and the amount of free disk space that you require. To complete this task, follow these steps:
- Oracle ASM Disk Space Requirements
  Determine the total amount of Oracle Automatic Storage Management (Oracle ASM) disk space that you require for the database files and recovery files.
- ASM Disk Group Options for Interactive and Noninteractive Installation
  You can select new disk groups during interactive installations, but you must use existing disk groups for noninteractive installations.
- Configuring Disks Manually for Oracle Automatic Storage Management
  To use Oracle Automatic Storage Management with direct attached storage (DAS) or storage area network (SAN), the disks must be stamped with a header.

Related Topics

- *Oracle Automatic Storage Management Administrator's Guide*

Identifying Storage Requirements for Oracle Automatic Storage Management

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

1. Determine whether you want to use Oracle ASM for Oracle Database files, recovery files, or both. Oracle Database files include data files, control files, redo log files, the server parameter file, and the password file.

   During the database installation, you have the option to select either a file system or Oracle ASM as the storage mechanism for Oracle Database files. Similarly, you also have the option to select either a file system or Oracle ASM as the storage mechanism for your recovery files.

   > **Note:**
   >
   > You do not have to use the same storage mechanism for both Oracle Database files and recovery files. You can use a file system for one file type and Oracle ASM for the other.

   If you select Oracle ASM as your storage option for Oracle Database files, then depending on your choice in the Specify Recovery Options screen, you have the following recovery options:

   - If you select the Oracle ASM option for your recovery files, then Oracle Universal Installer provides you with only the option to use the same disk group for both Oracle Database files and recovery files.
   - If you decide not to enable recovery during the database installation, then, after the database installation, you can modify the `DB_RECOVERY_FILE_DEST` parameter to enable the fast recovery area.

2. Choose the Oracle ASM redundancy level to use for each Oracle ASM disk group that you create.

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

   - **External redundancy**

     This option does not allow Oracle ASM to mirror the contents of the disk group. Oracle recommends that you select this redundancy level either when the disk group contains devices, such as RAID devices, that provide their own data protection or when the database does not require uninterrupted access to data.

   - **Normal redundancy**

     To optimize performance and reliability in a normal redundancy disk group, Oracle ASM uses two-way mirroring for data files and three-way mirroring for control files, by default. In addition, you can choose the mirroring characteristics for individual files in a disk group.

     A normal redundancy disk group requires a minimum of two failure groups (or two disk devices) if you are using two-way mirroring. The effective disk space in a normal redundancy disk group is half the sum of the disk space of all of its devices.

For most installations, Oracle recommends that you use normal redundancy disk groups. On Oracle Exadata, Oracle recommends that you use high redundancy disk groups for added protection against failure.

- **High redundancy**

  The contents of the disk group are three-way mirrored by default. To create a disk group with high redundancy, you must specify at least three failure groups (a minimum of three devices).

  Although high-redundancy disk groups provide a high level of data protection, you must consider the higher cost of additional storage devices before deciding to use this redundancy level.

- **Flex redundancy**

  A flex redundancy disk group is a new disk group type with features such as flexible file redundancy, mirror splitting, and redundancy change. A flex disk group can consolidate files with different redundancy requirements into a single disk group. It also provides the capability for databases to change the redundancy of its files.

  For database data, you can choose no mirroring (unprotected), two-way mirroring (mirrored), or three-way mirroring (high). A flex redundancy disk group requires a minimum of three disk devices (or three failure groups).

- **Extended redundancy**
  Extended redundancy disk group has features similar to the flex redundancy disk group. Extended redundancy is available when you configure an Oracle Extended Cluster. Extended redundancy extends Oracle ASM data protection to cover failure of sites by placing enough copies of data in different failure groups of each site.

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

   If an Oracle ASM instance is running on the system, then you can use an existing disk group to meet these storage requirements. If necessary, you can add disks to an existing disk group during the database installation.

   See, "Oracle ASM Disk Space Requirements" in *Oracle Database Installation Guide* for the Oracle ASM disk space requirements.

   > **Note:**
   >
   > - The disk devices must be owned by the user performing the grid installation.
   >
   >   Check with your system administrator to determine if the disks used by Oracle ASM are mirrored at the storage level. If so, select External for the redundancy. If the disks are not mirrored at the storage level, then select Normal for the redundancy.
   > - Every Oracle ASM disk is divided into allocation units (AU). An allocation unit is the fundamental unit of allocation within a disk group. You can select the AU Size value from 1, 2, 4, 8, 16, 32 or 64 MB, depending on the specific disk group compatibility level. The default value is 4 MB for flex disk group and 1 MB for all other disk group types. On engineered systems, the default value is 4 MB.

4. Optionally, identify failure groups for the Oracle ASM disk group devices.

If you intend to use a normal, high or flex redundancy disk group, then you can further protect your database against hardware failure by associating a set of disk devices in a custom failure group. By default, each device comprises its own failure group. However, if two disk devices in a normal redundancy disk group are attached to the same Host Bus Adapter (HBA), then the disk group becomes unavailable if the controller fails. The controller in this example is a single point of failure.

To protect against failures of this type, use two HBAs, each with two disks, and define a failure group for the disks attached to each controller. This configuration enables the disk group to tolerate the failure of one HBA.

Consider the following guidelines while defining custom failure groups:

- You can specify custom failure groups in the **Create ASM Disk Group** screen during an Oracle Grid Infrastructure installation.
- You can also define custom failure groups after installation, using the GUI tool ASMCA, the command line tool `asmcmd`, or SQL commands.
- If you define custom failure groups, then for failure groups containing database files only, you must specify a minimum of two failure groups for normal redundancy disk groups and three failure groups for high redundancy disk groups.

5. If you are sure that a suitable disk group does not exist on the system, then install or identify appropriate disk devices to add to a new disk group.

   Use the following guidelines when identifying appropriate disk devices:

   - The disk devices must be owned by the user performing the Oracle Grid Infrastructure installation.
   - All the devices in an Oracle ASM disk group must be the same size and have the same performance characteristics.
   - Do not specify multiple partitions on a single physical disk as a disk group device. Oracle ASM expects each disk group device to be on a separate physical disk.
   - Although you can specify a logical volume as a device in an Oracle ASM disk group, Oracle does not recommend their use because it adds a layer of complexity that is unnecessary with Oracle ASM. Oracle recommends that if you choose to use a logical volume manager, then use the logical volume manager to represent a single logical unit number (LUN) without striping or mirroring, so that you can minimize the effect on storage performance of the additional storage layer.

Related Topics

- *Oracle Automatic Storage Management Administrator's Guide*

Oracle ASM Disk Space Requirements

Determine the total amount of Oracle Automatic Storage Management (Oracle ASM) disk space that you require for the database files and recovery files.

Table 7-1 Oracle ASM Disk Number and Minimum Space Requirements for a multitenant container database (CDB) with one pluggable database (PDB)

Redundancy Level	Minimum Number of Disks	Data Files	Recovery Files	Both File Types
External	1	4.4 GB	13.2 GB	17.6 GB
Normal or Flex with two-way mirroring	2	8.6 GB	25.8 GB	34.4 GB

Table 7-1 (Cont.) Oracle ASM Disk Number and Minimum Space Requirements for a multitenant container database (CDB) with one pluggable database (PDB)

Redundancy Level	Minimum Number of Disks	Data Files	Recovery Files	Both File Types
High or Flex with three-way mirroring	3	12.9 GB	38.7 GB	51.6 GB

Note:

- If an Oracle ASM instance is running on the system, then you can use an existing disk group to meet these storage requirements. If necessary, you can add disks to an existing disk group during the database installation.
- The disk devices must be owned by the user performing the grid installation.

  Check with your system administrator to determine if the disks used by Oracle ASM are mirrored at the storage level. If so, select External for the redundancy. If the disks are not mirrored at the storage level, then select Normal for the redundancy.
- Every Oracle ASM disk is divided into allocation units (AU). An allocation unit is the fundamental unit of allocation within a disk group. You can select the AU Size value from 1, 2, 4, 8, 16, 32 or 64 MB, depending on the specific disk group compatibility level. The default value is 4 MB for flex disk group and 1 MB for all other disk group types. On engineered systems, the default value is 4 MB.

ASM Disk Group Options for Interactive and Noninteractive Installation

You can select new disk groups during interactive installations, but you must use existing disk groups for noninteractive installations.

Select from the following choices to store either database or recovery files in an existing Oracle ASM disk group, depending on installation method:

- Installation method that runs Database Configuration Assistant in an interactive mode (either during installation or after installation)
  - Select new Disk Group
  - Select existing Disk Group
- Installation method that runs Database Configuration Assistant in a noninteractive mode (either during installation or after installation)

  Select an existing Disk Group only. You cannot create a disk group during noninteractive installations. You can add disk devices to an existing disk group if it has insufficient free space.

> **Note:**
>
> The Oracle ASM instance that manages the existing disk group can be running in a different Oracle home directory.

Step 1: Enabling Disk Automounting

Before you can configure partitions or logical drives on Windows, you must enable disk automounting. Enable disk automounting when using:

- Disk partitions on both single-instance and Oracle RAC installations
- Cluster file system for Oracle RAC
- Oracle Clusterware
- Raw partitions for a single-node database installation
- Primary or logical partitions for Oracle Automatic Storage Management

To enable automounting:

1. Enter the following commands at a command prompt:

```
DRIVE_LETTER:\> diskpart
DISKPART> automount enable
DISKPART> exit
```

2. Restart your computer.

Step 2: Creating the Disk Partitions

To create disk partitions, use the disk administration tools provided by the operating system or third party vendors. The following administration tools are provided by the operating system:

- The graphical user interface Disk Management snap-in to manage disks.

  To access this tool, type `diskmgmt.msc` at the command prompt. (Optional) From the **Start** menu, select **All Programs**, then **Administrative Tools**, then **Computer Management**. Then select the **Disk Management** node in the Storage tree.

  Create primary partitions and logical drives in the extended partitions by selecting the **New Simple Volume** option. To create a raw device, assign a drive letter and remove the letter after the partition is created. You must select **Do not format this partition** to specify a raw partition. Do not use spanned volumes or striped volumes. These options convert the volume to a dynamic disk. Oracle Automatic Storage Management does not support dynamic disks.

  For other Windows, create primary partitions by selecting the **New Partition** option. Create the logical drives by selecting the **New Logical Drive** option.

- The command-line tool `diskpart.exe`, which lets you create primary partitions, extended partitions, and logical drives.

  To access this tool, enter `diskpart.exe` at the command prompt. The syntax for using `diskpart.exe` for the procedures in this section is as follows:

```
DRIVE_LETTER:\> diskpart
DISKPART> select disk diskn
DISKPART> create partition primary | extended | logical size=sizen
DISKPART>
```

where:

- `diskpart.exe` is the command-line tool for managing disks.
- *`diskn`* is the disk number where the partitions are created.
- *`sizen`* is the size of the partition, for example 500 represents 500 MB.

> **Note:**
>
> Refer to the online help or documentation for the administration tool that you are using.

You can enter the `diskpart.exe` commands directly at the command line. Alternatively, you can enter the commands in a text file, and then run `diskpart /s` using this file as a script.

You cannot create more than four primary disk partitions per disk. If you need more, you can get around this limitation by creating three primary partitions and then the fourth as an extended partition with as many logical partitions.

For example, to create the disk partitions on Disk 5 and assign them each a size:

```
DISKPART> select disk 5
DISKPART> create partition primary size=500
DISKPART> ...
DISKPART> create partition extended
DISKPART> create partition logical size=800
DISKPART> ...
DISKPART> create partition logical size=500
```

Configuring Disks Manually for Oracle Automatic Storage Management

To use Oracle Automatic Storage Management with direct attached storage (DAS) or storage area network (SAN), the disks must be stamped with a header.

If you install Oracle Restart in an interactive mode, Oracle Universal Installer configures the headers of the disk during the installation process. However, if you intend to install Oracle Restart in a response file mode, then you must manually configure the disks before installation by using either `asmtoolg` (GUI version) or `asmtool` (command-line version). You can also use these tools to reconfigure the disks after installation. The `asmtoolg` and `asmtool` utilities work only on partitioned disks: you cannot use Oracle Automatic Storage Management on unpartitioned disks.

The `asmtoolg` and `asmtool` tools associate meaningful, persistent names with disks to facilitate using those disks with Oracle Automatic Storage Management. Oracle Automatic Storage Management uses disk strings to more easily operate on groups of disks at once, so the names that `asmtoolg` or `asmtool` creates make this easier than using Windows drive letters.

All disk names created by `asmtoolg` or `asmtool` begin with the prefix `ORCLDISK` followed by a user-defined prefix (the default is `DATA`) and a disk number for identification purposes.

Using the asmtoolg Tool (Graphical User Interface)

The `asmtoolg` tool is a graphical interface for creating device names. Use `asmtoolg` to add, change, delete, and examine the devices available for use in Oracle Automatic Storage Management.

To add or change disk stamps:

1. In directory where you unzipped the Oracle Grid Infrastructure image files, go to the `bin\asmtool` folder and double-click `asmtoolg`.

   If Oracle Database is installed, go to *`ORACLE_HOME`*`\bin` and double-click `asmtoolg.exe`.

   If User Account Control is enabled, then create a shortcut for the command prompt window on your desktop. An icon for that shortcut appears on the desktop. Right click the icon for the newly created shortcut, and specify "Run as administrator." When the command window opens, go to *`ORACLE_HOME`*`\bin`, and then type `asmtoolg`.

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

   The `asmtoolg` tool shows the devices available on the system. Unrecognized disks are labeled as "Candidate device", stamped Oracle Automatic Storage Management disks as "Stamped ASM disk", and unstamped Oracle Automatic Storage Management disks as "Unstamped ASM disks." The tool also shows disks that are recognized by Windows as a file system (such as NTFS). These are not available for use as disks and cannot be selected. In addition, Microsoft Dynamic disks are not available for use as Oracle Automatic Storage Management disks.

3. In the Stamp Disks window, select the disks to stamp.

   Oracle Automatic Storage Management can generate unique stamps for all of the devices selected for a given prefix. The stamps are generated by concatenating a number with the prefix specified. For example, if the prefix is `DATA`, then the first Oracle Automatic Storage Management link name is `ORCLDISKDATA0`.

   You can also specify the stamps of individual devices.

4. (Optional) Select a disk to edit the individual stamp (Oracle Automatic Storage Management link name).

5. Click **Next**.

6. Click **Finish**.

To delete disk stamps:

1. Select the **Delete labels** option, then click **Next**.

   The delete option is only available if disks exist with stamps. The delete window shows all stamped Oracle Automatic Storage Management disks.

2. In the Delete Stamps window, select the disks to unstamp.

3. Click **Next**.

4. Click **Finish**.

Example 7-4 Using the asmtool Utility (Command Line)

The `asmtool` utility is a command-line interface for stamping disks. If User Account Control is enabled, then you can create a shortcut for the command prompt window on your desktop. An icon for that shortcut appears on the desktop. Right-click the icon for the newly created shortcut, and select "Run as administrator." Then start `asmtool`.

It has the following options:

Option	Description

`-add`	Adds or changes stamps. You must specify the hard disk, partition, and new stamp name. If the disk is a raw device or has an existing Oracle Automatic Storage Management stamp, then you must specify the `-force` option. Also sets Oracle Automatic Storage Management instances to rescan the available disks.
	Example:
	`asmtool -add [-force]`
	`\Device\Harddisk1\Partition1 ORCLDISKASM0`
	`\Device\Harddisk2\Partition1 ORCLDISKASM2...`

`-addprefix`	Adds or changes stamps using a common prefix to generate stamps automatically. The stamps are generated by adding a number with the prefix specified. If the disk is a raw device or has an existing Oracle Automatic Storage Management stamp, then you must specify the `-force` option. Also sets Oracle Automatic Storage Management instances to rescan the available disks.
	Example:
	`asmtool -addprefix ORCLDISKASM [-force]`
	`\Device\Harddisk1\Partition1`
	`\Device\Harddisk2\Partition1...`

`-list`	Lists available disks. The stamp, windows device name, and disk size in megabytes are shown. Some disks may be file systems, and cannot be stamped. If the disk is a raw device or has an existing Oracle Automatic Storage Management stamp, then you must specify the `-force` option. Example: `asmtool -list [-force]`
`-delete`	Removes existing stamps from disks. Also sets Oracle Automatic Storage Management instances to rescan the available disks. Example: `asmtool -delete ORCLDISKASM0 ORCLDISKASM1...`

Configuring Oracle Automatic Storage Management Disk Groups Manually Using Oracle ASMCA

The Oracle Automatic Storage Management Configuration Assistant utility creates a new Oracle Automatic Storage Management instance if there is no Oracle Automatic Storage Management instance currently configured on this computer.

If you want to create additional disk groups or manually configure Oracle Automatic Storage Management disks, then you can run the Oracle Automatic Storage Management Configuration Assistant as follows:

```
DRIVE_LETTER:\> cd ORACLE_HOME\bin
DRIVE_LETTER:\> asmca.bat
```

Related Topics

- *Oracle Automatic Storage Management Administrator's Guide*

Managing Oracle Automatic Storage Management

Describes about starting and stopping Oracle Automatic Storage Management.

Starting and Stopping Oracle Automatic Storage Management

To start and stop Oracle Automatic Storage Management, in addition to using SQL*Plus, you can use the `srvctl` utility.

To start Oracle Automatic Storage Management instance using the `srvctl` utility, run the following command:

```
srvctl start asm
```

To stop Oracle Automatic Storage Management instance using the `srvctl` utility, run the following command:

```
srvctl stop asm
```

Related Topics

- *Oracle Automatic Storage Management Administrator's Guide*

Oracle Automatic Storage Management Utilities

To manage Oracle Automatic Storage Management, you can use the following tools:

- `asmcmd`: This command-line tool lets you manage Oracle Automatic Storage Management disk group files and directories.
- `asmtool`: This command-line tool is required to stamp the disks to create or modify disk groups later on after the database installation.
- Oracle Automatic Storage Management Configuration Assistant: Oracle Automatic Storage Management Configuration Assistant (ASMCA) is an interactive utility that enables you to create an Oracle Automatic Storage Management instance or upgrade existing Oracle Automatic Storage Management instances. It also enables you to create and configure disk groups, Oracle Automatic Storage Management volumes and Oracle Automatic Storage Management File Systems (ASMFS).
- Oracle Enterprise Manager Cloud Control: If you have Oracle Enterprise Manager installed, you can use Cloud Control to manage Oracle ASM functions, such as migrating an existing database to Oracle ASM, checking the status of the Oracle ASM instance,

checking the performance of the Oracle ASM disk groups, and creating or dropping Oracle ASM disk groups.

- Oracle Enterprise Manager Database Express: This utility enables you to perform basic administrative tasks such as user, performance, memory, and space management.
- SQL*Plus: You can use Oracle Automatic Storage Management-specific commands from this tool. To connect to the Oracle Automatic Storage Management instance, you use the same methods that you use to connect to an Oracle Database instance.

Related Topics

- *Oracle Automatic Storage Management Administrator's Guide*

8

Installing and Configuring Oracle Grid Infrastructure for a Standalone Server

Oracle Grid Infrastructure for a standalone server includes Oracle Restart and Oracle Automatic Storage Management.

If you install Oracle Grid Infrastructure for a standalone server and then create your database, then the database is automatically added to the Oracle Restart configuration. Oracle Restart automatically restarts the database when required.

If you install Oracle Grid Infrastructure for a standalone server on a host computer on which a database already exists, then you must manually add the database, the listener, the Oracle ASM instance, and other components to the Oracle Restart configuration before you are able to configure automatic database restarts.

> **Note:**
>
> Oracle Grid Infrastructure for a standalone server can support multiple single-instance databases on a single host computer.

- About Image-Based Oracle Grid Infrastructure Installation
  Starting with Oracle Grid Infrastructure 12c Release 2 (12.2), installation and configuration of Oracle Grid Infrastructure software is simplified with image-based installation.
- Setup Wizard Installation Options for Creating Images
  Gold image-creation options to use with your Oracle Database or Oracle Grid Infrastructure installation setup wizards.
- Installing Oracle Grid Infrastructure for a Standalone Server with a New Database Installation
  Complete these steps to install Oracle Restart and then create a database that is managed by Oracle Restart.
- Installing Oracle Grid Infrastructure for a Standalone Server for an Existing Database
  Follow the high-level instructions in this section to install Oracle Grid Infrastructure and configure it for an existing Oracle database.
- Installing Oracle Grid Infrastructure for a Standalone Server Using a Software-Only Installation
  A software-only installation only installs the Oracle Restart binaries at the specified location. You must complete a few manual configuration steps to enable Oracle Grid Infrastructure after you install the software.
- Testing the Oracle Automatic Storage Management Installation
  After installing Oracle Grid Infrastructure for a single instance, use the ASMCMD command-line utility to test the Oracle ASM installation.
- Modifying Oracle Grid Infrastructure for a Standalone Server Binaries After Installation
  After installation, you must first stop the Oracle Restart stack to modify the software installed in your Grid home.

- Applying Patches During an Oracle Grid Infrastructure Installation or Upgrade
  Starting with Oracle Grid Infrastructure 18c, you can download and apply Release Updates (RUs) and one-off patches during an Oracle Grid Infrastructure installation or upgrade.

About Image-Based Oracle Grid Infrastructure Installation

Starting with Oracle Grid Infrastructure 12c Release 2 (12.2), installation and configuration of Oracle Grid Infrastructure software is simplified with image-based installation.

To install Oracle Grid Infrastructure, create the new Grid home with the necessary user group permissions, and then extract the image file into the newly-created Grid home, and run the setup wizard to register the Oracle Grid Infrastructure product.

Using image-based installation, you can do the following:

- Configure Oracle Grid Infrastructure for a new cluster.
- Configure Oracle Grid Infrastructure for a standalone server (Oracle Restart).
- Upgrade Oracle Grid Infrastructure.
- Setup software only.
- Add or remove nodes from your existing cluster, if the Oracle Grid Infrastructure software is already installed or configured.

This installation feature streamlines the installation process and supports automation of large-scale custom deployments. You can also use this installation method for deployment of customized images, after you patch the base-release software with the necessary Release Updates (RUs) or Release Update Revisions (RURs).

> **Note:**
>
> You must extract the image software into the directory where you want your Grid home to be located, and then run the `%ORACLE_HOME%\setup.exe` script to start the Oracle Grid Infrastructure Setup Wizard. Ensure that the Grid home directory path you create is in compliance with the Oracle Optimal Flexible Architecture recommendations.

Setup Wizard Installation Options for Creating Images

Gold image-creation options to use with your Oracle Database or Oracle Grid Infrastructure installation setup wizards.

In image-based installations, you can start your Oracle Database installation or Oracle Grid Infrastructure installation by running the setup wizard `setup.exe`. This wizard comes with the following image-creation options:

> **Note:**
>
> `setup.exe` is the recommended setup wizard for installing both Oracle Database and Oracle Grid Infrastructure.

Table 8-1 Image-Creation Options for Setup Wizard

Option	Description
`-createGoldImage`	Creates a gold image from the current Oracle home.
`-destinationLocation`	Specify the complete path, or location, where the gold image will be created.
`-exclFiles`	Specify the complete paths to the files to be excluded from the newly created gold image.
`–help`	Displays help for all the available options.

For example:

```
setup.exe -createGoldImage -destinationLocation c:\my_images
```

Where:

`c:\my_images` is the file location where the image zip file is created.

Installing Oracle Grid Infrastructure for a Standalone Server with a New Database Installation

Complete these steps to install Oracle Restart and then create a database that is managed by Oracle Restart.

Install Oracle Restart, which installs Oracle Restart and Oracle ASM, and creates one disk group.

1. Log in as the Oracle Restart software owner user (`grid`).
2. Download the Oracle Grid Infrastructure installation image files, create the Grid home directory, and extract the image files in this Grid home directory.

   For example:

   ```
   C:\> mkdir \app\oracle\product\21.0.0\grid
   C:\> icacls grid:oinstall \app\oracle\product\21.0.0\grid
   C:\> cd \app\oracle\product\21.0.0\grid
   C:\> unzip -q download_location\grid_home.zip
   ```

   > **Note:**
   >
   > Ensure that the Grid home directory path you create is in compliance with the Oracle Optimal Flexible Architecture recommendations. Also, unzip the installation image files only in this Grid home directory that you created.

3. Run `setup.exe` to start the Oracle Grid Infrastructure installation wizard.

   ```
   C:> Grid_home\setup.exe
   ```

> **Note:**
>
> You can use the `gridSetup.exe` command with the `-applyRU` and `-applyOneOffs` options to install Release Updates (RUs) and one-off patches during an Oracle Grid Infrastructure installation or upgrade.

4. In the Select Configuration Option screen, select the **Configure Oracle Restart** option to install and configure Oracle Restart and Oracle ASM. Click **Next.**
5. During installation, disk paths mounted on Oracle ASM and registered on Oracle ASMFD with the string `ORCL:*` are listed as default database storage candidate disks.
6. Configure Oracle ASM as needed with additional disk groups.
   - The default Disk Group Name is DATA. You can enter a new name for the disk group, or use the default name.
   - Any additional disk devices that you create must be owned by the user performing the grid installation.
7. Respond to the configuration prompts as needed to configure Oracle Grid Infrastructure. Click **Help** for information.
8. Provide information to automate root scripts, or run scripts as root when prompted by Oracle Universal Installer.

   If you configure automation for running root scripts, and a root script fails, then you can fix the problem manually, and click **Retry** to run the root script again
9. Start the Oracle Database installation, and select Oracle ASM disk groups for Oracle Database files storage. For assistance during installation, click **Help** on the Oracle Universal Installer page where you need more information.

Installing Oracle Grid Infrastructure for a Standalone Server for an Existing Database

Follow the high-level instructions in this section to install Oracle Grid Infrastructure and configure it for an existing Oracle database.

Oracle Restart can manage resources from the same release and releases up to one version lower than Oracle Restart. For this reason, you can install Oracle Restart to provide services only for Oracle Database 21c. However, previous release Oracle Databases can coexist on the same server without being managed by Oracle Restart.

To install Oracle Restart for a database that is already installed:

1. On the same host computer as the database, install Oracle Restart, and select **Configure Oracle Grid Infrastructure for a Standalone Server (Oracle Restart)** as the installation option. See, Installing Oracle Restart with a New Database Installation in *Oracle Database Installation Guide.*

   The Oracle Restart components are installed in an Oracle Grid Infrastructure Oracle home (Grid home), which is in a different location from existing Oracle Database homes.
2. If you have an existing Oracle Database, then register it for High Availability with Oracle Restart using the `srvctl` command:*DRIVE_LETTER*:\> cd *ORACLE_HOME*\bin *DRIVE_LETTER*:\> srvctl add database -db *dbname* -o *oracle_home_path*

Installing Oracle Grid Infrastructure for a Standalone Server Using a Software-Only Installation

A software-only installation only installs the Oracle Restart binaries at the specified location. You must complete a few manual configuration steps to enable Oracle Grid Infrastructure after you install the software.

> **Note:**
>
> Oracle recommends that only advanced users perform the software-only installation, because this installation method provides no validation of the installation and this installation option requires manual postinstallation steps to enable the Oracle Restart software.

- Installing Software Binaries for Oracle Grid Infrastructure for a Standalone Server
  Use this procedure to do a software-only installation of Oracle Grid Infrastructure for a standalone server.
- Configuring Software Binaries for Oracle Grid Infrastructure for a Standalone Server
  Use this procedure to configure and activate a software-only Oracle Restart without Oracle Automatic Storage Management (Oracle ASM).

Installing Software Binaries for Oracle Grid Infrastructure for a Standalone Server

Use this procedure to do a software-only installation of Oracle Grid Infrastructure for a standalone server.

1. Log in to Windows as an Administrator user.
2. Download the Oracle Grid Infrastructure installation image files, create the Grid home directory, and extract the image files in this Grid home directory.

   For example:

   ```
   C:\> mkdir \app\oracle\product\21.0.0\grid
   C:\> cd \app\oracle\product\21.0.0\grid
   C:\> unzip -q download_location\grid.zip
   ```

3. Verify that the server meets the installation requirements using the command `runcluvfy.bat stage -pre hacfg`. Ensure that you have completed all storage and server preinstallation requirements.

   For Example:

   ```
   C:\> app\oracle\product\21.0.0\grid\runcluvfy.bat
   ```

4. Log in as the Oracle Restart software owner user and run `setup.exe` to start the Oracle Grid Infrastructure installation wizard.

   ```
   C:\> app\oracle\product\21.0.0\grid\setup.exe
   ```

5. In the Select Configuration Option screen, select the **Set Up Software Only** option to perform a software-only installation of Oracle Restart. Click **Next**.
6. Respond to the prompts as needed to set up Oracle Grid Infrastructure. Click **Help** for information.

Configuring Software Binaries for Oracle Grid Infrastructure for a Standalone Server

Use this procedure to configure and activate a software-only Oracle Restart without Oracle Automatic Storage Management (Oracle ASM).

1. Log in as a member of the Administrators group and run the `roothas.bat -verbose` script from the *Grid_home*, using the following syntax:

   ```
   DRIVE_LETTER:\Grid_home\crs\install>roothas.bat -verbose
   ```

   For example, if your Grid home is `C:\app\oracle\product\21.0.0\grid`, then run the following script:

   ```
   C:\app\oracle\product\21.0.0\grid\crs\install\roothas.bat -verbose
   ```

2. Change the home directory to the path of the Oracle Restart home as follows:

   Grid_home`\oui\bin`, where *Grid_home* is the path of the Oracle Restart home.

3. Enter the following command:

   ```
   setup.exe -updateNodeList ORACLE_HOME=Grid_home
   CLUSTER_NODES= CRS=TRUE
   ```

   For example:

   ```
   C:\app\oracle\product\21.0.0\grid> setup.exe -updateNodeList
   ORACLE_HOME=C:\app\oracle\product\21.0.0\grid
   CLUSTER_NODES= CRS=TRUE
   ```

4. Use the `SRVCTL` utility along with Network Configuration Assistant and Oracle Automatic Storage Management Configuration Assistant to add the listener, the Oracle Automatic Storage Management instance, and all Oracle Automatic Storage Management disk groups to the Oracle Restart configuration.

Related Topics

- *Oracle Database Net Services Administrator's Guide*
- *Oracle Automatic Storage Management Administrator's Guide*
- *Oracle Database Administrator's Guide*

Testing the Oracle Automatic Storage Management Installation

After installing Oracle Grid Infrastructure for a single instance, use the ASMCMD command-line utility to test the Oracle ASM installation.

To test the Oracle Automatic Storage Management installation:

1. Use SQL*Plus to connect to the Oracle Automatic Storage Management instance as the `SYS` user with `SYSASM` privilege and start the instance if necessary:

   ```
   DRIVE_LETTER:\>sqlplus /nolog
   SQL> CONNECT SYS as SYSASM
   ```

```
Enter password: SYS_password
SQL> STARTUP
```

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

```
SQL> SELECT NAME,TYPE,TOTAL_MB,FREE_MB FROM V$ASM_DISKGROUP;
```

Related Topics

- *Oracle Automatic Storage Management Administrator's Guide*

Modifying Oracle Grid Infrastructure for a Standalone Server Binaries After Installation

After installation, you must first stop the Oracle Restart stack to modify the software installed in your Grid home.

For example, to apply a one-off patch or modify any of the DLLs used by Oracle Restart or Oracle ASM, you must follow these steps to stop and restart the Oracle Restart stack.

> **Caution:**
>
> Before relinking executables, you must shut down all executables that run in the Oracle home directory that you are relinking. In addition, shut down applications linked with Oracle shared libraries.

Prepare the Oracle Restart home for modification using the following procedure:

1. Log in using a member of the Administrators group and go to the directory *Grid_home*\bin, where *Grid_home* is the path to the Oracle Restart home.
2. Shut down the Oracle Restart stack using the following command:

   ```
   DRIVE_LETTER:\Grid_home\bin> crsctl stop has -f
   ```

   Alternatively, you can use the `roothas.bat` script to stop Oracle Restart, as shown in the following example:

   ```
   DRIVE_LETTER:\Grid_home\crs\install> roothas.bat -unlock
   ```

   > **Note:**
   >
   > Starting with Oracle Database 12*c* Release 1 (12.1.0.2), the `roothas.bat` script replaces the `roothas.pl` script in the Oracle Grid Infrastructure home.

   The `roothas.bat` script stops Oracle Restart and then verifies that it is stopped.
3. After the Oracle Restart stack is completely shut down, perform the changes to the software installed in the Grid home.

   Apply the patches using `opatch apply`.
4. Lock the Grid home:

```
DRIVE_LETTER:\Grid_home\crs\install>roothas.bat -lock
```

5. Use the following command to restart the Oracle Restart stack:

```
DRIVE_LETTER:\Grid_home\bin> crsctl start has
```

Applying Patches During an Oracle Grid Infrastructure Installation or Upgrade

Starting with Oracle Grid Infrastructure 18c, you can download and apply Release Updates (RUs) and one-off patches during an Oracle Grid Infrastructure installation or upgrade.

1. Download the patches you want to apply from My Oracle Support:

   https://support.oracle.com

2. Select the **Patches and Updates** tab to locate the patch.

   Oracle recommends that you select **Recommended Patch Advisor**, and enter the product group, release, and platform for your software.

3. Move the patches to an accessible directory like `/tmp`.

4. Change to the Oracle Grid Infrastructure home directory:

   ```
   C:\>cd C:\app\oracle\product\21.0.0\
   ```

5. Apply Release Updates (RUs) and any one-off patches during the installation or upgrade process:

   ```
   gridSetup.bat -applyRU patch_directory_location -applyOneOffs
   comma_seperated_list_of_patch_directory_locations
   ```

   > **Note:**
   >
   > You can apply RUs and one-off patches separately or together in the same command.

6. Complete the remaining steps in the Oracle Grid Infrastructure configuration wizard to complete the installation or upgrade.

9

Installing Oracle Database

Oracle Database and Oracle Grid Infrastructure installation software is available as image-based zip files and can be installed using several options.

You can download Oracle Database software from the Oracle website or the Oracle Software Delivery Cloud portal. In most cases, you use the graphical user interface (GUI) provided by Oracle Universal Installer to install the software. However, you can also run silent mode installations, without using the GUI. You can also use Oracle Fleet Patching and Provisioning for Oracle Database and Oracle Grid Infrastructure (clusterware) deployments.

Oracle Database software may be available on installation media on-demand.

> **Note:**
>
> To install Oracle Database files on Oracle Automatic Storage Management (Oracle ASM), you must first complete an Oracle Grid Infrastructure for a standalone server installation. Oracle Grid Infrastructure for a standalone server includes Oracle Restart and Oracle ASM.
>
> To upgrade an existing Oracle ASM installation, upgrade Oracle ASM by running an Oracle Grid Infrastructure upgrade. If you do not have Oracle ASM installed and you want to use Oracle ASM as your storage option, then you must complete an Oracle Grid Infrastructure for a standalone server installation before you start your Oracle Database installation.
>
> You cannot use Oracle Universal Installer from an earlier Oracle release to install components from this release.

- About Image-Based Oracle Database Installation
  Understand image-based installation to simplify installation and configuration of Oracle Database software.
- Downloading Oracle Software
  Select the method you want to use to download the software.
- About Character Set Selection During Installation
  Before you create the database, decide the character set that you want to use.
- Installing the Oracle Database Software
  These topics explain how to run Oracle Universal Installer to perform most database installations.
- Installing Standard Edition High Availability
  Learn how to Install high availability on Oracle Database Standard Edition 2.

About Image-Based Oracle Database Installation

Understand image-based installation to simplify installation and configuration of Oracle Database software.

To install Oracle Database, create the new Oracle home, extract the image file into the newly-created Oracle home, and run the setup wizard to register the Oracle Database product.

Using image-based installation, you can install and upgrade Oracle Database for single-instance and cluster configurations.

This installation feature streamlines the installation process and supports automation of large-scale custom deployments. You can also use this installation method for deployment of customized images, after you patch the base-release software with the necessary Release Updates (Updates) or Release Update Revisions (Revisions).

> **Note:**
>
> You must extract the image software (`db_home.zip`) into the directory where you want your Oracle Database home to be located, and then run the Oracle Database Setup Wizard to start the Oracle Database installation and configuration. Oracle recommends that the Oracle home directory path you create is in compliance with the Oracle Optimal Flexible Architecture recommendations.

Downloading Oracle Software

Select the method you want to use to download the software.

You can download Oracle Database software from the Oracle website or the Oracle Software Delivery Cloud portal and extract them on your hard disk. Ensure that you review and understand the terms of the license.

- Downloading the Installation Archive Files from the Oracle Database Website
  Download the installation archive files from the Oracle Database downloads page.
- Downloading the Software from Oracle Software Delivery Cloud Portal
  You can download the software from Oracle Software Delivery Cloud.

Downloading the Installation Archive Files from the Oracle Database Website

Download the installation archive files from the Oracle Database downloads page.

1. Use any browser to access the Oracle Database software downloads page:

   https://www.oracle.com/database/technologies/oracle-database-software-downloads.html
2. Go to the download page for the product to install.
3. On the download page, identify the required disk space by adding the file sizes for each required file.

   The file sizes are listed next to the file names.
4. Select a file system with enough free space to store and expand the archive files.

   In most cases, the available disk space must be at least twice the size of all of the archive files.
5. On the file system, create a parent directory for each product (for example, `OraDB21c`) to hold the installation directories.
6. Download all of the installation archive files to the directory you created for the product.

> **Note:**
>
> For Oracle Database Client installations, there are two installation archive files available for download. The first file is the client installation binary and the second file is a client gold image file. Download the appropriate zip file based on the type of installation you want to perform.

7. Verify that the files you downloaded are the same size as the corresponding files on the Oracle website. Also verify the checksums are the same as noted on the Oracle website using a command similar to the following, where *filename* is the name of the file you downloaded:

   ```
   cksum filename.zip
   ```

8. Extract the files in each directory that you just created.

Downloading the Software from Oracle Software Delivery Cloud Portal

You can download the software from Oracle Software Delivery Cloud.

1. Use a browser to access the Oracle Software Delivery Cloud portal:

   https://edelivery.oracle.com/

2. Click **Sign In** and enter your Oracle account username and password.
3. Type **Oracle Database** in the search bar. Click the **Add to Cart** button corresponding to the Oracle Database version that you want to download
4. In the Checkout page, click **Checkout** and deselect any products that you do not want to download.
5. Select the operating system platform on which you want to install the software from the **Platform/Languages** column.
6. Click **Continue**.
7. Review the license agreement.
8. Select the **I reviewed and accept the Oracle License Agreement** checkbox. Click **Continue**.
9. Click **Download** to start downloading the software.
10. After you download the files, click **View Digest** to verify that the checksum matches the value listed on the download page.

About Character Set Selection During Installation

Before you create the database, decide the character set that you want to use.

After a database is created, changing its character set is usually very expensive in terms of time and resources. Such operations may require converting all character data by exporting the whole database and importing it back. Therefore, it is important that you carefully select the database character set at installation time.

Oracle Database uses character sets for the following:

- Data stored in SQL character data types (`CHAR`, `VARCHAR2`, `CLOB`, and `LONG`).

- Identifiers such as table names, column names, and PL/SQL variables.
- Stored SQL and PL/SQL source code, including text literals embedded in this code.

The default database character set of a database created from the General Purpose/ Transaction Processing or the Data Warehousing template is Unicode `AL32UTF8`.

Unicode is the universal character set that supports most of the currently spoken languages of the world. It also supports many historical scripts (alphabets). Unicode is the native encoding of many technologies, including Java, XML, XHTML, ECMAScript, and LDAP. Unicode is ideally suited for databases supporting the Internet and the global economy.

Because `AL32UTF8` is a multibyte character set, it requires slightly more CPU time for text processing compared to single-byte character sets. Also, storage space requirements are higher for text in most languages compared to corresponding legacy character sets. However, the universality and flexibility of Unicode that enables easy addition of data in new languages to applications running in an `AL32UTF8` database generally outweighs these additional costs.

The database character set of an Oracle Database, that is, of its `CDB$ROOT` container, determines which pluggable databases (PDBs) can be plugged into it. If you use Unicode `AL32UTF8` as your database character set, then you can plug in a PDB in any database character set supported by Oracle Database (with the exception of `EBCDIC`-based character sets). If you use any character set other than `AL32UTF8` when creating the container database, you will be able to plug in PDBs in the same character set only. Therefore, you should generally use the default option for the database character set when installing a new database.

If you need to deploy PDBs in a given legacy character set to fulfill a specific compatibility, storage, or performance requirement, create a temporary container database in this legacy character set with one empty PDB. This PDB will have the same legacy database character set. Then, unplug this PDB and plug it into the target `AL32UTF8` container database. Drop the temporary container database. You can use such a plugged-in PDB as a template to clone further PDBs in the same legacy character set as needed. You can use the same method to add further legacy character set template PDBs to the same `AL32UTF8` container database, as required.

> **See Also:**
>
> *Oracle Database Globalization Support Guide* for more information about choosing a database character set for an Oracle Database.

Installing the Oracle Database Software

These topics explain how to run Oracle Universal Installer to perform most database installations.

> **Note:**
>
> - If you plan to use Oracle Restart or Oracle ASM, then you must install Oracle Grid Infrastructure for a standalone server before you install and create the database. Otherwise, you must manually register the database with Oracle Restart.
> - You can install Oracle Database by using the silent or response file installation method, without the GUI. This method is useful to perform multiple installations of Oracle Database.

- Setup Wizard Installation Options for Creating Images
  Gold image-creation options to use with your Oracle Database or Oracle Grid Infrastructure installation setup wizards.
- Applying Patches During an Oracle Database Installation or Upgrade
  Starting with Oracle Database 18c, you can download and apply Release Updates (RUs) during an Oracle Database installation or upgrade.
- Running Oracle Universal Installer to Install Oracle Database
  Extract the database image files and use the runInstaller command to start the installation.

Setup Wizard Installation Options for Creating Images

Gold image-creation options to use with your Oracle Database or Oracle Grid Infrastructure installation setup wizards.

In image-based installations, you can start your Oracle Database installation or Oracle Grid Infrastructure installation by running the setup wizard `setup.exe`. This wizard comes with the following image-creation options:

> **Note:**
>
> `setup.exe` is the recommended setup wizard for installing both Oracle Database and Oracle Grid Infrastructure.

Table 9-1 Image-Creation Options for Setup Wizard

Option	Description
`-createGoldImage`	Creates a gold image from the current Oracle home.
`-destinationLocation`	Specify the complete path, or location, where the gold image will be created.
`-exclFiles`	Specify the complete paths to the files to be excluded from the newly created gold image.
`–help`	Displays help for all the available options.

For example:

```
setup.exe -createGoldImage -destinationLocation c:\my_images
```

Where:

`c:\my_images` is the file location where the image zip file is created.

Applying Patches During an Oracle Database Installation or Upgrade

Starting with Oracle Database 18c, you can download and apply Release Updates (RUs) during an Oracle Database installation or upgrade.

1. Download the patches you want to apply from My Oracle Support:

   https://support.oracle.com

2. Select the **Patches and Updates** tab to locate the patch.

   Oracle recommends that you select **Recommended Patch Advisor**, and enter the product group, release, and platform for your software.

3. Move the patches to an accessible directory like `/tmp`.

4. Change to the Oracle Database home directory:

   ```
   C:\>cd C:\app\oracle\product\21.0.0\
   ```

5. Apply Release Updates (RUs) during the installation or upgrade process:

   ```
   gridSetup.bat -applyRU patch_directory_location
   ```

6. Complete the remaining steps in the Oracle Database configuration wizard to complete the installation or upgrade.

Running Oracle Universal Installer to Install Oracle Database

Extract the database image files and use the runInstaller command to start the installation.

Have all the information you need to provide regarding users groups, and storage paths before you start installation. Oracle recommends that you have your My Oracle Support credentials available during installation.

1. Login as an `Administrator` user. Follow the Oracle Optimal Flexible Architecture (OFA) recommendations and specify the correct owner, group, and permissions for this directory.

   ```
   C:\>md C:\app\oracle
   C:\>icacls oracle:oinstall C:\app\oracle
   ```

   If you are installing on a Primary Domain Controller (PDC) or a Backup Domain Controller (BDC), log on as a member of the Domain Administrators group.

2. If you are installing Oracle Database on a computer with multiple Network Interface Cards or multiple aliases, use **System** in the Control Panel to create the `ORACLE_HOSTNAME` system environment variable. Set this variable to point to the host name of the computer on which you are installing Oracle Database.

3. Log in to the Oracle Database server as the Oracle Database software owner user (`oracle`).

4. Download the Oracle Database 21c release 21.3 installation image file (`db_home.zip`) from Oracle Software Delivery Cloud website to a directory of your choice.

   https://edelivery.oracle.com/

5. Create an OFA-compliant Oracle home directory on the local file system and extract the image files that you have downloaded in to this Oracle home directory. For example:

```
C:\>md C:\app\oracle\product\21.0.0\dbhome_1
C:\>cd C:\app\oracle\product\21.0.0\dbhome_1
C:\app\oracle\product\21.0.0\dbhome_1> unzip \tmp\db_home.zip
```

6. From the Oracle home directory, run the `setup.exe` command to start the Oracle Database Setup Wizard.

   Starting with Oracle Database 21c, installation of non-CDB Oracle Database architecture is no longer supported.

   The non-CDB architecture was deprecated in Oracle Database 12c. It is desupported in Oracle Database 21c. Oracle Universal Installer can no longer be used to create non-CDB Oracle Database instances.

```
C:\app\oracle\product\21.0.0\dbhome_1>setup.exe
```

> **Note:**
>
> Run the `setup.exe` command from the Oracle home directory only. Do not use the `setup.exe` command that resides at `%ORACLE_HOME%\oui\bin\`, or any other location, to install Oracle Database.

7. In the Select Configuration Option screen, select **Set Up Software Only**.
8. In the Select Database Installation Option screen, select **Single instance database installation**.
9. In the Select Database Edition screen, select **Enterprise Edition**.
10. Respond to the configuration prompts as needed.

> **Note:**
>
> Click **Help** if you have any questions about the information you are asked to submit during installation.

11. When the Configuration Assistant tasks are complete, click **Finish**, click **Exit**, then click **Yes** to exit from Oracle Universal Installer.
12. See for information about tasks that you must complete after you have installed Oracle Database.

Installing Standard Edition High Availability

Learn how to Install high availability on Oracle Database Standard Edition 2.

- About Standard Edition High Availability
  In this release, you can install Oracle Database Standard Edition 2 in high availability mode.
- Requirements for Installing Standard Edition High Availability
  Review these requirements before you install and deploy the Standard Edition High Availability feature.

- Deploying Standard Edition High Availability
  Learn the process and options to deploy high availability on Oracle Database Standard Edition 2.

About Standard Edition High Availability

In this release, you can install Oracle Database Standard Edition 2 in high availability mode.

Standard Edition High Availability provides cluster-based failover for single-instance Standard Edition Oracle Databases using Oracle Clusterware.

Oracle Standard Edition High Availability benefits from the cluster capabilities and storage solutions that are already part of Oracle Grid Infrastructure, such as Oracle Clusterware, and Oracle Automatic Storage Management (Oracle ASM).

Using integrated, shared, and concurrently mounted storage, such as Oracle ASM for database files as well as for unstructured data, enables Oracle Grid Infrastructure to restart an Oracle Database on a failover node much faster than any cluster solution that relies on failing over and remounting volumes and file systems.

Standard Edition High Availability is supported on Linux x86-64, Microsoft Windows, and HP-UX Itanium.

> **Note:**
>
> This section is specific to Standard Edition High Availability, which provides cluster-based database failover for Standard Edition Oracle Databases 21c and later. For more information about high availability options for Oracle Database, see *Oracle Clusterware Administration and Deployment Guide*.

Requirements for Installing Standard Edition High Availability

Review these requirements before you install and deploy the Standard Edition High Availability feature.

- You must configure Standard Edition High Availability using at least two nodes of a cluster running Oracle Grid Infrastructure 21c or later for Standalone Cluster.
- You must configure Standard Edition High Availability using Oracle Database home of version 21c or later.

  > **Note:**
  >
  > When updating your Oracle Database home using 21c or later, ensure that you apply the Oracle Clusterware (OCW) RU of the same version to the Oracle Database home.

- Ensure that all cluster nodes on which you plan to install Oracle Database have the same operating system users, groups, and resource limits for the database software owner.
- You must store the Oracle Database binaries only on local storage.
- You must store the Oracle Database data files only on Oracle ASM.

- You must have the same single-instance Standard Edition 2 installation and updates on each node. You must also use the same Oracle base and Oracle home directory structure on each node.
- You must perform the same Oracle home operations on all the nodes.
- You must use an SPFILE for the database instance initialization parameters and a database password file stored for the database instance initialization parameters in Oracle ASM. This approach ensures that the parameters are consistent across all nodes and the password file is available after a failover or a relocation.
- You must register the Standard Edition 2 single-instance database with SCAN listeners as remote listener and node listeners as local listener.

Deploying Standard Edition High Availability

Learn the process and options to deploy high availability on Oracle Database Standard Edition 2.

After installing Oracle Clusterware, as described in *Oracle Grid Infrastructure Installation and Upgrade Guide* for your platform, install single instance Standard Edition 2 Oracle Database software on the cluster nodes on which you want to configure Standard Edition High Availability.

- Installing Standard Edition High Availability Database Software on Local File System
  You can install Oracle Database software binaries on a local file system to enable the Oracle Database Standard Edition high availability feature.
- Creating a Standard Edition High Availability Database Using Oracle DBCA
  Starting with Oracle Database 23ai, you can use Oracle DBCA to create a Standard Edition High Availability database.

Related Topics

- *Oracle Grid Infrastructure Installation and Upgrade Guide for Microsoft Windows*
- Managing Standard Edition High Availability

Installing Standard Edition High Availability Database Software on Local File System

You can install Oracle Database software binaries on a local file system to enable the Oracle Database Standard Edition high availability feature.

Ensure that all the cluster nodes, on which you plan to configure Standard Edition High Availability, have the same operating system configuration, database users, database groups, resource limits, and SSH equivalence for the Oracle Database software owner user (`oracle`).

Before you start the installation, have all the information you need about users, groups, and storage paths. You should also be prepared to run root scripts or provide information to automate root scripts.

1. As the `Administrator` user, log into the first cluster node on which you want to configure Standard Edition High Availability and create the Oracle base directory on the local file system. Follow the Oracle Optimal Flexible Architecture (OFA) recommendations and specify the correct owner, group, and permissions for this directory.

   ```
   C:\>md C:\app\oracle
   C:\>icacls oracle:oinstall C:\app\oracle
   ```

2. Log in to the first cluster node as the Oracle Database software owner user (`oracle`).

3. Download the Oracle Database 21c release installation image file (`db_home.zip`) from Oracle Software Delivery Cloud website to a directory of your choice.

   https://edelivery.oracle.com/

4. Create an OFA-compliant Oracle home directory on the local file system and extract the image files that you have downloaded in to this Oracle home directory. For example:

   ```
   C:\>md C:\app\oracle\product\21.0.0\dbhome_1
   C:\>cd C:\app\oracle\product\21.0.0\dbhome_1
   C:\app\oracle\product\21.0.0\dbhome_1> unzip \tmp\db_home.zip
   ```

5. From the Oracle home directory, run the `setup.exe` command to start the Oracle Database Setup Wizard.

   ```
   C:\app\oracle\product\21.0.0\dbhome_1>setup.exe
   ```

   > **Note:**
   >
   > Run the `setup.exe` command from the Oracle home directory only. Do not use the `setup.exe` command that resides at `%ORACLE_HOME%\oui\bin\`, or any other location, to install Oracle Database.

6. In the Select Configuration Option screen, select **Set Up Software Only**.
7. In the Select Database Installation Option screen, select **Single instance database installation**.
8. In the Select Database Edition screen, select **Standard Edition 2**.
9. Respond to the configuration prompts as needed.
10. Provide information to automate root scripts, or run scripts as root when prompted by the setup wizard.

    If you configure automation for running root scripts, and a root script fails, then you can fix the problem manually, and click Retry to run the root script again.

    > **Note:**
    >
    > Click **Help** if you have any questions about the information you are asked to submit during installation.

11. As the `Administrator` user, create the Oracle base directory on all of the other cluster nodes on which you want to configure Standard Edition High Availability.

    ```
    C:\>md C:\app\oracle
    C:\>icacls oracle:oinstall C:\app\oracle
    ```

12. As the `oracle` user, run the `addnode.bat` script from the first node to perform the following operations on the other nodes on which you want to configure Standard Edition High Availability:

    - Copy the Oracle home directory from the first node to the other nodes.

- Setup Oracle base, Oracle inventory directories, and Oracle DB registry keys on the other nodes.

```
C:\>%ORACLE_HOME%\addnode\addnode.bat -silent
CLUSTER_NEW_NODES=comma_separated_list_of_other_nodes
```

13. If you specify a non built-in and a non Administrator's user account while installing Oracle Database, then add the respective user's password to the CRS wallet using the following command:

```
crsctl add wallet -type OSUSER -user DB service user name -password
```

After the Oracle Database software installation is complete, use Oracle Database Configuration Assistant (Oracle DBCA), in either interactive or silent mode, to create a Standard Edition database on the first cluster node on which you installed the Oracle Database software.

For more information about the requirements for creating a database, and the procedure for enabling and configuring Standard Edition High Availability for Oracle Databases, refer to *Oracle Multitenant Administrator's Guide*

Related Topics

- *Oracle Grid Infrastructure Installation and Upgrade Guide for Microsoft Windows*
- *Creating a Database with Oracle DBCA*

Creating a Standard Edition High Availability Database Using Oracle DBCA

Starting with Oracle Database 23ai, you can use Oracle DBCA to create a Standard Edition High Availability database.

After you complete installing Standard Edition High Availability database software you can use Oracle DBCA, in either interactive or silent mode, to create a single-instance Oracle Database.

1. Start Oracle Database Configuration Assistant (Oracle DBCA).

```
cd ORACLE_HOME\bin
         dbca
```

2. In the **Select Database Operation** screen, select **Create a database** and click **Next.**
3. In the **Select Database Creation Mode** screen, select **Advanced configuration** and click **Next.**
4. In the **Select Database Deployment type** screen, select **Oracle Standard Edition HA database**, as the Database type. Select **Automatic** as the Database Management policy, and select an appropriate template for your database. Click **Next.**
5. In the **Select List of Nodes** screen, select all the nodes on which you want to create the Standard Edition High Availability database. Click **Next** to continue.
6. Respond to the configuration screens and prompts as needed to complete the database creation process. Configuration screens vary depending on the configuration option that you select.

> **Note:**
>
> Click **Help** if you have any questions about the information you are asked to submit during database creation.

Related Topics

- *Oracle Multitenant Administrator's Guide*

10

Configuring Oracle Homes

Understand how read-only Oracle homes work and how you can configure read-only Oracle homes.

- Evolution of Oracle Homes
  Learn about read-only Oracle home concepts like `ORACLE_BASE_HOME` and `ORACLE_BASE_CONFIG`.
- File Path and Directory Changes in Read-Only Oracle Homes
  Examples of hierarchical file mappings in a read-only Oracle home as compared to a read/write Oracle home.
- Determining if an Oracle Home is Read-Only
  By default, an Oracle Database installation configures all Oracle Database homes in a read-only mode. You can use the Registry Editor to determine if your Oracle home is a read-only Oracle home.

Evolution of Oracle Homes

Learn about read-only Oracle home concepts like `ORACLE_BASE_HOME` and `ORACLE_BASE_CONFIG`.

- About Read-Only Oracle Homes
  Starting with Oracle Database 21c, an Oracle Database installation configures all Oracle Database homes in read-only mode by default.
- About Oracle Base Homes
  In a read-only ORACLE_HOME, the user-specific files, instance-specific files, and log files reside in a location known as the ORACLE_BASE_HOME.
- About Oracle Base Config
  In a read-only ORACLE_HOME, the configuration files reside in a location known as ORACLE_BASE_CONFIG.

About Read-Only Oracle Homes

Starting with Oracle Database 21c, an Oracle Database installation configures all Oracle Database homes in read-only mode by default.

A read-only Oracle Home simplifies provisioning by implementing separation of installation and configuration.

Before Oracle Database 21c, the default `ORACLE_HOME` layout combined `ORACLE_HOME`, `ORACLE_BASE_HOME` and `ORACLE_BASE_CONFIG` into a single location. Starting with Oracle Database 21c, the only available configuration is a read-only `ORACLE_HOME` where `ORACLE_BASE_HOME` and `ORACLE_BASE_CONFIG` are located separately from `ORACLE_HOME`.

In a read-only Oracle home, all the configuration data and log files reside outside of the read-only Oracle home.

Apart from the traditional `ORACLE_BASE` and `ORACLE_HOME` directories, the following directories contain files that used to be in `ORACLE_HOME`:

- ORACLE_BASE_HOME
- ORACLE_BASE_CONFIG

> **Note:**
>
> This feature does not affect how database administrators monitor, diagnose, and tune their system performance.

About Oracle Base Homes

In a read-only ORACLE_HOME, the user-specific files, instance-specific files, and log files reside in a location known as the ORACLE_BASE_HOME.

Starting with Oracle Database 21c, the only available configuration is a read-only ORACLE_HOME where ORACLE_BASE_HOME and ORACLE_BASE_CONFIG are located separately from ORACLE_HOME.

In a read-only ORACLE_HOME, the ORACLE_BASE_HOME directory is not co-located with ORACLE_HOME but is located at `ORACLE_BASE\homes\HOME_NAME`.

Where, HOME_NAME is the internal name for ORACLE_HOME.

For example, the networking directories `network\admin`, `network\trace`, and `network\log` are located in the ORACLE_BASE_HOME directory. In a read-only ORACLE_HOME, the networking directories are located in `ORACLE_BASE\homes\HOME_NAME`.

To print the ORACLE_BASE_HOME path, run the `orabasehome` command from the `%ORACLE_HOME%\bin` directory:

```
C:\> set ORACLE_HOME=C:\app\oracle\product\21.0.0\dbhome_1
C:\> cd %ORACLE_HOME%\bin
orabasehome
```

For example:

```
orabasehome
C:\app\oracle\homes\OraDB21Home1
```

Where, `C:\app\oracle` is ORACLE_BASE and `OraDB21Home1` is HOME_NAME

About Oracle Base Config

In a read-only ORACLE_HOME, the configuration files reside in a location known as ORACLE_BASE_CONFIG.

Starting with Oracle Database 21c, the only available configuration is a read-only ORACLE_HOME where ORACLE_BASE_HOME and ORACLE_BASE_CONFIG are located separately from ORACLE_HOME.

In a read-only ORACLE_HOME, the ORACLE_BASE_CONFIG path is the same as ORACLE_BASE.

`ORACLE_BASE_CONFIG\database` contains the configuration files for ORACLE_HOME. Each file in the `database` directory contains ORACLE_SID so that the directory can be shared by many different ORACLE_SIDs.

To print the ORACLE_BASE_CONFIG path, run the `orabaseconfig` command from the `%ORACLE_HOME%\bin` directory:

```
C:\> set ORACLE_HOME=C:\app\oracle\product\21.0.0\dbhome_1
C:\> cd %ORACLE_HOME%\bin
orabaseconfig
```

For example:

```
orabaseconfig
C:\> C:\app\oracle
```

Where, `C:\app\oracle` is ORACLE_BASE.

File Path and Directory Changes in Read-Only Oracle Homes

Examples of hierarchical file mappings in a read-only Oracle home as compared to a read/write Oracle home.

Prior to Oracle Database 21c, the default ORACLE_HOME layout combined ORACLE_HOME, ORACLE_BASE_HOME and ORACLE_BASE_CONFIG into a single location. Starting with Oracle Database 21c, the only available configuration is a read-only ORACLE_HOME where ORACLE_BASE_HOME and ORACLE_BASE_CONFIG are located separately from ORACLE_HOME.

This example shows an Optimal Flexible Architecture-compliant Oracle Database installation, for the user `oracle`, with the ORACLE_HOME, ORACLE_BASE, ORACLE_BASE_HOME, and ORACLE_BASE_CONFIG logical locations. The database files are under `oraclebase\oradata`.

This example also shows the changes in the Oracle Database software defined paths of configuration files, log files, and other directories in a read-only Oracle home when compared to a read/write Oracle home.

Table 10-1 read/write and Read-Only Oracle Home File Path Examples

Directory	Read/Write Oracle Home File Path (before 21c)	Read-Only Oracle Home File Path (21c onwards)
ORACLE_HOME	`C:\app\oracle\product\19.0.0\dbhome_1`	`C:\app\oracle\product\21.0.0\dbhome_1`
ORACLE_BASE	`C:\app\oracle\`	`C:\app\oracle\`
ORACLE_BASE_HOME	ORACLE_HOME (or) `C:\app\oracle\product\19.0.0\dbhome_1`	ORACLE_BASE\homes\HOME_NAME. (or) `C:\app\oracle\homes\OraDB21Home1`

Table 10-1 (Cont.) read/write and Read-Only Oracle Home File Path Examples

Directory	Read/Write Oracle Home File Path (before 21c)	Read-Only Oracle Home File Path (21c onwards)
ORACLE_BASE_CONFIG	ORACLE_HOME (or) C:\app\oracle\product\19.0.0\dbhome_1	ORACLE_BASE (or) C:\app\oracle\
network	ORACLE_HOME\network\admin (or) C:\app\oracle\product\19.0.0\dbhome_1\network\admin	ORACLE_BASE_HOME\network\admin (or) C:\app\oracle\homes\OraDB21Home1\network\admin
database	ORACLE_HOME\database (or) C:\app\oracle\product\19.0.0\dbhome_1\database	ORACLE_BASE_CONFIG\database (or) C:\app\oracle\database
hs	ORACLE_HOME\hs\admin (or) C:\app\oracle\product\19.0.0\dbhome_1\hs\admin	ORACLE_BASE_HOME\hs\admin (or) C:\app\oracle\homes\OraDB21Home1\hs\admin
mgw	ORACLE_HOME\mgw\admin (or) C:\app\oracle\product\19.0.0\dbhome_1\mgw\admin	ORACLE_BASE_HOME\mgw\admin (or) C:\app\oracle\homes\OraDB21Home1\mgw\admin
drdaas	ORACLE_HOME\drdaas\admin (or) C:\app\oracle\product\19.0.0\dbhome_1\drdaas\admin	ORACLE_BASE_HOME\drdaas\admin (or) C:\app\oracle\homes\OraDB21Home1\drdaas\admin

- To print the ORACLE_BASE_HOME path, run:

```
C:\> set ORACLE_HOME=C:\app\oracle\product\21.0.0\dbhome_1
C:\> cd %ORACLE_HOME%\bin
orabasehome
```

- To print the ORACLE_BASE_CONFIG path, run:

```
C:\> set ORACLE_HOME=C:\app\oracle\product\21.0.0\dbhome_1
C:\> cd %ORACLE_HOME%\bin
orabaseconfig
```

Determining if an Oracle Home is Read-Only

By default, an Oracle Database installation configures all Oracle Database homes in a read-only mode. You can use the Registry Editor to determine if your Oracle home is a read-only Oracle home.

Start Registry Editor and navigate to the `ORACLE_HOME_READONLY` entry in the `HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE\KEY_`*`OracleHomeName`* Windows Registry key.

The default value for the `ORACLE_HOME_READONLY` parameter appears as `Y` in a read-only mode. Do not modify this value.

11

Oracle Database Postinstallation Tasks

Complete configuration tasks after you install Oracle Database.

Oracle recommends that you complete additional tasks immediately after installation. You must also complete product-specific configuration tasks before you use those products.

- Required Postinstallation Tasks
  Download and apply required patches for your software release after completing your initial installation.
- Recommended Postinstallation Tasks
  Oracle recommends that you complete these tasks after installation.
- Configuring Oracle Components
  Many Oracle products and options must be configured before you use them for the first time.
- Starting Oracle Enterprise Manager Database Express
  To start Oracle Enterprise Manager Database Express, use the EM Express URL provided by Oracle Database Configuration Assistant (Oracle DBCA) during the database installation and creation.
- Creating a Fast Recovery Area Disk Group
  During installation, by default you can create multiple disk groups.
- Checking the Installed Oracle Database Contents and Directory Location
  Use Oracle Universal Installer to check the contents and directory location of your Oracle Database installation.
- Changing the Oracle Home User Password
  Oracle Home User Control is a command-line utility that allows an administrator to update the password for an Oracle Home User.
- Cloning Oracle Database
  Cloning an Oracle home involves creating a copy of the Oracle home and then configuring it for a new environment.

Required Postinstallation Tasks

Download and apply required patches for your software release after completing your initial installation.

- Downloading Release Update Patches
  Download and install Release Updates (RU) and Release Update Revisions (RUR) patches for your Oracle software after you complete installation.
- Unlocking and Resetting User Passwords
  Passwords for all Oracle system administration accounts except `SYS`, `SYSTEM`, and `DBSNMP` are revoked after installation.

Downloading Release Update Patches

Download and install Release Updates (RU) and Release Update Revisions (RUR) patches for your Oracle software after you complete installation.

Starting with Oracle Database 18c, Oracle provides quarterly updates in the form of Release Updates (RU) and Release Update Revisions (RUR). Oracle no longer releases patch sets. For more information, see My Oracle Support Note 2285040.1.

Check the My Oracle Support website for required updates for your installation.

1. Use a web browser to view the My Oracle Support website:

   https://support.oracle.com

2. Log in to My Oracle Support website.

   > **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 **Patch Search** region, select **Product or Family (Advanced)**.
5. On the **Product or Family (Advanced)** display, provide information about the product, release, and platform for which you want to obtain patches, and click **Search**.

   The Patch Search pane opens, displaying the results of your search.

6. Select the patch number and click **ReadMe**.

   The README page is displayed. It contains information about the patch and how to apply the patches to your installation.

7. Uncompress the Oracle patch updates that you downloaded from My Oracle Support.

Related Topics

- My Oracle Support note 888.1
- Patch Delivery Methods for Oracle Database

Unlocking and Resetting User Passwords

Passwords for all Oracle system administration accounts except `SYS`, `SYSTEM`, and `DBSNMP` are revoked after installation.

Before you use a locked account, you must unlock it and reset its password. If you created a preconfigured database during the installation, but you did not unlock accounts required to use the database, then you must unlock and reset those accounts using these procedures.

Apply the following guidelines when specifying passwords:

- Passwords must be between 8 and 30 characters long.
- Passwords must not start with a numeral.
- Password cannot contain invalid characters: ! @ % ^ & * ( ) + = \ | ` ~ [{] } ; : ' " , < > ?
- Passwords must not be the same as the user name.

- Passwords must not be Oracle reserved words.
- The `SYSTEM` account password cannot be `manager`

  (case-insensitive).
- The `SYSMAN` account password cannot be `sysman`

  (case-insensitive).
- The `DBSNMP` account password cannot be `dbsnmp`

  (case-insensitive).
- If you choose to use the same password for all the accounts, then that password cannot be `manager`, `sysman`, or `dbsnmp`

  (case-insensitive).
- Passwords must have at least one alphabetic, one numeric, and one special character.
- Passwords must not be simple or obvious words, such as `welcome`, `account`, `database`, and `user`.

> **Note:**
>
> If you select the option to create the database as a multitenant container database, then you must provide the pluggable database administrator password.

If you created a starter database during the installation, but you did not unlock the required account, unlock the account using one of the following methods:

- Requirements for Database Password
  To secure your database, every password must satisfy the Oracle recommended password requirements, even the passwords for predefined user accounts.
- Oracle Database System Privileges Accounts and Passwords
  Review these system privileges accounts after installation in preparation for unlocking accounts and changing passwords.
- Using SQL*Plus to Unlock and Change Passwords
  Use this SQL*Plus procedure to unlock and reset user account passwords.

Related Topics

- *Oracle Database Administrator's Guide*

Requirements for Database Password

To secure your database, every password must satisfy the Oracle recommended password requirements, even the passwords for predefined user accounts.

Oracle Database provides a set of predefined user accounts. You must create passwords in a secure fashion. If you have default passwords, you must change these.

You can manage the security for Oracle Database users by enforcing restrictions on the passwords that are created, creating user profiles, and using user resource limits to further secure user accounts.

Related Topics

- *Oracle Database Security Guide*

Oracle Database System Privileges Accounts and Passwords

Review these system privileges accounts after installation in preparation for unlocking accounts and changing passwords.

All databases created by the Database Configuration Assistant (DBCA) include the `SYS`, `SYSTEM`, and `DBSNMP` database accounts. In addition, Oracle Database provides several other administrative accounts. Before using these accounts, you must unlock them and reset their passwords.

Starting with Oracle Database 21c, all sample schemas are distributed on GitHub:

https://github.com/oracle/db-sample-schemas

> **Note:**
>
> This list contains some of the important system privileges user accounts, but it is not complete. Use Oracle Enterprise Manager Database Express to view the complete list of database accounts.

Table 11-1 Partial List of Oracle Database System Privileges Accounts Locked After Installation

User Name	Description	For More Information
ANONYMOUS	Enables HTTP access to Oracle XML DB.	*Oracle XML DB Developer's Guide*
APEX_050100	The account that owns the Oracle Application Express schema and metadata.	*Oracle Application Express App Builder User's Guide*
APEX_PUBLIC_USER	The minimally privileged account used for Oracle Application Express configuration with Oracle Application Express Listener or Oracle HTTP Server and `mod_plsql`.	*Oracle Application Express App Builder User's Guide*
APPQOSSYS	Used for storing and managing all data and metadata required by Oracle Quality of Service Management.	None
AUDSYS	The account where the unified audit data trail resides.	*Oracle Database Security Guide*
CTXSYS	The Oracle Text account.	*Oracle Text Application Developer's Guide*
DBSFWUSER	The account used to run the DBMS_SFW_ACL_ADMIN package.	*Oracle Database PL/SQL Packages and Types Reference*
DBSNMP	The account used by the Management Agent component of Oracle Enterprise Manager to monitor and manage the database.	*Oracle Enterprise Manager Cloud Control Administrator's Guide*
DIP	The account used by the Directory Integration Platform (DIP) to synchronize the changes in Oracle Internet Directory with the applications in the database.	None

Table 11-1 (Cont.) Partial List of Oracle Database System Privileges Accounts Locked After Installation

User Name	Description	For More Information
DVSYS	There are two roles associated with this account. The Database Vault owner role manages the Database Vault roles and configurations. The Database Vault Account Manager is used to manage database user accounts. **Note**: Part of Oracle Database Vault user interface text is stored in database tables in the DVSYS schema. By default, only the English language is loaded into these tables. You can use the `DVSYS.DBMS_MACADM.ADD_NLS_DATA` procedure to add other languages to Oracle Database Vault.	*Oracle Database Vault Administrator's Guide*
DVF	The account owned by Database Vault that contains public functions to retrieve the Database Vault Factor values.	*Oracle Database Vault Administrator's Guide*
FLOWS_FILES	The account owns the Oracle Application Express uploaded files.	*Oracle Application Express App Builder User's Guide*
GGSYS	The internal account used by Oracle GoldenGate. It should not be unlocked or used for a database login.	None
GSMADMIN_INTERNAL	The internal account that owns the Global Data Services schema. It should not be unlocked or used for a database login.	*Oracle Database Global Data Services Concepts and Administration Guide*
GSMCATUSER	The account used by Global Service Manager to connect to the Global Data Services catalog.	*Oracle Database Global Data Services Concepts and Administration Guide*
GSMUSER	The account used by Global Service Manager to connect to the database.	*Oracle Database Global Data Services Concepts and Administration Guide*
LBACSYS	The Oracle Label Security administrator account. Starting with Oracle Database 18c, the LBACSYS user account is created as a schema-only account.	*Oracle Label Security Administrator's Guide*
MDDATA	The schema used by Oracle Spatial and Graph for storing geocoder and router data.	*Oracle Spatial and Graph Developer's Guide*
MDSYS	The Oracle Spatial and Graph administrator account.	*Oracle Spatial and Graph Developer's Guide*
OUTLN	The account that supports plan stability. Plan stability enables you to maintain the same execution plans for the same SQL statements. OUTLN acts as a role to centrally manage metadata associated with stored outlines.	None
ORACLE_OCM	This account contains the instrumentation for configuration collection used by the Oracle Configuration Manager.	None

Table 11-1 (Cont.) Partial List of Oracle Database System Privileges Accounts Locked After Installation

User Name	Description	For More Information
REMOTE_SCHEDULER_AGENT	The account to disable remote jobs on a database. This account is created during the remote scheduler agent configuration. You can disable the capability of a database to run remote jobs by dropping this user.	*Oracle Database Administrator's Guide*
SYS	The account used to perform database administration tasks.	*Oracle Database Administrator's Guide*
SYSTEM	Another account used to perform database administration tasks.	*Oracle Database Administrator's Guide*
SYSBACKUP	The account used to perform backup and recovery tasks.	*Oracle Database Administrator's Guide*
SYSKM	The account used to perform encryption key management.	*Oracle Database Administrator's Guide*
SYSDG	The account used to administer and monitor Oracle Data Guard.	*Oracle Database Administrator's Guide*
SYSRAC	The account used to administer Oracle Real Application Clusters (RAC).	*Oracle Database Administrator's Guide*
SYS$UMF	The account used to administer Remote Management Framework, including the remote Automatic Workload Repository (AWR).	*Oracle Database Performance Tuning Guide*
WMSYS	The account used to store the metadata information for Oracle Workspace Manager.	*Oracle Database Workspace Manager Developer's Guide*
XDB	The account used for storing Oracle XML DB data and metadata.	*Oracle XML DB Developer's Guide*
XS$NULL	The internal account that represents the absence of a database schema user in a session, and indicates an application user session is in use. XS$NULL cannot be authenticated to a database, nor can it own any database schema objects, or possess any database privileges.	*Oracle Database Real Application Security Administrator's and Developer's Guide*

Except for the accounts provided with the Oracle Sample Schemas, most of these database accounts are locked by default and created without passwords as schema only. This prevents malicious users from logging into these accounts using the default password set during catalog creation. To find the status of an account, query the `AUTHENTICATION_TYPE` column of the `DBA_USERS` data dictionary view. If `AUTHENTICATION_TYPE` is schema only, then the status is `NONE`.

Many of these accounts are automatically created when you run standard scripts such as the various `cat*.sql` scripts. To find user accounts that are created and maintained by Oracle, query the `USERNAME` and `ORACLE_MAINTAINED` columns of the `ALL_USERS` data dictionary view. If the output for `ORACLE_MAINTAINED` is `Y`, then you must not modify the user account except by running the script that was used to create it.

Related Topics

- *Oracle Database Security Guide*

- *Oracle Database Sample Schemas*

Using SQL*Plus to Unlock and Change Passwords

Use this SQL*Plus procedure to unlock and reset user account passwords.

To change a password after installation:

1. Start SQL*Plus:

   ```
   C:\> sqlplus /nolog
   ```

2. Connect as `SYSDBA`:

   ```
   SQL> CONNECT SYS AS SYSDBA
   Enter password: SYS_password
   ```

3. Enter a command similar to the following, where *`account`* is the user account to unlock and *`password`* is the new password:

   ```
   SQL> ALTER USER account IDENTIFIED BY password ACCOUNT UNLOCK;
   ```

Related Topics

- *Oracle Database Security Guide*
- *Oracle Database SQL Language Reference*
- *Oracle Database Administrator's Guide*

Recommended Postinstallation Tasks

Oracle recommends that you complete these tasks after installation.

- Recompiling Invalid Objects on Windows Systems
  Run the `utlrp.sql` script after you install, patch, or upgrade a database, to identify, and recompile invalid objects.
- About Installing Oracle Autonomous Health Framework
  Oracle Autonomous Health Framework is pre-installed with Oracle Database.

Recompiling Invalid Objects on Windows Systems

Run the `utlrp.sql` script after you install, patch, or upgrade a database, to identify, and recompile invalid objects.

The `utlrp.sql` script recompiles all invalid objects, including packages, procedures, and types. Run the script immediately after installation, to ensure that users do not encounter invalid objects.

1. Log in as an Administrator user, or as the Oracle Home user.
2. Start SQL*Plus and log in as a SYSDBA user:
   a. Click **Start**.
   b. Select **Programs** (or **All Programs**).
   c. Select **Oracle - *HOME_NAME***.
   d. Select **Application Development**.

e. Select **SQL*Plus**.

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

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

The `utlrp.sql` script automatically recompiles invalid objects in either serial or parallel recompilation, based on the number of invalid objects, and on the number of CPUs available. CPUs are calculated using the number of CPUs (`cpu_count`) multiplied by the number of threads for each CPU (`parallel_threads_per_cpu`). On Oracle Real Application Clusters (Oracle RAC), this number is added across all Oracle RAC nodes.

About Installing Oracle Autonomous Health Framework

Oracle Autonomous Health Framework is pre-installed with Oracle Database.

Oracle Autonomous Health Framework performs proactive heath checks and collects diagnostics data for the Oracle software stack. Oracle Autonomous Health Framework updates are available on My Oracle Support and also shipped with Oracle Database Release Updates.

Oracle recommends that you update to the latest version of Oracle Autonomous Health Framework by either applying the latest Database Release Updates or by downloading and installing it from My Oracle Support Note 2550798.1:

https://support.oracle.com/epmos/faces/DocContentDisplay?id=2550798.1&parent=DOCUMENTATION&sourceId=USERGUIDE

Oracle Autonomous Health Framework includes the functionality from Oracle ORAchk, Oracle EXAchk, and Oracle Trace File Analyzer (TFA). Oracle Autonomous Health Framework extends health check coverage to the entire Oracle software stack, based on critical and reoccurring problems. Oracle Autonomous Health Framework proactively scans for known problems with Oracle products and deployments, including the following:

- Single-instance Oracle Database
- Oracle Grid Infrastructure
- Oracle Real Application Clusters
- Maximum Availability Architecture (MAA) Validation
- Upgrade Readiness Validations
- Oracle GoldenGate
- Oracle Exadata
- Oracle SuperCluster
- Oracle Zero Data Loss Recovery Appliance

Related Topics

- *Oracle Autonomous Health Framework Checks and Diagnostics User's Guide*

Configuring Oracle Components

Many Oracle products and options must be configured before you use them for the first time.

Before using individual Oracle products or options, refer to the appropriate manual in the product documentation library.

> **Note:**
>
> Perform postinstallation tasks only for the components that you intend to use.

- Windows Authentication No Longer Uses NTLM by Default
- Configuring the OraClrAgnt Service for Oracle Database Extensions for .NET
  Oracle Database Extensions for .NET depends on a Windows service to operate properly. This service is called the OraClrAgnt service, which can be accessed through the Service Control Panel, as `Oracle`*`ORACLE_HOME`*`ClrAgent`, where *`ORACLE_HOME`* represents an Oracle home name.
- Configuring Oracle Net Services
  Describes how to configure Oracle Net Services.
- Setting Credentials for the Job System to Work with Oracle Enterprise Manager
  Windows systems require that you set the correct credentials for the Jobs system to work properly in Oracle Enterprise Manager.
- Configuring Oracle Database to Communicate with Oracle Automatic Storage Management
  On Windows, Oracle Database installations that use Oracle Automatic Storage Management must use Windows native authentication.
- Creating the OraMTS Service for Microsoft Transaction Server
  Oracle Services for Microsoft Transaction Server (OraMTS) permit Oracle databases to be used as resource managers in Microsoft application coordinated transactions.

Windows Authentication No Longer Uses NTLM by Default

Date: August 2023

Related Topics

- Upgrade Your Database Now - ORA-12638 on Windows only from Oracle 19.10.0 onwards
- Windows : While Connect to Database Getting ORA-12638 After Applying Jan 2021 WINDBBP 19.10.0.0.210119 On Windows 64/32 Bit Database Client (Doc ID 2757734.1)

Configuring the OraClrAgnt Service for Oracle Database Extensions for .NET

Oracle Database Extensions for .NET depends on a Windows service to operate properly. This service is called the OraClrAgnt service, which can be accessed through the Service Control Panel, as `Oracle`*`ORACLE_HOME`*`ClrAgent`, where *`ORACLE_HOME`* represents an Oracle home name.

In earlier versions of Oracle Database, the OraClrAgnt service was automatically created by the installer. Starting with Oracle Database 12*c* Release 2 (12.2), after installation you use the `OraClrCtl.exe` utility to create, start, stop, and delete the OraClrAgnt service. The OraClrAgnt service is configured by this tool using the Oracle Home User account specified during the Oracle Database installation.

Related Topics

- *Oracle Database Extensions for .NET Developer's Guide for Microsoft Windows*

Configuring Oracle Net Services

Describes how to configure Oracle Net Services.

If you have a previous release of Oracle software installed on this system, you can copy information from the Oracle Net `tnsnames.ora` and `listener.ora` configuration files from the previous release to the corresponding files for the new release.

> **Note:**
>
> The default location for the `tnsnames.ora` and `listener.ora` files is the *`ORACLE_BASE`*`\`*`ORACLE_HOME`*`\network\admin\` directory.

Modifying the listener.ora File

If you are upgrading from a previous release of Oracle Database, Oracle recommends that you use the current release of Oracle Net listener instead of the listener from the previous release.

If you have referenced the previous Oracle home directory names in the static listener information, then these directory names must be modified before the `listener.ora` file can be used in the 21c environment.

To use the listener from the current release, you must copy static service information from the `listener.ora` file from the previous release to the version of that file used by the new release.

For any database instances earlier than release 8.0.3, add static service information to the `listener.ora` file. Oracle Database releases later than release 8.0.3 do not require static service information.

Modifying the tnsnames.ora File

Unless you are using a central `tnsnames.ora` file, copy Oracle Net service names and connect descriptors from the previous release `tnsnames.ora` file to the version of that file used by the new release.

If necessary, you can also add the connection information for additional database instances to the new file.

Setting Credentials for the Job System to Work with Oracle Enterprise Manager

Windows systems require that you set the correct credentials for the Jobs system to work properly in Oracle Enterprise Manager.

By default, the Management Agent service is installed as a `LocalSystem` user. When submitting jobs, such as stopping or starting the database, the operating system user submitting the job must have the **Log on as a batch job** privilege enabled.

Perform the following steps to establish that privilege for any operating system user who must submit an Oracle Enterprise Manager job.

1. Under the Security Settings list, expand the list to **Local Policies**.
2. Under Local Policies, double-click **User Rights Assignment**.

3. Under Policy, search for the **Log on as a batch job** policy.

   If the Management Agent service is installed as any other user (that is, not `LocalSystem`), then, in addition to granting the **Log on as a batch job** privilege, you must grant the Windows service user the following three privileges:

   - **Act as part of the operating system**
   - **Adjust memory quotas for a process**
   - **Replace a process level token**

     The service under the "Windows service" user runs at the operating system level.

4. With each policy, perform the following steps:

   a. Double-click the policy name.

   b. In the Properties dialog box, click **Add User or Group**.

   c. In the Select Users or Groups dialog box, enter the name of the user (for example, `jsmith`, `administrator`, and so on.)

   > **Note:**
   >
   > On Windows Server 2008, the name of the dialog box is Select Users, Computers, or Groups.

   d. Click **Check Names** to check that you have entered the name correctly.

   e. Click **OK**.

5. Click **OK** to exit the Properties dialog box, then exit Local Security Settings and Administrative Tools.

6. Restart your computer.

If a user exists locally and at the domain level, Windows gives the local user precedence. To use the domain user, qualify the user name with the domain name. For example, to use the user `joe` in the `ACCOUNTS` domain specify the user name as `ACCOUNTS\joe`.

Configuring Oracle Database to Communicate with Oracle Automatic Storage Management

On Windows, Oracle Database installations that use Oracle Automatic Storage Management must use Windows native authentication.

By default, Windows native authentication is enabled. To ensure that Windows native authentication is enabled, check the `sqlnet.ora` file, which by default is located in *`ORACLE_HOME`*`\network\admin`, and ensure that it has NTS enabled. For example:

```
sqlnet.authentication_services=(NTS)
```

Creating the OraMTS Service for Microsoft Transaction Server

Oracle Services for Microsoft Transaction Server (OraMTS) permit Oracle databases to be used as resource managers in Microsoft application coordinated transactions.

OraMTS acts as a proxy for the Oracle database to the Microsoft Distributed Transaction Coordinator (MSDTC). As a result, OraMTS provides client-side connection pooling and allows

client components that leverage Oracle to participate in promotable and distributed transactions. In addition, OraMTS can operate with Oracle databases running on any operating system, given that the services themselves are run on Windows.

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

To create the OraMTS service after performing a software-only installation for Oracle Database, perform the following steps:

1. Open a command window.
2. Change directories to *ORACLE_HOME*\bin.
3. Run the `OraMTSCtl` utility to create the OraMTS Service:

```
C:\ORACLE_HOME\bin> oramtsctl.exe -new
```

Related Topics

- *Oracle Services for Microsoft Transaction Server Developer's Guide for Microsoft Windows*

Starting Oracle Enterprise Manager Database Express

To start Oracle Enterprise Manager Database Express, use the EM Express URL provided by Oracle Database Configuration Assistant (Oracle DBCA) during the database installation and creation.

Oracle Enterprise Manager Database Express (EM Express) is deprecated, and will be removed in a future Oracle Database release.

EM Express is a web-based database management tool that is built inside the Oracle Database. It supports key performance management and basic database administration functions. Many of EM Express's capabilities are also available in Oracle SQL Developer, which is included in all Oracle Database editions. Oracle recommends that you replace your use of EM Express with Oracle SQL Developer.

Creating a Fast Recovery Area Disk Group

During installation, by default you can create multiple disk groups.

If you plan to add an Oracle Database for a standalone server, then you must create the fast recovery area for database files.

- About the Fast Recovery Area and the Fast Recovery Area Disk Group
  The fast recovery area is a unified storage location for all Oracle Database files related to recovery. Enabling rapid backups for recent data can reduce requests to system administrators to retrieve backup tapes for recovery operations.
- Creating the Fast Recovery Area Disk Group
  Use this procedure to create the fast recovery area disk group.
- Enabling and Disabling Database Options After Installation
  When you install Oracle Database, some options are enabled and the others disabled. You can view the enabled Oracle Database options by querying the `V$OPTION` view using SQL*Plus.

About the Fast Recovery Area and the Fast Recovery Area Disk Group

The fast recovery area is a unified storage location for all Oracle Database files related to recovery. Enabling rapid backups for recent data can reduce requests to system administrators to retrieve backup tapes for recovery operations.

Database administrators can define the `DB_RECOVERY_FILE_DEST_SIZE` parameter to the path for the fast recovery area to enable on-disk backups, and rapid recovery of data.

When you enable fast recovery in the `init.ora` file, it writes all RMAN backups, archive logs, control file automatic backups, and database copies to the fast recovery area. RMAN automatically manages files in the fast recovery area by deleting obsolete backups and archive files no longer required for recovery.

Oracle recommends that you create a fast recovery area disk group. Oracle Clusterware files and Oracle Database files can be placed on the same disk group, and you can also place fast recovery files in the same disk group. However, Oracle recommends that you create a separate fast recovery disk group to reduce storage device contention.

The fast recovery area is enabled by setting `DB_RECOVERY_FILE_DEST_SIZE`. The size of the fast recovery area is set with `DB_RECOVERY_FILE_DEST_SIZE`. As a general rule, the larger the fast recovery area, the more useful it becomes. For ease of use, Oracle recommends that you create a fast recovery area disk group on storage devices that can contain at least three days of recovery information. Ideally, the fast recovery area must be large enough to hold a copy of all of your data files and control files, the online redo logs, and the archived redo log files needed to recover your database using the data file backups kept under your retention policy.

Multiple databases can use the same fast recovery area. For example, assume you have created one fast recovery area disk group on disks with 150 GB of storage, shared by three different databases. You can set the size of the fast recovery for each database depending on the importance of each database. For example, if `database1` is your least important database, `database2` is of greater importance and `database3` is of greatest importance, then you can set different `DB_RECOVERY_FILE_DEST_SIZE` settings for each database to meet your retention target for each database: 30 GB for `database1`, 50 GB for `database2`, and 70 GB for `database3`.

Creating the Fast Recovery Area Disk Group

Use this procedure to create the fast recovery area disk group.

1. Navigate to the Grid home bin directory, and start ASM Configuration Assistant (ASMCA). For example:

   ```
   DRIVE_LETTER:\> cd \app\oracle\product\21.0.0\grid\bin
   DRIVE_LETTER:\> asmca
   ```

2. ASMCA opens at the Disk Groups tab. Click **Create** to create a disk group.
3. The Create Disk Groups window opens.

   In the Disk Group Name field, enter a descriptive name for the fast recovery area group. For example: `FRA`.

   In the Redundancy section, select the level of redundancy you want to use.

   In the Select Member Disks field, select the eligible disks to be added to the fast recovery area, and click **OK**.

4. The Diskgroup Creation window opens to inform you when the disk group creation is complete. Click **OK**.
5. Click **Exit**.

Related Topics

- *Oracle Database Backup and Recovery User's Guide*
- *Oracle Automatic Storage Management Administrator's Guide*

Enabling and Disabling Database Options After Installation

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

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

If you need to enable or disable a particular database feature for an Oracle home, then use the `chopt` tool. The `chopt` tool is a command-line utility that is located in the *`ORACLE_HOME`*`\bin` directory. The syntax for `chopt` is as follows:

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

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

Table 11-2 Database Options for Chopt Tool Command

Value	Description
`olap`	Oracle OLAP
`rat`	Oracle Real Application Testing

> **Note:**
>
> The Oracle Advanced Analytics (OAA) feature is enabled by default for Oracle Database. You cannot disable it using the chopt tool.

Example 11-1 Running the Chopt Tool

To enable the Oracle Real Application Testing option in your Oracle binary files:

1. Shut down the database with `srvctl` or SQL*Plus:

   ```
   srvctl stop database -d myDb
   ```

2. Stop the database service, `OracleService`*`SID`*, using the Services program in Control Panel.

3. Run the following commands:

```
cd ORACLE_HOME/bin
chopt enable rat
```

4. Start the database service, `OracleService`*`SID`*, using the Services program in Control Panel.
5. Start up the database:

```
srvctl start database -d myDb
```

Checking the Installed Oracle Database Contents and Directory Location

Use Oracle Universal Installer to check the contents and directory location of your Oracle Database installation.

Follow these steps:

1. From the **Start** menu, select **All Programs**, then **Oracle - *HOMENAME***, then **Oracle Installation Products**, then **Universal Installer**.
2. In the Welcome window, click **Installed Products** to display the Inventory dialog box.
3. To check the installed contents, find the Oracle Database product in the list.

   To find additional information about an installed product, click **Details**.
4. To check the directory location of the installed contents, click the **Environment** tab.
5. Click **Close** to exit the Inventory dialog box.
6. Click **Cancel** to exit Oracle Universal Installer, then click **Yes** to confirm.

Changing the Oracle Home User Password

Oracle Home User Control is a command-line utility that allows an administrator to update the password for an Oracle Home User.

This tool updates the password for Windows services in the Oracle home. The input password must match the password for the Windows User Account used as the Oracle Home User. So, first use the Windows operating system tools to change the Windows password and then use this tool to update the Windows services in the Oracle home to use the same password.

> **Note:**
>
> You must have the Administrator privileges to run this Oracle Home User Control utility.

Syntax Overview:

The following is the command syntax:

```
orahomeuserctl list | updpwd [-user username] [-host hostname1, hostname2, . . .] [-log
logfilename]
```

where:

- `orahomeuserctl` is used to display the Oracle Home User name associated with the current Oracle home or to update the Oracle Home User password.
- `list` displays the Oracle Home User name associated with the current Oracle home.
- `updpwd` prompts for the new password and updates the password for the named Oracle Service User. The following are the options for `updpwd`:
  - `-user username`

    This option determines the Oracle Home User name. If this option is not present, then the user name associated with the current Oracle home is used. If the named user, be it the *username* or user of the current Oracle home, is an MSA or Windows Built-in account, then an error message is displayed and the command is terminated.
  - `-host hostname1, hostname2,. . .`

    When this option is present, the utility updates the passwords for all the services belonging to the named Oracle Home User on the specified hosts. Otherwise, the Oracle Home User Control utility updates the passwords for all the services belonging to the named Oracle Home User on a specified host with single instance installation, or updates the passwords for all services belonging to the named Oracle Home User on all the specified hosts.

    When the update completes, the utility displays the number of successful updates and any services that failed to update with the new password.
  - `-log logfilename`

    This option adds the password update operation results to a log file for every service name receiving the new password. By default, the log files are located in the *ORACLE_HOME*`\log` directory. If *logfilename* specifies only a file name, then the log is stored in the named file in the default directory. However, if the *logfilename* contains a path, then that path is used without modification.

Cloning Oracle Database

Cloning an Oracle home involves creating a copy of the Oracle home and then configuring it for a new environment.

If you are performing multiple Oracle Database installations, then you may want to use cloning to create each Oracle home, because copying files from an existing Oracle Database installation takes less time than creating a new version of them. This method is also useful if the Oracle home that you are cloning has had patches applied to it. When you clone the Oracle home, the new Oracle home has the patch updates.

- Cloning an Oracle Database Home Using an Image File
  Learn how to clone an Oracle Database home using the `-createGoldImage` option.
- Cloning an Oracle Home Using clone.pl
  Follow these steps to clone an Oracle home.

Cloning an Oracle Database Home Using an Image File

Learn how to clone an Oracle Database home using the `-createGoldImage` option.

Create an image file from the source Oracle home using the `-createGoldImage` option, unzip the image file, and perform a software-only Oracle Database installation to register the Oracle Database product.

1. Log in as the Oracle installation owner user account (`oracle`).
2. Go to the source Oracle home directory.

   ```
   C:\app\username\product\21.0.0\dbhome_1
   ```

3. Use the `setup.exe` command with the `-createGoldImage` option to create a gold image from the source Oracle home.

   For example, to create an image file of `dbhome_1` and save it in the temporary destination location `my_db_images`:

   ```
   setup.exe -createGoldImage -destinationLocation \tmp\my_db_images
   ```

4. Create a new OFA-compliant Oracle home directory and extract the image file that you have created in to this destination Oracle home directory. For example:

   ```
   C:\>md C:\app\oracle\product\21.0.0\dbhome_2
   C:\>cd C:\app\oracle\product\21.0.0\dbhome_2
   C:\app\oracle\product\21.0.0\dbhome_1> unzip \tmp\db_home.zip
   ```

   > **Note:**
   >
   > Oracle home or Oracle base cannot be symlinks, nor can any of their parent directories, all the way to up to the `root` directory.

5. From this new destination Oracle home directory, run the `setup.exe` command to start the Oracle Database Setup Wizard and register Oracle Database.

   ```
   C:\app\oracle\product\21.0.0\dbhome_2>setup.exe
   ```

6. In the Select Configuration Option screen, select **Set Up Software Only** to perform a software-only Oracle Database installation.
7. Select your installation type and respond to the configuration prompts as needed.
8. Provide information to automate root scripts, or run scripts as `root` when prompted by the setup wizard.

   > **Note:**
   >
   > Click **Help** if you have any questions about the information you are asked to submit during installation.

9. Oracle Database is now successfully registered. Run Oracle Database Configuration Assistant (Oracle DBCA) to create a database and configure the listener for the newly-cloned Oracle home.

   ```
   C:\>cd C:\app\oracle\product\21.0.0\dbhome_2\bin\dbca
   ```

Cloning an Oracle Home Using clone.pl

Follow these steps to clone an Oracle home.

> **Note:**
>
> - This procedure using the `clone.pl` script is deprecated starting Oracle Database 19c and can be removed in a future release. Hence, Oracle recommends that you use the software-only installation option, available in the database installer, instead of `clone.pl` to clone your database.
> - During cloning, Oracle Universal Installer (OUI) prompts you to run scripts that require `root` privileges.

1. Verify that the installation of Oracle Database to clone is successful.

   You can do this by reviewing the `installActions`*`date_time`*`.log` file for the installation session, which is typically located in the following directory:

   ```
   C:\Program Files\Oracle\Inventory\logs
   ```

   If you have installed patches, you can check their status by running the following commands at a command prompt:

   ```
   C:\ORACLE_HOME\OPatch> set ORACLE_HOME=ORACLE_HOME_using_patch
   C:\ORACLE_HOME\OPatch> opatch lsinventory
   ```

2. Stop all processes related to the Oracle home. You can stop Oracle services by the following method:

   Microsoft Windows Services utility: From the **Start** menu, select **Control Panel**, then **Administrative Tools**, then **Services**. Right-click any service that begins with **Oracle**, and then from the menu, select **Stop**.

3. Create a ZIP file with the Oracle home (but not Oracle base) directory.

   For example, if the source Oracle installation is in `C:\app\`*`username`*`\product\21.0.0\dbhome_1` you zip the `dbhome_1` directory, leaving out the `admin`, `flash_recovery_area`, and `oradata` directories that are under `21.0.0`. These directories are created in the target installation later on when you create a new database there.

4. Copy the ZIP file to the root directory of the target computer. If you use File Transfer Protocol (FTP), then transfer the ZIP file in binary mode only.

5. Extract the ZIP file contents, selecting the **Use folder names** option.

6. Repeat steps 4 and 5 for each computer where you want to clone the Oracle home, unless the Oracle home is on a shared storage device.

7. In the source Oracle home, restart the services that you stopped in step 2.

8. On the target computer, `cd` to the unzipped Oracle home directory, and perform the following steps:

   a. Remove the `*.ora` files that are present in unzipped *`ORACLE_HOME`*`\network\admin` directory, such as `listener.ora`, `sqlnet.ora`, and `tnsnames.ora`.

   b. Delete unnecessary files from the unzipped Oracle home directory.

      The unzipped Oracle home directory contains files that are relevant only to the source Oracle home. Remove the unnecessary files from the unzipped Oracle home in the `log`, `crs/init`, `crf`, and `cdata` directories. The following example shows how to remove these unnecessary files from the unzipped Oracle home directory:

```
[grid_home]# cd copy_path
    [grid_home]# rm -rf host_name
    [grid_home]# rm -rf log/host_name
    [grid_home]# rm -rf gpnp/host_name
    [grid_home]# rm -rf find gpnp -type f -exec rm -f {} \;
       c:\<Gridhome> c:\mksnt\find gpnp -type f and delete these files.
       gpnp/init/host_name
       gpnp/init/host_name.pid
         gpnp/profiles/peer/profile.xml
       gpnp/profiles/peer/profile_orig.xml
       gpnp/host_name/profiles/peer/profile.old
       gpnp/host_name/profiles/peer/profile.xml
                gpnp/host_name/profiles/peer/profile_orig.xml
       gpnp/host_name/wallets/pa/cwallet.sso
       gpnp/host_name/wallets/peer/cwallet.sso
       gpnp/host_name/wallets/prdr/cwallet.sso
       gpnp/host_name/wallets/root/ewallet.p12
       gpnp/wallets/pa/cwallet.sso
       gpnp/wallets/peer/cwallet.sso
       gpnp/wallets/prdr/cwallet.sso
       gpnp/wallets/roor/ewallet.p12

    [grid_home]# find cfgtoollogs -type f -exec rm -f {} \;
    [grid_home]# rm -rf crs/init/*
[grid_home]# rm -rf cdata/*
[grid_home]# rm -rf crf/*
[grid_home]# rm -rf network/admin/*.ora
```

9. From the `ORACLE_HOME\clone\bin` directory, run `clone.pl` for the unzipped Oracle home.

   Use the following syntax:

```
C:\ORACLE_HOME\clone\bin>target_home\perl\bin\perl.exe clone.pl
ORACLE_HOME="target location" ORACLE_BASE="target Base location"
ORACLE_HOME_USER="Windows User Account" OSDBA_GROUP=OSDBA_privileged_group
OSOPER_GROUP=OSOPER_privileged_group OSBACKUPDBA_GROUP=OSBACKUPDBA_privileged_group
OSDGDBA_GROUP=OSDGDBA_privileged_group OSKMDBA_GROUP=OSKMDBA_privileged_group
OSRACDBA_GROUP=OSRACDBA_privileged_group -defaultHomeName
```

   where *`ORACLE_HOME_USER="Windows User Account"`* is the Oracle Home User for the cloned home.

   Windows Built-in Account is used as the Oracle Home User if the parameter for *`ORACLE_HOME_USER`* is not specified.

   For example:

```
C:\ORACLE_HOME\clone\bin>target_home\perl\bin\perl.exe clone.pl

ORACLE_HOME="C:\app\username\product\21.0.0\dbhome_1"
```

```
ORACLE_BASE="C:\app\username"
ORACLE_HOME_USER="mydomain\username" -defaultHomeName
OSDBA_GROUP=dba OSOPER_GROUP=oper OSBACKUPDBA_GROUP=backupdba OSDGDBA_GROUP=dgdba
OSKMDBA_GROUP=kmdba OSRACDBAGROUP=racdba -defaultHomeName
```

Oracle Universal Installer starts, and then records the cloning actions in the `cloneActions`*`timestamp`*`.log` file. This log file is normally located in `C:\Program Files\Oracle\Inventory\logs`.

> **Note:**
>
> Run `\ORACLE_HOME\clone\bin>`*`target_home`*`\perl\bin\perl.exe clone.pl -help` command for more information about the command option flags.

10. To configure connection information for the new database, run Net Configuration Assistant.

    To start Net Configuration Assistant, select **Start**, then **All Programs**, then **Oracle - *HOMENAME***, then **Configuration and Migration Tools**, and then **Net Configuration Assistant**.

11. To create a new database for the newly cloned Oracle home, run Oracle Database Configuration Assistant.

    To start Oracle Database Configuration Assistant, select **Start**, then **All Programs**, then **Oracle - *HOMENAME***, then **Configuration and Migration Tools**, and then **Database Configuration Assistant**.

Related Topics

- *Oracle Database Administrator's Guide*

12

Removing Oracle Database Software

Use the `deinstall` command that is included in Oracle homes to remove Oracle software. Oracle does not support the removal of individual products or components.

> **Caution:**
>
> If you have a standalone database on a node in a cluster, and if you have multiple databases with the same global database name (GDN), then you cannot use the `deinstall` command to remove one database only.

- About Oracle Deinstallation Options
  The `deinstall.bat` command stops Oracle software, and removes Oracle software and configuration files on the operating system.
- Files Deleted by the deinstall Command
  The `deinstall` command removes Oracle software and files from your system.
- Deinstallation Examples for Oracle Database
  Use these examples to help you understand how to run the `deinstall` command.
- Downgrading Oracle Restart
  Use this procedure to deconfigure and downgrade Oracle Restart, or to troubleshoot Oracle Restart installation errors.
- Deinstalling Previous Release Grid Home
  Use this procedure to deinstall the previous release Grid home.

About Oracle Deinstallation Options

The `deinstall.bat` command stops Oracle software, and removes Oracle software and configuration files on the operating system.

You can remove the following software using `deinstall`:

- Oracle Database
- Oracle Grid Infrastructure, which includes Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM)
- Oracle Real Application Clusters (Oracle RAC)
- Oracle Database Client

The deinstall command is available in Oracle home directories after installation. It is located in the *ORACLE_HOME*`\deinstall` directory.

The deinstallation tool uses the information you provide, plus information gathered from the software home to create a response file. You can alternatively supply a response file generated

previously by the `deinstall` command using the `-checkonly` option, or by editing the response file template.

> **Note:**
>
> - You must run the `deinstall` command from the same release to remove Oracle software. Do not run the `deinstall` command from a later release to remove Oracle software from an earlier release. For example, do not run the `deinstall` command from the 21c Oracle home to remove Oracle software from an existing 12.2 Oracle home
> - Starting with Oracle Database 12*c* Release 1 (12.1.0.2), the `roothas.bat` script replaces the `roothas.pl` script in the Oracle Grid Infrastructure home for Oracle Restart, and the `rootcrs.bat` script replaces the `rootcrs.pl` script in the Grid home for Oracle Grid Infrastructure for a cluster.

If the software in the Oracle home is not running (for example, after an unsuccessful installation), then the deinstallation tool cannot determine the configuration, and you must provide all the configuration details either interactively or in a response file.

In addition, before you run `deinstall` for Oracle Grid Infrastructure installations, if Grid Naming Service (GNS) is in use, then notify your DNS administrator to delete the subdomain entry from the DNS.

Related Topics

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

Files Deleted by the deinstall Command

The `deinstall` command removes Oracle software and files from your system.

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

- `admin`
- `cfgtoollogs`
- `checkpoints`
- `diag`
- `oradata`
- `fast_recovery_area`

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

> **Caution:**
>
> The `deinstall` command deletes Oracle Database configuration files, user data, and fast recovery area (FRA) files even if they are located outside of the Oracle base directory path.

Deinstallation Examples for Oracle Database

Use these examples to help you understand how to run the `deinstall` command.

Run `deinstall` from the `ORACLE_HOME\deinstall` directory. The deinstallation starts without prompting you for the Oracle home path.

You can generate a deinstallation response file by running `deinstall` with the `-checkonly` flag. Alternatively, you can use the response file template located at *`DRIVE_LETTER`*`:\>ORACLE_HOME/deinstall/response/deinstall.rsp.tmpl`.

In the following example, the `deinstall` command is in the path `C:\app\oracle\product\21.0.0\dbhome_1\deinstall`, and it uses a response file in the software owner location `C:\Documents and Settings\oracle\`:

```
DRIVE_LETTER:\> cd \app\oracle\product\21.0.0\dbhome_1\deinstall\
DRIVE_LETTER:\> deinstall.bat -paramfile %HOMEPATH%\my_db_paramfile.tmpl
```

For the grid infrastructure home, use (`deinstall.bat`) in the Oracle Grid Infrastructure home. In this example, the Oracle Grid Infrastructure home is `C:\app\oracle\product\21.0.0\grid`

```
DRIVE_LETTER:\> cd \app\oracle\product\21.0.0\grid\deinstall\
DRIVE_LETTER:\> deinstall.bat -paramfile %HOMEPATH%\my_grid_paramfile.tmpl
```

Downgrading Oracle Restart

Use this procedure to deconfigure and downgrade Oracle Restart, or to troubleshoot Oracle Restart installation errors.

Running `roothas.bat` with the command flags `-deconfig -force` enables you to deconfigure Oracle Restart without removing the installed binaries. This feature is useful if you encounter an error during an Oracle Grid Infrastructure for a standalone server installation. For example, when you run the `root.sh` command, and find a missing operating system package. By running `roothas.bat -deconfig -force`, you can deconfigure Oracle Restart, correct the cause of the error, and then run `root.sh` again.

1. As the `oracle` user, create a backup of the SPFILE to a PFILE.

   ```
   CREATE PFILE='C:\app\oracle\product\21.0.0\dbhome_1\dbs\test_init.ora'
   FROM SPFILE='C:\oracle\dbs\test_spfile.ora';
   ```

2. List all the Oracle databases on the server with their version, unique name of the database, and Oracle home information.

   ```
   C:\> srvctl config database -home
   ```

3. Downgrade Oracle Database. Refer to *Oracle Database Upgrade Guide* for more information about required pre-downgrade tasks, downgrade tasks, post-downgrade tasks, and compatibility information.

> **Note:**
>
> Downgrade Oracle Database only if the Oracle Database version is higher than the Oracle Restart version to which you are downgrading Oracle Restart.

4. As the `oracle` user, downgrade the Oracle Restart resources if you have downgraded your Oracle Database.

```
C:\> srvctl downgrade database -d db_unique_name -oraclehome %ORACLE_HOME%
-t to_version
```

5. Inspect the Oracle Restart configuration of each database, service, and listener.

```
C:\> srvctl config database -db db_unique_name
C:\> srvctl config service -db db_unique_name
C:\> srvctl config listener -listener listener_name
```

Make a note of the configuration information and use this information when adding the components back to Oracle Restart.

6. Stop all databases and listeners that are running before you deconfigure or downgrade Oracle Restart.

```
C:\> srvctl stop database -db db_unique_name
C:\> srvctl stop listener [-listener listener_name]
```

7. As the `root` user, run `roothas.bat` with the `-deconfig -force` flags to deconfigure Oracle Restart.

```
C:\> C:\app\oracle\product\21.0.0\grid\crs\install\roothas.bat -deconfig -
force
```

8. As the `grid` user, update the Oracle central inventory (oraInventory).

```
C:\> C:\app\oracle\product\21.0.0\grid\oui\bin\setup.exe -updateNodeList -
silent ORACLE_HOME=upgraded_Grid_home -local CRS=false
```

9. As the `root` user, run `roothas.bat` with the `-unlock` flag to unlock the previous release Oracle Restart home.

```
C:\> C:\app\oracle\product\19.0.0\grid\crs\install\roothas.bat -unlock -
dstcrshome previous_release_Grid_home
```

10. As the `grid` user, reconfigure the previous release Oracle Restart home using the `setup.exe` command.

```
C:\> C:\app\oracle\product\19.0.0\grid\setup.exe
```

11. As the `oracle` user, add the components back to Oracle Restart with the same attributes that you noted down before deconfiguring Oracle Restart.
    a. Add Oracle Database to the Oracle Restart configuration.

    ```
    C:\> srvctl add database -db db_unique_name -oraclehome Oracle_home
    ```

    b. Add the listener to the Oracle Restart configuration.

    ```
    C:\> srvctl add listener -listener listener_name -oraclehome Oracle_home
    ```

    For the `-oraclehome` parameter, provide the Oracle home path from which the listener was running before the downgrade.

    c. Add each service to the database, using the `srvctl add service` command.

    ```
    C:\> srvctl add service -db db_unique_name -service service_name_list
    ```

Related Topics

- *Oracle Database Upgrade Guide*

Deinstalling Previous Release Grid Home

Use this procedure to deinstall the previous release Grid home.

For upgrades from previous releases, if you want to deinstall the previous release Grid home, then perform the following steps:

1. Log in as the `Administrator` user.
2. Manually change the permissions of the previous release Grid home.

    ```
    # chmod -R 775 C:\app\oracle\product\19.0.0\grid
    # chown -R oracle:oinstall C:\app\oracle\product\19.0.0\grid
    # chown oracle C:\app\oracle\product\19.0.0\
    ```

    In this example:

    - `C:\app\oracle\product\19.0.0\grid` is the previous release Oracle Grid Infrastructure for a standalone server home
    - `oracle` is the Oracle Grid Infrastructure installation owner user
    - `oinstall` is the name of the Oracle Inventory group (OINSTALL group)
    - `C:\app\oracle\product\19.0.0\` is the parent directory of the previous Grid home.
3. Log in as the Oracle Grid Infrastructure software owner user (`oracle`) and run the `deinstall` command.

A

Installing and Configuring Oracle Database Using Response Files

Learn how to install and configure Oracle products using response files.

How Response Files Work

Response files can assist you with installing an Oracle product multiple times on multiple computers.

When you start Oracle Universal Installer (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 an interactive mode, which means that it prompts you to provide information on the graphical user interface (GUI). When you use response files to provide this information, you run Oracle Universal Installer at 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 the 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 the response file mode. During a response file mode installation, the installer displays all the screens. The screens for which you specify information in the response file, and for those which you did not specify the required information in the response file. To use the response file mode, run `setup.exe` without the `-silent` parameter, but include the response file or any other parameters that apply.

You define the settings for a silent or a response file installation by entering values for the variables listed in the response file. For instance, to specify the Oracle home, provide the appropriate value for the *ORACLE_HOME* variable, as in the following example:

```
ORACLE_HOME="C:\app\product"
```

Another way of specifying the response file variable settings is to pass them as command-line arguments when you run Oracle Universal Installer. For example:

```
DRIVE_LETTER:<setup.exe_location> setup -silent "ORACLE_HOME=C:\app\product" ...
```

This method supports only the Oracle Home User passwords.

Reasons for Using Silent Mode or Response File Mode

Review this section for use cases for running the installer in silent mode or response file mode.

Table A-1 Reasons for Using Silent Mode or Response File Mode

Mode	Uses
Silent	Use silent mode to: • Complete an unattended installation, which you schedule using operating system utilities. • 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. The installer displays progress information on the terminal that you used to start it, but it does not display any of the installer screens.
Response file	Use response file mode to complete similar Oracle software installations on more than one system, providing default answers to some, but not all of the installer prompts. 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.

Using Response Files

Review this information to use response files.

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

1. If you plan to use Oracle Automatic Storage Management and configure new disks, then you must perform the following steps:
   a. Create partitions for DAS or SAN disks.
   b. Manually configure the disks using the `asmtoolg` or `asmtool` utility.
2. Customize or create a response file for the installation settings that you need.

   You can create the response file by using one of the following methods:
   - Modify one of the sample response files that is provided with the installation.
   - Run Oracle Universal Installer at a command prompt and save the inputs by selecting the **Save Response File** option.
3. Run Oracle Universal Installer from a command prompt, specifying the response file, using either silent or response file mode.

> **Note:**
>
> Windows requires Administrator privileges at the command prompt.

Preparing a Response File

Learn about the methods that you can use to prepare a response file for use during silent-mode or response file-mode installations.

- Editing a Response File Template
- Saving a Response File

Editing a Response File Template

Oracle provides response file templates for each product and the installation type, and for each configuration tool. These files are located in the *ORACLE_BASE**ORACLE_HOME*\`assistants` directory, and the `database\response` directory in the Oracle Database home.

> **Note:**
>
> If you copied the software to a hard disk, the response files are located in the *stage_area*\`database\response` directory.

The following table lists the available sample response files:

All response file templates contain comment entries, sample formats, examples, and other useful instructions. Read the response file instructions to understand how to specify values for the response file variables, so that you can customize your installation.

Table A-2 Response Files

Response File Name	Description
`db_install.rsp`	Silent installation of Oracle Database
`grid_install.rsp`	Silent installation of Oracle Grid Infrastructure
`dbca.rsp`	Silent installation of Database Configuration Assistant
`netca.rsp`	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 must be given to the Oracle software installation owner only. Oracle strongly recommends that database administrators or other administrators delete or secure response files when they are not in use.

To copy and modify a response file:

1. Copy the appropriate response files from the `Oracle_home\database\inventory\response` directory in the Oracle Database home.
2. Modify the response files with a text file editor.
3. Run the response file.

Saving a Response File

You can use the Oracle Universal Installer in an interactive mode to save a response file, which you can edit and then use to complete a silent mode or a response file mode installation.

You can save all the installation steps into a response file during installation by clicking **Save Response File** on the Summary page. You can use the generated response file for a silent installation later.
When you save the response file, you can either complete the installation, or you can exit from Oracle Universal Installer on the Summary page, before it starts to copy the software to the system.

> **Note:**
>
> Oracle Universal Installer does not save passwords in the response file.

To save a response file:

1. Ensure that the computer on which you are creating the response file has met the requirements described in Oracle Database Preinstallation Tasks.

   When you run Oracle Universal Installer to save 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 save the response file while completing an installation.

> **Note:**
>
> As an administrator, go to the Oracle home and run `setup.exe`.

2. After Oracle Universal Installer starts, enter the installation settings, to save the response file.
3. When the installer displays the Summary screen, perform the following:
   a. Click **Save Response File** and specify a file name and location for the response file. Then, click **Save** to save the values to the file.
   b. Click **Finish** to continue with the installation.

      Click **Cancel** if you do not want to continue with the installation. The installation stops, but the saved response file is retained.
4. 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.

Running Oracle Universal Installer Using the Response File

At this stage, you are ready to run Oracle Universal Installer at the command line, specifying the response file you created, to perform the installation.

On Windows, open the command prompt with Administrator privileges. The Oracle Universal Installer executable, `setup.exe`, provides several options. For help information about the full set of these options, run `setup.exe` with the `-help` option, for example:

```
DRIVE_LETTER:\setup.exe_location setup -help
```

A new command window with the "Preparing to launch..." message appears.

To run Oracle Universal Installer, and specify a response file:

1. Place the response file on the computer where you want to install Oracle Database.
2. At a command prompt, run Oracle Universal Installer with the appropriate response file. On Windows, you must open command prompt with the Administrator privileges. For example:

```
DRIVE_LETTER:<setup.exe_location> setup [-silent] "variable=setting" [-nowelcome]
[-noconfig] [-nowait] -responseFile
 filename
```

   where:

   - *filename*: Identifies the full path of the response file.
   - *setup.exe_location*: Indicates the location of `setup.exe`.
   - `-silent`: Runs Oracle Universal Installer in silent mode and suppresses the Welcome window.

- "*variable=setting*" refers to a variable within the response file that you may prefer to run at the command line rather than set in the response file. Enclose the variable and its setting in quotes.
- `-noconfig`: Suppresses running the configuration assistants during installation, performing a software-only installation instead.
- `-nowait`: Closes the console window when the silent installation completes.

If you save a response file during a silent installation, then Oracle Universal Installer saves the variable values that were specified in the original source response file into the new response file.

Running Net Configuration Assistant Using a Response File

When you run Net Configuration Assistant with a response file, you run it in a silent mode.

This lets you configure and start an Oracle Net listener on the system, configure naming methods, and configure Oracle Net service names. To run NetCA in a silent mode, use the `netca.rsp` response file in the *ORACLE_BASE*`\`*ORACLE_HOME*`\assistants\netca` directory, and the `response` directory in the `Oracle_home\database\inventory\response` directory.

> **Note:**
>
> If you copied the software to a hard disk, the response files are located in the *stage_area*`\database\response` directory.

On Windows, you must open command prompt with the Administrator privileges.

To create a Net Configuration Assistant response file:

1. Copy the `netca.rsp` response file template from the response file directory to a directory on your system.

   The `netca.rsp` is located in the `>netca.bat -silent -responsefile ORACLE_HOME\assistants\netca.rsp` directory on the Oracle Database.
2. Open the response file in a text editor.
3. Edit the file, following the instructions in the file.

   Net Configuration Assistant fails if you do not correctly configure the `netca.rsp` response file.

To run Net Configuration Assistant using the response file you just created, run Net Configuration Assistant in silent mode as follows, replacing *local_dir* with the directory where you placed your version of the `netca.rsp` response file:

```
oracle_home\bin\netca -silent -responsefile X:\local_dir\netca.rsp
```

For example:

```
>netca.bat -silent -responsefile ORACLE_HOME\assistants\netca.rsp
```

Running Oracle Database Configuration Assistant Using a Response File

You can run Oracle Database Configuration Assistant in a silent or a response file mode to configure and start an Oracle database on your system.

To run Oracle Database Configuration Assistant in silent or response file mode, use the `dbca.rsp` response file in the *`ORACLE_BASE`*`\`*`ORACLE_HOME`*`\assistants\netca` directory, and the `response` directory in the `database\response` directory.

> **Note:**
>
> If you copied the software to a hard disk, the response files are located in the *`stage_area`*`\database\response` directory.

To run Database Configuration Assistant in a response file mode, you must use the `-responseFile` flag in combination with either the `-silent` or `-progressOnly` flag. To run Database Configuration Assistant in response file mode, you must use a graphical display and set the `DISPLAY` environment variable.

On Windows, you must open the command prompt with Administrator privileges.

- Silent Mode of Database Configuration Assistant
  Use the `-silent` flag in combination with the `-responseFile` flag to set the mode to silent.
- Running Oracle Database Configuration Assistant in Response File Mode
  Use this procedure to run Oracle Database Configuration Assistant (Oracle DBCA) in response file mode.

Related Topics

- *Oracle Database Administrator's Guide*
- *Oracle Automatic Storage Management Administrator's Guide*

Silent Mode of Database Configuration Assistant

Use the `-silent` flag in combination with the `-responseFile` flag to set the mode to silent.

In the silent mode, Database Configuration Assistant uses values that you specify, in the response file or as command-line options, to create a database. No window or user interface is displayed in the silent mode.

Running Oracle Database Configuration Assistant in Response File Mode

Use this procedure to run Oracle Database Configuration Assistant (Oracle DBCA) in response file mode.

To create an Oracle DBCA response file:

1. Copy the `dbca.rsp` response file template from the response file directory to a directory on your system.

   The `dbca.rsp` response file is located in the `C:\ORACLE_HOME\assistants\dbca` directory.

2. Open the `dbca.rsp` response file in a text editor.
3. Edit the `dbca.rsp` file, following the instructions in the file.

   Oracle DBCA fails if you do not correctly configure the `dbca.rsp` response file.

To run the Oracle DBCA using the response file you just created, run Oracle DBCA in a silent or a response file mode using the following syntax:

```
C:\> %ORACLE_HOME%\bin\dbca [-silent] -createDatabase -responseFile local_dir/dbca.rsp
```

where:

- `-createDatabase` creates Oracle Database.
- `-silent` runs Oracle Database Configuration Assistant in the silent mode.
- `local_dir` is the full path of the directory where you copied the `dbca.rsp` response file template.

For example:

```
C:\> %ORACLE_HOME%\bin\dbca -createDatabase -responseFile
C:\oracle_response_files\mydbca.rsp
```

As an alternative to creating a database using a response file, you can run `dbca` at the command line by specifying all the required information as command line options. Database Configuration Assistant writes progress messages to `stdout`. For information about the list of options supported, enter the following command:

```
C:\ORACLE_HOME\bin\dbca -help
```

Postinstallation Configuration Using Response File Created During Installation

To run a response file configuration after installing Oracle software:

- About the Postinstallation Configuration File
  When you run a silent or a response file installation, you provide information about your servers in a response file that you otherwise provide manually during a graphical user interface installation.
- Running Postinstallation Configuration Using Response File
  Use this procedure to run postinstallation configuration using response file.

About the Postinstallation Configuration File

When you run a silent or a 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 the response file mode by using a password response file. The script uses the passwords to run the configuration tools in succession to complete the configuration.

If you keep the password file to use for clone installations, then Oracle strongly recommends that you store it in a secure location. In addition, if you must stop an installation to fix an error,

you can run the configuration assistants using `configToolAllCommands` and a password response file.

The `configToolAllCommands` password response file consists of the following syntax options:

- *internal_component_name* is the name of the component that the configuration assistant configures
- *variable_name* is the name of the configuration file variable
- *value* is the desired value of the configuration.

The command syntax is as follows:

internal_component_name|*variable_name*=*value*

For example:

```
oracle.crs|S_ASMPASSWORD=PassWord
```

Oracle strongly recommends that you maintain security with a password response file:

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

Running Postinstallation Configuration Using Response File

Use this procedure to run postinstallation configuration using response file.

To run configuration assistants with the `executeConfigTools` script:

1. Create a response file using the syntax *filename*.properties. For example:

   ```
   C:\> copy nul cfgrsp.properties
   ```

2. Open the file with a text editor, and cut and paste the password template, modifying as needed.
3. Secure the cfgrsp.properties file by changing permissions in Properties page. Right-click the file to open the Properties page. Select the **Security** tab, click the **Edit** button, select a group or user, then select **Deny** check box against Read permissions to remove read access for unwanted users.
4. Change directory to `ORACLE_HOME\cfgtoollogs`
5. Before running `configToolAllCommands`, rename it using the following command:

   ```
   copy configToolAllCommands configToolAllCommands.bat
   ```

6. Run the configuration script using the following syntax:

   ```
   configToolAllCommands.bat RESPONSE_FILE=\path\name.properties
   ```

   for example:

   ```
   C:\> configToolAllCommands.bat RESPONSE_FILE=C:\oracle\cfgrsp.properties
   ```

Example A-1 Password response file for Oracle Grid Infrastructure for a Standalone Server

Oracle Grid Infrastructure requires passwords for Oracle Automatic Storage Management Configuration Assistant (ASMCA), and for Intelligent Platform Management Interface Configuration Assistant (IPMICA) if you have a BMC card and you want to enable this feature. Provide the following response file:

```
oracle.crs|S_ASMPASSWORD=password
oracle.crs|S_ASMMONITORPASSWORD=password
oracle.crs|S_OMSPASSWORD=password
oracle.crs|S_BMCPASSWORD=password
oracle.crs|S_WINSERVICEUSERPASSWORD=password
```

Example A-2 Password response file for Oracle Database

Oracle Database configuration requires the `SYS`, `SYSTEM`, and `DBSNMP` passwords for use with Database Configuration Assistant (DBCA). The `S_ASMSNMPPASSWORD` password is necessary only if the database is using Oracle ASM for storage. Specify the `S_PDBADMINPASSWORD` password for your multitenant container database (CDB) with one or more pluggable databases (PDBs). Also, if you select configure Oracle Enterprise Manager, then provide the password for the Oracle software installation owner for the `S_EMADMINPASSWORD` password.

```
oracle.server|S_SYSPASSWORD=password
oracle.server|S_SYSTEMPASSWORD=password
oracle.server|S_DBSNMPPASSWORD=password
oracle.server|S_PDBADMINPASSWORD=password
oracle.server|S_EMADMINPASSWORD=password
oracle.server|S_ASMSNMPPASSWORD=password
```

If you do not want to enable Oracle Enterprise Manager or Oracle ASM, then leave those password fields blank.

Using the Installation Response File for Postinstallation Configuration

Use the response file created during installation to also complete postinstallation configuration.

Run the installer with the `-executeConfigTools` option to configure configuration assistants after installing Oracle Grid Infrastructure or Oracle Database. You can use the response file located at `%ORACLE_HOME%\install\response\product_timestamp.rsp` to obtain the passwords required to run the configuration tools. You must update the response file with the required passwords before running the `-executeConfigTools` command.

Oracle strongly recommends that you maintain security with a password response file. The owner of the response file must be the installation owner user.

Example A-3 Response File Passwords for Oracle Grid Infrastructure

```
oracle.install.crs.config.ipmi.bmcPassword=password
oracle.install.asm.SYSASMPassword=password
oracle.install.asm.monitorPassword=password
oracle.install.config.emAdminPassword=password
```

If you do not have a BMC card, or you do not want to enable IPMI, then leave the `ipmi.bmcPassword` input field blank.

> **Note:**
>
> IPMI is not available on Microsoft Windows for Oracle Database Release 21c, but will be available in a future release.

If you do not want to enable Oracle Enterprise Manager for management, then leave the `emAdminPassword` password field blank.

Example A-4 Response File Passwords for Oracle Grid Infrastructure for a Standalone Server (Oracle Restart)

```
oracle.install.asm.SYSASMPassword=password
oracle.install.asm.monitorPassword=password
oracle.install.config.emAdminPassword=password
```

If you do not want to enable Oracle Enterprise Manager for management, then leave the `emAdminPassword` password field blank.

Example A-5 Response File Passwords for Oracle Database

This example illustrates the passwords to specify for use with the database configuration assistants.

```
oracle.install.db.config.starterdb.password.SYS=password
oracle.install.db.config.starterdb.password.SYSTEM=password
oracle.install.db.config.starterdb.password.DBSNMP=password
oracle.install.db.config.starterdb.password.PDBADMIN=password
oracle.install.db.config.starterdb.emAdminPassword=password
oracle.install.db.config.asm.ASMSNMPPassword=password
oracle.install.OracleHomeUserPassword=password
```

You can also specify `oracle.install.db.config.starterdb.password.ALL=password` to use the same password for all database users.

Oracle Database configuration assistants require the SYS, SYSTEM, PDBADMIN, and DBSNMP passwords for use with Oracle Database Configuration Assistant (DBCA). Specify the following passwords, depending on your system configuration:

- If the database uses Oracle ASM for storage, then you must specify a password for the `ASMSNMPPassword` variable. If you are not using Oracle ASM, then leave the value for this password variable blank.
- If you did not specify an Oracle Home user for the Oracle Database installation, then leave the `OracleHomeUserPassword` field blank.

B

Optimal Flexible Architecture

Oracle Optimal Flexible Architecture (OFA) rules are a set of configuration guidelines created to ensure well-organized Oracle installations, which simplifies administration, support and maintenance.

About the Optimal Flexible Architecture Standard

Oracle Optimal Flexible Architecture (OFA) rules help you to organize database software and configure databases to allow multiple databases, of different versions, owned by different users to coexist.

In earlier Oracle Database releases, the OFA rules provided optimal system performance by isolating fragmentation and minimizing contention. In current releases, OFA rules provide consistency in database management and support, and simplifies expanding or adding databases, or adding additional hardware.

By default, Oracle Universal Installer places Oracle Database components in directory locations and with permissions in compliance with OFA rules. Oracle recommends that you configure all Oracle components in accordance with OFA guidelines.

Oracle recommends that you accept the OFA default. Following OFA rules is especially of value if the database is large, or if you plan to have multiple databases.

> **Note:**
>
> OFA assists in identification of an ORACLE_BASE with its Automatic Diagnostic Repository (ADR) diagnostic data to properly collect incidents.

About Multiple Oracle Homes Support

Oracle Database supports multiple Oracle homes. You can install this release or earlier releases of the software more than once on the same system, in different Oracle home directories.

Careful selection of mount point names can make Oracle software easier to administer. Configuring multiple Oracle homes in compliance with Optimal Flexible Architecture (OFA) rules provides the following advantages:

- You can install this release, or earlier releases of the software, more than once on the same system, in different Oracle home directories. However, you cannot install products from one release of Oracle Database into an Oracle home directory of a different release.
- Multiple databases, of different versions, owned by different users can coexist concurrently.
- To install Oracle Database software in multiple Oracle homes, you must extract the image file in each Oracle home, and then run the setup wizard from the respective Oracle home.
- You must install a new Oracle Database release in a new Oracle home that is separate from earlier releases of Oracle Database.

  You cannot install multiple releases in one Oracle home. Oracle recommends that you create a separate Oracle Database Oracle home for each release, in accordance with the Optimal Flexible Architecture (OFA) guidelines.
- In production, the Oracle Database server software release is the release number in the format of major and RU release number. For example, with the release number 19.3.0.0.0, the major release is 19 and the RU release number is 3.
- Later Oracle Database releases can access earlier Oracle Database releases. However, this access is only for upgrades. For example, Oracle Database 19c can access an Oracle Database 18c if the 18c database is started up in upgrade mode.
- Oracle Database Client can be installed in the same Oracle Database home if both products are at the same release level. For example, you can install Oracle Database Client 19c into an existing Oracle Database 19c home but you cannot install Oracle Database Client 19c into an existing Oracle Database 18c home. If you apply a patch set or release update before installing the client, then you must apply the patch set or release update again.
- Structured organization of directories and files, and consistent naming for database files simplify database administration.
- Login home directories are not at risk when database administrators add, move, or delete Oracle home directories.
- You can test software upgrades in an Oracle home in a separate directory from the Oracle home where your production database is located.
- For information about release support timelines, refer to My Oracle Support Doc ID 742060.1

Related Topics

- My Oracle Support Note 742060.1

Oracle Base Directory Naming Convention

This section describes what the Oracle base is, and how it functions.

The Oracle Base directory is the database home directory for Oracle Database installation owners and the log file location for Oracle Grid Infrastructure owners. You should name Oracle base directories using the syntax `\pm\h\u`, where *pm* is a string mount point name, *h* is selected from a small set of standard directory names, and *u* is the name of the owner of the directory.

You can use the same Oracle base directory for multiple installations. If different operating system users install Oracle software on the same system, then you must create a separate Oracle base directory for each installation owner. For ease of administration, Oracle recommends that you create a unique owner for each Oracle software installation owner, to separate log files.

Because all Oracle installation owners write to the central Oracle inventory file, and that file mount point is in the same mount point path as the initial Oracle installation, Oracle recommends that you use the same `\pm\h` path for all Oracle installation owners.

Table B-1 Examples of OFA-Compliant Oracle Base Directory Names

Example	Description
`C:\app\oracle`	Oracle base directory for Oracle Database , where the Oracle Database software installation owner name is `oracle`. The Oracle Database binary home is located underneath the Oracle base path.
`C:\app\grid`	Oracle base directory for Oracle Grid Infrastructure, where the Oracle Grid Infrastructure software installation owner name is `grid`.

Caution:

The Oracle Grid Infrastructure Oracle base should not contain the Oracle Grid Infrastructure binaries for an Oracle Grid Infrastructure for a cluster installation. Permissions for the file path to the Oracle Grid Infrastructure binary home is changed to `LocalSystem` or the Oracle Home User, if specified, during installation.

Oracle Home Directory Naming Convention

By default, Oracle Universal Installer configures Oracle home directories using these Oracle Optimal Flexible Architecture conventions.

The directory pattern syntax for Oracle homes is `\pm\s\u\product\v\type_[n]`. The following table describes the variables used in this syntax:

Variable	Description
pm	A mount point name.
s	A standard directory name.
u	The name of the owner of the directory.
v	The version of the software.

Variable	Description
type	The type of installation. For example: Database (`dbhome`), Client (`client`), or Oracle Grid Infrastructure (`grid`)
n	An optional counter, which enables you to install the same product more than once in the same Oracle base directory. For example: Database 1 and Database 2 (`dbhome_1`, `dbhome_2`)

For example, the following path is typical for the first installation of Oracle Database on this system:

```
C:\app\oracle\product\21.0.0\dbhome_1
```

Optimal Flexible Architecture File Path Examples

This topic shows examples of hierarchical file mappings of an Optimal Flexible Architecture-compliant installation.

```
D:\E:\F:\
```

Note:

- The Grid homes are examples of Grid homes used for an Oracle Grid Infrastructure for a standalone server deployment (Oracle Restart), or a Grid home used for an Oracle Grid Infrastructure for a cluster deployment (Oracle Clusterware). You can have either an Oracle Restart deployment, or an Oracle Clusterware deployment. You cannot have both options deployed at the same time.
- Oracle Automatic Storage Management (Oracle ASM) is included as part of an Oracle Grid Infrastructure installation. Oracle recommends that you use Oracle ASM to provide greater redundancy and throughput.

Table B-2 Optimal Flexible Architecture Hierarchical File Path Examples

Directory	Description
`C:\`	System directory
`C:\app\`	Subtree for application software
`C:\app\oraInventory`	Central OraInventory directory, which maintains information about Oracle installations on a server. Members of the group designated as the OINSTALL group have permissions to write to the central inventory. All Oracle software installation owners must have the OINSTALL group as their primary group, and be able to write to this group.

Table B-2 (Cont.) Optimal Flexible Architecture Hierarchical File Path Examples

Directory	Description
`C:\app\oracle\`	Oracle base directory for user `oracle`. There can be many Oracle Database installations on a server, and many Oracle Database software installation owners. Oracle software homes that an Oracle installation owner owns should be located in the Oracle base directory for the Oracle software installation owner, unless that Oracle software is Oracle Grid Infrastructure deployed for a cluster.
`C:\app\grid\`*`username`*	Oracle base directory for the Oracle Grid Infrastructure software, where *username* is the name of the user that performed the software installation. The Oracle home (Grid home) for Oracle Grid Infrastructure for a cluster installation is located outside of the Grid user. There can be only one Grid home on a server, and only one Grid software installation owner. The Grid home contains log files and other administrative files.
`C:\app\oracle\admin\`	Subtree for database administration files
`C:\app\oracle\admin\TAR`	Subtree for support log files
`C:\app\oracle\admin\db_sales\`	admin subtree for database named “sales”
`C:\app\oracle\admin\db_dwh\`	admin subtree for database named “dwh”
`C:\app\oracle\fast_recovery_area\`	Subtree for recovery files
`C:\app\oracle\fast_recovery_area\db_sales`	Recovery files for database named “sales”
`C:\app\oracle\fast_recovery_area\db_dwh`	Recovery files for database named “dwh”

`D:\app\oracle\oradata`
`E:\app\oracle\oradata`
`F:\app\oracle\oradata`
	Oracle data file directories

Table B-2 (Cont.) Optimal Flexible Architecture Hierarchical File Path Examples

Directory	Description
`C:\app\oracle\product\`	Common path for Oracle software products other than Oracle Grid Infrastructure for a cluster.
`C:\app\oracle\product\21.0.0\dbhome_1`	Oracle home directory for Oracle Database 1, owned by Oracle Database installation owner account `oracle`.
`C:\app\oracle\product\21.0.0\dbhome_2`	Oracle home directory for Oracle Database 2, owned by Oracle Database installation owner account `oracle`
`C:\app\oradbowner\product\21.0.0\dbhome_2`	Oracle home directory for Oracle Database 2, owned by Oracle Database installation owner account `oradbowner`.
`C:\app\oracle\product\21.0.0\grid`	Oracle home directory for Oracle Grid Infrastructure for a standalone server, owned by Oracle Database and Oracle Grid Infrastructure installation owner `oracle`.
`C:\app\21.0.0\grid`	Oracle home directory for Oracle Grid Infrastructure for a cluster (Grid home), owned by user `grid` before installation, and owned by `root` after installation.
`C:\app\grid\`*`username`*`\diag\crs\`*`hostname`*`\crs\trace`	Oracle Clusterware log files

C

Managing Oracle Database Port Numbers

Review default port numbers.

If needed, use these steps to change assigned ports after installation.

- About Managing Ports
  During installation, Oracle Universal Installer assigns port numbers to the components from a set of default port numbers.
- Oracle Database Component Port Numbers and Protocols
  This table lists the port numbers and protocols configured for Oracle Database components during a single-instance installation.
- Changing the Oracle Services for Microsoft Transaction Server Port
  In most cases, you need not reconfigure the port number.

About Managing Ports

During installation, Oracle Universal Installer assigns port numbers to the components from a set of default port numbers.

Many Oracle Database components and services use ports. As an administrator, it is important to know the port numbers used by these services, and to ensure that the same port number is not used by two services on your host.

Most port numbers are assigned during installation. Every component and service has an allotted port range, which is the set of port numbers Oracle Database attempts to use when assigning a port. Oracle Database 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, even a non-Oracle Database process.
- Is the port listed in the `/etc/services` file?

If the answer to any of the preceding questions is yes, then Oracle Database moves to the next highest port in the allotted port range, and continues checking until it finds a free port.

Oracle Database Component Port Numbers and Protocols

This table lists the port numbers and protocols configured for Oracle Database components during a single-instance installation.

By default, the first port in the range is assigned to the component, if it is available.

Table C-1 Ports Used in Oracle Components

Component and Description	Default Port Number	Port Range	Protocol
Oracle Net Listener Enables Oracle client connections to the database by using Oracle Net services. You can configure this port number during installation. To reconfigure this port, use Net Configuration Assistant.	1521	Port number changes to the next available port. Modifiable manually to any available port.	TCP
Oracle Connection Manager Listening port for Oracle client connections. It is not configured during installation, but can be configured manually by editing the cman.ora parameter file. You can find the file under `/network/admin` directory.	1630	1630	TCP
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.	0	Configured Manually	HTTP
Oracle XML DB Developer's Guide 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.	0	Configured Manually	FTP
Oracle Services for Microsoft Transaction Server The port number for Microsoft Transaction Server is configured when you enter its value in the Oracle Universal Installer the first time you install the software on a particular server. If you install the software in multiple Oracle homes on the same server, then Oracle Universal Installer uses the same port number that you specified during the first installation. In most cases, you do not have to reconfigure the port number.	Dynamic	49152-65535	TCP

Related Topics

- *Oracle Enterprise Manager Cloud Control Advanced Installation and Configuration Guide*
- *Oracle Real Application Clusters Installation Guide for Microsoft Windows x64 (64-Bit)*
- *Oracle XML DB Developer's Guide*

Changing the Oracle Services for Microsoft Transaction Server Port

In most cases, you need not reconfigure the port number.

If you must, then you can use the Registry Editor to edit its value in the `HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE\OracleMTSRecoveryService\Protid_0` Registry Editor key to any available port within the range `1024 to 65535`.

During installation, Oracle Universal Installer takes the value for the port from the key, if it exists. Otherwise, a free port ranging from `49152 to 65535` is chosen.