

Oracle® Database

Upgrade Guide

12c Release 2 (12.2)

E49634-17

July 2017

Oracle Database Upgrade Guide, 12c Release 2 (12.2)

E49634-17

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Changes in This Release for Oracle Database Upgrade Guide

The new release of Oracle Database provides improvements to upgrade performance, automation, and reporting.

Changes in Oracle Database 12c Release 2 (12.2)

The following are changes in *Oracle Database Upgrade Guide* for Oracle Database 12c release 2 (12.2).

New Features

New features for Oracle Database 12c release 2 (12.2)

See Also:

Oracle Database New Features Guide for a complete description of the new features in Oracle Database 12c release 2 (12.2).

- **Adaptive Optimizer Parameters**
The parameters `OPTIMIZER_ADAPTIVE_PLANS` and `OPTIMIZER_ADAPTIVE_STATISTICS` replace `OPTIMIZER_ADAPTIVE_FEATURES`.
- **Automatic setting of user tablespaces to Read-Only during upgrade**
You can use the new `-T` option for the parallel upgrade utility (`catctl.pl`) to set user tablespaces automatically to READ-ONLY during an upgrade. After the upgrade, the tablespaces are changed back automatically to READ/WRITE.
- **Database Upgrade Assistant (DBUA) Enhancements and Changes**
Database Upgrade Assistant includes numerous new features and code enhancements for this release.
- **Enhancement for Rolling Upgrade Using Active Data Guard**
Starting with Oracle Database 12c release 2 (12.2), when you perform a rolling upgrade using the `DBMS_ROLLING` PL/SQL package, you no longer need to disable the broker. In addition, the broker now reports when a rolling upgrade is in place, and tracks its status. The status information is displayed in the output of the `DGMGRL` commands `SHOW CONFIGURATION` and `SHOW DATABASE`.

- Long Identifiers

Through Oracle Database 12c Release 1 (12.1), the length limit for most names was 30 bytes. The names of users, roles, editions, tables, columns, indexes, constraints, views, synonyms, PL/SQL units, and all types of names in PL/SQL source text (variables, formal parameters, types and subtypes, exceptions, and so on) are some examples. Now, this limit is increased to 128 bytes for almost all kinds of names. There are, however, some exceptions. For example, the limit for the names of tablespaces and PDBs stays at 30 bytes. The exceptions are documented locally. The need to store longer names in the dictionary was already reflected in release 12.1 by changing the widths of appropriate VARCHAR2 columns in documented dictionary views from 30 bytes to 128 bytes.

See Also:

Oracle Database SQL Language Reference

- Oracle Label Security support for rolling upgrades

Databases that use Oracle Label Security (OLS) can be upgraded to new Oracle Database releases and patchsets using Oracle Data Guard database rolling upgrades (transient logical standby database only). This support is for rolling upgrades from Oracle Database 12c Release 2 (12.2) onward.

See Also:

- *Oracle Label Security Administrator's Guide*
 - *Oracle Data Guard Concepts and Administration*
-
-

- Automatic `catuppst.sql` Script Run During Upgrade

The `catuppst.sql` script is now run automatically after an upgrade is completed.

- Automatic Resume After Failed Upgrades

You can resume a failed upgrade from the failed phase after you have resolved the issue causing the upgrade failure. Run the Parallel Upgrade Utility using the `-R` parameter to resume the upgrade at the point of failure, so that only the missing upgrade phases are rerun.

- Parallel Upgrade Utility Command Line Changes

In Oracle Database 12c release 2 (12.2), you can run the Parallel Upgrade Utility directly from the command line by using the shell command `dbupgrade`.

- Parallel Upgrade Utility Keeps Open Databases With Errors

Starting in Oracle Database 12c release 2 (12.2), Non-CDB and CDB databases being upgraded that show errors during upgrades are no longer shut down, but instead remain open in upgrade mode.

- Parallel Upgrade Utility Parameters `-n` and `-N`

The Parallel Upgrade Utility parameters `-n` and `-N` control the number of parallel SQL processes to use when upgrading databases.

- **Parallel Upgrade Utility Upgrade Emulation Tests (Parameter -E)**
You can run upgrade emulations with the Parallel Upgrade Utility, which enables you to perform an upgrade emulation to test Parallel Upgrade Utility parameter settings.
- **Pre-Upgrade Information Tool Script Changes**
The Pre-Upgrade Information Tool script `preupgrd.sql` and `utluppkg.sql` are no longer supplied as part of the 12.2 release. The Pre-Upgrade Information Tool `preupgrade.jar` replaces both of these files.

See Also:

[Using the Pre-Upgrade Information Tool for Oracle Database](#) (page 2-35)

- **Prioritize PDB upgrades**
You can prioritize the PDBs in a CDB when you upgrade the CDB.
- **Rapid Home Provisioning provides the following new features:**
 - Provisioning, Patching, and Upgrade of Oracle Grid Infrastructure releases 12.2, 12.1.0.2, and 11.2.0.4
 - Provisioning of single-instance Oracle Databases on various versions of client clusters
 - Upgrade of Oracle Database
- **UNIFORM_LOG_TIMESTAMP_FORMAT Parameter and ISO 8601**
In Oracle Database 12c release 2 (12.2), timestamps conform to ISO 8601. Set this parameter to FALSE to use timestamp formats used in release 12.1
- **Upgrading a CDB With One or More PDBs in a Single Operation**
You can now upgrade a multitenant container database (CDB) with one or more pluggable databases (PDBs) plugged into it in a single operation.
- **Upgrading a PDB in Less Time**
Time is significantly reduced when upgrading a pluggable database (PDB) by unplugging it from a lower release multitenant container database (CDB) and subsequently plugging it into a higher release CDB.
- **SQL92_SECURITY Parameter Default is TRUE**
The default value of the initialization parameter `SQL92_SECURITY` parameter is changed from FALSE to TRUE.

Related Topics:

[Behavior Changes, Deprecated and Desupported Features for Oracle Database 12c Release 2 \(12.2\)](#) (page 8-1)

Deprecated Features

Deprecated features for Oracle Database 12c release 2 (12.2).

For more information about these deprecations, refer to chapter 8, "Behavior Changes, Deprecated and Desupported Features for Oracle Database 12c Release 2 (12.2)."

- Deprecation of `O7_DICTIONARY_ACCESSIBILITY` initialization parameter
The initialization parameter `O7_DICTIONARY_ACCESSIBILITY` is deprecated in this release. This initialization parameter provided backward compatibility for Oracle7. It is no longer needed. The `FALSE` value for the parameter extended the reach of system privileges that allow access to objects in "any schema" to objects in the `SYS` schema.
- Deprecation of `ALTER TYPE REPLACE` syntax of the `ALTER TYPE` clause
Starting with Oracle Database 12c release 2 (12.2.0.1), the `ALTER TYPE REPLACE` syntax of the `ALTER TYPE` clause is deprecated.
- Deprecation of `ASM_PREFERRED_READ_FAILURE_GROUPS` initialization parameter
The `ASM_PREFERRED_READ_FAILURE_GROUPS` initialization parameter is deprecated in Oracle Automatic Storage Management 12c release 2 (12.2.0.1). Starting with Oracle Automatic Storage Management (Oracle ASM) 12c release 2 (12.2.0.1), specifying the preferred read failure groups is done automatically, so the use of the `ASM_PREFERRED_READ_FAILURE_GROUPS` initialization parameter is no longer required. Use the `PREFERRED_READ.ENABLED` disk group attribute to control the preferred read functionality.
- Deprecation of `configToolAllCommands` script
The script `configToolAllCommands` runs in the response file mode to configure Oracle products after installation. It uses a separate password response file. Starting with Oracle Database 12c release 2 (12.2), `configToolAllCommands` is deprecated. It may be desupported in a future release.

You can now obtain postinstallation checks as part of the installation process. Oracle recommends that you run the Oracle Database or Oracle Grid Infrastructure installer with the option `-executeConfigTools`. You can use the same response file created during installation to complete postinstallation configuration.
- The `DBMS_DEBUG` package is deprecated in Oracle Database 12c release 1 (12.1). Oracle recommends that you use `DBMS_DEBUG_JDWP`.
- Deprecation of `DBMS_JOBS` Package
The `DBMS_JOB` package is deprecated, and may be desupported in a future release.

Oracle recommends that developers move to `DBMS_SCHEDULER`, which provides a richer set of features and capabilities.
- Deprecation of Intelligent Data Placement
The Intelligent Data Placement (IDP) feature has been deprecated in Oracle ASM 12c release 2 (12.2.0.1)
- Deprecation of Non-CDB Architecture
The non-CDB architecture is deprecated in Oracle Database 12c release 1 (12.1), and may be desupported and unavailable in a release after Oracle Database 12c Release 2 (12.2).

Oracle recommends use of the CDB architecture.

- Deprecation of Oracle Administration Assistant for Windows

Oracle Administration Assistant for Windows is a tool for creating database administrators, operators, users, and roles in Windows. It also allows database service, startup/shutdown configuration, and Windows Registry parameter management. Oracle Administration Assistant for Windows is deprecated in Oracle Database 12c release 2 (12.2). Instead of using Oracle Administration Assistant for Windows, use native Windows administration tools.

- Deprecation of Oracle Data Provider for .NET attribute `PromotableTransaction`

The `PromotableTransaction` attribute is deprecated. There is no replacement for this attribute. Oracle recommends that you accept the default value of opening transactions in promotable mode.

- Deprecation of `oracle.jdbc.OracleConnection.unwrap()`

Starting in Oracle Database 12c release 2 (12.2), the Java package `oracle.jdbc.OracleConnection.unwrap()` is deprecated. Oracle recommends that you use the Java standard method `unwrap(class)` to replace this feature.

- Deprecation of `oracle.jdbc.rowset` Package

Starting in Oracle Database 12c release 2 (12.2), the Java package `oracle.jdbc.rowset` is deprecated. Oracle recommends that you use the Standard JDBC RowSet package to replace this feature.

- Deprecation of Oracle Multimedia DICOM Support

Starting in Oracle Database 12c release 2 (12.2), the Oracle Multimedia DICOM feature is deprecated. There is no replacement for DICOM support in Oracle Database.

- Deprecation of Oracle Multimedia Java APIs

Starting in Oracle Database 12c release 2 (12.2), the Oracle Multimedia Java APIs are deprecated. Oracle recommends that you replace these APIs with embedded PL/SQL anonymous blocks in your Java code.

- Deprecation of Oracle Multimedia SQL/MM Still Image Standard Support

Starting in Oracle Database 12c release 2 (12.2), Oracle Multimedia SQL/MM Still Image standard support is deprecated. Oracle recommends that you replace SQL/MM still image with `ORDImage` for image processing. There is no replacement for image matching in Oracle Database. You can use open source packages for image-matching, such as OpenCV.

- Deprecation of Oracle SQL (`oracle.sql.*`) Extensions

All `oracle.sql.*` extensions are deprecated in Oracle Database 12c release 2 (12.2) in favor of standard Java classes or `oracle.jdbc` extension types.

- Deprecation of `PARALLEL_ADAPTIVE_MULTI_USER` initialization parameter

There is no replacement parameter. In addition to being deprecated, in this release the default value of this parameter changes from `TRUE` to `FALSE`. Oracle recommends that you use the Oracle Database feature Parallel Statement Queuing to run SQL statements in parallel.

- Deprecation of XML DB options

The following XML DB options are deprecated:

 - Oracle XQuery function `ora:contains`. Use XQuery Full Text instead.
 - Oracle SQL function `XMLRoot`. Use SQL/XML function `XMLSerialize()` with a version number instead.
 - Nested tables stored as index-ordered tables (IOTs). This deprecation includes both the use of option `DBMS_XMLSCHEMA.REGISTER_NT_AS_IOT`, and the use of clause `NESTED TABLE N STORE AS ... (ORGANIZATION INDEX)` when creating a table with nested-table column *N*. Instead, store nested-table columns using heap storage (the default behavior for PL/SQL procedure `DBMS_XMLSCHEMA.registerSchema`).
 - PL/SQL procedure `DBMS_XSLPROCESSOR.CLOB2FILE`. Use `DBMS_LOB.CLOB2FILE` instead.
 - PL/SQL function `DBMS_XSLPROCESSOR.READ2CLOB`. Use `DBMS_LOB.LOADCLOBFROMFILE` instead.
 - Use of XLink with Oracle XML DB.
 - Oracle XML DB Content Connector.
- Deprecation of Unicode Collation Algorithm UCA 6.1 Collations

The Unicode Collation Algorithm (UCA) 6.1 collations (UCA0610_*) are deprecated. They can be desupported and unavailable in a future release.
- Deprecation of `UNIFIED_AUDIT_SGA_QUEUE_SIZE`

The `UNIFIED_AUDIT_SGA_QUEUE_SIZE` parameter has been deprecated, but is retained for backward compatibility.
- Deprecation of `V$MANAGED_STANDBY`

This view is deprecated in Oracle Database 12c Release 2 (12.2.0.1). Oracle recommends that you use the `V$DATAGUARD_PROCESS` view instead.
- Deprecation of `VERIFY_FUNCTION` and `VERIFY_FUNCTION_11G`

`VERIFY_FUNCTION` and `VERIFY_FUNCTION_11G` are deprecated. Oracle recommends that you use the `ora12c_verify_function` and `ora12c_strong_verify_function` password verification functions to ensure that new or changed passwords are sufficiently complex to prevent intruders who try to break into the system by guessing passwords.
- Deprecation of `V$MANAGED_STANDBY` View

The `V$MANAGED_STANDBY` view is deprecated in Oracle Database 12c Release 2 (12.2.0.1). Oracle recommends that you use the view `V$DATAGUARD_PROCESS` view.
- Deprecation of `UTL_FILE_DIR` Initialization Parameter

use directory objects instead.

Related Topics:

[Behavior Changes, Deprecated and Desupported Features for Oracle Database 12c Release 2 \(12.2\)](#) (page 8-1)

Oracle Database 12c introduces upgrade behavior changes for your database in addition to new features. Changes in behavior include deprecated and desupported initialization parameters, options, syntax, and the deprecation and desupport of features and components.

[Deprecated Features in Oracle Database 12c Release 2 \(12.2\)](#) (page 8-6)

Desupported Features

Desupported features for Oracle Database 12c release 2 (12.2)

For more information about these desupported features, refer to chapter 8, "Behavior Changes, Deprecated and Desupported Features for Oracle Database 12c Release 2 (12.2)."

- Desupport of Advanced Replication

Advanced Replication is desupported in Oracle Database 12c release 2 (12.2).

- Desupport of Direct File System Placement for Oracle Cluster Registry (OCR) and Voting Files

Starting with Oracle Grid Infrastructure 12c Release 2 (12.2), the placement of Oracle Clusterware files directly on a shared file system is desupported in favor of having Oracle Clusterware files managed by Oracle Automatic Storage Management (Oracle ASM). Oracle Clusterware files include the Oracle Cluster Registry (OCR), and the Voting Files.

You cannot place Oracle Clusterware files directly on a shared file system. If you need to use a supported shared file system, either a Network File System, or on a shared cluster file system instead of native disk devices, then you must create Oracle ASM disks on supported network file systems that you plan to use for hosting Oracle Clusterware files before installing Oracle Grid Infrastructure. You can then use the Oracle ASM disks in an Oracle ASM disk group to manage Oracle Clusterware files. If your Oracle Database files are stored on a shared file system, then you can continue to use shared file system storage for database files, instead of moving them to Oracle ASM storage.

- The following initialization parameters are desupported:
 - The GLOBAL_CONTEXT_POOL_SIZE initialization parameter is removed and desupported in this release.
 - The MAX_ENABLED_ROLES initialization parameter is removed and desupported in this release.
 - The OPTIMIZER_ADAPTIVE_FEATURES initialization parameter is removed and desupported in this release.
 - The PARALLEL_AUTOMATIC_TUNING initialization parameter is removed and desupported in this release.
 - The PARALLEL_IO_CAP_ENABLED initialization parameter is removed and desupported in this release.

- The PARALLEL_SERVER initialization parameter is removed and desupported in this release.
- The PARALLEL_SERVER_INSTANCES initialization parameter is removed and desupported in this release
- The USE_INDIRECT_DATA_BUFFERS initialization parameter is removed and desupported in this release.
- Server-side SQLJ code is not supported with Oracle Database 12c release 2 (12.2): This applies to running stored procedures, functions, and triggers inside the database environment.
- Desupport of JPublisher

All Oracle JPublisher features are desupported and unavailable in Oracle Database 12c Release 2 (12.2.0.1).

Related Topics:

[Desupported Features in Oracle Database 12c Release 2 \(12.2\)](#) (page 8-13)
Review this list of desupported features as part of your upgrade planning.

[Desupported Initialization Parameters in Oracle Database 12c Release 2 \(12.2\)](#) (page 8-4)
Review this list of desupported initialization parameters for changes and replacements in parameter settings in this release.

Changes in Oracle Database 12c Release 1 (12.1)

The following are changes in Oracle Database Upgrade Guide for Oracle Database 12c release 1 (12.1).

New Features

Review this section for new features for Oracle Database 12c release 1.

Oracle Database 12c includes many new features, some of which directly affect upgrading. The following features are new for the upgrade process.

See Also:

Oracle Database New Features Guide for a complete description of the new features in Oracle Database 12c

- Pre-Upgrade Information Tool

The Pre-Upgrade Information utility provides fixup scripts to address issues that may be present, both before and after the upgrade. Database Upgrade Assistant (DBUA) and the Pre-Upgrade Information Tool perform detailed checks of the database that you want to upgrade, and the special scripts are generated specifically to fix any problems that are found.

During the pre-upgrade phase, you can interactively run fixup scripts to resolve issues that are found. Post-upgrade fixup scripts are generated depending on the results of the upgrade process. DBUA prompts you to run the appropriate scripts as critical issues are found.

- **Parallel Processing for Database Upgrade**

In Oracle Database 12c release 1 (12.1), the `catupgrd.sql` Upgrade Utility is replaced with the `catctl.pl` Parallel Upgrade Utility. You can choose to upgrade your database in parallel or serial mode with the Parallel Upgrade Utility. In earlier releases, only serial mode was available, which meant that the upgrade scripts and processes ran one after the other, regardless of how much CPU capacity was available.

Database Upgrade Assistant (DBUA) takes full advantage of the Parallel Upgrade Utility. DBUA runs in parallel upgrade mode by default. Parallel processing decreases the time for the database upgrade by optimizing the use of CPU power in the system where the database is located.

See [About the Parallel Upgrade Utility for Oracle Database \(CATCTL.PL and DBUPGRADE\)](#) (page 3-3)

- **Upgrade Steps in DBUA Can Be Restarted During the Upgrade Process**

In this release, there are more options for recovering from failures during upgrade and for restarting the upgrade from the upgrade step point where the failure occurred.

- **Enhanced Pre-Upgrade and Post-Upgrade Summary Report**

DBUA generates HTML reports before and after the upgrade. The reports enable you to check details of database object status, including invalid objects, where an action to fix a problem may be available.

See [Using DBUA to Upgrade the Database on Linux, UNIX, and Windows Systems](#) (page 3-13)

- **Oracle Grid Infrastructure Upgrade Enhancements**

Upgrading Oracle Grid Infrastructure for Oracle Database 12c includes root script automation procedures, improved ability to perform full release and patch upgrades, and enhancements to status checks and upgrade checkpoints to provide improved stability and ease of use.

See *Oracle Grid Infrastructure Installation and Upgrade Guide* for your operating system for information about upgrading Oracle Grid Infrastructure.

- **Pluggable Databases**

The pluggable database (PDB) feature is new in Oracle Database 12c release 1.

Oracle Database uses multitenant architecture. You can configure a multitenant container database (CDB) and have one PDB. If you purchase the Oracle Multitenant option, then you can have multiple PDBs inside a CDB. One of the key benefits of the multitenant architecture is that you can upgrade or apply a patch to a CDB, and the upgrade or patch is implemented on all the PDBs within that CDB. This greatly simplifies administration for upgrading.

See *Oracle Database Concepts* for an overview and documentation roadmap for working with PDBs.

- **Oracle XML Database is Installed When You Upgrade**

You cannot uninstall Oracle XML DB, and there is no option not to include it when you create a new database. During the upgrade, if Oracle XML DB is not found, then Oracle XML DB is automatically loaded into the SYSAUX tablespace. The upgraded Oracle Database includes Oracle XML DB.

See *Oracle XML DB Developer's Guide* for information about new features in Oracle XML DB.

Deprecated Features

Check the features deprecated in Oracle Database, and in the Oracle upgrade process.

In addition to deprecating one or more features that directly affect the upgrade process, this release includes deprecations for a range of Oracle Database features and respective replacements for those features.

- The `catupgrd.sql` upgrade script is deprecated in Oracle Database 12c. The Parallel Upgrade Utility, `catctl.pl` replaces `catupgrd.sql`.
- Appendix A, Changes for Earlier Releases of Oracle Database, describe changes that affect the behavior of Oracle Database 12c release 1 (12.1) after upgrading..
- Deprecation of Non-CDB Architecture
The non-CDB architecture is deprecated in Oracle Database 12c release 1, and may be desupported and unavailable in a release after Oracle Database 12c Release 2. Oracle recommends use of the CDB architecture.

Related Topics:

[Deprecation of catupgrd.sql Script and Introduction of Parallel Upgrade Utility](#) (page A-4)

[Behavior Changes, Deprecated and Desupported Features for Oracle Database 12c Release 2 \(12.2\)](#) (page 8-1)

[Changes for Earlier Releases of Oracle Database](#) (page A-1)

Desupported Features

The comprehensive list of features that are desupported in Oracle Database 12c release 1 is provided in Appendix A, Changes for Earlier Releases of Oracle Database.

Oracle recommends that you check the entire chapter for changes that affect your database environment.

Related Topics:

[Changes for Earlier Releases of Oracle Database](#) (page A-1)

Preface

These topics provide information about the scope of these contents for upgrading plans and procedures.

This book guides you through the process of planning and executing Oracle Database upgrades. In addition, this manual provides information about compatibility, upgrading applications, and important changes in the new Oracle Database release, such as initialization parameter changes and data dictionary changes.

Oracle Database Upgrade Guide contains information that describes the features and functions of Oracle Database (also known as the standard edition) and Oracle Database Enterprise Edition products. Oracle Database and Oracle Database Enterprise Edition have the same basic features. However, several advanced features are available only with Oracle Database Enterprise Edition, and some of these are optional. For example, to use application failover, you must have the Enterprise Edition with the Oracle Real Application Clusters option.

[Audience](#) (page xxix)

[Documentation Accessibility](#) (page xxx)

[Related Documentation](#) (page xxx)

[Conventions](#) (page xxx)

See Also:

Oracle Database New Features Guide for information about the differences between Oracle Database and Oracle Database Enterprise Edition and the features and options that are available to you

Audience

Oracle Database Upgrade Guide is intended for database administrators (DBAs), application developers, security administrators, system operators, and anyone who plans or performs Oracle Database upgrades.

To use this document, you must be familiar with the following information:

- Relational database concepts
- Your current Oracle Database release
- Your operating system environment

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.

Related Documentation

Review this documentation list for additional information.

- *Oracle Database Concepts* for a comprehensive introduction to the concepts and terminology used in this manual
- *Oracle Database Administrator's Guide* for information about administering Oracle Database
- *Oracle Database SQL Language Reference* for information on Oracle Database SQL commands and functions
- *Oracle Database Utilities* for information about utilities bundled with Oracle Database
- *Oracle Database Net Services Administrator's Guide* for information about Oracle Net Services

Many of the examples in this guide use the sample schemas, installed by default when you select the Basic Installation option with an Oracle Database installation. For information on how these schemas are created and how you can use them, refer to the following guide:

Oracle Database Sample Schemas

Conventions

The following text conventions are used in this document:

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

Introduction to Upgrading Oracle Database

Oracle provides upgrade options and strategies that are designed for your database environment, and an array of tools that automate the Oracle Database upgrade process.

Topics:

[Overview of Oracle Database Upgrade Tools and Processes](#) (page 1-1)

Review these topics to understand Oracle Database terms, tools and processes.

[Major Steps in the Upgrade Process for Oracle Database](#) (page 1-5)

Oracle Database upgrades consist of six major steps.

[Compatibility and Interoperability between Oracle Database Releases](#) (page 1-9)

Review to understand compatibility differences.

[About Running Multiple Oracle Releases](#) (page 1-17)

Run multiple releases using Optimal Flexible Architecture (OFA).

[About Converting Databases During Upgrades](#) (page 1-20)

Review these topics to determine which is the best path for you to select to upgrade Oracle Databases.

[About Upgrading Platforms for a New Oracle Database Release](#) (page 1-26)

Review these topics if you upgrade your operating system or hardware for a new Oracle Database release.

1.1 Overview of Oracle Database Upgrade Tools and Processes

Review these topics to understand Oracle Database terms, tools and processes.

[Definition of Terms Upgrading and Migrating](#) (page 1-2)

Upgrading and migrating are different types of database changes.

[Upgrade and Data Migration Methods and Processes](#) (page 1-2)

Oracle provides features and products to automate the upgrade process, and to assist you with completing upgrades efficiently.

[Oracle Database Releases That Support Direct Upgrade](#) (page 1-3)

Review the supported options for direct upgrades to the latest Oracle Database release.

[Where to Find the Latest Information About Upgrading Oracle Database](#) (page 1-4)

In addition to this document, Oracle provides information about upgrades on its support site, and through its Pre-Upgrade Information Tool.

1.1.1 Definition of Terms Upgrading and Migrating

Upgrading and migrating are different types of database changes.

Upgrading transforms an existing Oracle Database environment (including installed components and associated applications) into an Oracle Database 12c environment. The data dictionary for the database is upgraded to the new release. Upgrading does not directly affect user data; no data is touched, changed, or moved during an upgrade.

Migrating data refers to moving data from one Oracle Database into another database previously created for migrating or moving the data. You migrate data when you need to move your database environment to a new hardware or operating system platform, or to a new character set. Migrating does not include upgrading to the latest release. The upgrade process is handled separately after you migrate the data.

The upgrade steps in *Oracle Database Upgrade Guide* apply to all operating systems, unless otherwise specified. There may be upgrading steps required specifically for your operating system.

Related Topics:

[Migrating Data With Oracle Data Pump Before Upgrades](#) (page 7-2)

See Also:

Oracle Database Installation Guide for your operating system

1.1.2 Upgrade and Data Migration Methods and Processes

Oracle provides features and products to automate the upgrade process, and to assist you with completing upgrades efficiently.

Oracle Database supports the following methods for upgrading or migrating a database to the new release:

- Database Upgrade Assistant (DBUA)
Provides a graphical user interface that guides you through the upgrade of a database. DBUA can be launched during installation with the Oracle Universal Installer, or you can launch DBUA as a standalone tool at any time in the future.
- Manual upgrade using the Parallel Upgrade Utility, and other command-line utilities
Enables upgrades to be performed using shell scripts.
- Migrating data using Oracle Data Pump
Provides export and import utilities. Oracle Data Pump can perform a full or partial export from your database, followed by a full, or partial import into the new release of Oracle Database. Export/Import in Oracle Data Pump can copy a subset of the data, leaving the database unchanged.
- CREATE TABLE AS SQL statement
Migrates data from a database into a new Oracle Database release. By using this method, you can copy a subset of the data, leaving the database unchanged.

- Upgrading CDBs and PDBs using a priority list to group and upgrade PDBs according to their priority.

Run the Parallel Upgrade Utility (`dbupgrade`, or `catctl.pl`) using the `-L` option to run the upgrade using a priority list, and to call that list as the upgrade runs.

- Synchronizing a standby database, upgrading, and using Oracle GoldenGate to synchronize the upgraded database (a zero downtime option)
- Using Rapid Home Provisioning (RHP) to upgrade databases.

In a Rapid Home Provisioning upgrade, you carry out a new Oracle Database installation. After testing the database, and modifying it in accordance with the standard operating environment (SOE) that you want to use for your databases, you create an RHP gold image. A DBA deploys instances of that gold image to servers that have earlier release databases that you want to upgrade. After deployment of these gold images, a DBA can run a single `rhpctl` command to move files, perform configuration changes, and perform other steps required to use the new binaries. Refer to *Oracle Clusterware Administration and Deployment Guide* for more information about Rapid Home Provisioning.

Related Topics:

[Choose an Upgrade Method for Oracle Database](#) (page 2-3)

Oracle Clusterware Administration and Deployment Guide

1.1.3 Oracle Database Releases That Support Direct Upgrade

Review the supported options for direct upgrades to the latest Oracle Database release.

You can perform a direct upgrade to the new release from the following releases:

- 11.2.0.3 or later
- 12.1.0.1 and 12.1.0.2

The path that you must take to upgrade to the latest release of Oracle Database 12c release 2 (12.2) depends on the release number of your current database.

If your current Oracle Database is a release earlier than 11.2.0.3, then you cannot directly upgrade your Oracle Database to the latest release. In this case, you are required to upgrade to an intermediate release before upgrading to Oracle Database 12c release 2.

If you cannot carry out a direct upgrade, then carry out an upgrade to the most recent release where direct upgrades are supported.

For any multi-step upgrade, if you must carry out two upgrades to upgrade to the current release, then you must run the preupgrade script twice: First, for the intermediate upgrade release, and second, for the target upgrade target release.

For example, if the database from which you are upgrading is running Oracle Database 10g, then follow these steps:

1. Upgrade release 10.2.0.5 to release 12.1.0.2 using the instructions in *Oracle Database Upgrade Guide 12c Release 1 (12.1)*, including running the pre-upgrade script for 12.1.0.2.

2. Upgrade Oracle Database 12c release 1 (12.1.0.2) directly to Oracle Database 12c release 2 (12.2.0.1) using the instructions in this book, *Oracle Database Upgrade Guide*, including running the preupgrade script for 12.2.0.1.

The following table shows the required upgrade path for each release of Oracle Database. Use the upgrade path and the specified documentation to perform an intermediate upgrade of your database before fully upgrading to Oracle Database 12c.

Table 1-1 Examples of Upgrade Paths for Oracle Database 12c

| Current Release | Upgrade Options |
|---|---|
| 12.1.0.1, 12.1.0.2 11.2.0.3 or later | Direct upgrade is supported. Perform the upgrade using the current <i>Oracle Database Upgrade Guide</i> , which is this guide. |
| 11.2.0.1, 11.2.0.2 11.1.0.6, 11.1.0.7 10.2.0.2, 10.2.0.3, 10.2.0.4 and 10.2.0.5 10.1.0.5 9.2.0.8 or earlier | <p>Direct upgrade to Oracle Database 12c is not supported.</p> <p>Solution: Upgrade to an intermediate Oracle Database release that can be directly upgraded to the current release. You must upgrade Oracle Database releases that are not supported for direct upgrade in this release to an intermediate Oracle Database release that is supported for direct upgrade. When upgrading to an intermediate Oracle Database release, follow the instructions in the intermediate release documentation. After you complete an upgrade to the intermediate release Oracle Database, you can upgrade the intermediate release database to the current Oracle Database 12c release.</p> <p>This restriction does not apply if you use Oracle Data Pump export/import to migrate data to the new release.</p> <p>For example:</p> <ul style="list-style-type: none"> • If you are upgrading from release 11.2.0.2 or 11.1.0.7, then you must first upgrade to Oracle Database 11g release 2 (11.2.0.4). • If you are upgrading from release 10.2.0.2, 10.2.0.3, 10.2.0.4, 10.2.0.5 or 10.1.0.5, then you must first upgrade to release 11.2.0.4 or 12.1.0.2. • If you are upgrading from release 9.2.0.8, then you must first upgrade to a sequence of intermediate Oracle Database releases: Upgrade from release 9.2.0.8 to release 11.2.0.3 or 11.2.0.4. Then upgrade from release 11.2.0.4 to 12.2 |

1.1.4 Where to Find the Latest Information About Upgrading Oracle Database

In addition to this document, Oracle provides information about upgrades on its support site, and through its Pre-Upgrade Information Tool.

Through its support website, Oracle provides late-breaking updates, discussions, and best practices about pre-upgrade requirements, upgrade processes, post-upgrade, compatibility, and interoperability.

Oracle also strongly recommends that you download and run the Pre-Upgrade Information Tool, which is available on My Oracle Support.

See Also:

- My Oracle Support:
<http://support.oracle.com>
You can search in the library, or search on My Oracle Support for keywords, such as "Database Upgrade"
 - *Oracle Database Pre-Upgrade Utility* (Document ID 884522.1) at My Oracle Support
-
-

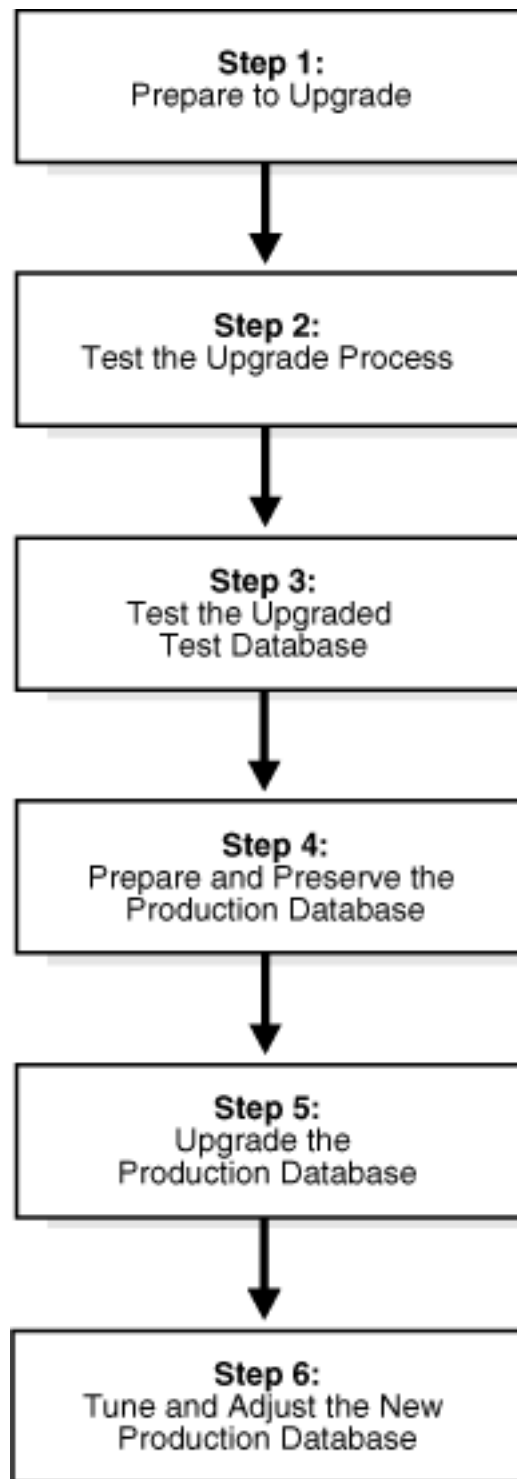
1.2 Major Steps in the Upgrade Process for Oracle Database

Oracle Database upgrades consist of six major steps.

Upgrade Steps Workflow

The following figure summarizes the major procedures performed during the upgrade process:

Figure 1-1 Upgrade Steps Workflow for Oracle Database



Step 1: Prepare to Upgrade Oracle Database

- Become familiar with the features of the new release of Oracle Database.
- Determine the upgrade path to the new release.
- Select an upgrade method.

- Select an Oracle home directory for the new release.
- Develop a testing plan.
- Prepare a backup strategy.
- Follow preupgrade recommendations.
- Run preupgrade fixup scripts, or carry out manual preupgrade system updates.

Note:

During the upgrade, consider running multiple releases of the database software, so that you can use the existing release as your production environment while you test the new release.

Step 2: Test the Upgrade Process for Oracle Database

- Perform a test upgrade using a test database. Conduct the test upgrade in an environment created for testing that does not interfere with the production database. Your test environment should be on a server that is as much as possible a replica of the production environment. For example: the server should not only use the same operating system. The operating system should be running the same patch level, with the same packages, and match other details of system configuration.

Step 3: Test the Upgraded Test Oracle Database

- Perform the tests that you planned in Step 1 on the test database that you upgraded to the new release of Oracle Database.
- Review the results, noting anomalies in the tests.
- Investigate ways to correct any anomalies that you find and then implement the corrections.
- Repeat Step 1, Step 2, and the first parts of Step 3, as necessary, until the test upgrade is successful and works with any required applications.
- To test for anomalies and determine potential support questions, carry out SQL plan management. SQL plan management includes the following steps:
 1. Before the upgrade, capture baselines and plans on the earlier release Oracle Database, and store those plans.

Oracle recommends that you store the plans on staging tables, and then run the Data Pump Export utility `expdp` for those tables.
 2. After the upgrade, in the event of a regression or a performance issue, apply (load/accept/evolve) an old plan that you know is good, based on the plans you captured from the previous release Oracle Database.

See Also:

- *Oracle Database SQL Tuning Guide* for more information about SQL plan management
 - Document 1948958.1 Patches to Consider for 11.2.0.3 to Avoid Problems with SQL Plan Management (SPM)
 - Document 2034706.1 Patches to Consider for 11.2.0.4 to Avoid Problems with SQL Plan Management (SPM)
 - Document 2035897.1 Patches to Consider When Upgrading From 12.1.0.1 to Avoid Problems with SQL Plan Management (SPM)
-
-

Step 4: Prepare and Preserve the Production Oracle Database

Complete these tasks before you upgrade your existing production database:

- Prepare the current production database as appropriate to ensure that the upgrade to the new release of Oracle Database is successful.
- Schedule the downtime required for backing up and upgrading the production database.
- Back up the current production database.

Before you carry out a major change to a system, Oracle recommends that you make sure that you have a fallback strategy implemented. Your fallback strategy should include the following:

- Test your backup strategy, and ensure that it works.
- If you need a backup strategy, then plan for the time required to apply it.
- To perform plan stability checks in preparation for upgrade, carry out SQL plan management. Raise a service request if you need assistance.

Note:

A database upgrade that installs a new optimizer version usually results in plan changes for a small percentage of SQL statements.

Most plan changes result in either improvement or no performance change. However, some plan changes may cause performance regressions. SQL plan baselines significantly minimize potential regressions resulting from an upgrade.

When you upgrade, the database only uses plans from the plan baseline. The database puts new plans that are not in the current baseline into a holding area, and later evaluates them to determine whether they use fewer resources than the current plan in the baseline. If the plans perform better, then the database promotes them into the baseline; otherwise, the database does not promote them.

See Also:*Oracle Database SQL Tuning Guide*

Step 5: Upgrade the Production Oracle Database

- Upgrade the production database to the new release of Oracle Database.
- After the upgrade, perform a full backup of the production database and perform other post-upgrade tasks.

Step 6: Tune and Adjust the New Production Oracle Database

- Tune the new production database for Oracle Database 12c. The new production database should perform to the same standards, or better, than the database before the upgrade.
- Determine which features of Oracle Database 12c to use, and update your applications accordingly.
- Develop new database administration procedures as needed.
- Do not upgrade production users to the new release until all applications have been tested and operate properly.

Related Topics:

[Upgrading Oracle Database](#) (page 3-1)

<https://support.oracle.com/epmos/faces/DocumentDisplay?cmd=show&type=NOT&id=1948958.1>

<https://support.oracle.com/epmos/faces/DocumentDisplay?cmd=show&type=NOT&id=2034706.1>

<https://support.oracle.com/epmos/faces/DocumentDisplay?cmd=show&type=NOT&id=2035897.1>

[Post-Upgrade Tasks for Oracle Database](#) (page 4-1)

[Upgrading Applications After Upgrading Oracle Database](#) (page 5-1)

1.3 Compatibility and Interoperability between Oracle Database Releases

Review to understand compatibility differences.

Compatibility and interoperability issues may arise because of differences between Oracle Database releases. These differences can affect both general database administration and existing applications.

[About Oracle Database Release Numbers](#) (page 1-10)

Oracle Database releases are categorized by five numeric segments that indicate release information.

[Convention for Referring to Release Numbers in Oracle Database Upgrade Guide](#) (page 1-11)

Review to understand how statements apply to releases.

[What Is Oracle Database Compatibility?](#) (page 1-11)

If new features are incompatible with your earlier release, then Database compatibility can cause issues.

[What Is Interoperability for Oracle Database Upgrades?](#) (page 1-15)

In the context of upgrading Oracle Database, *interoperability* is the ability of different releases of Oracle Database to communicate and work in a distributed environment.

[About Invalid Schema Objects and Database Upgrades](#) (page 1-16)

Run `utlrp.sql` to validate invalid objects as part of your upgrade test plan.

[About Upgrading Oracle OLAP Data Security Policies](#) (page 1-16)

Security policies are stored differently in Oracle Database 12c. You may need to carry out actions before and after upgrades.

1.3.1 About Oracle Database Release Numbers

Oracle Database releases are categorized by five numeric segments that indicate release information.

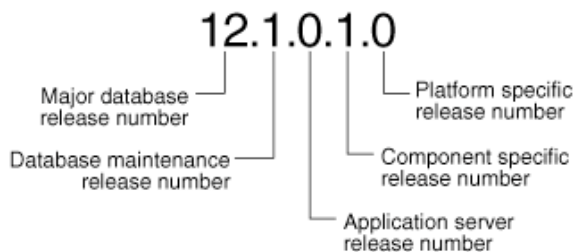
Oracle Database releases are categorized by five numeric segments, which are divided by periods. The first, second, fourth, and fifth numerals provide information about the Oracle Database release:

- First numeral: Oracle Database major release number. For example: Oracle 11g; Oracle 12c
- Second numeral: Oracle Database maintenance release number. For example: Oracle 12c release 1; Oracle 12c release 2
- Fourth numeral: Oracle Database patch release number. For example: 12.1.0.1; 12.1.0.2; 12.2.0.1
- Fifth numeral: Oracle Database platform patch set release number for a platform. For example: GA release (initial release-no patch): 12.2.0.1.0; bundle patch or patch set update (BP or PSU) 12.1.0.1.2; BP or PSU 12.1.0.2.3

Caution:

Oracle strongly recommends that you upgrade your source and target databases to the most recent bundle patch set update before starting an upgrade, and before starting a downgrade.

The following illustration shows each part of a release number, and what each numeral represents:

Figure 1-2 Example of an Oracle Release Number**Related Topics:**

Oracle Database Administrator's Guide

<https://support.oracle.com/rs?type=doc&id=854428.1>

1.3.2 Convention for Referring to Release Numbers in *Oracle Database Upgrade Guide*

Review to understand how statements apply to releases.

When a statement is made in *Oracle Database Upgrade Guide* about a major database release number, the statement applies to all releases within that major database release.

Similarly, when a statement is made in *Oracle Database Upgrade Guide* about a maintenance release, the statement applies to all component-specific and platform-specific releases within that maintenance release. A statement about Oracle Database 12c applies to all component-specific and platform-specific releases within this release. A statement about Oracle Database 11g Release 2 (11.2) applies to release 11.2.0.2, release 11.2.0.3, and all other platform-specific releases within Oracle Database 11g Release 2 (11.2).

1.3.3 What Is Oracle Database Compatibility?

If new features are incompatible with your earlier release, then Database compatibility can cause issues.

Databases from different releases of Oracle Database software are compatible if they support the same features, and if those features perform the same way. When you upgrade to a new release of Oracle Database, certain new features can make your database incompatible with your earlier release.

Your upgraded database becomes incompatible with your earlier release under the following conditions:

- A new feature stores any data on disk (including data dictionary changes) that cannot be processed with your earlier release.
- An existing feature behaves differently in the new environment as compared to the old environment.

Topics:

[The COMPATIBLE Initialization Parameter in Oracle Database](#) (page 1-12)

Review to understand how to set the COMPATIBLE initialization parameter for non-CDB and multitenant architecture containers.

[Values for the COMPATIBLE Initialization Parameter in Oracle Database](#)
(page 1-13)

Review to find the default, minimum, and maximum values for COMPATIBLE.

[About Downgrading and Compatibility for Upgrading Oracle Database](#)
(page 1-14)

Before upgrading to Oracle Database 12c, you must set the COMPATIBLE initialization parameter to at least 11.2.0.

[How the COMPATIBLE Initialization Parameter Operates in Oracle Database](#)
(page 1-14)

The COMPATIBLE initialization parameter enables or disables Oracle Database features based on release compatibility

[Checking the Compatibility Level of Oracle Database](#) (page 1-15)

Use this SQL procedure to check that the compatibility level of your database corresponds to the value of the COMPATIBLE initialization parameter:

[When to Set the COMPATIBLE Initialization Parameter in Oracle Database](#)
(page 1-15)

Oracle recommends increasing the COMPATIBLE parameter only after you have completed testing the upgraded database.

1.3.3.1 The COMPATIBLE Initialization Parameter in Oracle Database

Review to understand how to set the COMPATIBLE initialization parameter for non-CDB and multitenant architecture containers.

Oracle Database enables you to control the compatibility of your database with the COMPATIBLE initialization parameter.

Understanding the COMPATIBLE Initialization Parameter

When the COMPATIBLE initialization parameter is not set in your parameter file, the COMPATIBLE parameter value defaults to 12.2.0 for Oracle Database 12c release 2 (12.2). If you do not set the COMPATIBLE initialization parameter to 12.2.0, then you cannot use the new Oracle Database 12c release 2 (12.2) features, because your upgraded database is not running in the required COMPATIBILITY setting for Oracle Database 12c features.

When the Oracle Database COMPATIBLE parameter is increased to 12.2.0, the first Java call to the database initiates a "name translation" operation. This operation can require a few minutes to complete. You should expect this delay the first time a Java call is made to the database after you increase the compatibility parameter. This initial delay to carry out the name translation occurs only during the initial Java call.

Note:

- Before upgrading to Oracle Database 12c, you must set the `COMPATIBLE` initialization parameter to at least 11.2.0, which is the minimum setting for Oracle Database 12c.
- The compatible parameter must be at least 3 decimal numbers, separated by periods. For example:

```
SQL> ALTER SYSTEM SET COMPATIBLE = '12.1.0.2' SCOPE=SPFILE;
```
- Oracle recommends that you only raise the `COMPATIBLE` parameter after you have thoroughly tested the upgraded database.
- After you increase the `COMPATIBLE` parameter, you cannot downgrade the database.

Caution:

If you are upgrading from Oracle Database release 11.2, then you must set the compatible value to at least 11.2.0. You must do this at the time of the upgrade. Do not make this change until you are ready to upgrade, because a downgrade back to an earlier compatibility level is not possible after you raise the `COMPATIBLE` initialization parameter value.

See Also:

Oracle Database Administrator's Guide for information about managing initialization parameters

Rules for COMPATIBLE Parameter Settings in Multitenant Architecture

The `COMPATIBLE` parameter of the container database (CDB) affects the `COMPATIBLE` parameter settings of pluggable databases (PDBs) plugged into that container database. Review the following scenarios that occur when you plug in a PDB to a CDB:

- PDB `COMPATIBLE` equal to CDB\$ROOT `COMPATIBLE` parameter setting.
Result: No change to the PDB `COMPATIBLE` parameter setting.
- PDB `COMPATIBLE` is lower than CDB\$ROOT `COMPATIBLE` parameter setting.
Result: The PDB `COMPATIBLE` parameter is increased automatically to the same `COMPATIBLE` parameter setting as CDB\$ROOT. After you plug in the PDB, you cannot downgrade the PDB to an earlier release.
- PDB `COMPATIBLE` is lower than CDB\$ROOT `COMPATIBLE` parameter setting.
Result: The PDB cannot be plugged in. Only PDBs with a `COMPATIBLE` parameter setting equal to or lower than CDB\$ROOT can be plugged in to the CDB.

1.3.3.2 Values for the COMPATIBLE Initialization Parameter in Oracle Database

Review to find the default, minimum, and maximum values for `COMPATIBLE`.

The following table lists the default, minimum, and maximum values of the `COMPATIBLE` initialization parameter in Oracle Database 12c and in each release supported for upgrading to Oracle Database 12c:

Table 1-2 The `COMPATIBLE` Initialization Parameter

| Oracle Database Release | Default Value | Minimum Value | Maximum Value |
|--------------------------------------|---------------|---------------|---------------|
| Oracle Database 12c Release 2 (12.2) | 12.2.0 | 11.2.0 | 12.2.0 |
| Oracle Database 12c Release 1 (12.1) | 12.0.0 | 11.0.0 | 12.1.0 |
| Oracle Database 11g Release 2 (11.2) | 11.2.0 | 10.0.0 | 11.2.0 |

1.3.3.3 About Downgrading and Compatibility for Upgrading Oracle Database

Before upgrading to Oracle Database 12c, you must set the `COMPATIBLE` initialization parameter to at least 11.2.0.

After upgrading to Oracle Database 12c, you can set the `COMPATIBLE` initialization parameter to match the release number of the new release. Doing so enables you to use all features of the new release, but prevents you from downgrading to your earlier release. Only a subset of Oracle Database 12c features are available while the `COMPATIBLE` initialization parameter is set to a lower value.

Note:

After you increase the `COMPATIBLE` parameter, the database cannot be downgraded.

Related Topics:

[Downgrading Oracle Database to an Earlier Release](#) (page 6-1)

1.3.3.4 How the `COMPATIBLE` Initialization Parameter Operates in Oracle Database

The `COMPATIBLE` initialization parameter enables or disables Oracle Database features based on release compatibility

The `COMPATIBLE` initialization parameter operates in the following way:

- The `COMPATIBLE` initialization parameter enables or disables the use of features, to help protect your existing application use of data.

If you run an Oracle Database 12c database with the `COMPATIBLE` initialization parameter set to 11.2.0, then the database software generates database structures on disk that are compatible with Oracle Database Release 11g release 2 (11.2). If you try to use features that are part of a later release of Oracle Database, and make the database incompatible with the `COMPATIBLE` initialization parameter, then an error occurs. However, new features are enabled that do not create changes on disk that are incompatible with Oracle Database Release 11g release 2.

- If you make changes to the database that make the database incompatible with the `COMPATIBLE` initialization parameter setting you want to use, then the database does not start, and initialization terminates in an error. If this happens, then you

must set the `COMPATIBLE` initialization parameter to an appropriate value for the database.

See Also:

Oracle Database Concepts for more information about database structures

1.3.3.5 Checking the Compatibility Level of Oracle Database

Use this SQL procedure to check that the compatibility level of your database corresponds to the value of the `COMPATIBLE` initialization parameter:

```
SQL> SELECT name, value FROM v$parameter
        WHERE name = 'compatible';
```

1.3.3.6 When to Set the COMPATIBLE Initialization Parameter in Oracle Database

Oracle recommends increasing the `COMPATIBLE` parameter only after you have completed testing the upgraded database.

After the upgrade is complete, you can increase the setting of the `COMPATIBLE` initialization parameter to the maximum level for Oracle Database 12c. However, after you increase the `COMPATIBLE` parameter, you cannot subsequently downgrade the database.

1.3.4 What Is Interoperability for Oracle Database Upgrades?

In the context of upgrading Oracle Database, *interoperability* is the ability of different releases of Oracle Database to communicate and work in a distributed environment.

A distributed database system can comprise different releases of Oracle Database, and all supported releases of Oracle Database can participate in the distributed database system. However, the applications that work with a distributed database must also be able to interoperate with the features and functions that are available at each node in the system.

Interoperability across disparate operating systems and operating system versions can cause problems (especially during rolling upgrades) because the minimum requirements for the new Oracle Database release may require you to upgrade the operating systems on some or all of your hosts. For this reason, before you start an Oracle Database upgrade, you must check to ensure that drivers, network, and storage are compatible for all the interim upgrade states of the system during the rolling upgrade.

Note:

Because *Oracle Database Upgrade Guide* discusses upgrading and downgrading between different releases of Oracle Database, the definition of *interoperability* is for Oracle Database releases. Other Oracle documentation may use a broader definition of the term *interoperability*. For example, interoperability in some cases can describe communication between different hardware platforms and operating systems.

My Oracle Support note 207303.1 "Client / Server / Interoperability Support Between Different Oracle Versions" provides additional information.

Related Topics:

<https://support.oracle.com/rs?type=doc&id=207303.1>

1.3.5 About Invalid Schema Objects and Database Upgrades

Run `utlrp.sql` to validate invalid objects as part of your upgrade test plan.

After database upgrades, release changes can result in invalid schema objects in the upgraded database. Typically, invalid objects fix themselves as they are accessed or run. However, Oracle recommends that you recompile invalid objects in the database as part of your patching and upgrade procedure, so that you resolve issues with invalid objects, and any required dependencies, before users encounter these invalid objects.

Object validation is an operation that checks the Oracle Database Data Definition Language (DDL) statements. These statements are used to define the database structure or schema. Validating DDL statements can take time to complete. The following is a list of some common factors that can affect object validation time:

- Number of invalid objects
- CPU types
- Processor speeds
- System loads
- Available physical memory

The `utlrp.sql` command recompiles all objects in an invalid state, including packages, procedures, and types. It is located in the `$ORACLE_HOME/rdbms/admin` directory. The `utlrp.sql` script automatically runs in serial or in parallel recompilation, based on the number of CPUs available (identified by the parameter `cpu_count`), multiplied by the number of threads for each CPU (identified by the parameter `parallel_threads_per_cpu`). On Oracle Real Application Clusters systems (Oracle RAC), the number of parallel threads is added across all Oracle RAC nodes.

Run the command either as the SYS user, or as another user account that is granted the SYSDBA system privileges.

Oracle recommends that you run the `utlrp.sql` command in the earlier release Oracle Database to recompile any existing invalid objects in your database. Particularly ensure that SYS and SYSTEM user schema invalid objects are updated. During upgrade tests, run `utlrp.sql` in the upgraded Oracle Database as part of your upgrade test plan, so that you can include planning for recompilation time as part of your upgrade. Recompilation time is proportional to the number of invalid objects in the database. If the upgrade results in a large number of invalid objects, then `utlrp.sql` can take a significant amount of time to run.

1.3.6 About Upgrading Oracle OLAP Data Security Policies

Security policies are stored differently in Oracle Database 12c. You may need to carry out actions before and after upgrades.

In Oracle Database 12c, Oracle OLAP uses Oracle Real Application Security (ORAS) to store OLAP data security policies instead of Extensible Data Security (XDS), which it used in Oracle Database 11g releases.

When you upgrade Oracle Database from release 11g to release 12c, any XDS data security policies are automatically converted to ORAS.

Note:

Data security roles defined in a release 11g Oracle Database instance are not automatically converted to ORAS. Before you upgrade an 11g database to Oracle Database 12c, you must delete any data security roles that are defined in the 11g database. After the upgrade, you may use Analytic Workspace Manager 12c to define the data security roles again.

If you upgrade an 11g database to Oracle Database 12c without deleting the 11g data security roles, then any data security policies that include a data security role are invalid in the Oracle Database 12c database.

Related Topics:

Oracle OLAP User's Guide

1.4 About Running Multiple Oracle Releases

Run multiple releases using Optimal Flexible Architecture (OFA).

Optimal Flexible Architecture (OFA) is a set of configuration guidelines for efficient and reliable Oracle Database and Oracle Grid Infrastructure deployments. Oracle recommends that you deploy all Oracle software installations in accordance with the OFA architecture standard for Oracle Database installations. Following the OFA standard helps to ensure that your installations are easier for you to maintain, and easier for you to obtain rapid assistance from Oracle Support.

OFA provides the following benefits:

- Organizes large amounts of complicated software and data on disk, which can help to avoid device bottlenecks and poor performance
- Facilitates routine administrative tasks, such as software and data backup functions, which are often vulnerable to data corruption
- Simplifies the administration of multiple Oracle databases
- Helps eliminate fragmentation of free space in the data dictionary, isolates other fragmentation, and helps to minimize resource contention
- Assists database administrators to deploy an effective enterprise data management strategy

If you are not currently using the OFA standard, then switching to the OFA standard involves modifying your directory structure and relocating your database files.

For more information about OFA, refer to your operating system-specific Oracle documentation. For more information about managing data files and temp files, refer to *Oracle Database Administrator's Guide*.

[Databases in Multiple Oracle Homes on Separate Computers](#) (page 1-18)
Review if you want to connect to multiple releases using Oracle Database clients.

[Databases in Multiple Oracle Homes on the Same Computer](#) (page 1-18)

Installing earlier releases of Oracle Database on the same computer that is running Oracle Database 12c can cause issues with client connections.

[About the Optimal Flexible Architecture Standard](#) (page 1-18)

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.

[About Multiple Oracle Homes Support](#) (page 1-19)

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.

Related Topics:

Oracle Database Administrator's Guide

1.4.1 Databases in Multiple Oracle Homes on Separate Computers

Review if you want to connect to multiple releases using Oracle Database clients.

You can install Oracle Database 12c and Oracle Database 11g databases in Oracle homes on separate computers and Oracle Database 12c with Oracle Database 11g clients connecting to any or all of the databases. However, you must install the latest release first and install earlier releases subsequently in descending chronological order. Installing in descending chronological order ensures that each installation can find the Oracle inventory and register its installation, so that you can avoid a corruption of the Oracle inventory.

1.4.2 Databases in Multiple Oracle Homes on the Same Computer

Installing earlier releases of Oracle Database on the same computer that is running Oracle Database 12c can cause issues with client connections.

You may not be able to install earlier releases of Oracle Database on the same computer that is running Oracle Database 12c and have clients connect to the databases of the earlier releases. For example, you cannot have Oracle Database 10g, Oracle Database 11g, and Oracle Database 12c databases in multiple (or separate) Oracle homes on the same computer and have Oracle Database 10g, Oracle Database 11g, and Oracle Database 12c clients connecting to any or all of the databases on this computer. You may be able to have a combination of some releases on one system.

Oracle recommends that you obtain the latest information on compatibility and supported configurations from My Oracle Support Note 207303.1 "Client / Server / Interoperability Support Between Different Oracle Versions" on My Oracle Support.

See Also:

<https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=207303.1>

1.4.3 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 on the installation media 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.

1.4.4 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. For example, you cannot install Oracle Database 12c software into an existing Oracle 11g Oracle home directory.
- Multiple databases, of different versions, owned by different users can coexist concurrently.
- 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 must be the same as the Oracle Database dictionary release through the first four digits (the major, maintenance, and patch release number).
- Later Oracle Database releases can access earlier Oracle Database releases. However, this access is only for upgrades. For example, Oracle Database 12c release 2 can access an Oracle Database 11g release 2 (11.2.0.4) database if the 11.2.0.4 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 12.2.0.1 into an existing Oracle Database 12.2.0.1 home but you cannot install Oracle Database Client 12.2.0.1 into an existing Oracle Database

12.1.0.2 home. If you apply a patch set before installing the client, then you must apply the patch set 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.

1.5 About Converting Databases During Upgrades

Review these topics to determine which is the best path for you to select to upgrade Oracle Databases.

[Overview of Converting Databases During Upgrades](#) (page 1-20)

There are four methods you can use to convert databases during Oracle Database upgrades.

[About 32-bit Oracle Databases to 64-bit Oracle Database Conversions](#) (page 1-22)

32-bit Oracle Databases are automatically converted to 64-bit.

[About Upgrading Using Standby Databases](#) (page 1-22)

You can perform rolling upgrades of databases using physical standbys, Oracle Data Guard, or Oracle Enterprise Manager Cloud Control.

[Using Oracle GoldenGate for Online Database Upgrades](#) (page 1-23)

The continuous extraction and replication capabilities of Oracle GoldenGate can enable online upgrades of Oracle Database.

[Migrating From Standard Edition to Enterprise Edition of Oracle Database](#) (page 1-24)

Review these options to migrate to Oracle Database Enterprise Edition from Oracle Database Standard Edition

[Migrating from Enterprise Edition to Standard Edition of Oracle Database](#) (page 1-26)

Converting from Enterprise Edition to Standard Edition requires exporting and importing data.

[Migrating from Oracle Database Express Edition \(Oracle Database XE\) to Oracle Database](#) (page 1-26)

You must upgrade from Oracle Database Express Edition to Oracle Database Enterprise Edition, and then upgrade to the current Oracle Database release.

1.5.1 Overview of Converting Databases During Upgrades

There are four methods you can use to convert databases during Oracle Database upgrades.

The following table lists methods that you can use to convert upgrades, including references to availability issues. It also provides references to the documentation that describes how to carry out each upgrade method.

Table 1-3 Methods for Converting Databases During Upgrades

| Method | Description | Reference |
|--|---|---|
| Oracle Data Guard SQL Apply and logical standby databases | Use SQL Apply and logical standby databases to upgrade Oracle Database software and patchsets. | <i>Oracle Database Upgrade Guide, "Requirement for Upgrading Oracle Databases that Use Oracle Database Vault"</i> |
| Oracle Data Guard Transient Standby (Physical Standby) database | Use an existing physical standby database to perform a database upgrade by temporarily converting it to a logical standby database, and then converting it back to a physical standby. | <i>Oracle Database Upgrade Guide, "About Upgrading Using Standby Databases"</i> |
| Oracle GoldenGate synchronization of production and standby databases for zero downtime upgrades | Use Oracle GoldenGate with software upgrades and with Oracle Database data migration procedures to carry out a synchronization approach to maintaining availability during an upgrade: <ul style="list-style-type: none"> • Use RMAN restore and upgrade to set up a standby database running the earlier release software using an existing backup • Upgrade the standby database to the new Oracle Database release • Move the entire database and synchronize the standby database with the production database using the following tools: <ul style="list-style-type: none"> – Oracle Data Pump – Transportable Tablespaces (TTS) – CREATE TABLE AS SELECT (CTIS) to create new tables and populate them with rows from specified queries. – INSERT AS SELECT (IAS) to create nonpartitioned tables • Use Data Load/Unload to load data into the new database release, and unload data from the old database release | Oracle GoldenGate documentation, and relevant Oracle Database documentation |
| Oracle Enterprise Manager Cloud Control | Starting with Oracle Database 12c, Oracle provides Cloud Control support for performing database upgrades. This option requires that you purchase the Enterprise Manager Lifecycle Management Pack. | Online help in Oracle Enterprise Manager Cloud Control |

Note:

Upgrades of Oracle Grid Infrastructure (Oracle Clusterware and Oracle Automatic Storage Management) are carried out separately, before Oracle Database upgrades. You must complete Oracle Grid Infrastructure upgrades before you upgrade Oracle Database installations. Other features installed with Oracle Database can have additional upgrade requirements.

Related Topics:

Oracle Grid Infrastructure Installation Guide for your platform

[Oracle GoldenGate documentation](#)

1.5.2 About 32-bit Oracle Databases to 64-bit Oracle Database Conversions

32-bit Oracle Databases are automatically converted to 64-bit.

If you are installing 64-bit Oracle Database software, and your existing Oracle Database is a 32-bit Oracle Database installation, then your existing Oracle Database is automatically converted to 64-bit during the upgrade to Oracle Database 12c.

1.5.3 About Upgrading Using Standby Databases

You can perform rolling upgrades of databases using physical standbys, Oracle Data Guard, or Oracle Enterprise Manager Cloud Control.

You can perform rolling upgrades using standby databases. During the upgrade, you can run different releases of Oracle Database software on the primary and standby databases. You can then upgrade databases one at a time to reduce your downtime on the primary database. Use one of the following methods to carry out this upgrade procedure:

- SQL Apply and logical standby databases

You can use Oracle Data Guard SQL Apply on a logical standby database to perform a rolling upgrade to the new Oracle Database release. A logical standby accepts archived logs while the upgrade is in progress. Data protection is maintained during the Data Guard database rolling upgrade process by enabling the standby database that is the target of the upgrade to continue receiving primary database redo while the standby database is open in upgrade mode. Rolling upgrade with SQL Apply provides additional disaster protection.

- Use of physical standby database for rolling upgrades

A physical standby database can take advantage of the rolling upgrade feature provided by a logical standby. Through the use of the `KEEP IDENTITY` clause option to the `SQL ALTER DATABASE RECOVER TO LOGICAL STANDBY` statement, a physical standby database can be temporarily converted into a logical standby database for the rolling upgrade, and then reverted to the original configuration of a primary database and a physical standby database when the upgrade is done.

- Rolling Upgrade Using Active Data Guard in Oracle Database 12c and later releases

Oracle Database 12c provides the `DBMS_ROLLING` PL/SQL package, which enables you to upgrade the database software in a Data Guard configuration in a rolling fashion. Rolling Upgrade Using Active Data Guard uses a Data Guard physical standby database and the SQL Apply process. This is supported for rolling upgrades from Oracle Database release 12.1 onward.

In Oracle Database 12c release 2 (12.2) and later releases, when you perform a rolling upgrade using the `DBMS_ROLLING` PL/SQL package, you no longer need to disable the broker. In addition, the broker now reports when a rolling upgrade is in place, and tracks its status. The status information is displayed in the output of the `DGMGRL` commands `SHOW CONFIGURATION` and `SHOW DATABASE`.

Note:

Starting with Oracle Database 12c release 1 (12.1) and later releases, Oracle Enterprise Manager Cloud Control provides options to perform a rolling upgrade of databases in a Data Guard configuration. The procedures are described in online help within Cloud Control.

See Also:

- *Oracle Data Guard Broker* for information about upgrading and downgrading in an Oracle Data Guard Broker configuration
 - *Oracle Data Guard Concepts and Administration* for information about using DBMS_ROLLING to perform a rolling upgrade.
 - *Oracle Data Guard Concepts and Administration* for information about upgrading using standby databases
-
-

1.5.4 Using Oracle GoldenGate for Online Database Upgrades

The continuous extraction and replication capabilities of Oracle GoldenGate can enable online upgrades of Oracle Database.

Topics:

[About Oracle GoldenGate and Online Database Upgrade](#) (page 1-23)

Using Oracle GoldenGate replication can simplify your upgrade by enabling you to carry out the upgrade online.

[Overview of Steps for Upgrading Oracle Database Using Oracle GoldenGate](#) (page 1-24)

Review these steps to understand how to upgrade Oracle Database using Oracle GoldenGate.

1.5.4.1 About Oracle GoldenGate and Online Database Upgrade

Using Oracle GoldenGate replication can simplify your upgrade by enabling you to carry out the upgrade online.

In an Oracle GoldenGate replication environment, you can perform an online database upgrade to the current release of Oracle Database. Using an Oracle GoldenGate replication environment minimizes database downtime during upgrading. Oracle GoldenGate is an excellent method to minimize downtime during planned maintenance, including application and database upgrades, in addition to platform migrations. Oracle GoldenGate is an Oracle product sold independently of Oracle Database for Oracle and third-party database management systems.

See Also:

Oracle GoldenGate documentation for more information

1.5.4.2 Overview of Steps for Upgrading Oracle Database Using Oracle GoldenGate

Review these steps to understand how to upgrade Oracle Database using Oracle GoldenGate.

Upgrading to Oracle Database 12c using Oracle GoldenGate consists of the following high-level steps.

1. Set up a standby database running the earlier database software release using an existing database backup.
2. Upgrade the standby database to Oracle Database 12c.
3. Synchronize the standby database with the production database.
4. Test your environment in active/live mode.
5. Switch over the application to the standby database.
6. Upgrade the primary database to Oracle Database 12c after comprehensive application testing on the standby database.

See Also :

Oracle GoldenGate documentation library for Oracle GoldenGate procedures, unless otherwise specified

Oracle Database Testing Guide for information about testing a database upgrade

1.5.5 Migrating From Standard Edition to Enterprise Edition of Oracle Database

Review these options to migrate to Oracle Database Enterprise Edition from Oracle Database Standard Edition

If you have Oracle Database Standard Edition at a release earlier than the new Oracle Database release, then you can change it from a Standard Edition release to Oracle Database Enterprise Edition by selecting one of the following options:

- Perform a normal upgrade procedure.

Install Oracle Enterprise Edition software in a new Oracle home, and follow the normal upgrade procedures as described in the "Upgrading Oracle Database" chapter. The Data Dictionary for Standard Edition and Enterprise Edition configurations are the same. The difference between Standard Edition and Enterprise Edition is in the options that are available in the server executable.

- Perform an In-Place Upgrade using the same Oracle home.

If you have a Standard Edition database at a release earlier than the new release of Oracle Database, and you want to perform an in-place upgrade using the same Oracle home, then you must first upgrade the Standard Edition Database. After you complete the upgrade, use the procedure described here to install Oracle Database Enterprise Edition software and to move to Oracle Database Enterprise Edition.

Caution:

Performing this procedure deinstalls the Oracle Standard Edition software. It results in deleting database files that exist under the Oracle home, and under the Fast Recovery Area (FRA). Back up database files under the current Oracle home before you begin this procedure.

1. Ensure that the release number of your Oracle Standard Edition server software is the same release as your Oracle Enterprise Edition server software.
2. Shut down your database.
3. If your operating system is Windows, then stop all Oracle services, including the OracleServiceSID Oracle service, where *SID* is the instance name.
4. Back up all database files under the current Oracle home that you must keep.
5. Deinstall the Standard Edition server software.

Caution:

This step deletes all existing database files that reside under the Oracle home.

Run the deinstallation tool from the Oracle home. The deinstallation tool is available as a separate command (`deinstall`) under the Oracle home directory after installation. It is located under `ORACLE_HOME\deinstall`.

To deinstall an Oracle home on Windows, use the following syntax:

```
setup.exe -deinstall -home path_of_oracle_home_to_be_deinstalled
```

To deinstall an Oracle home on Linux and UNIX, use the following syntax:

```
$ ./runInstaller -deinstall -home path_of_oracle_home_to_be_deinstalled
```

Note:

Starting with Oracle Database 12c, the deinstallation tool is integrated with the database installation media. You can run the deinstallation tool using `runInstaller` on Linux and UNIX, or by using `setup.exe` on Windows with the `-deinstall` and `-home` options from the base directory of the Oracle Database, Oracle Database Client, or Oracle Grid Infrastructure installation media.

6. Install Oracle Enterprise Edition server software using Oracle Universal Installer (OUI).

Select the same Oracle home that was used for the Standard Edition that you uninstalled, or select a new Oracle home. During the installation, be sure to select Enterprise Edition. When prompted, choose `Software Only` from the Database Configuration screen.

7. If you have an existing database, then set your `ORACLE_SID` to this preexisting database.

If your existing database is on Windows, then you must recreate the database service by using the ORADIM utility.

8. Start up your database.

Related Topics:

[Upgrading Oracle Database](#) (page 3-1)

Oracle provides a comprehensive set of tools for upgrading Oracle Database with minimal downtime and for migrating your applications to the new release.

1.5.6 Migrating from Enterprise Edition to Standard Edition of Oracle Database

Converting from Enterprise Edition to Standard Edition requires exporting and importing data.

To properly convert from an Enterprise Edition database to a Standard Edition database, you must perform an Export/Import operation. Oracle recommends that you use the Standard Edition Export utility to export the data. If you only install Standard Edition software, then some data dictionary objects become invalid. These invalid objects create problems when maintaining the database.

The Export/Import operation does not introduce data dictionary objects specific to the Enterprise Edition, because the SYS schema objects are not exported. After the Import in the Standard Edition database, you are only required to drop user schemas related to Enterprise Edition features.

1.5.7 Migrating from Oracle Database Express Edition (Oracle Database XE) to Oracle Database

You must upgrade from Oracle Database Express Edition to Oracle Database Enterprise Edition, and then upgrade to the current Oracle Database release.

Oracle Database Express Edition (Oracle Database XE) is an entry-level edition of Oracle Database.

To upgrade Oracle Database 11g release 2 (11.2) Express Edition (Oracle Database XE) to Oracle Database 12c release 2 (12.2), you must first upgrade from Oracle Database XE to Oracle Database 12c release 1 (12.1.0.2) Enterprise Edition, and then upgrade to Oracle Database 12c release 2 (12.2).

See Also:

- *Oracle Database Installation Guide* for your operating system
 - Oracle online forum, under "Oracle Database Express Edition (XE)":
<http://forums.oracle.com>
-

1.6 About Upgrading Platforms for a New Oracle Database Release

Review these topics if you upgrade your operating system or hardware for a new Oracle Database release.

[About Upgrading Your Operating System](#) (page 1-27)

Check operating system requirements for new releases, and if necessary, upgrade your operating system before upgrading Oracle Database.

[Options for Transporting Data to a Different Operating System](#) (page 1-27)

Review these restrictions and guidelines if you want to perform a cross-platform upgrade.

1.6.1 About Upgrading Your Operating System

Check operating system requirements for new releases, and if necessary, upgrade your operating system before upgrading Oracle Database.

When you upgrade to a new release of Oracle software, the operating system requirements may have changed. If required, upgrade the operating system before upgrading Oracle Database.

See Also:

- *Oracle Database Installation Guide* for your platform to obtain a list of supported operating systems
 - Your operating system-specific documentation for information about how to perform an operating system upgrade
-
-

1.6.2 Options for Transporting Data to a Different Operating System

Review these restrictions and guidelines if you want to perform a cross-platform upgrade.

When using DBUA or when performing a manual upgrade for Oracle Database, you cannot directly migrate or transport data in a database on one operating system to a database on another operating system. For example, you cannot migrate data in an Oracle database on Solaris to an Oracle 12c database on Windows using DBUA. You must follow procedures specific to your operating system platforms.

To see the platforms that support cross-platform data transport, run the following query using SQL*Plus:

```
SELECT * FROM V$TRANSPORTABLE_PLATFORM ORDER BY PLATFORM_NAME;
```

Note:

If the source platform and the target platform are of different endianness, then you cannot use the `RMAN CONVERT DATABASE` command. This process requires both the source and target platform to be the same endian value. Your available options are Data Pump replication, Data Pump export/import, or Transportable Tablespace, with an `RMAN CONVERT TABLESPACE`. If the platforms are of the same endianness, then no conversion is necessary and data can be transported as if on the same platform.

See Also:

- *Oracle Database Administrator's Guide* for a discussion of transporting data across platforms
 - *Oracle Database Backup and Recovery User's Guide* for information on using the `RMAN CONVERT DATABASE` and `RMAN CONVERT TABLESPACE` commands
-
-

Preparing to Upgrade Oracle Database

Complete preupgrade tasks and checks to assist you with completing a successful upgrade.

This chapter provides information and procedures for the pre-upgrade tasks, including planning your upgrades, data-gathering, testing, installing the new Oracle software for the upgrade, using the Parallel Upgrade Utility to carry out your upgrade, and performing other checks and tasks.

Topics:

[Tasks to Prepare for Oracle Database Upgrades](#) (page 2-2)

Carry out these tasks to prepare your upgrade.

[Checklists for Oracle Database Upgrade](#) (page 2-13)

Use checklists to plan and carry out Oracle Database upgrades.

[Installing the New Oracle Database Software](#) (page 2-15)

Use this procedure overview to assist you to install the software for the new Oracle Database release.

[Database Preparation Tasks to Complete Before Starting Oracle Database Upgrades](#) (page 2-16)

Ensure you have completed these database preparation tasks before starting Oracle Database upgrades.

[Preparing the New Oracle Home for Upgrading](#) (page 2-32)

After backing up the database that you want to upgrade, prepare the new Oracle home in a new location. Install the software for Oracle Database 12c into the new location.

[Prerequisites for Preparing Oracle Home on Windows](#) (page 2-34)

Your system must meet these requirements before you can upgrade Oracle Database on Microsoft Windows platforms.

[Using the Pre-Upgrade Information Tool for Oracle Database](#) (page 2-35)

Review these topics to understand and to use the Pre-Upgrade information tool (`preupgrade.jar`).

[Testing the Upgrade Process for Oracle Database](#) (page 2-48)

Your test plan for Oracle Database upgrades should include these test procedures.

[About Upgrading Oracle Grid Infrastructure](#) (page 2-75)

Review these topics if your Oracle Database installations are on Oracle Grid Infrastructure, so that your upgrade plan must include an Oracle Grid Infrastructure upgrade.

[Required Task to Preserve Downgrade Capability](#) (page 2-80)

To preserve the option to downgrade after upgrading your database to Oracle 12c release 2 (12.2), install the patch for bug 20898997 in your source ORACLE_HOME.

[Requirements for Upgrading Databases That Use Oracle Label Security and Oracle Database Vault](#) (page 2-81)

You must complete these tasks before starting an upgrade with a database using Oracle Label Security or Oracle Database Vault.

[Requirement for Upgrading Databases that Use Oracle Warehouse Builder \(OWB\)](#) (page 2-82)

Select one of these three procedures to upgrade Oracle Database deployments with OWB release 11.2.0.3 and later.

2.1 Tasks to Prepare for Oracle Database Upgrades

Carry out these tasks to prepare your upgrade.

Before you upgrade your database, Oracle recommends that you review the new features and determine the best upgrade path and method to use, and carry out procedures to prepare your database for upgrade. Oracle strongly recommends that you test the upgrade process and prepare a backup strategy.

[Become Familiar with New Oracle Database Features](#) (page 2-2)

Before you plan the upgrade process, become familiar with the features of the new Oracle Database release.

[Choose an Upgrade Method for Oracle Database](#) (page 2-3)

Oracle offers several methods to upgrade your database, which support the complexities of your enterprise.

[Choose a New Location for Oracle Home when Upgrading](#) (page 2-6)

You cannot install the new software into the same location for Oracle home as your current release.

[Develop a Test Plan for Upgrading Oracle Database](#) (page 2-6)

Review these topics to understand how to create a series of carefully designed tests to validate all stages of the upgrade process.

[Prepare a Backup Strategy before Upgrading Oracle Database](#) (page 2-12)

You must design and carry out an appropriate backup strategy to ensure a successful upgrade.

2.1.1 Become Familiar with New Oracle Database Features

Before you plan the upgrade process, become familiar with the features of the new Oracle Database release.

Oracle Database New Features Guide is a good starting point for learning the differences between Oracle Database releases. Also, check specific guides in the Oracle Database documentation library to find information about new features for a certain component. For example, see *Oracle Real Application Clusters Administration and Deployment Guide* for changes in Oracle Real Application Clusters.

Note:

Oracle Database training classes are an excellent way to learn how to take full advantage of the features and functions available with Oracle Database. More information can be found at <http://education.oracle.com/>

See Also:

Oracle Database New Features Guide

2.1.2 Choose an Upgrade Method for Oracle Database

Oracle offers several methods to upgrade your database, which support the complexities of your enterprise.

There are differences between *upgrading* and *migrating* data.

Topics:

[The Automated \(DBUA\) Method for Upgrading Oracle Database](#) (page 2-3)

Database Upgrade Assistant (DBUA) interactively steps you through the upgrade process and configures the database for the new Oracle Database release.

[The Manual, Command-line Method for Upgrading Oracle Database](#) (page 2-3)

Manual upgrades provide benefits and risks.

[The Export/Import Method for Migrating Data When Upgrading Oracle Database](#) (page 2-4)

Oracle recommends using Data Pump Export and Import for higher performance, and to ensure support for new data types.

2.1.2.1 The Automated (DBUA) Method for Upgrading Oracle Database

Database Upgrade Assistant (DBUA) interactively steps you through the upgrade process and configures the database for the new Oracle Database release.

DBUA starts the Pre-Upgrade Tool, which automatically fixes some configuration settings to the values required for the upgrade. For example, the Pre-Upgrade Tool can change initialization parameters to values required for the upgrade. The Pre-Upgrade Tool also provides you with a list of items that you need to fix manually before you can continue with the upgrade.

2.1.2.2 The Manual, Command-line Method for Upgrading Oracle Database

Manual upgrades provide benefits and risks.

A manual upgrade consists of running SQL scripts and utilities from a command line to upgrade a database to the new Oracle Database release.

Manual upgrades give you finer control over the upgrade process. However, manual upgrades are susceptible to error when upgrade or pre-upgrade steps either are not followed, or are performed out of order.

Before the Upgrade

- Analyze the database using the Pre-Upgrade Information Tool.

The Pre-Upgrade Information Tool is a Java JAR file that is supplied with Oracle Database. When you start the tool, it self-extracts, and then executes SQL scripts.

The Pre-Upgrade Information Tool displays warnings about possible upgrade issues with the database, and generates fixup scripts for you to use to address any issues. It also displays information about required initialization parameters for the new release of Oracle Database.

- Prepare the new Oracle home.
- Perform a backup of the database.

Depending on the Oracle Database release you upgrade, you can be required to perform more pre-upgrade steps. These steps can include adjusting the parameter file for the upgrade, removing desupported initialization parameters, or adjusting initialization parameters that can cause upgrade problems.

2.1.2.3 The Export/Import Method for Migrating Data When Upgrading Oracle Database

Oracle recommends using Data Pump Export and Import for higher performance, and to ensure support for new data types.

Unlike DBUA or a manual command-line upgrade, the Oracle Data Pump Export and Import utilities physically migrate a copy of data from your current database to a new database in the new release. Before you can load export dump file contents, either the new database must exist, or you must create the database in the new Oracle home.

During a data import from an earlier release, the new Oracle Database release import utility makes appropriate changes to data definitions as it reads the export dump files from the earlier release.

Note:

- If your database is earlier than Oracle Database release 10.1, then you can use the original Export and Import utilities to perform a full or partial export from your database, followed by a full or partial import into a new database for the upgraded Oracle Database. Export/Import can copy a subset of the data in a database, leaving the original database unchanged.
 - The original Export utility is no longer being updated to support new data types.
-
-

[The Effects of Export/Import on Upgraded Oracle Databases](#) (page 2-4)

Review this topic to understand the benefits of Export/Import data migration.

[Export/Import Benefits for Migrating Data for Oracle Database](#) (page 2-5)

Migrating data when upgrading Oracle Database using Export/Import provides benefits that can increase performance.

[Time Requirements for Migrating Data and Upgrading with Export/Import](#) (page 2-5)

Understand the time it takes for data migration and software upgrades.

2.1.2.3.1 The Effects of Export/Import on Upgraded Oracle Databases

Review this topic to understand the benefits of Export/Import data migration.

The Export/Import data migration method does not change the current database, which enables the database to remain available throughout the upgrade process. However, if a consistent snapshot of the database is required (for data integrity or other purposes), then the database must run in restricted mode or must otherwise be protected from changes during the export procedure. Because the current database can remain available, you can, for example, keep an existing production database running while the newly upgraded Oracle Database database is being built at the same time by Export/Import. During the upgrade, to maintain complete database consistency, changes to the data in the database cannot be permitted without the same changes to the data in the newly upgraded Oracle database.

Most importantly, the Export/Import operation results in a completely new database. Although the current target database ultimately contains a copy of the specified data that you migrated, the upgraded database can perform differently from the original source database. Although Export/Import creates an identical copy of the database, other factors can cause unexpected performance issues. (For example: disk placement of data, and unset tuning parameters).

2.1.2.3.2 Export/Import Benefits for Migrating Data for Oracle Database

Migrating data when upgrading Oracle Database using Export/Import provides benefits that can increase performance.

Using Export/Import to migrate data provides the following benefits:

- Defragments the data. You can compress the imported data to improve performance.
- Restructures the database. You can create new tablespaces or modify existing tables, tablespaces, or partitions that you want to populate with imported data.
- Facilitates side-by-side testing of the old and new releases of Oracle Database because an entirely new database is created.
- Enables the copying of specified database objects or users. Importing only the objects, users, and other items you need is useful for establishing a test environment for the new software on only a subset of the production data. Data Pump Export/Import provides flexible data-subsetting capabilities.
- Serves as a backup archive. You can use a full database export as an archive of the current database.
- Enables you to establish the upgraded database on a different operating system or hardware platform than the platform on which your earlier release database is placed.
- Network-based Data Pump Import enables you to load the new release Oracle Database directly across the network for your earlier release Oracle Database. By using network-based Data Pump import, you are not required to use intervening dump files.

2.1.2.3.3 Time Requirements for Migrating Data and Upgrading with Export/Import

Understand the time it takes for data migration and software upgrades.

Migrating data and upgrading an entire Oracle database by using Export/Import can take a long time, especially compared to using DBUA or performing a manual upgrade. You may need to schedule the upgrade during non-peak hours or make provisions for propagating to the new database any changes that are made to the current database during the upgrade.

Related Topics:

[Migrating Data Using Oracle Data Pump](#) (page 7-1)

Use the Export and Import utilities in Oracle Data Pump to migrate data from one database to another.

2.1.3 Choose a New Location for Oracle Home when Upgrading

You cannot install the new software into the same location for Oracle home as your current release.

You must choose a location for Oracle home for the new release of Oracle Database that is separate from the Oracle home of your current release.

Using separate installation locations enables you to keep your existing Oracle software installed along with the new Oracle software. This method enables you to test the upgrade process on a test database before replacing your production environment entirely.

2.1.4 Develop a Test Plan for Upgrading Oracle Database

Review these topics to understand how to create a series of carefully designed tests to validate all stages of the upgrade process.

Oracle recommends that you perform rigorous tests of your database and applications. When you run and complete tests successfully, you help to ensure that you understand the process of upgrading the production database, so that the upgrade process is predictable and successful. Oracle strongly recommends that you perform as much testing as possible before upgrading a production database. Do not underestimate the importance of a complete and repeatable testing process.

You can choose to perform tests manually, or you can use utilities to assist your tests, such as Oracle Real Application Testing features like Database Replay or SQL Performance Analyzer. In either case, the types of tests that you perform are the same.

Your test plan must include these types of tests:

[Upgrade Testing](#) (page 2-7)

Create, test, and validate an upgrade plan.

[Minimal Testing](#) (page 2-7)

Minimal testing can find application startup or invocation problems.

[Functional Testing After Upgrades](#) (page 2-7)

Perform functional testing of the upgraded Oracle Database after the upgrade is complete.

[High Availability Testing](#) (page 2-7)

Plan to perform High Availability testing on your upgraded system.

[Integration Testing to Ensure Applications are Compatible](#) (page 2-8)

Integration testing for Oracle Database examines the interactions among components of the system.

[Performance Testing an Upgraded Oracle Database](#) (page 2-8)

Plan performance testing comparisons between your earlier release and new release Oracle Database.

[Volume and Load Stress Testing for Oracle Database Upgrades](#) (page 2-11)

Use Database Replay to perform volume and load stress testing of the entire upgraded Oracle database under high volume and loads.

[Test Plan Guidelines for Oracle Database Upgrade Planning](#) (page 2-12)

Perform planned tests on your current database and on the test database that you upgraded to the new Oracle Database release.

2.1.4.1 Upgrade Testing

Create, test, and validate an upgrade plan.

Upgrade testing for Oracle Database entails planning and testing the upgrade path from your current software to Oracle Database 12c, whether you use Oracle Database Upgrade Assistant (DBUA), perform a manual upgrade, or use Export/Import or other data-copying methods. Regardless of the upgrade method you choose, you must establish, test, and validate an upgrade plan.

2.1.4.2 Minimal Testing

Minimal testing can find application startup or invocation problems.

Minimal testing for Oracle Database entails moving all or part of an application from the current database to the new database and running the application without enabling any new database features. Minimal testing might not reveal problems that would appear in an actual production environment. However, minimal testing immediately reveals any application startup or invocation problems.

2.1.4.3 Functional Testing After Upgrades

Perform functional testing of the upgraded Oracle Database after the upgrade is complete.

Functional testing for Oracle Database is a set of tests in which new and existing features and functions of the system are tested after the upgrade. Functional testing includes all database, networking, and application components. The objective of functional testing is to verify that each component of the system functions as it did before upgrading and to verify that new functions are working properly.

2.1.4.4 High Availability Testing

Plan to perform High Availability testing on your upgraded system.

High Availability testing for Oracle Database ensures that the upgraded database system meets these recovery business requirements:

- Recovery Time Objective (RTO)
- Recovery Point Objective (RPO)

Oracle recommends the following test procedures for high availability testing:

- Create node or instance failures during stress testing. Node or instance failures help to evaluate the Oracle RAC recovery capability.
- Test fallback plans and procedures to ensure that you can minimize downtime on upgraded databases.
- Check database performance and stability, and resolve performance problems. Resolving performance problems helps to ensure that the upgrade process runs within the time that you have allocated.

2.1.4.5 Integration Testing to Ensure Applications are Compatible

Integration testing for Oracle Database examines the interactions among components of the system.

Oracle recommends that you carry out the following tests as part of your integration testing:

- Test Pro*C/C++ application clients of Oracle Database 12c instances to ensure that these applications are compatible with the upgraded database.
- Test graphical user interfaces.
- Test all applications that interact directly or indirectly with the database. Subtle changes in Oracle Database 12c, such as data types, data in the data dictionary (additional rows in the data dictionary, object type changes, and so on) can affect front-end applications, even if those applications are not directly connected to a new Oracle Database 12c instance.
- Test and stress-test any Oracle Net or Oracle Net Services connections between components.

Note:

See *Pro*C/C++ Programmer's Guide* for more information about Pro*C/C++ applications.

See *Oracle Database Net Services Reference* for more information about upgrade recommendations for Oracle Net Services.

2.1.4.6 Performance Testing an Upgraded Oracle Database

Plan performance testing comparisons between your earlier release and new release Oracle Database.

Performance testing of the new Oracle Database compares the performance of various SQL statements in the new database with the performance of those same statements in the current database. Before upgrading, analyze the performance profile of applications under the current database. Specifically, analyze and understand the calls that applications make to the database server.

[Database Replay and Performance Testing](#) (page 2-8)

Use the Database Replay feature to perform real-world testing of a database upgrade on your production workload before actually upgrading the production database.

[SQL Performance Analyzer](#) (page 2-9)

Use the SQL Performance Analyzer to forecast the impact of system changes on a SQL workload.

[SQL Plan Management](#) (page 2-9)

Review this topic to understand how to carry out SQL plan managements after upgrades to avoid performance regressions.

2.1.4.6.1 Database Replay and Performance Testing

Use the Database Replay feature to perform real-world testing of a database upgrade on your production workload before actually upgrading the production database.

The Database Replay feature captures the actual database workload on the production system, and replays it on the test system. Database Replay also provides analysis and reporting to highlight potential problems; for example, errors encountered, divergence in performance, and so forth. In addition, all the regular Enterprise Manager performance monitoring and reporting tools such as Automatic Database Diagnostic Monitor, Automatic Workload Repository (AWR), and Active Session History are available to address any problems.

Note:

You can change the stored procedure logic in the database. However, the stored PL/SQL procedures that implement the application logic must maintain the same interfaces as before the upgrade. If an upgrade affects the stored procedures of an application, replaying the workload may not be possible. Using Database Replay tool with the same interfaces provides you with good diagnostics to see if the new application logic in the server is performing as expected after the upgrade.

See Also:

- *Oracle Database Testing Guide* for information about how to capture and replay workloads
- *Oracle Database Performance Tuning Guide* for more information on the Automatic Workload Repository

2.1.4.6.2 SQL Performance Analyzer

Use the SQL Performance Analyzer to forecast the impact of system changes on a SQL workload.

SQL Performance Analyzer enables you to evaluate the effect of an upgrade on your SQL workloads. SQL Performance Analyzer finds possible issues by identifying the SQL statements affected by the upgrade. It then measures the performance divergence of SQL workloads before the upgrade, and after the upgrade. The analysis enables you to assess the overall effect of the upgrade on SQL performance. You can then take measures to avoid any negative outcome from SQL workload changes before they can affect users.

See Also:

Oracle Database Testing Guide for further information, and examples of using the SQL Performance Analyzer to perform analysis on potential database changes

2.1.4.6.3 SQL Plan Management

Review this topic to understand how to carry out SQL plan managements after upgrades to avoid performance regressions.

A database upgrade that installs a new optimizer version usually results in plan changes for a small percentage of SQL statements. Most plan changes result in no performance change or improvement. However, certain plan changes may cause

performance regressions. SQL plan management prevents performance regressions resulting from sudden changes to the execution plan of a SQL statement by providing components for capturing, selecting, and evolving SQL plan information. SQL plan management is a preventative mechanism that records and evaluates the execution plans of SQL statements over time, and builds SQL plan baselines composed of a set of existing plans that are proven efficient after repeated use. SQL plan management uses the SQL plan baselines to preserve the performance of corresponding SQL statements, regardless of changes occurring in the system.

With SQL plan management, the optimizer automatically manages execution plans and ensures that only known or verified plans are used. When SQL Plan management finds a new plan for a SQL statement, it does not use this plan until the database verifies that the new plan has comparable or better performance than the current plan. If you seed SQL plan management with your current execution plans, then those plans becomes the SQL plan baseline for each statement. The optimizer uses these plans after the upgrade. If the Oracle Database 12c optimizer determines that a different plan can result in better performance, then the new plan is queued for verification and is not used until it has been confirmed to have comparable or better performance than the current plan.

There are several ways to seed or populate a SQL Management Base (SMB) with execution plans:

Bulk Load a SQL Management Base from the Cursor Cache

Bulk loading of execution plans or SQL plan baselines from the cursor cache is useful when upgrading a database from Oracle Database 11g to the latest release of Oracle Database. The cursor cache is a shared SQL area, and SQL plans that are bulk loaded are automatically accepted and added to existing or new plan histories as SQL plan baselines.

1. In the source release of Oracle Database, use the `DBMS_SPM.LOAD_PLAN_FROM_CURSOR_CACHE` procedure or Oracle Enterprise Manager to load all of the execution plans in the cursor cache into the SQL Management Base.
2. Upgrade the database.

See Also:

Oracle Database SQL Tuning Guide for more information on how to load plans from the shared SQL area using PL/SQL or Oracle Enterprise Manager

Bulk Load a SQL Management Base with a SQL Tuning Set (STS)

Bulk loading of execution plans or SQL plan baselines may be done with a SQL Tuning Set. This is useful when upgrading from Oracle Database 10g, where no SQL Management Base (SMB) exists to directly load from the cursor cache, or to load historic plans from the Automatic Workload Repository.

1. In the source release of Oracle Database, create an STS that includes the execution plan for each of the SQL statements.
2. Load the STS into a staging table and export the staging table into a dump file.
3. Import the staging table from a dump file into the new release of Oracle and unload the STS.

4. Use Oracle Enterprise Manager or `DBMS_SPM.LOAD_PLANS_FROM_SQLSET` to load the execution plans into the SQL Management Base.

See Also:

Oracle Database SQL Tuning Guide for the complete procedure for bulk loading execution plans or SQL plan baselines

Unpack Existing SQL Plan Baselines from a Staging Table

You can test and tune all of your critical SQL queries on an Oracle Database test environment and then move those SQL execution plans to your Oracle Database production environment. Alternatively, you can take plans for SQL queries from your pre-upgrade Oracle Database production environment and move them to your post-upgrade production environment.

1. On the Oracle Database 12c test system, after completing all testing and tuning, use the `DBMS_SPM.LOAD_PLAN_FROM_CURSOR_CACHE` procedure or Enterprise Manager to load all of the execution plans in the cursor cache into the SQL Management Base.
2. Create a staging table using the `DBMS_SPM.CREATE_STGTAB_BASELINE` procedure.
3. Pack the SQL plan baselines you created in step 1 into the staging table using the `DBMS_SPM.PACK_STGTAB_BASELINE` function.
4. Export the staging table into a flat file using Data Pump.
5. Transfer this flat file to the target system.
6. Import the staging table from the flat file using Data Pump.
7. Unpack the SQL plan baselines from the staging table into the SQL Management Base on the target system using the `DBMS_SPM.UNPACK_STGTAB_BASELINE` function.

See Also:

- *Oracle Database SQL Tuning Guide* for more information about loading plans from a staging table
 - *Oracle Database Utilities* for information about using Data Pump
-
-

2.1.4.7 Volume and Load Stress Testing for Oracle Database Upgrades

Use Database Replay to perform volume and load stress testing of the entire upgraded Oracle database under high volume and loads.

Volume describes the amount of data being manipulated. Load describes the level of concurrent demand on the system. Volume and load testing can emulate how a production system behaves under various volumes and loads.

Volume and load stress testing is crucial. However, it is commonly overlooked. Oracle has found that customers often do not conduct any kind of volume or load stress

testing. Instead, customers often rely on benchmarks that do not characterize business applications. Oracle recommends that you conduct benchmarks of your applications. Benchmarking can help you to uncover problems relating to functions, performance, and integration. However, they cannot replace volume and load stress testing.

Load testing involves running an application load against the new Oracle Database release. The load test ensures that applications do not encounter problems, such as new errors, or performance issues under the load conditions that you think are likely found in production. Many times, problems manifest only under certain load conditions, and are normally not seen in functional testing. The Database Replay feature is ideal for such load testing. Database Replay enables you to capture the system workload from a production environment, and replay it in identical fashion on the test system.

See Also:

Oracle Database Testing Guide for information about using Database Replay for stress testing

2.1.4.8 Test Plan Guidelines for Oracle Database Upgrade Planning

Perform planned tests on your current database and on the test database that you upgraded to the new Oracle Database release.

- Compare the test results, noting anomalies.
- Repeat the test upgrade as many times as necessary until issues are resolved.

Test the newly upgraded test database with existing applications to verify that they operate properly with a new Oracle database.

- Test enhanced functions and new capabilities by adding available Oracle Database features.
- Ensure that the applications operate in the same manner as they did in the current database.
- Recompile invalid objects (for example, using `utlrp.sql`) to determine the time required.

See Also:

Oracle Database Testing Guide for information on testing a database upgrade

2.1.5 Prepare a Backup Strategy before Upgrading Oracle Database

You must design and carry out an appropriate backup strategy to ensure a successful upgrade.

To develop a backup strategy, consider the following questions:

- How long can the production database remain inoperable before business consequences become intolerable?
- What backup strategy is necessary to meet your availability requirements?

- Are backups archived in a safe, offsite location?
- How quickly can backups be restored (including backups in offsite storage)?
- Have recovery procedures been tested successfully?

Your backup strategy should answer all of these questions and include procedures for successfully backing up and recovering your database.

See Also::

Oracle Database Backup and Recovery User's Guide for information about implementing backup strategies using RMAN

2.2 Checklists for Oracle Database Upgrade

Use checklists to plan and carry out Oracle Database upgrades.

Oracle recommends that you use checklists as part of your upgrade planning and implementation process. Using checklists can help you to use available upgrade utilities, and can help you to ensure you carry out a successful upgrade.

[Source Server Preparation Upgrade Checklist](#) (page 2-13)

Use this checklist to prepare your server with the earlier Oracle Database release before you start the upgrade.

[Target Server Post-Upgrade Checklist](#) (page 2-14)

Complete these checks on the upgraded Oracle Database environment.

2.2.1 Source Server Preparation Upgrade Checklist

Use this checklist to prepare your server with the earlier Oracle Database release before you start the upgrade.

Table 2-1 Source Server Preparation Upgrade Checklist

| Task | Description |
|-----------------------------|--|
| Clean up the database | <ul style="list-style-type: none"> • Empty the recycle bin • Check for INVALID objects in SYS and SYSTEM • Check for duplicate objects in SYS and SYSTEM |
| Check components | <ul style="list-style-type: none"> • Check for INVALID components • Check for mandatory components • Remove obsolete components |
| Check materialized views | <ul style="list-style-type: none"> • Check the status of all materialized views (MV), and refresh any materialized views that are not fresh. • Check the size of your materialized view logs. If any materialized view logs have non-zero rows, then refresh the base table materialized views. • Check the size of direct loader logs and PMOP logs (partition maintenance operation logs). If any direct loader logs or PMOP logs have non-zero rows, then refresh the MVs indicated by the logs. |
| Obtain performance baseline | <ul style="list-style-type: none"> • Preserve performance statistics • Check network performance |

Table 2-1 (Cont.) Source Server Preparation Upgrade Checklist

| Task | Description |
|---------------------------------|--|
| Perform system integrity checks | <ul style="list-style-type: none"> Perform your own integrity checks Run Pre-Upgrade Information Tool (<code>preupgrade.jar</code>) |
| Check Time Zone setting | <ul style="list-style-type: none"> Default time zone version for Oracle Database 12c release 2 (12.2) is V26 If the source database Time Zone version is higher than the target database, then apply the Time Zone patch on the target database to match the source database version. Time Zone defaults are in located in the path <code>\$ORACLE_HOME/oracore/zoneinfo</code>. |
| Gather dictionary statistics | To decrease Oracle Database downtime, gather optimizer statistics. |
| Back up the database | <ul style="list-style-type: none"> Back up the database, create a guaranteed flashback restore point, or both. Test your fallback strategies at least once before your upgrade window. Ensure that you have fallback strategies for issues both during upgrade, and after upgrade. |

See Also:

Oracle Database PL/SQL Packages and Types Reference

2.2.2 Target Server Post-Upgrade Checklist

Complete these checks on the upgraded Oracle Database environment.

Table 2-2 Target Server Post-Upgrade Checklist

| Task | Description |
|--|--|
| Run postinstallation SQL scripts | <ul style="list-style-type: none"> <code>\$ORACLE_HOME/rdbms/admin/utlrp.sql</code> <code>\$ORACLE_HOME/rdbms/admin/utlu122s.sql</code> <code>\$ORACLE_BASE/cfgtoollogs/SID/preupgrade/postupgrade_fixups.sql</code> |
| Review upgrade logs and trace files | <ul style="list-style-type: none"> <code>\$ORACLE_BASE/cfgtoollogs/DBUA/upgradeTimestamp</code> (Look under <code>\$ORACLE_HOME</code> if <code>\$ORACLE_BASE</code> is not set). Also, folders with the system identifier (SID) of individual database are in this timestamp folder. The SID folders contain files for individual databases for the preupgrade and upgrade process. <code>alert_SID.log</code> |
| Verify upgrade status for CATALOG and CATPROC components | <ul style="list-style-type: none"> <code>select substr(comp_name, 1, 45) as comp_name, substr(version, 1, 8) as version, substr(status, 1, 8) as status from dba_registry</code> Look for version and status changes. |

Table 2-2 (Cont.) Target Server Post-Upgrade Checklist

| Task | Description |
|--|---|
| Run Oracle Database 12.2 Post-Upgrade Status Tool (utlul22s.sql) | <ul style="list-style-type: none"> • /rdbms/admin/utlul22s.sql |
| Update time zone settings | <ul style="list-style-type: none"> • If Time Zone version at source database is lower than the target database, then run Time Zone conversion after the upgrade. Time Zone defaults are in the path \$ORACLE_HOME/oracore/zoneinfo |
| Create Oracle Database system files | <ul style="list-style-type: none"> • Create an SPFILE from the PFILE • Gather new Oracle Cost-Based Optimizer (CBO) statistics • Back up the database |

2.3 Installing the New Oracle Database Software

Use this procedure overview to assist you to install the software for the new Oracle Database release.

Note:

You cannot upgrade a database using Database Upgrade Assistant (DBUA) when the source and target Oracle homes are owned by different users. Attempting to do so returns error PRKH-1014. Either ensure that the source and target databases have the same owner, or perform a manual upgrade.

To install the new Oracle Database software for this release:

1. If you are upgrading an Oracle RAC database, then you must perform the following steps in the order shown:
 - a. Upgrade Oracle Clusterware first as described in the Oracle Grid Infrastructure installation guide for your operating system.

Note:

When upgrading a non-Oracle RAC database, DBUA uses NETCA to enable you to migrate listeners from the source database as part of the entire upgrade process. At the end of the upgrade, listeners are also relocated and upgraded.

- b. Mount the Oracle Grid Infrastructure installation media.
- c. Perform operating system prerequisite checks on each of the nodes that you intend to upgrade, to ensure that they meet the system prerequisites for Oracle Grid Infrastructure (Oracle Clusterware and Oracle ASM).
- d. If necessary, perform patch upgrades of the earlier release of Oracle Clusterware software to the most recent patch version.

- e. Ensure that you are logged in as the user that owns the Oracle Grid Infrastructure installation, and run the Oracle Grid Infrastructure installation. Provide information as prompted by the installer.
 - f. When prompted, open a separate terminal session, log in as `root`, and run `root.sh`.
2. After upgrading Oracle Clusterware, follow the instructions in your Oracle operating system-specific documentation to prepare for installation of Oracle Database software and start Oracle Universal Installer.
 - Oracle recommends that you run the Pre-Upgrade Information Tool before you upgrade using DBUA. You can preview the types of items DBUA checks, and see any issues ahead of time that might be present in the database. The Pre-Upgrade Information Tool helps you fix prerequisite issues that it finds. You can then run DBUA independently after the installation is complete, or run Oracle Universal Installer.
 - If you use Oracle Label Security, Oracle Database Vault, or both, then select **Enterprise Edition** on the Select Database Edition page, click **Select Options**, and enable one or both components from the components list.

When installation of Oracle Database software has completed successfully, click **Exit** to close Oracle Universal Installer.

Related Topics:

Oracle Clusterware Installation Guide for your platform

Oracle Real Application Clusters Installation Guide for your platform

2.4 Database Preparation Tasks to Complete Before Starting Oracle Database Upgrades

Ensure you have completed these database preparation tasks before starting Oracle Database upgrades.

[Patch Set Updates and Requirements for Upgrading Oracle Database](#)
(page 2-18)

Update your new release Oracle Database to the latest Oracle bundle patch or patch set update (BP or PSU) before starting upgrades.

[Gathering Optimizer Statistics to Decrease Oracle Database Downtime](#)
(page 2-18)

Oracle strongly recommends that you use this procedure to gather statistics before performing Oracle Database upgrades.

[Verifying Materialized View Refreshes are Complete Before Upgrade](#)
(page 2-19)

Use this procedure to query the system to determine if there are any materialized view refreshes still in progress.

[Ensuring That No Files Are in Backup Mode Before Upgrading](#) (page 2-19)

Use this procedure to query the system to obtain a list of any files in backup mode.

[Ensuring That No Files Need Media Recovery Before Upgrading](#) (page 2-20)

Use this procedure to obtain a list of files that require media recovery.

[Resolving Outstanding Distributed Transactions Before Upgrading](#) (page 2-20)
Use this procedure to resolve any outstanding distributed transactions before you start an upgrade.

[Synchronizing the Standby Database with the Primary Database When Upgrading](#) (page 2-21)

If a standby database exists, then check to see if you need to synchronize it with the primary database before upgrading Oracle Database.

[Purging the Database Recycle Bin Before Upgrading](#) (page 2-21)

Use the `PURGE` statement before the upgrade to remove items and their associated objects and to release their storage space.

[Saving Oracle Enterprise Manager Database Control Configuration and Data](#) (page 2-22)

Use the `emdwgrd` utility before the upgrade to save DB Control files so that you can downgrade and restore Oracle Enterprise Manager Database Control (DB Control).

[Manually Removing DB Control with `emremove.sql`](#) (page 2-23)

Use this SQL procedure to minimize downtime during the upgrade process.

[Dropping JSON-Enabled Context Search Indexes](#) (page 2-24)

If you are upgrading from Oracle Database 12c release 1 (12.1) to 12c release 2 (12.2), then Oracle recommends that you drop the JSON-enabled context index before upgrading.

[Relocate Existing Data Files to the New Oracle Database Environment](#) (page 2-24)

Before you remove the earlier release Oracle environment, you must relocate any data files in that environment to the new Oracle Database environment.

[Copying Transparent Encryption Oracle Wallets](#) (page 2-24)

If you use Oracle wallet with Transparent Data Encryption (TDE), and you use Database Upgrade Assistant (DBUA) to upgrade the database, then copy the `sqlnet.ora` and wallet file to the new Oracle home.

[Recommendations for Oracle Net Services When Upgrading Oracle Database](#) (page 2-25)

Review these procedures and parameter changes for Oracle Net Services before you upgrade.

[Understanding Password Case Sensitivity and Upgrades](#) (page 2-26)

By default, Oracle Database 12c release 2 (12.2) is upgraded to an Exclusive Mode. Exclusive Modes do not support case-insensitive password-based authentication.

[Checking for Accounts Using Case-Insensitive Password Version](#) (page 2-27)

Use these procedures to identify if the Oracle Database that you want to upgrade has accounts or configuration parameters that are using a case-insensitive password version.

[Removing the Unified Auditing Schema and Roles](#) (page 2-30)

Use this procedure to remove the Unified Auditing schema and roles.

Running Upgrades with Read-Only and Offline Tablespaces (page 2-31)

Use the Parallel Upgrade Utility with the `-T` option available with Oracle Database 12c release 2 to take schema-based tablespaces offline during upgrade.

2.4.1 Patch Set Updates and Requirements for Upgrading Oracle Database

Update your new release Oracle Database to the latest Oracle bundle patch or patch set update (BP or PSU) before starting upgrades.

The software for Oracle Database 12c contains a full release that includes all the latest patches and updates for Oracle Database at the time of the release.

Before you start an upgrade or downgrade process, Oracle strongly recommends that you update both your earlier release and your new release Oracle Database to the latest Oracle bundle patch or patch set update (BP or PSU).

My Oracle Support provides detailed notes about how you can obtain the latest patches, as well as tools for lifecycle management and automated patching. For example:

- My Oracle Support note 854428.1 contains information about patch sets and updates.
- My Oracle Support note 730365 contains an upgrade reference list for most available Oracle Database releases, including download information, patch numbers, and links to other notes.
- My Oracle Support note 2180188.1 contains lists of one-off patches for upgrades, downgrades, and coexistence with previous releases.

Refer to

Related Topics:

<https://support.oracle.com/rs?type=doc&id=854428.1>

<https://support.oracle.com/rs?type=doc&id=730365.1>

<https://support.oracle.com/rs?type=doc&id=2180188.1>

2.4.2 Gathering Optimizer Statistics to Decrease Oracle Database Downtime

Oracle strongly recommends that you use this procedure to gather statistics before performing Oracle Database upgrades.

Statistics gathering occurs for those tables that lack statistics, or that are significantly changed during the upgrade of Oracle Database.

If your database contains thousands of dictionary tables, then Oracle strongly recommends that you collect statistics the night before starting the upgrade.

To decrease the amount of downtime, use the procedure for your database configuration:

- Non-CDB Oracle Database: Oracle recommends that you use the `DBMS_STATS.GATHER_DICTIONARY_STATS` procedure to gather these statistics. For example, enter the following SQL statement:

```
SQL> EXEC DBMS_STATS.GATHER_DICTIONARY_STATS;
```

- CDB (multitenant architecture) Oracle Database: Oracle recommends that you use `catcon` to gather Data Dictionary statistics across the entire multitenant architecture.

To gather dictionary statistics for all PDBs in a container database, use the following syntax:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/
catcon.pl -l /tmp -b gatherstats -- --x"exec
dbms_stats.gather_dictionary_stats"
```

To gather dictionary statistics on a particular PDB, use syntax similar to the following:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -l /tmp -c
'SALES1' -b gatherstats -- --x"exec dbms_stats.gather_dictionary_stats"
```

In the preceding example, the `-c SALES1` option specifies a PDB inclusion list for the command that you run, specifying the database named `SALES1`. The option `-b gatherstats` specifies the base name for the logs. The option `--x` specifies the SQL command that you want to execute. The SQL command itself is inside the quotation marks.

See Also:

Oracle Database PL/SQL Packages and Types Reference for the syntax and complete information for the `GATHER_DICTIONARY_STATS` procedure

2.4.3 Verifying Materialized View Refreshes are Complete Before Upgrade

Use this procedure to query the system to determine if there are any materialized view refreshes still in progress.

Before upgrading Oracle Database, you must wait until all materialized views have completed refreshing.

1. Run the following SQL query:

```
SQL> SELECT o.name FROM sys.obj$ o, sys.user$ u, sys.sum$ s
        WHERE o.type# = 42 AND bitand(s.mflags, 8) =8;
```

See Also:

- *Oracle Database PL/SQL Packages and Types Reference* for information on using the `DBMS_MVIEW` package to manage materialized views
 - *Oracle Database SQL Language Reference* for information about the `DROP MATERIALIZED VIEW` statement to permanently remove an existing materialized view from the database
-
-

2.4.4 Ensuring That No Files Are in Backup Mode Before Upgrading

Use this procedure to query the system to obtain a list of any files in backup mode.

You cannot have files in backup mode when upgrading Oracle Database. Run this `v $backup` procedure to check for the status of the backup:

```
SQL> SELECT * FROM v$backup WHERE status != 'NOT ACTIVE';
```

If this SQL statement indicates that files are still in backup, then either wait for the backup to complete, or abort any backups that are not needed before you attempt to upgrade.

See Also:

Oracle Database Backup and Recovery User's Guide for information about backing up and archiving data

2.4.5 Ensuring That No Files Need Media Recovery Before Upgrading

Use this procedure to obtain a list of files that require media recovery.

Before upgrading Oracle Database, you must ensure that there are no files requiring media recovery. You can query the system to get a list of files, and then recover them as appropriate.

1. Run the following statement:

```
SQL> SELECT * FROM v$recover_file;
```

See Also:

Oracle Database Backup and Recovery User's Guide for information about performing block media recovery

2.4.6 Resolving Outstanding Distributed Transactions Before Upgrading

Use this procedure to resolve any outstanding distributed transactions before you start an upgrade.

You must resolve outstanding distributed transactions before upgrading Oracle Database. You can do this by first querying to see any pending transactions, and then committing the transactions. You must wait until all pending distributed transactions have been committed.

1. Run the following statement:

```
SQL> SELECT * FROM dba_2pc_pending;
```

2. If the query in the previous step returns any rows, then run the following statements:

```
SQL> SELECT local_tran_id FROM dba_2pc_pending;  
SQL> EXECUTE dbms_transaction.purge_lost_db_entry('');  
SQL> COMMIT;
```

Tip:

Oracle Database Administrator's Guide for information about managing distributed transactions

2.4.7 Synchronizing the Standby Database with the Primary Database When Upgrading

If a standby database exists, then check to see if you need to synchronize it with the primary database before upgrading Oracle Database.

1. Run the following query:

```
SQL> SELECT SUBSTR(value, INSTR(value, '=', INSTR(UPPER(value), 'SERVICE'))+1)
FROM v$parameter
WHERE name LIKE 'log_archive_dest%' AND UPPER(value) LIKE 'SERVICE%';
```

2. If the query in the previous step returns a row, then synchronize the standby database with the primary database.
 - Make sure all the logs are transported to the standby server after a final log switch in the primary.
 - Start the recovery of the standby database with the `NODELAY` option.

See Also:

Oracle Database Backup and Recovery User's Guide for information on synchronizing a physical standby database with the primary database

2.4.8 Purging the Database Recycle Bin Before Upgrading

Use the `PURGE` statement before the upgrade to remove items and their associated objects and to release their storage space.

All the user recycle bins in the database must be empty before you begin the upgrade process for Oracle Database. If you have the `SYSDBA` privilege, then you can purge all the recycle bins in the entire database by specifying `DBA_RECYCLEBIN`, instead of `RECYCLEBIN`. Starting with Oracle Database 12c, you can use the new `PURGE DBA_RECYCLEBIN` system privilege to perform the same action without the requirement of granting or being granted the `SYSDBA` privilege.

The `PURGE DBA_RECYCLEBIN` statement is a special `PURGE` command that removes all the objects from the systemwide recycle bin and is equivalent to purging the recycle bin of every user. In earlier releases, this statement required the `SYSDBA` administrative privilege, which is highly undesirable in terms of separation of duty and least privilege. To provide compliance with separation of duty, Oracle Database 12c introduces a new system privilege, `PURGE DBA_RECYCLEBIN`, which enables you to run `PURGE DBA_RECYCLEBIN` without having the `SYSDBA` administrative privilege.

To empty the database recycle bin, run the following command:

```
SQL> PURGE DBA_RECYCLEBIN
```

Caution:

The database recycle bin must be empty during the upgrade process to avoid possible `ORA-00600` errors, and to minimize the upgrade time.

See Also:

- *Oracle Database Administrator's Guide* for information about purging objects in the recycle bin
 - *Oracle Database SQL Language Reference* for complete information about the PURGE statement
 - *Oracle Database Security Guide* for information about separation of duty for database administration
-

2.4.9 Saving Oracle Enterprise Manager Database Control Configuration and Data

Use the `emdwgrd` utility before the upgrade to save DB Control files so that you can downgrade and restore Oracle Enterprise Manager Database Control (DB Control).

After you upgrade your database, you can only restore Oracle Enterprise Manager DB Control if you saved your existing DB Control configuration files and data before the upgrade. Save these files if you need to preserve the option to downgrade and restore DB Control.

Starting with Oracle Database 12c release 1 (12.1), DB Control is removed as part of the upgrade process. Oracle provides the `emdwgrd` utility to use before upgrading your database to keep a copy of your DB Control configuration and data. To downgrade and restore the DB Control configuration from your earlier release Oracle Database, you must have a copy of your DB Control configuration and data.

The `emdwgrd` utility is located in the `ORACLE_HOME/bin` directory in the new Oracle Database 12c release. The `emdwgrd` utility consists of `emdwgrd` and `emdwgrd.pl` for Linux and UNIX, and `emdwgrd.bat` and `emdwgrd.pl` for Windows. Before running the utility, you must install the software for Oracle Database 12c, and then run the script from the new Oracle home. The `emdwgrd` utility requires that you set `ORACLE_HOME` to the Oracle home of the release that you are upgrading.

1. Install the software for the new Oracle Database 12c release.
2. Set `ORACLE_HOME` to your old Oracle home.
3. Set `ORACLE_SID` to the SID of the database being upgraded.
4. Set `PATH`, `LD_LIBRARY_PATH`, and `SHLIB_PATH` to point to the upgraded Oracle Database Oracle home.
5. Change directory to the new Oracle Database release Oracle home.
6. Run `emdwgrd` using the procedure for your database deployment, using the following guidelines:
 - If the Oracle home is on a shared device, then add the `-shared` option to the `emdwgrd` command line.
 - In these examples, `old_SID` is the system identifier (SID) of the database that you are upgrading, and `save_directory` is the path to the storage place that you select to save your existing DB Control files and data:
 - Single-instance databases:

```
emdwgrd -save -sid old_SID -path save_directory
```


On Linux and UNIX systems, the script is in `emdwgrd.sh`.

On Windows, the script is in `emdwgrd.bat`.

- Oracle Real Application Clusters (Oracle RAC) databases:
 - a. You must have remote copy enabled across all cluster member nodes. To indicate which remote copy is configured, define an environment variable. For example:

```
setenv EM_REMCP /usr/bin/scp
```

- b. Run `emdwgrd` using the following syntax:

```
emdwgrd -save -cluster -sid old_SID -path
save_directory
```

7. Enter the SYS password for the database that you want to upgrade.

Note:

The DBUA backup and restore process also enables you to revert to your previous Oracle Enterprise Manager Database Control environment after upgrading your database. However, all user data that is accumulated between the time of upgrade and restore operations is lost. Saving your database control files and data enables you to downgrade both your database and DB Control. All user data is retained even though all DB Control data that is accumulated between the time of upgrade and downgrade is lost.

2.4.10 Manually Removing DB Control with `emremove.sql`

Use this SQL procedure to minimize downtime during the upgrade process.

You can choose to run `emremove.sql` script as part of your pre-upgrade preparation.

The `emremove.sql` script drops the Oracle Enterprise Manager-related schemas and objects. This script can take a few minutes to complete, because it completes the process in six stages. The script can take longer to complete if you have SYSMAN and related sessions active from SQL*Plus, or Oracle Enterprise Manager, or other clients.

Caution:

To restore DB Control after a downgrade, you must first back up your DB Control configuration and data. Complete a backup before you start this procedure.

1. If the DB Control application is configured, then shut it down. Use the following command:

```
$ emctl stop dbconsole
```

2. Start SQL*Plus and connect to the database using the SYS account AS SYSDBA.
3. You can configure `emremove.sql` in silent and verbose modes. If you want to monitor the script while it is running, then set the following variables:

```
SET ECHO ON;  
SET SERVEROUTPUT ON;
```

4. Run `emremove.sql`. The script is located in the new Oracle Database 12c home, in the path `ORACLE_HOME/rdbms/admin/`.

For example:

```
SQL> @emremove.sql
```

5. After `emremove.sql` completes, you must manually remove `ORACLE_HOME/HOSTNAME_SID` and `ORACLE_HOME/oc4j/j2ee/OC4J_DBConsole_HOSTNAME_SID` directories from your file system.

Note:

If you previously upgraded DB Control from release 10.2.0.3 to 10.2.0.4, then you must also remove the following directories from the file system:

```
ORACLE_HOME/HOSTNAME_SID.upgrade
```

```
ORACLE_HOME/oc4j/j2ee/OC4J_DBConsole_HOSTNAME_SID.upgrade
```

6. On Windows platforms, also delete the DB Console service, which generally is named `OracleDBConsoleSID`.

2.4.11 Dropping JSON-Enabled Context Search Indexes

If you are upgrading from Oracle Database 12c release 1 (12.1) to 12c release 2 (12.2), then Oracle recommends that you drop the JSON-enabled context index before upgrading.

Oracle recommends that you drop your existing JSON-enabled index.

Related Topics:

Oracle Database JSON Developer's Guide

2.4.12 Relocate Existing Data Files to the New Oracle Database Environment

Before you remove the earlier release Oracle environment, you must relocate any data files in that environment to the new Oracle Database environment.

Plan for how you relocate files after upgrading to the new release.

If you perform a manual upgrade, then refer to *Oracle Database Administrator's Guide* for information about relocating data files. Also review the Optimal Flexible Architecture guidelines to ensure that your data file placement follows best practice guidelines for data file storage.

Related Topics:

Oracle Database Administrator's Guide

2.4.13 Copying Transparent Encryption Oracle Wallets

If you use Oracle wallet with Transparent Data Encryption (TDE), and you use Database Upgrade Assistant (DBUA) to upgrade the database, then copy the `sqlnet.ora` and wallet file to the new Oracle home.

You must copy the `sqlnet.ora` and the wallet file manually before starting the upgrade.

1. Log in as an authorized user.
2. Manually copy the `sqlnet.ora` file, and the wallet file, `ewallet.p12`, to the new release Oracle home.
3. Open the Oracle wallet in mount.

For example:

```
SQL> STARTUP MOUNT;  
SQL> ALTER SYSTEM SET ENCRYPTION WALLET OPEN
```

2.4.14 Recommendations for Oracle Net Services When Upgrading Oracle Database

Review these procedures and parameter changes for Oracle Net Services before you upgrade.

In Oracle Database 12c, new, underlying net services parameters enable data compression, which reduces the size of the session data unit that is transmitted over a SQL TCP connection.

The following new parameters for the `sqlnet.ora` file specify compression, and the preferred compression scheme:

- `SQLNET.COMPRESSION`
- `SQLNET.COMPRESSION_LEVELS`
- `SQLNET.COMPRESSION_THRESHOLD`

These new parameters are not supported in earlier releases, and are only available in Oracle Database 12c.

If the Oracle Database that you are upgrading does not have a listener configured, then before you run DBUA, you must run Oracle Net Configuration Assistant (NETCA) to configure the listening protocol address and service information for the new release of Oracle Database, including a `listener.ora` file. You must create a new version of the listener for releases of Oracle Database earlier than release 11.2. The new listener is backward-compatible with earlier Oracle databases.

When you upgrade an Oracle RAC database with DBUA, it automatically migrates the listener from your old Oracle home to the new Oracle Grid Infrastructure home. You must administer the listener by using the `lsnrctl` command in the Oracle Grid Infrastructure home. Do not attempt to use the `lsnrctl` commands from Oracle home locations for earlier releases.

Note:

If there are listeners configured on the source home, and the Oracle Database in the source home is older than the target Oracle Database home, then DBUA by default selects the listeners in the source home for migration during the upgrade process .

See Also:

Oracle Database Net Services Reference for information about the new `sqlnet.ora` compression parameters

Oracle Database Net Services Administrator's Guide for complete information about using Oracle Net Configuration Assistant

2.4.15 Understanding Password Case Sensitivity and Upgrades

By default, Oracle Database 12c release 2 (12.2) is upgraded to an Exclusive Mode. Exclusive Modes do not support case-insensitive password-based authentication.

Accounts that have only the 10G password version become inaccessible when the server runs in an Exclusive Mode.

In previous Oracle Database releases, the authentication protocol could be configured to allow case-insensitive password based authentication by setting `SEC_CASE_SENSITIVE_LOGON=FALSE`. Starting with Oracle Database 12c release 2 (12.2), the default password-based authentication protocol configuration excludes the use of the case-insensitive 10G password version, because, by default, the `SQLNET.ORA` parameter `SQLNET.ALLOWED_LOGON_VERSION_SERVER` is set to 12, which is an Exclusive Mode. When the database is configured in Exclusive Mode, the password-based authentication protocol requires that one of the case-sensitive password versions (11G or 12C) is present for the account being authenticated. This mode excludes the use of the 10G password version used in earlier releases. After upgrading to Oracle Database 12c release 2, accounts that have only the case-insensitive 10G password version become inaccessible. This occurs because the server runs in an Exclusive Mode by default. When Oracle Database is configured in Exclusive Mode, it cannot make use of the old 10G password version to authenticate the client. The server is left with no password version with which to authenticate the client.

For greater security, Oracle recommends that you leave case-sensitive password-based authentication enabled. This is the default. However, you can temporarily disable case-sensitive authentication during the upgrade to Oracle Database 12c release 2 (12.2). After the upgrade, you can then decide if you want to enable the case sensitive password-based authentication feature as part of your implementation plan to manage your password versions.

Before upgrading, Oracle recommends that you perform the following checks to determine if you are affected by this change to the default password-based authentication protocol configuration:

- Identify if you have accounts that use only 10G case-insensitive password authentication versions.
- Identify if you have Oracle Database 11g release 2 (11.2.0.3) database or earlier clients that have not applied critical patch update `CPUOct2012`, or a later patch update, and have any account that does not have the case-insensitive 10G password version.
- Ensure that you do not have the deprecated parameter `SEC_CASE_SENSITIVE_LOGON` set to `FALSE`. Setting this parameter to `FALSE` prevents the use of the case-sensitive password versions (the 11G and 12C password versions) for authentication.

Options for Accounts Using Case-Insensitive Versions

If you have user accounts that have only the case-insensitive 10G password version, then you must choose one of the following alternatives:

- Before upgrade, update the password versions for each account that has only the 10G password version. You can do this by expiring user passwords using the 10G password version, and requesting these users to log in to their account. When they attempt to log in, the server automatically updates these user's list of password versions, which includes the case-sensitive password versions.
- Change the setting of the SQLNET.ORA parameter SQLNET.ALLOWED_LOGON_VERSION_SERVER to any of the settings that are not Exclusive Mode. For example:
SQLNET.ALLOWED_LOGON_VERSION_SERVER=11

Related Topics:

Oracle Database 2 Day DBA

Oracle Database Net Services Reference

Oracle Database Security Guide

2.4.16 Checking for Accounts Using Case-Insensitive Password Version

Use these procedures to identify if the Oracle Database that you want to upgrade has accounts or configuration parameters that are using a case-insensitive password version.

By default, in Oracle Database 12c release 2 (12.2), the 10G password version is neither generated nor allowed.

If you do not set SQLNET.ALLOWED_LOGON_VERSION_SERVER to a permissive authentication protocol that permits case-insensitive versions, and you do not want user accounts authenticated with case-insensitive password versions to be locked out of the database, then you must identify affected accounts, and ensure that they are using case-sensitive password versions.

Example 2-1 Finding User Accounts That Use Case-Insensitive (10G) Version

Log in to SQL*Plus as an administrative user, and enter the following SQL query:

```
SELECT USERNAME,PASSWORD_VERSIONS FROM DBA_USERS;
```

following result shows password versions for the accounts:

| USERNAME | PASSWORD_VERSIONS |
|----------|-------------------|
| JONES | 10G 11G 12C |
| ADAMS | 10G 11G |
| CLARK | 10G 11G |
| PRESTON | 11G |
| BLAKE | 10G |

In this example, the background for each user account password verification versions in use are different:

- JONES was created in Oracle Database 10G, and the password for JONES was reset in Oracle Database 12C when the setting for the

SQLNET.ALLOWED_LOGON_VERSION_SERVER parameter was set to 8. As a result, this password reset created all three versions. 11G and 12C use case-sensitive passwords.

- ADAMS and CLARK were originally created with the 10G version, and then 11G, after they were imported from an earlier release. These account passwords were then reset in 11G, with the deprecated parameter SEC_CASE_SENSITIVE_LOGON set to TRUE.
- The password for BLAKE was created with the 10G version, and the password has not been reset. As a result, User BLAKE continues to use the 10G password version, which uses a case-insensitive password.

The user BLAKE has only the 10G password version before upgrade:

```
SQL> SELECT USERNAME,PASSWORD_VERSIONS FROM DBA_USERS;
```

```
USERNAME PASSWORD_VERSIONS
-----
BLAKE 10G
```

If you upgrade to 12c release 2 (12.2) without taking any further action, then this account becomes inaccessible. You must ensure that the system is not configured in Exclusive Mode (by setting the SQLNET.ORA parameter SQLNET.ALLOWED_LOGON_VERSION_SERVER to a more permissive authentication mode) before the upgrade.

Example 2-2 Fixing Accounts with Case-Insensitive Passwords

Complete the following procedure:

1. Use the following SQL query to find the accounts that only have the 10G password version:

```
select USERNAME
       from DBA_USERS
      where ( PASSWORD_VERSIONS = '10G '
            or PASSWORD_VERSIONS = '10G HTTP ' )
            and USERNAME <> 'ANONYMOUS';
```

2. Configure the system so that it is not running in Exclusive Mode by editing the setting of the SQLNET.ORA parameter SQLNET.ALLOWED_LOGON_VERSION_SERVER to a level appropriate for affected accounts. For example:

```
SQLNET.ALLOWED_LOGON_VERSION_SERVER=11
```

After you do this, proceed with the upgrade.

3. After the upgrade completes, use the following command syntax to expire the accounts you found in step 1, where *username* is the name of a user returned from the query in step 1:

```
ALTER USER username PASSWORD EXPIRE;
```

4. Ask the users for whom you have expired the passwords to log in.
5. When these users log in, they are prompted to reset their passwords. The system internally generates the missing 11G and 12C password versions for their account, in addition to the 10G password version. The 10G password version continues to be present, because the system is running in the permissive mode.

6. Ensure that the client software with which users are connecting has the O5L_NP capability flag.

Note:

All Oracle Database release 11.2.0.4 and later clients, and all Oracle Database release 12.1 and later clients have the O5L_NP capability. Other clients require the CPUOct2012 patch to acquire the O5L_NP capability.

The O5L_NP capability flag is documented in *Oracle Database Net Services Reference*, in the section on the parameter SQLNET.ALLOWED_LOGON_VERSION_SERVER.

7. After all clients have the O5L_NP capability, raise the server's security back to Exclusive Mode by using the following procedure:
 - a. Remove the SEC_CASE_SENSITIVE_LOGON setting from the instance initialization file, or set the SEC_CASE_SENSITIVE_LOGON instance initialization parameter to TRUE. For example:


```
SEC_CASE_SENSITIVE_LOGON = TRUE
```
 - b. Remove the SQLNET.ALLOWED_LOGON_VERSION_SERVER parameter from the server's SQLNET.ORA file, or set the value of SQLNET.ALLOWED_LOGON_VERSION_SERVER in the server's SQLNET.ORA file back to 12, to set it to an Exclusive Mode. For example:


```
SQLNET.ALLOWED_LOGON_VERSION_SERVER = 12
```
8. Use the following SQL query to find the accounts that still have the 10G password version:

```
select USERNAME
   from DBA_USERS
  where PASSWORD_VERSIONS like '%10G%'
     and USERNAME <> 'ANONYMOUS';
```

9. Use the list of accounts returned from the query in step 8 to expire all of the accounts that still have the 10G password version. Expire the accounts using the following syntax, where *username* is a name on the list returned by the query:


```
ALTER USER username PASSWORD EXPIRE;
```
10. Request the users whose accounts you expired to log into their accounts.

When the users log in, they are prompted to reset their password. The system internally generates only the 11G and 12C password versions for their account. Because the system is running in Exclusive Mode, the 10G password version is no longer generated.
11. Check that the system is running in a secure mode by re-running the query from step 1. Ensure that no users are found. When no users are found by the query, this means that no 10G password version remains present in the system.

Example 2-3 Checking for the Presence of SEC_CASE_SENSITIVE_LOGON Set to FALSE

Oracle Database does not prevent the use of the FALSE setting for SEC_CASE_SENSITIVE_LOGON when the

SQLNET.ALLOWED_LOGON_VERSION_SERVER parameter is set to 12 or 12a. This can result in all accounts in the upgraded database becoming inaccessible.

```
SQL> SHOW PARAMETER SEC_CASE_SENSITIVE_LOGON
```

| NAME | TYPE | VALUE |
|--------------------------|---------|-------|
| ----- | ----- | ----- |
| sec_case_sensitive_logon | boolean | FALSE |

You can change this parameter using the following command:

```
SQL> ALTER SYSTEM SET SEC_CASE_SENSITIVE_LOGON = TRUE;
```

System altered.

Note:

Unless the value for the parameter SQLNET.ALLOWED_LOGON_VERSION_SERVER is changed to a version that is more permissive than 12, such as 11, do not set the SEC_CASE_SENSITIVE_LOGON parameter to FALSE.

Related Topics:

Oracle Database Net Services Reference

Oracle Database Security Guide

2.4.17 Removing the Unified Auditing Schema and Roles

Use this procedure to remove the Unified Auditing schema and roles.

Remove the AUDSYS schema and the AUDIT_ADMIN and AUDIT_VIEWER roles. At this stage, there should be no AUDSYS schema.

Note:

If you want to be able to back up from the upgrade to a previous release, then before you start this procedure, back up your existing audits, perform a SQL query to select from the UNIFIED_AUDIT_TRAIL view, and insert that output into your own table, using similar definitions.

Starting in Oracle Database 12c release 2 (12.2), you can use Oracle Data Pump to carry out an export/import of the Unified Audit trail.

1. Log into SQL*Plus as user SYS with the SYSDBA system privilege.

```
sqlplus sys as sysdba  
Enter password: password
```

2. If the AUDSYS schema exists, then start the database in migrate mode and drop the AUDSYS user:

```
SQL> startup migrate pfile=$T_WORK/t_init1.ora  
ORACLE instance started.  
SQL> drop user audsys cascade;
```

User dropped.

3. Drop the AUDSYS schema (if it does exist) and the AUDIT_ADMIN and AUDIT_VIEWER roles.

```
SQL> DROP USER AUDSYS CASCADE;
SQL> DROP ROLE AUDIT_ADMIN;
SQL> DROP ROLE AUDIT_VIEWER;
```

2.4.18 Running Upgrades with Read-Only and Offline Tablespaces

Use the Parallel Upgrade Utility with the `-T` option available with Oracle Database 12c release 2 to take schema-based tablespaces offline during upgrade.

Oracle Database can read file headers created in earlier releases, so you are not required to do anything to them during the upgrade. The file headers of offline data files are updated later when they are brought online. The file headers of `READ ONLY` tablespaces are updated when they are changed to `READ WRITE`. Setting tablespaces offline ensures that your tablespaces are not altered during the upgrade. After the upgrade is complete, any user tablespace that was taken offline during the upgrade is brought back online.

If the upgrade suffers a catastrophic error, so that the upgrade is unable to bring the tablespaces back online, then review the upgrade log files. The log files contain the actual SQL statements required to make the tablespaces available. To bring the tablespaces back online, you must run the SQL statements in the log files for the database, or run the log files for each PDB.

Changes for Upgrades of Tablespaces in Oracle Database 12c Release 2 (12.2)

Starting with Oracle Database 12c release 2, you can run the Parallel Upgrade Utility with the `-T` option to have schema-based tablespaces (user tablespaces) taken offline during the upgrade. Taking these tablespaces offline can reduce the necessity of backing up before upgrades. The Parallel Upgrade Utility (`catctl.pl`) analyzes tablespaces, and automatically selects the right set of tablespaces to set to read only. The utility does not set to `READ ONLY` any tablespaces that contain Oracle-Maintained objects.

This change enables you to set more tablespaces automatically to `READ ONLY` mode as part of the upgrade. In previous releases, you could set tablespaces to `READ ONLY` or `OFFLINE` mode manually. However, in some cases you had to revert to `READ WRITE` to prevent upgrade failures.

Also in Oracle Database 12c release 2 (12.2), the behavior of the `ALTER TYPE` statement is changed. During upgrades, if a dependent table is in an accessible tablespace, then it is automatically upgraded to the new version of the type. If the dependent table is in a `READ ONLY` tablespace, then it is not automatically upgraded. In that case, run the `utluptabdata.sql` script after the upgrade is completed to upgrade those tables that were in `READ ONLY` tablespaces during the upgrade.

To take schema-based tablespaces offline, run the Parallel Upgrade Utility (`catctl.pl`) from the command line, using the `-T` option. You can run `catctl.pl` by using the `dbupgrade` script.

For example, on Linux and UNIX platforms:

```
$ dbupgrade -T
```

Run the `utluptabdata.sql` script after the upgrade completes to upgrade those tables set to `READ ONLY` tablespaces during the upgrade.

Viewing Tablespace Commands In Upgrade Log Files

If a catastrophic upgrade failure occurs, then you can run commands in the log files manually to bring up tablespaces. You can view tablespace commands in the following log files:

- Non-CDB Upgrades: `catupgrd0.log`
- PDB databases: `catupdrdpdbname0.log`, where *pdname* is the name of the PDB that you are upgrading.

At the beginning of each log file, you find SQL statements such as the following, which sets tables to READ ONLY:

```
SQL> ALTER TABLESPACE ARGROTLSPA6 READ ONLY;
```

```
Tablespace altered.
```

```
SQL> ALTER TABLESPACE ARGROTLSPB6 READ ONLY;
```

```
Tablespace altered.
```

Near the end of each log file, you find SQL statements to reset tables to READ WRITE:

```
SQL> ALTER TABLESPACE ARGROTLSPA6 READ WRITE;
```

```
Tablespace altered.
```

```
SQL> ALTER TABLESPACE ARGROTLSPB6 READ WRITE;
```

```
Tablespace altered.
```

See Also:

Oracle Database Administrator's Guide for information about transporting tablespaces between databases

2.5 Preparing the New Oracle Home for Upgrading

After backing up the database that you want to upgrade, prepare the new Oracle home in a new location. Install the software for Oracle Database 12c into the new location.

1. Copy configuration files from the Oracle home of the database being upgraded to the new Oracle home for Oracle Database 12c. If you are using DBUA, the configuration files are copied for you automatically and you can ignore this step.

If you need to manually copy your configuration files to the new Oracle home:

- a. If your parameter file resides within the old environment's Oracle home, then copy it to the new Oracle home. By default, Oracle looks for the parameter file in the `ORACLE_HOME/dbs` directory on Linux or UNIX platforms and in the `ORACLE_HOME\database` directory on Windows operating systems. The parameter file can reside anywhere, but it must not reside in the Oracle home of the old environment after you upgrade to Oracle Database 12c.

Note:

You may need to create a text initialization parameter file (*PFILE*) from the server parameter file (*SPFILE*) so that you can edit the initialization parameters.

- b. If your parameter file resides within an Oracle ASM instance, then back up the parameter file using the following command:

```
CREATE pfile FROM spfile;
```

If you must downgrade the database and your *SPFILE* resided within Oracle ASM, then you must restore the parameter file before the downgrade.

- c. If your parameter file is a text-based initialization parameter file with either an *IFILE* (include file) or a *SPFILE* (server parameter file) entry, and the file specified in the *IFILE* or *SPFILE* entry resides within the old environment's Oracle home, then copy the file specified by the *IFILE* or *SPFILE* entry to the new Oracle home. The file specified in the *IFILE* or *SPFILE* entry contains additional initialization parameters.
- d. If you have a password file that resides within the old environment's Oracle home, then move or copy the password file to the new Oracle home in Oracle Database 12c.

The name and location of the password file are operating system-specific. On Linux or UNIX platforms, the default password file is *orapwSID*, located in the *ORACLE_HOME/dbs* directory. On Windows operating systems, the default password file is *pwdSID.ora*, located in the *ORACLE_HOME\database* directory. In both cases, *SID* is your Oracle instance ID.

2. Adjust your parameter file in Oracle Database 12c by completing the following steps:

- a. Remove desupported initialization parameters and adjust deprecated initialization parameters. Certain parameters are desupported in Oracle Database 12c, while other parameters have become deprecated. Remove all desupported parameters from any parameter file that starts an Oracle Database 12c instance. Desupported parameters might cause errors in Oracle Database 12c. Also, alter any parameter whose syntax has changed in the new release.

The Pre-Upgrade Information Tool displays any deprecated parameters and desupported parameters it finds in the **Deprecated Parameters** and **Desupported Parameters** sections, respectively.

Adjust the values of the initialization parameters to at least the minimum values indicated by the Pre-Upgrade Information Tool.

Make sure all path names in the parameter file are fully specified. You should not have relative path names in the parameter file.

- b. If the parameter file contains an *IFILE* entry, then change the *IFILE* entry in the parameter file to point to the new location of the include file that you specified in step 1. Then, edit the file specified in the *IFILE* entry in the same way that you edited the parameter file in Step a through Step d.

- c. If you are upgrading a cluster database, then you may need to modify the `SPFILE` or `initORACLE_SID.ora` files.

Make sure you save all of the files you modified after making these adjustments.

3. If you are upgrading a cluster database, then set the `CLUSTER_DATABASE` initialization parameter to `false`. After the upgrade, you must set this initialization parameter back to `true`.

Related Topics:

[Behavior Changes, Deprecated and Desupported Features for Oracle Database 12c Release 2 \(12.2\) \(page 8-1\)](#)

See Also:

- *Oracle Database Administrator's Guide* for information about managing initialization parameters
 - *Oracle Real Application Clusters Administration and Deployment Guide* for information about initialization parameter files in Oracle RAC environments
 - *Oracle Database Reference* for information about `CLUSTER_DATABASE`
 - *Oracle Real Application Clusters Administration and Deployment Guide* for information about initialization parameter files in Oracle RAC
-
-

2.6 Prerequisites for Preparing Oracle Home on Windows

Your system must meet these requirements before you can upgrade Oracle Database on Microsoft Windows platforms.

For security reasons, different Microsoft Windows user accounts configured as Oracle home users for different Oracle homes are not allowed to share the same Oracle Base.

- Database upgrade is supported when the same Windows user account is used as the Oracle home user in both the *source* and *destination* Oracle homes.
- Database upgrade is supported when the Oracle home from which the database is being upgraded uses the Windows Built-in Account. Releases earlier than Oracle Database 12c (release 11.2 and earlier) only supported the built-in account option for the Oracle home user on Windows.
- The Oracle home user may not have access to files outside its own Oracle Base and Oracle home. If that is the case, then if you choose a different Oracle Base during upgrade, it is possible that Oracle Database services cannot access files in the older Oracle Base. Using DBUA for database upgrade ensures that the Oracle home user has access to files outside of its own Oracle Base and its own Oracle home.

Before upgrading manually, or before using the custom files from the older Oracle Base (for example, wallets, configuration files and other custom files), you must grant access to the Oracle home user for these outside files, or copy these files to the new Oracle Base.

See Also:

Oracle Database Platform Guide for Microsoft Windows for information about database administration on Windows

2.7 Using the Pre-Upgrade Information Tool for Oracle Database

Review these topics to understand and to use the Pre-Upgrade information tool (`preupgrade.jar`).

[About the Pre-Upgrade Information Tool](#) (page 2-35)

The Pre-Upgrade Information Tool is revised and enhanced in Oracle Database 12c release 2 (12.2). Run this tool on your earlier release Oracle Database to determine if it is ready for upgrading.

[Setting Up Environment Variables for the Pre-Upgrade Information Tool](#) (page 2-37)

Before you run the Pre-Upgrade Information Tool, set up the user environment variables for the Oracle user that runs the tool, and open pluggable databases (PDBs) for analysis.

[Pre-Upgrade Information Tool \(`preupgrade.jar`\) Command](#) (page 2-37)

Use Pre-Upgrade Information Tool (`preupgrade.jar`) commands to check your system before upgrades.

[Output of the Pre-Upgrade Information Tool](#) (page 2-40)

The Pre-Upgrade Information Tool (`preupgrade.jar`) creates fixup scripts and log files in the output directory that you specify with the `DIR` command-line option.

[Pre-Upgrade Information Tool Warnings and Recommendations for Oracle Database](#) (page 2-42)

Use this section to analyze any Pre-Upgrade Information Tool warnings before you upgrade to the new release of Oracle Database.

[Pre-Upgrade Information Tool Output Example](#) (page 2-45)

In this example, you can see how the Pre-Upgrade Information Tool displays recommended fixes, but does not carry out fixes automatically.

2.7.1 About the Pre-Upgrade Information Tool

The Pre-Upgrade Information Tool is revised and enhanced in Oracle Database 12c release 2 (12.2). Run this tool on your earlier release Oracle Database to determine if it is ready for upgrading.

Oracle Database 12c release 2 introduces the `preupgrade.jar` Pre-Upgrade Information Tool. You can run the tool from the operating system command line. In previous Oracle Database releases, the Pre-Upgrade Information Tool was run within SQL*Plus as a SQL file.

Note:

Oracle requires that you run the Pre-Upgrade Information Tool before you upgrade to Oracle Database 12c release 2.

What the Pre-Upgrade Information Tool Does

The Pre-Upgrade Information Tool (`preupgrade.jar`) creates the following files:

- A log file (`preupgrade.log`).
The log file contains the output of the Pre-Upgrade Information Tool.
- The pre-upgrade fixups:
 - Non-CDB: `preupgrade_fixups.sql`
 - CDB: `preupgrade_fixups.sql` (a consolidated script for all PDBs), and individual scripts for each PDB, named `postupgrade_fixups_pdbname.sql`, where *pdbname* is the name of the PDB.

You must run these scripts before you run the upgrade. The scripts resolve many of the issues identified by the preupgrade tool, either by using `catcon.pl`, or by using SQL*Plus commands.

- The post-upgrade fixups:
 - Non-CDB: `postupgrade_fixups.sql`
 - CDB: `postupgrade_fixups.sql` (a consolidated script for all PDBs), and individual scripts for each PDB, named `preupgrade_fixups_pdbname.sql`, where *pdbname* is the name of the PDB.

You must run these scripts after you complete the upgrade. The scripts resolve many of the issues identified by the preupgrade tool, either by using `catcon.pl`, or by using SQL*Plus commands.

- Each identified issue includes a description of the problem, and a task that you can carry out to resolve the problem. The preupgrade tool itself does not make changes to your database to correct errors. However, it does generate scripts that you can use to correct identified errors.
- The tool generates a preupgrade SQL script, `preupgrade_fixups.sql`, which you can run before the upgrade to repair issues that can be fixed before the upgrade.

The `preupgrade_fixups.sql` script fixes only those issues that an automated script can fix safely.

Preupgrade issues that the automated script cannot fix safely typically require DBA knowledge of user applications. You can address those issues manually.

- The tool generates a postupgrade SQL script, `postupgrade_fixups.sql`, which you can run after the upgrade to fix issues that can be fixed after the upgrade.
Postupgrade issues that the automatic script cannot fix safely typically require DBA knowledge of user applications. You can address those issues manually.

Overview of Pre-Upgrade Information Tool Output Files

The Pre-Upgrade Information Tool (`preupgrade.jar`) creates the following files:

- The log file `preupgrade.log`.

The log file contains the output of the Pre-Upgrade Information Tool.

- The `preupgrade_fixups_pdbname.sql` (for PDBs, where `pdbname` is the name of the PDB) or `preupgrade_fixups.sql` script (Non-CDB databases).

Before you run the upgrade, you can run the `preupgrade_fixups` script manually in SQL*Plus to resolve many of the issues identified by the `preupgrade` tool.

- The `postupgrade_fixups_pdbname.sql` (for PDBs, where `pdbname` is the name of the PDB) or `postupgrade_fixups.sql` script (Non-CDB databases).

You can run this script to fix issues after the database upgrade is completed.

Related Topics:

[Running the `postupgrade_fixups.sql` Script](#) (page 4-20)

2.7.2 Setting Up Environment Variables for the Pre-Upgrade Information Tool

Before you run the Pre-Upgrade Information Tool, set up the user environment variables for the Oracle user that runs the tool, and open pluggable databases (PDBs) for analysis.

You must set up the user environment variables for the Pre-Upgrade information tool. This example shows how to use shell commands to set up user environment variables to point to an earlier release Oracle home. For multitenant architecture upgrades, you must also open up all the PDBs that you want the tool to analyze.

In this example, the operating system is Linux or UNIX, the system identifier is `sales01`, and the earlier release Oracle home path is `/u01/app/oracle/product/12.1.0/dbhome_1`.

1. Log in as the Oracle installation owner (`oracle`).
2. Set up the user environment variables to point to the earlier release Oracle home that you want to upgrade.

For example:

```
$ export ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1
$ export ORACLE_BASE=/u01/app/oracle
$ export ORACLE_SID=sales01
$ export PATH=.:$ORACLE_HOME/bin:$PATH
```

3. (Multitenant architecture upgrades): If you are running the Pre-Upgrade Information Tool in a CDB, then use the command `alter pluggable database all open` to open the PDBs so that the tool can analyze them.

For example: Log in to the database and enter the following command to open all PDBs:

```
$ sqlplus \ as SYSDBA
.
.
.
SQL> alter pluggable database all open;
```

2.7.3 Pre-Upgrade Information Tool (`preupgrade.jar`) Command

Use Pre-Upgrade Information Tool (`preupgrade.jar`) commands to check your system before upgrades.

Prerequisites

The Pre-Upgrade Information Tool is in the new release Oracle home, in the file path `ORACLE_HOME/rdbms/admin/preupgrade.jar`. Oracle has configured it with the system checks necessary for Oracle Database 12c release 2 (12.2). However, the checks that the tool performs are carried out on the earlier release Oracle Database home. Set up the Oracle user environment variables so that they point to the earlier release Oracle home.

Run the Pre-Upgrade Information Tool by using the Java version in your earlier release Oracle home. For multitenant architecture (CDB and PDB) upgrades, open up all the PDBs that you want the tool to analyze before you run the tool.

Set the environment variables for your user account to point to the earlier release `ORACLE_HOME`, `ORACLE_BASE`, and `ORACLE_SID`.

File Path

The `preupgrade.jar` file is located in the new Oracle home:

```
New_release_Oracle_home/rdbms/admin/preupgrade.jar
```

You can also copy the `preupgrade.jar` binaries to a path of your choosing. For example:

```
/tmp/preupgrade.jar
```

Syntax

```
$Earlier_release_Oracle_home/jdk/bin/java -jar $New_release_Oracle_home  
/rdbms/admin/preupgrade.jar [FILE|TERMINAL] [TEXT|XML] [DIR output_dir]
```

Options

| Command Option | Description |
|-----------------------|---|
| FILE TERMINAL | Script output location. Use FILE to direct script output to a file. Use TERMINAL to direct output to the terminal. If you do not specify a value, then the default is FILE. If you specify TERMINAL, then screen output is directed to the display, and scripts and logs are placed in the output directory path. |
| TEXT XML | Output type. Use TEXT to specify text output. Use XML to specify XML output. If you do not specify an output type, then the default is text. |
| DIR <i>output_dir</i> | Directs the output to a specific directory. If you do not specify an output directory with the DIR option, then the output is directed to one of the following default locations: <ul style="list-style-type: none"> If you do not specify an output directory with DIR, but you define an <code>ORACLE_BASE</code> environment variable, then the generated scripts and log files are created. If you do not specify an output directory, and <code>ORACLE_BASE</code> is not defined, then the generated scripts and log files are created in the following path: <code>ORACLE_HOME/cfgtoollogs/dbunique_name/preupgrade</code> |

| Command Option | Description |
|--|--|
| <p><code>-c "pdb1 pdb2 pdb3"</code> (Windows)</p> <p><code>-c 'pdb1 pdb2 pdb3'</code> (Linux and UNIX)</p> | <p>Specifies a list of containers inside a CDB that you want to include for processing (a "White list"). Provide a space-delimited list of PDBs that you want processed. To specify the list, use single quotes on Linux and UNIX operating systems, and use double quotes on Windows systems.</p> <p>If you do not specify either <code>-c</code> or <code>-C</code>, then all PDBs in a CDB are processed.</p> |
| <p><code>-C "pdb1 pdb2 pdb3"</code> (Windows)</p> <p><code>-C 'pdb1 pdb2 pdb3'</code> (Linux and UNIX)</p> | <p>Specifies a list of containers inside a CDB that you want to exclude from processing (a "Black list"). Provide a space-delimited list of PDBs that you want to exclude from processing. To specify the list, use single quotes on Linux and UNIX operating systems, and use double quotes on Windows systems.</p> <p>If you do not specify either <code>-c</code> or <code>-C</code>, then all PDBs in a CDB are processed.</p> |
| <code>-loadonly</code> | <p>Loads the Pre-Upgrade Information Tool into the database, without carrying out any other action.</p> <p>You can use this parameter to prepare earlier releases for upgrades. For example, if you plug in an earlier release PDB into a current release CDB, the PDB, you can use this option to load the tool where the PDB does not have all packages and the directory loaded, or where the directory is not present in the new Oracle home.</p> |
| <code>-p <i>password</i></code> | <p>Provides the password for the user.</p> <p>If you do not use operating system authentication to connect to the database, then use the <code>-p</code> option to specify a password on the command line. If a username is specified on the command line with <code>-u</code>, but no password specified with <code>-p</code>, then the tool prompts you for a password.</p> |
| <code>-u <i>username</i></code> | <p>Provides the user name of the user that you want to use to connect as SYSDBA to the database that you want to check. Use this option only if you do not use operating system authentication to connect to the database</p> <p>For example, You log in as a user that is not a member of the OSDBA group for the database that you want to check. In that case, the user account does not have operating system authentication privileges for the SYSDBA system privilege. Use the <code>-u</code> and <code>-p</code> option to provide data dictionary authentication to log in as a user with SYSDBA system privileges.</p> |

| Command Option | Description |
|--|--|
| <code>-oh <i>oracle_home</i></code> | Specifies an Oracle home that you want to check. Provide the path of the Oracle home that you want to check. If you do not specify an Oracle home path to check, then the Pre-Upgrade Information Tool defaults to the path specified by the user environment variable for the Oracle home. That variable is <code>\$ORACLE_HOME</code> on Linux and UNIX systems, and <code>%ORACLE_HOME%</code> on Windows systems. |
| <code>-sid <i>system_identifier</i></code> | Specifies an Oracle system identifier that you want to check. Provide the <code>ORACLE_SID</code> of the database that you want to check. |
| <code>-help</code> | Displays the command-line syntax help text. |

Example 2-4 Non-CDB In the Source Oracle Home Example

1. Set your user environment variables to point to the earlier release Oracle home.

```
$ export ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1
$ export ORACLE_BASE=/u01/app/oracle
$ export ORACLE_SID=sales01
$ export PATH=.:$ORACLE_HOME/bin:$PATH
```

2. Run the new release Oracle Database Pre-Upgrade Information Tool on the earlier release Oracle Database server (12.2), using the environment settings you have set to the earlier release Oracle home.

```
$ORACLE_HOME/jdk/bin/java -jar /u01/app/oracle/product/12.2.0/rdbms/admin/
preupgrade.jar TERMINAL TEXT
```

Example 2-5 CDB in a Source Oracle Home

1. Open all the pluggable databases

```
SQL> alter pluggable database all open;
```

2. Set your user environment variables to point to the earlier release Oracle home.

```
$ export ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1
$ export ORACLE_BASE=/u01/app/oracle
$ export ORACLE_SID=sales01
$ export PATH=.:$ORACLE_HOME/bin:$PATH
```

3. Run the Pre-Upgrade Information Tool with an inclusion list, using the `-c` option. In this example, the inclusion list is `PDB1` and `PDB2`, and the command is run on a Linux or UNIX system. The output of the command is displayed to the terminal, and the output is displayed as text.

```
$ORACLE_HOME/jdk/bin/java -jar /u01/app/oracle/product/12.2.0/rdbms/admin/
preupgrade.jar TERMINAL TEXT -c 'pdb1 pdb2'
```

2.7.4 Output of the Pre-Upgrade Information Tool

The Pre-Upgrade Information Tool (`preupgrade.jar`) creates fixup scripts and log files in the output directory that you specify with the `DIR` command-line option.

When you run the Pre-Upgrade Information Tool, it generates the following files inside the directory that you specify as the output directory.

Log File (preupgrade.log)

The file `preupgrade.log` is the report that the Pre-Upgrade Information Tool generates whenever you run the command with the `FILE` option. The log file contains all the tool recommendations and requirements for upgrade. The log file is located in the following path, where *timestamp* is the date and time when the command is run: `$ORACLE_BASE/cfgtoollogs/dbua/upgradetimestamp/SID/`. If you run the command with the `TERMINAL` option, then the content of this file is output to the display. Refer to the section "Pre-Upgrade Information Tool Output Example" for an example of a log file.

XML DBUA File (upgrade.xml)

If you specify XML file output on the Pre-Upgrade Information Tool command line, then it generates the `upgrade.xml` file instead of `preupgrade.log`.

Preupgrade Fixup File (preupgrade_fixups.sql) and Postupgrade Fixup File (postupgrade_fixups.sql)

The Pre-Upgrade Information Tool identifies issues that can block or hinder an upgrade.

Some issues require a DBA to resolve, because it is not possible for the automated script to understand the specific goals of your application. However, other issues do not present any difficulty in resolving. In these cases, the Pre-Upgrade Information Tool automatically generates scripts that contain the SQL statements necessary to resolve the issues. Using these scripts can perform, track, and simplify the work that DBAs must do to resolve potential upgrade issues. The SQL statements that resolve issues before upgrade are placed in the `preupgrade_fixups.sql` script. The SQL statements that resolve issues after upgrade are placed in the `postupgrade_fixups.sql` script. When you run the Pre-Upgrade Information tool on a multitenant architecture Oracle Database, you can run the consolidated scripts `preupgrade_fixups.sql` script and `postupgrade_fixups.sql` across all the containers. Run the consolidated scripts using `catcon.pl`.

Both of these fixup files are generated in the output directory that you specify with the Pre-Upgrade Information Tool `DIR` command-line option.

The script carries out the following steps to resolve pre-upgrade or post-upgrade issues:

1. For each issue that the Pre-Upgrade Information Tool identifies, it reruns the individual Pre-Upgrade Information Tool check again, to determine if the issue is still present.
2. If the issue is present, then the tool does one of the following, depending on whether there is a fixup routine for the issue:
 - If there is an Oracle-supplied fixup routine for that issue, then the script executes that fixup routine. It then reruns the Pre-Upgrade Information Tool check again, to confirm that the issue is resolved. If the issue is resolved, then the script displays a message that the issue is resolved.
 - If there is no Oracle-supplied fixup routine, then the script displays a message that the issue is still present.

Review the issues that the script indicates are still present after it completes its checks. Resolve all the issues marked `Required` before upgrading. You can choose to resolve

recommended fixes and informational fixes. You can rerun the `preupgrade_fixups.sql` and `postupgrade_fixups.sql` scripts as many times as you want to. You can use the scripts as a progress report to track remaining issues as part of your issue resolution plan.

After you resolve issues identified by the Preupgrade fixup and Postupgrade fixup scripts, Oracle recommends that you rerun the Pre-Upgrade Information Tool (`preupgrade.jar`) one more time before upgrade. Running the tool one more time helps to confirm that you have resolved all issues that you intend to address.

If you are checking a multitenant environment system (CDBs and PDBs), then the `preupgrade_fixups.sql` and `postupgrade_fixups.sql` scripts contain a rollup of the fixup code for all the individual PDBs. They are coded so that only the code for the current PDB runs. You can run the same script in each PDB. The script fixes only the issues in that PDB. As a result, it is easy to use the `preupgrade_fixups.sql` and `postupgrade_fixups.sql` with `catcon.pl` to run fixups across an entire CDB.

Related Topics:

[Pre-Upgrade Information Tool Output Example](#) (page 2-45)

[Scripts for Upgrading Oracle Database](#) (page B-1)

2.7.5 Pre-Upgrade Information Tool Warnings and Recommendations for Oracle Database

Use this section to analyze any Pre-Upgrade Information Tool warnings before you upgrade to the new release of Oracle Database.

Refer to My Oracle Support note 472937.1 for information about installed database components and schemas. Refer to My Oracle Support note 753041.1 for information about diagnosing components with NON VALID status.

[Updating Access Control Lists and Network Utility Packages](#) (page 2-43)

Use this procedure to update access control lists (ACLs) and Network Utility Packages.

[Evaluate Dependencies and Add ACLs for Network Utility Packages](#)
(page 2-43)

You can receive a warning about network utility package dependencies. Use this procedure to evaluate the dependencies, and provide access by adding the appropriate access control lists (ACLs).

[About Database Links with Passwords from Earlier Oracle Database Releases](#)
(page 2-44)

This information is important only for downgrading to your original database release after performing the upgrade.

[About Oracle Database Warnings for `TIMESTAMP WITH TIME ZONE` Data Type](#) (page 2-44)

Oracle Database upgrades include updated time zone data types, which may affect existing `TIMESTAMP WITH TIME ZONE` data types.

Related Topics:

<https://support.oracle.com/rs?type=doc&id=472937.1>

<https://support.oracle.com/rs?type=doc&id=753041.1>

2.7.5.1 Updating Access Control Lists and Network Utility Packages

Use this procedure to update access control lists (ACLs) and Network Utility Packages.

Starting with Oracle Database 12c, the access control of the UTL packages is implemented using Oracle Database Real Application Security. UTL packages include UTL_TCP, UTL_SMTP, UTL_MAIL, UTL_HTTP, and UTL_INADDR. The access control does not require Oracle XML DB.

1. Ensure that the logged-in user has the `connect` privilege for the host and port specified by `DBMS_LDAP.init`. There is new behavior for the `DBMS_LDAP` PL/SQL package and the `HttpUriType` type. Because of this new behavior, you must create or update access control lists (ACLs) after you upgrade to the new Oracle Database release.

For example, if your application depends on the `DBMS_LDAP` package, then the error "ORA-24247: network access denied by access control list (ACL)" can occur. To avoid this error, the logged-in user must have the `connect` privilege for the host and port specified by `DBMS_LDAP.init`.

2. If you have any of the following packages installed, then you can be required to reinstall these packages after upgrade:

- UTL_TCP
- UTL_SMTP
- UTL_MAIL
- UTL_HTTP
- UTL_INADDR

Ensure that you have the latest version of these packages for the new Oracle Database release.

See Also:

Oracle Database Real Application Security Administrator's and Developer's Guide for information about configuring access control lists

2.7.5.2 Evaluate Dependencies and Add ACLs for Network Utility Packages

You can receive a warning about network utility package dependencies. Use this procedure to evaluate the dependencies, and provide access by adding the appropriate access control lists (ACLs).

1. Run the Pre-Upgrade Information Tool.
2. Check the output from the Pre-Upgrade Information Tool (`preupgrade.jar`) for warning messages, such as the following example:

```
WARNING: --> Database contains schemas with objects dependent on network
packages.
... Refer to the Database Upgrade Guide for instructions to configure Network
ACLs.
... USER WKSYS has dependent objects.
```

```
.... USER SYSMAN has dependent objects.  
.... USER FLOWS_010600 has dependent objects.  
.
```

3. Query the view `DBA_DEPENDENCIES` to obtain more information about the dependencies. For example:

```
SELECT * FROM DBA_DEPENDENCIES  
WHERE referenced_name IN  
( 'UTL_TCP', 'UTL_SMTP', 'UTL_MAIL', 'UTL_HTTP', 'UTL_INADDR', 'DBMS_LDAP' )  
AND owner NOT IN ( 'SYS', 'PUBLIC', 'ORDPLUGINS' );
```

4. To ensure that the new access controls are part of your upgrade testing, prepare a post-upgrade script to make the scripts available in your database environment.

Use the package `DBMS_NETWORK_ACL_ADMIN` to update your database access control lists (ACLs). You use this package to create, assign, and add privileges to the new access controls so that the updated access control packages can work as they did in prior releases. Refer to the example script provided in *Oracle Database Real Application Security Administrator's and Developer's Guide* to see how to use `DBMS_NETWORK_ACL_ADMIN` to update your access control list.

5. After the upgrade, grant specific required privileges. Access is based on the usage in the original database.

Related Topics:

Oracle Database Real Application Security Administrator's and Developer's Guide

2.7.5.3 About Database Links with Passwords from Earlier Oracle Database Releases

This information is important only for downgrading to your original database release after performing the upgrade.

During the upgrade to Oracle Database 12c any passwords in database links are encrypted.

- To downgrade to the release from which you upgraded, you must drop all of the database links with encrypted passwords before the downgrade. Consequently, the database links are nonexistent in the downgraded database.
- If you must be able to downgrade to your original release, then save the information about affected database links from the `SYS.LINK$` table, so that you can recreate the database links after the downgrade.
- For information about earlier releases, refer to the original documentation for the Oracle Database release from which you upgraded. Also refer to your platform-specific *Oracle Database Installation Guide* for the earlier release.

See Also:

Oracle Database Administrator's Guide for information about authentication and database links

2.7.5.4 About Oracle Database Warnings for `TIMESTAMP WITH TIME ZONE` Data Type

Oracle Database upgrades include updated time zone data types, which may affect existing `TIMESTAMP WITH TIME ZONE` data types.

The time zone files supplied with Oracle Database 12c are updated to reflect changes in transition rules for some time zone regions. The changes may affect existing `TIMESTAMP WITH TIME ZONE` data types.

Oracle recommends that you ensure that you have the latest time zone files before you upgrade the database. If the time zone file version of the database you are upgrading is not the most recent version of the time zone file available for the new release of Oracle Database, then the Pre-Upgrade Information Tool displays a warning and describes how to proceed. The following table describes the warnings and summarizes how to resolve a mismatch in time zone file versions.

Caution:

The `TIMESTAMP WITH TIME ZONE` data stored in the database can become corrupted during the upgrade if there is a time zone file version mismatch.

Table 2-3 Choices for Fixing the Time Zone File Version

| Time Zone Version On the Database Being Upgraded | When to Fix the Time Zone Files |
|---|--|
| Earlier than the most current version included in the new database release and the Pre-Upgrade Information Tool displays "Database is using a time zone file older than version <i>n</i> ." | After completing the database upgrade. Use the <code>DBMS_DST</code> PL/SQL package and follow the instructions in "Steps to Upgrade Time Zone File and Timestamp with Time Zone Data. Refer to the following document: <i>Oracle Database Globalization Support Guide</i> . |
| Later than the version included in the new database release and the Pre-Upgrade Information Tool displays "Database is using a time zone file greater than version <i>n</i> ." | Before beginning the database upgrade. You must patch the Oracle home by using an <code>RDBMS_DST</code> patch with the appropriate patch for the time zone file version in use. Apply the patch for each database that you want to upgrade. Otherwise, the upgrade script terminates without upgrading the database. The <code>RDBMS_DST</code> patches are available from My Oracle Support note ID 412160.1. |

Related Topics:

Oracle Database PL/SQL Packages and Types Reference

<https://support.oracle.com/rs?type=doc&id=1509653.1>

<https://support.oracle.com/rs?type=doc&id=412160.1>

Oracle Database Globalization Support Guide

2.7.6 Pre-Upgrade Information Tool Output Example

In this example, you can see how the Pre-Upgrade Information Tool displays recommended fixes, but does not carry out fixes automatically.

You have control over how and when the fixup scripts are run.

The following example shows the output that is generated and written to `preupgrade.log` by running the Oracle Database 12c Pre-Upgrade Information Tool on a release 11.2.0.3 database:

Report generated by Oracle Database Pre-Upgrade Information Tool Version 12.2.0.1.0

Upgrade-To version: 12.2.0.1.0

=====
 Status of the database prior to upgrade
 =====

```

Database Name: AIME1
Container Name: Not Applicable in Pre-12.1 database
Container ID: Not Applicable in Pre-12.1 database
Version: 11.2.0.3.0
Compatible: 11.2.0
Blocksize: 8192
Platform: Linux x86 64-bit
Timezone File: 14
Database log mode: NOARCHIVELOG
Readonly: FALSE
Edition: EE
  
```

| Oracle Component | Upgrade Action | Current Status |
|--------------------------------------|------------------|----------------|
| Oracle Server | [to be upgraded] | VALID |
| JServer JAVA Virtual Machine | [to be upgraded] | VALID |
| Oracle XDK for Java | [to be upgraded] | VALID |
| Oracle Workspace Manager | [to be upgraded] | VALID |
| OLAP Analytic Workspace | [to be upgraded] | VALID |
| Oracle Label Security | [to be upgraded] | VALID |
| Oracle Database Vault | [to be upgraded] | VALID |
| Oracle Enterprise Manager Repository | [to be upgraded] | VALID |
| Oracle Text | [to be upgraded] | VALID |
| Oracle XML Database | [to be upgraded] | VALID |
| Oracle Java Packages | [to be upgraded] | VALID |
| Oracle Multimedia | [to be upgraded] | VALID |
| Oracle Spatial | [to be upgraded] | VALID |
| Expression Filter | [to be upgraded] | VALID |
| Rule Manager | [to be upgraded] | VALID |
| Oracle Application Express | [to be upgraded] | VALID |
| Oracle OLAP API | [to be upgraded] | VALID |

=====
 BEFORE UPGRADE
 =====

Run `<preupgradeLogDirPath>/preupgrade_fixups.sql` to complete all of the BEFORE UPGRADE action items below marked with '(AUTOFIXUP)'.

REQUIRED ACTIONS

=====

+ Adjust TABLESPACE SIZES as needed.

| Tablespace | Size | Auto Extend | 12.2.0.1.0 Min Size | Action |
|------------|--------|-------------|---------------------|--------|
| EXAMPLE | 314 MB | DISABLED | 309 MB | None |

| | | | | |
|----------|--------|---------|---------|------|
| SYSAUX | 530 MB | ENABLED | 1442 MB | None |
| SYSTEM | 720 MB | ENABLED | 1228 MB | None |
| TEMP | 20 MB | ENABLED | 150 MB | None |
| UNDOTBS1 | 75 MB | ENABLED | 400 MB | None |

Note that 12.2.0.1.0 minimum sizes are estimates.

If you plan to upgrade multiple pluggable databases concurrently, then you must ensure that the UNDO tablespace size is equal to at least the number of pluggable databases that you upgrade concurrently, multiplied by that minimum. Failing to allocate sufficient space can cause the upgrade to fail.

- + Update NUMERIC INITIALIZATION PARAMETERS to meet estimated minimums.

| Parameter | 12.2.0.1.0 minimum |
|-----------|--------------------|
| ----- | ----- |
| processes | 300 |

- + You must rename or drop the USER or ROLE named AUDSYS from the database.

The database contains a USER or ROLE named AUDSYS. That name was reserved to Oracle in release 12.1.0.1.0, and remains reserved in release 12.2.0.1.0.

Oracle occasionally adds new internal USERS and ROLES as the database evolves. To avoid a name conflict in the upgraded version, a source database must not contain any USER or ROLE with a name that matches one reserved by Oracle in the target release.

- + You must rename or drop the USER or ROLE named AUDIT_ADMIN from the database.

The database contains a USER or ROLE named AUDIT_ADMIN. That name was reserved to Oracle in release 12.1.0.1.0, and remains reserved in release 12.2.0.1.0.

Oracle occasionally adds new internal USERS and ROLES as the database evolves. To avoid a name conflict in the upgraded version, a source database must not contain any USER or ROLE with a name that matches one reserved by Oracle in the target release.

- + Run rdbms/admin/olspreupgrade from the new Oracle Database 12.2.0.1.0 home.

olspreupgrade.sql has not been run on this database. To view the number of records that olspreupgrade.sql moves, use the following command:

```
SELECT count(*) from system.aud$
```

As part of the upgrade to 12.2.0.1.0, records in the 11.2.0.3.0 audit table SYSTEM.AUD\$ are moved to SYS.AUD\$. This step can be manually performed before the upgrade to reduce downtime. Refer to the 12.2.0.1.0 Oracle Label Security Administrator's Guide, or to Oracle Database Upgrade Guide for further details.

+ (AUTOFIXUP) Empty the RECYCLEBIN immediately before database upgrade.

The database contains 3 objects in the recycle bin.

The recycle bin must be completely empty before database upgrade.

RECOMMENDED ACTIONS

=====

+ Remove the EM repository.

- Copy the rdbms/admin/emremove.sql script from the target 12.2.0.1.0 ORACLE_HOME into the source 11.2.0.3.0 ORACLE_HOME.

- Stop EM Database Control:

```
$> emctl stop dbconsole
```

- Connect to the database using the SYS account AS SYSDBA

```
SET ECHO ON;
SET SERVEROUTPUT ON;
@emremove.sql
```

Without the set echo and serveroutput commands, you will not be able to follow the progress of the script.

The database has an Enterprise Manager Database Control repository.

Starting with Oracle Database 12c, the local Enterprise Manager Database Control does not exist anymore. The repository will be removed from your database during the upgrade. This step can be manually performed before the upgrade to reduce downtime.

+ Run 11.2.0.3.0 ORACLE_HOME/rdbms/admin/utlrp.sql to recompile invalid objects. You can view the individual invalid objects with

```
SET SERVEROUTPUT ON;
EXECUTE DBMS_PREUP.INVALID_OBJECTS;
```

2 objects are INVALID.

There should be no INVALID objects in SYS/SYSTEM or user schemas before database upgrade.

+ Remove OLAP Catalog by running the SQL script \$ORACLE_HOME/olap/admin/catnoamd.sql script.

The OLAP Catalog component, AMD, exists in the database.

Starting with Oracle Database 12c, the OLAP Catalog (OLAP AMD) is desupported and will be removed from the database during the database upgrade. This step can be manually performed before the upgrade to reduce downtime.

2.8 Testing the Upgrade Process for Oracle Database

Your test plan for Oracle Database upgrades should include these test procedures.

Oracle recommends that you create a full working copy of your database environment in which to test all the pre-upgrade, upgrade, and post-upgrade processes.

You can create a test environment that does not interfere with the current production Oracle database. Oracle Data Guard, for example, enables you to create physical and snapshot standby databases.

Your test environment depends on the upgrade method you choose:

- If you plan to use DBUA or perform a manual upgrade, then create a test version of the current production database.
- If you plan to use Data Pump Export/Import, then export and import in stages, using subsets of the current production database.

Practice upgrading the database using the test environment. The best practice is to perform testing of the upgrade process on an exact copy of the database that you want to upgrade, rather than on a downsized copy or test data. If an exact copy is impractical, then carefully chose a representative subset of your data to move over to your test environment and test the upgrade on that data.

[Example of Testing Upgrades Using Priority List Emulation](#) (page 2-49)

You can use the Parallel Upgrade Utility on multitenant architecture Oracle Databases to run upgrade emulations to test your priority list or other parameter settings before you run your upgrade.

[Upgrade Oracle Call Interface \(OCI\) and Precompiler Applications](#) (page 2-75)

Upgrade any Oracle Call Interface (OCI) and precompiler applications that you plan to use with the new release of Oracle Database.

See Also:

- *Oracle Database Testing Guide* for information about testing a database upgrade
 - *Oracle Database Utilities* for information on Data Pump Export and Import utilities
 - *Oracle Data Guard Concepts and Administration* for information on physical and snapshot standby databases
-
-

2.8.1 Example of Testing Upgrades Using Priority List Emulation

You can use the Parallel Upgrade Utility on multitenant architecture Oracle Databases to run upgrade emulations to test your priority list or other parameter settings before you run your upgrade.

On multitenant architecture Oracle Database systems, starting with Oracle Database 12c release 2 (12.2), you can use priority lists to upgrade or exclude specific PDBs, or to set a specific upgrade priority order. Running the Parallel Upgrade Utility using priority emulation is a way to test your priority list without actually running the upgrade. Use the Parallel Upgrade Utility emulation feature to test your upgrade plan using priority lists.

Preparing for Upgrade Emulation Tests

Before you run the emulation, you must set up your source and target upgrade locations, and prepare your database in the same way you prepare for an actual upgrade. No upgrade actually occurs, but the Parallel Upgrade Utility generates log files that show how an actual upgrade is carried out.

Note:

You can use the `-E` parameter to run the Parallel Upgrade Utility in emulation mode to test how priority lists run, or to test how other upgrade parameter selections are carried out during an upgrade. For example, you can run an upgrade emulation to obtain more information about how the resource allocation choices you make using the `-n` and `-N` parameters are carried out.

Syntax for Running Priority List Emulation

You can use any of the parameter settings that you normally use with the Parallel Upgrade Utility. However, you must create a priority list, and you must use the `-L` parameter to call the list when you run the Parallel Upgrade Utility with the `-E` parameter to set it to perform an upgrade emulation.

The following is an example of the minimum required syntax for running the Parallel Upgrade Utility using priority list emulation, where *priority_list_name* is the name of your priority list file:

```
catctl -E -L priority_list_name catupgrd.sql
```

Example 2-6 Example of Running the Parallel Upgrade Utility using Priority List Emulation

The following example uses this priority list, which is named `plist.txt`:

```
1,CDB$ROOT
2,PDB$SEED
3,CDB1_PDB2
4,CDB1_PDB4
4,CDB1_PDB3
5,CDB1_PDB5
5,CDB1_PDB1
```

The following command runs a parallel emulation, calling this priority list:

```
$ORACLE_HOME/perl/bin/perl catctl.pl -L plist.txt -E -n 4 -N 2 catupgrd.sql
```

This command uses the following parameter settings:

- `-E` specifies that Parallel Upgrade Utility runs the upgrade procedures in emulation mode.
- `-n 4` specifies that the upgrade allocates four processes to perform parallel upgrade operations.
- `-N 2` specifies that the upgrade runs two SQL processors to upgrade the PDBs. The maximum PDB upgrades running concurrently is the value of `-n` divided by the value of `-N`, so the upgrade runs no more than two concurrent PDB upgrades.
- `-L` specifies the priority list that the command reads to set upgrade priority.

As the Parallel Upgrade Utility carries out the emulated upgrade, it displays on screen the same output that you see during an actual upgrade.

When the upgrade emulation completes, it generates a log file, `catctl_priority_run.list`, which is stored either in the default logging directory, or in a logging directory location that you specify with the `-l` parameter. Because in this example we did not specify a different log directory, and we are running the

upgrade on the container database named CDB1, the output is placed in the path `Oracle_base/cfgtoollogs/CDB1/run`, where `Oracle_base` is the Oracle base of the user running the upgrade, and CDB1 is the name of the container database (CDB) on which you are running the upgrade.

The log file `catctl_priority_run.lst` displays the list of how the upgrade priority was carried out during the upgrade emulation. It shows how the Parallel Upgrade Utility grouped PDB upgrades. You can see a priority run that contains the groupings and priorities before you actually carry out the upgrade. The log file generated by the upgrade is also displayed on the screen after the upgrade completes.

The following is the screen output and log file the Parallel Upgrade Utility generates using this upgrade scenario, with the parameter settings and the priority list:

```
Argument list for [catctl.pl]
Run in                c = 0
Do not run in        C = 0
Input Directory      d = 0
Echo OFF             e = 1
Simulate             E = 1
Log Id               i = 0
Child Process        I = 0
Log Dir              l = 0
Priority List Name    L = plist.txt
Upgrade Mode active  M = 0
SQL Process Count    n = 4
SQL PDB Process Count N = 2
Open Mode Normal     o = 0
Reverse Order        r = 0
Start Phase          p = 0
End Phase            P = 0
Script               s = 0
Serial Run           S = 0
RO User Tablespaces T = 0
Display Phases       y = 0
Debug catcon.pm      z = 0
Debug catctl.pl      Z = 0

catctl.pl VERSION: [12.2.0.1.0]

orahome = [/u01/app/oracle/12.2.0]
catctlGetOrabase = [/u01/app/oracle]

Analyzing file ./catupgrd.sql

Log file directory = [/u01/app/oracle/cfgtoollogs/CDB1/upgrade20151009185119]

catcon: ALL catcon-related output will be written to [/[u01/app/oracle/cfgtoollogs/
CDB1/upgrade20151009185119/catupgrd_catcon_8126.lst]
catcon: See [/[u01/app/oracle/cfgtoollogs/CDB1/upgrade20151009185119/catupgrd*.log]
files for output generated by scripts
catcon: See [/[u01/app/oracle/cfgtoollogs/CDB1/upgrade20151009185119/
catupgrd*.lst] files for spool files, if any

Number of Cpus        = 2
DATABASE NAME        = CDB1

DataBase Version      = 12.2.0.1.0
catcon: ALL catcon-related output will be written to [/[u01/app/oracle/cfgtoollogs/
```

```

CDB1/cfgtoollogs/dbopens/upgrade20151009185122/catupgrd_catcon_8126.lst]
catcon: See [/[u01/app/oracle/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrd*.log] files for output generated by scripts
catcon: See [/[u01/app/oracle/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrd_*.lst] files for spool files, if any

Log file directory = [/[u01/app/oracle/cfgtoollogs/CDB1/dbopens/
upgrade20151009185122]

Parallel SQL Process Count (PDB)          = 2
Parallel SQL Process Count (CDB$ROOT)    = 4
Concurrent PDB Upgrades                   = 2
Generated PDB Inclusion:[NONE]
Generated PDB Inclusion:[PDB$SEED CDB1_PDB2 CDB1_PDB3 CDB1_PDB4 CDB1_PDB1 CDB1_PDB5]

-----
Phases [0-104]          Start Time:[2015_10_09 18:51:24]
Container Lists Inclusion:[CDB$ROOT] Exclusion:[NONE]
-----

***** Executing Change Scripts *****
Serial Phase #:0 [CDB$ROOT] Files:1 Time: 0s
***** Catalog Core SQL *****
Serial Phase #:1 [CDB$ROOT] Files:5 Time: 0s
Restart Phase #:2 [CDB$ROOT] Files:1 Time: 0s
***** Catalog Tables and Views *****
Parallel Phase #:3 [CDB$ROOT] Files:20 Time: 0s
Restart Phase #:4 [CDB$ROOT] Files:1 Time: 1s
***** Catalog Final Scripts *****
Serial Phase #:5 [CDB$ROOT] Files:5 Time: 0s
***** Catproc Start *****
Serial Phase #:6 [CDB$ROOT] Files:1 Time: 0s
***** Catproc Types *****
Serial Phase #:7 [CDB$ROOT] Files:4 Time: 0s
Restart Phase #:8 [CDB$ROOT] Files:1 Time: 0s
***** Catproc Tables *****
Parallel Phase #:9 [CDB$ROOT] Files:69 Time: 0s
Restart Phase #:10 [CDB$ROOT] Files:1 Time: 1s
***** Catproc Package Specs *****
Serial Phase #:11 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:12 [CDB$ROOT] Files:1 Time: 1s
***** Catproc Procedures *****
Parallel Phase #:13 [CDB$ROOT] Files:94 Time: 0s
Restart Phase #:14 [CDB$ROOT] Files:1 Time: 0s
Parallel Phase #:15 [CDB$ROOT] Files:116 Time: 0s
Restart Phase #:16 [CDB$ROOT] Files:1 Time: 1s
Serial Phase #:17 [CDB$ROOT] Files:10 Time: 0s
Restart Phase #:18 [CDB$ROOT] Files:1 Time: 0s
***** Catproc Views *****
Parallel Phase #:19 [CDB$ROOT] Files:33 Time: 0s
Restart Phase #:20 [CDB$ROOT] Files:1 Time: 1s
Serial Phase #:21 [CDB$ROOT] Files:3 Time: 0s
Restart Phase #:22 [CDB$ROOT] Files:1 Time: 0s
Parallel Phase #:23 [CDB$ROOT] Files:23 Time: 0s
Restart Phase #:24 [CDB$ROOT] Files:1 Time: 1s
Parallel Phase #:25 [CDB$ROOT] Files:14 Time: 0s
Restart Phase #:26 [CDB$ROOT] Files:1 Time: 0s
***** Catproc CDB Views *****
Serial Phase #:27 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:28 [CDB$ROOT] Files:1 Time: 1s
Serial Phase #:30 [CDB$ROOT] Files:1 Time: 0s
***** Catproc PLBs *****

```

```

Serial Phase #:31 [CDB$ROOT] Files:277 Time: 0s
Serial Phase #:32 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:33 [CDB$ROOT] Files:1 Time: 1s
Serial Phase #:34 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:35 [CDB$ROOT] Files:1 Time: 0s
***** Catproc DataPump *****
Serial Phase #:36 [CDB$ROOT] Files:4 Time: 0s
Restart Phase #:37 [CDB$ROOT] Files:1 Time: 1s
***** Catproc SQL *****
Parallel Phase #:38 [CDB$ROOT] Files:13 Time: 0s
Restart Phase #:39 [CDB$ROOT] Files:1 Time: 0s
Parallel Phase #:40 [CDB$ROOT] Files:11 Time: 0s
Restart Phase #:41 [CDB$ROOT] Files:1 Time: 1s
Parallel Phase #:42 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:43 [CDB$ROOT] Files:1 Time: 0s
***** Final Catproc scripts *****
Serial Phase #:44 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:45 [CDB$ROOT] Files:1 Time: 1s
***** Final RDBMS scripts *****
Serial Phase #:46 [CDB$ROOT] Files:1 Time: 0s
***** Upgrade Component Start *****
Serial Phase #:47 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:48 [CDB$ROOT] Files:1 Time: 0s
***** Upgrading Java *****
Serial Phase #:49 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:50 [CDB$ROOT] Files:1 Time: 1s
***** Upgrading XDK *****
Serial Phase #:51 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:52 [CDB$ROOT] Files:1 Time: 0s
***** Upgrading APS,OLS,DV,CONTEXT *****
Serial Phase #:53 [CDB$ROOT] Files:1 Time: 0s
***** Upgrading XDB *****
Restart Phase #:54 [CDB$ROOT] Files:1 Time: 1s
Serial Phase #:56 [CDB$ROOT] Files:3 Time: 0s
Serial Phase #:57 [CDB$ROOT] Files:2 Time: 0s
Parallel Phase #:58 [CDB$ROOT] Files:11 Time: 0s
Parallel Phase #:59 [CDB$ROOT] Files:24 Time: 0s
Serial Phase #:60 [CDB$ROOT] Files:4 Time: 0s
Serial Phase #:61 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:62 [CDB$ROOT] Files:30 Time: 0s
Serial Phase #:63 [CDB$ROOT] Files:1 Time: 0s
Parallel Phase #:64 [CDB$ROOT] Files:6 Time: 0s
Serial Phase #:65 [CDB$ROOT] Files:2 Time: 0s
Serial Phase #:66 [CDB$ROOT] Files:3 Time: 0s
Restart Phase #:67 [CDB$ROOT] Files:1 Time: 1s
***** Upgrading CATJAVA,OWM,MGW,RAC *****
Serial Phase #:68 [CDB$ROOT] Files:1 Time: 0s
***** Upgrading ORDIM *****
Restart Phase #:69 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:71 [CDB$ROOT] Files:1 Time: 0s
Parallel Phase #:72 [CDB$ROOT] Files:2 Time: 0s
Serial Phase #:73 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:74 [CDB$ROOT] Files:1 Time: 1s
Parallel Phase #:75 [CDB$ROOT] Files:2 Time: 0s
Serial Phase #:76 [CDB$ROOT] Files:2 Time: 0s
***** Upgrading SDO *****
Restart Phase #:77 [CDB$ROOT] Files:1 Time: 1s
Serial Phase #:79 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:80 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:81 [CDB$ROOT] Files:1 Time: 0s
Parallel Phase #:82 [CDB$ROOT] Files:3 Time: 0s

```

```

Serial Phase #:83 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:84 [CDB$ROOT] Files:1 Time: 0s
Parallel Phase #:85 [CDB$ROOT] Files:4 Time: 0s
Serial Phase #:86 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:87 [CDB$ROOT] Files:3 Time: 0s
Restart Phase #:88 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:89 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:90 [CDB$ROOT] Files:1 Time: 1s
***** Upgrading Misc. ODM, OLAP *****
Serial Phase #:91 [CDB$ROOT] Files:1 Time: 0s
***** Upgrading APEX *****
Restart Phase #:92 [CDB$ROOT] Files:1 Time: 1s
Serial Phase #:93 [CDB$ROOT] Files:1 Time: 0s
Restart Phase #:94 [CDB$ROOT] Files:1 Time: 0s
***** Final Component scripts *****
Serial Phase #:95 [CDB$ROOT] Files:1 Time: 0s
***** Final Upgrade scripts *****
Serial Phase #:96 [CDB$ROOT] Files:1 Time: 0s
***** Migration *****
Serial Phase #:97 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:98 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:99 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:100 [CDB$ROOT] Files:1 Time: 1s
***** Post Upgrade *****
Serial Phase #:101 [CDB$ROOT] Files:1 Time: 0s
***** Summary report *****
Serial Phase #:102 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:103 [CDB$ROOT] Files:1 Time: 0s
Serial Phase #:104 [CDB$ROOT] Files:1 Time: 0s

```

```

-----
Phases [0-104] End Time:[2015_10_09 18:51:43]
Container Lists Inclusion:[CDB$ROOT] Exclusion:[NONE]
-----

```

```

Start processing of PDB$SEED
[/u01/app/oracle/12.1.0/CDB1/perl/bin/perl catctl.pl -L plist.txt -E -n 2 -N 2 -I -i
pdb_seed -c 'PDB$SEED' -l /u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122 catupgrd.sql]

```

```

Start processing of CDB1_PDB2
[/u01/app/oracle/12.1.0/CDB1//perl/bin/perl catctl.pl -L plist.txt -E -n 2 -N 2 -I -
i cdb1_pdb2 -c 'CDB1_PDB2' -l /u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122 catupgrd.sql]

```

```

Argument list for [catctl.pl]
Run in c = PDB$SEED
Do not run in C = 0
Input Directory d = 0
Echo OFF e = 1
Simulate E = 1
Log Id i = pdb_seed
Child Process I = 1
Log Dir l = /u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122
Priority List Name L = plist.txt
Upgrade Mode active M = 0
SQL Process Count n = 2
SQL PDB Process Count N = 2
Open Mode Normal o = 0
Reverse Order r = 0

```



```
Start Phase          p = 0
End Phase            P = 0
Script               s = 0
Serial Run           S = 0
RO User Tablespaces T = 0
Display Phases       y = 0
Debug catcon.pm     z = 0
Debug catctl.pl     Z = 0
```

```
catctl.pl VERSION: [12.2.0.1.0]
```

```
Argument list for [catctl.pl]
```

```
Run in                c = CDB1_PDB2
Do not run in         C = 0
Input Directory       d = 0
Echo OFF              e = 1
Simulate              E = 1
Log Id                i = cdb1_pdb2
Child Process         I = 1
Log Dir               l = /u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122
Priority List Name    L = plist.txt
Upgrade Mode active  M = 0
SQL Process Count    n = 2
SQL PDB Process Count N = 2
Open Mode Normal     o = 0
Reverse Order        r = 0
Start Phase          p = 0
End Phase            P = 0
Script               s = 0
Serial Run           S = 0
RO User Tablespaces T = 0
Display Phases       y = 0
Debug catcon.pm     z = 0
Debug catctl.pl     Z = 0
```

```
catctl.pl VERSION: [12.2.0.1.0]
```

```
orahome = [/u01/app/oracle/12.1.0/CDB1/]
orahome = [/u01/app/oracle/12.1.0/CDB1/]
/u01/app/oracle/12.1.0/CDB1/bin/orabasehome = [/u01/app/oracle/
catctlGetOrabase = [/u01/app/oracle/]
```

```
Analyzing file ./catupgrd.sql
```

```
Log file directory = [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122]
```

```
/u01/app/oracle/12.1.0/CDB1/bin/orabasehome = [/u01/app/oracle]
catctlGetOrabase = [/u01/app/oracle]
```

```
Analyzing file ./catupgrd.sql
```

```
Log file directory = [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122]
```

```

catcon: ALL catcon-related output will be written to [/u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122/catupgrdpdb_seed_catcon_10120.lst]
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdpdb_seed*.log] files for output generated by scripts
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdpdb_seed_*.lst] files for spool files, if any
catcon: ALL catcon-related output will be written to [/u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122/catupgrdcdb1_pdb2_catcon_10122.lst]
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb2*.log] files for output generated by scripts
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb2_*.lst] files for spool files, if any

```

```

Number of Cpus          = 2

Number of Cpus          = 2
DATABASE NAME           = dbopens

DATABASE NAME           = dbopens

DataBase Version        = 12.2.0.1.0
DataBase Version        = 12.2.0.1.0
Generated PDB Inclusion:[CDB1_PDB2]
Generated PDB Inclusion:[PDB$SEED]
CDB$ROOT Open Mode = [OPEN MIGRATE]

```

```

-----
Phases [0-104]          Start Time:[2015_10_09 18:51:47]
Container Lists Inclusion:[CDB1_PDB2] Exclusion:[NONE]
-----

```

```

***** Executing Change Scripts *****
Serial Phase #:0 [CDB1_PDB2] Files:1 Time: 0s
***** Catalog Core SQL *****
Serial Phase #:1 [CDB1_PDB2] Files:5 Time: 0s
Restart Phase #:2 [CDB1_PDB2] Files:1 CDB$ROOT Open Mode = [OPEN MIGRATE]

```

```

-----
Phases [0-104]          Start Time:[2015_10_09 18:51:47]
Container Lists Inclusion:[PDB$SEED] Exclusion:[NONE]
-----

```

```

***** Executing Change Scripts *****
Serial Phase #:0 [PDB$SEED] Files:1 Time: 0s
***** Catalog Core SQL *****
Serial Phase #:1 [PDB$SEED] Files:5 Time: 0s
Restart Phase #:2 [PDB$SEED] Files:1 Time: 0s
***** Catalog Tables and Views *****
Parallel Phase #:3 [PDB$SEED] Files:20 Time: 0s
Restart Phase #:4 [PDB$SEED] Files:1 Time: 0s
***** Catalog Tables and Views *****
Parallel Phase #:3 [CDB1_PDB2] Files:20 Time: 0s
Restart Phase #:4 [CDB1_PDB2] Files:1 Time: 1s
***** Catalog Final Scripts *****
Serial Phase #:5 [CDB1_PDB2] Files:5 Time: 0s
***** Catproc Start *****
Serial Phase #:6 [CDB1_PDB2] Files:1 Time: 0s
***** Catproc Types *****
Serial Phase #:7 [CDB1_PDB2] Files:4 Time: 0s
Restart Phase #:8 [CDB1_PDB2] Files:1 Time: 1s
***** Catalog Final Scripts *****
Serial Phase #:5 [PDB$SEED] Files:5 Time: 0s
***** Catproc Start *****

```

```

Serial Phase #:6 [PDB$SEED] Files:1 Time: 0s
***** Catproc Types *****
Serial Phase #:7 [PDB$SEED] Files:4 Time: 0s
Restart Phase #:8 [PDB$SEED] Files:1 Time: 0s
***** Catproc Tables *****
Parallel Phase #:9 [CDB1_PDB2] Files:69 Time: 0s
Restart Phase #:10 [CDB1_PDB2] Files:1 Time: 0s
***** Catproc Tables *****
Parallel Phase #:9 [PDB$SEED] Files:69 Time: 0s
Restart Phase #:10 [PDB$SEED] Files:1 Time: 1s
***** Catproc Package Specs *****
Serial Phase #:11 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:12 [CDB1_PDB2] Files:1 Time: 1s
***** Catproc Package Specs *****
Serial Phase #:11 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:12 [PDB$SEED] Files:1 Time: 0s
***** Catproc Procedures *****
Parallel Phase #:13 [CDB1_PDB2] Files:94 Time: 0s
Restart Phase #:14 [CDB1_PDB2] Files:1 Time: 0s
***** Catproc Procedures *****
Parallel Phase #:13 [PDB$SEED] Files:94 Time: 0s
Restart Phase #:14 [PDB$SEED] Files:1 Time: 1s
Parallel Phase #:15 [CDB1_PDB2] Files:116 Time: 0s
Restart Phase #:16 [CDB1_PDB2] Files:1 Time: 1s
Parallel Phase #:15 [PDB$SEED] Files:116 Time: 0s
Restart Phase #:16 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:17 [CDB1_PDB2] Files:10 Time: 0s
Restart Phase #:18 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:17 [PDB$SEED] Files:10 Time: 0s
Restart Phase #:18 [PDB$SEED] Files:1 Time: 1s
***** Catproc Views *****
Parallel Phase #:19 [CDB1_PDB2] Files:33 Time: 0s
Restart Phase #:20 [CDB1_PDB2] Files:1 Time: 1s
***** Catproc Views *****
Parallel Phase #:19 [PDB$SEED] Files:33 Time: 0s
Restart Phase #:20 [PDB$SEED] Files:1 Time: 1s
Serial Phase #:21 [PDB$SEED] Files:3 Time: 0s
Restart Phase #:22 [PDB$SEED] Files:1 Time: 1s
Serial Phase #:21 [CDB1_PDB2] Files:3 Time: 0s
Restart Phase #:22 [CDB1_PDB2] Files:1 Time: 0s
Parallel Phase #:23 [CDB1_PDB2] Files:23 Time: 0s
Restart Phase #:24 [CDB1_PDB2] Files:1 Time: 0s
Parallel Phase #:23 [PDB$SEED] Files:23 Time: 0s
Restart Phase #:24 [PDB$SEED] Files:1 Time: 1s
Parallel Phase #:25 [CDB1_PDB2] Files:14 Time: 0s
Restart Phase #:26 [CDB1_PDB2] Files:1 Time: 1s
Parallel Phase #:25 [PDB$SEED] Files:14 Time: 0s
Restart Phase #:26 [PDB$SEED] Files:1 Time: 0s
***** Catproc CDB Views *****
Serial Phase #:27 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:28 [CDB1_PDB2] Files:1 Time: 0s
***** Catproc CDB Views *****
Serial Phase #:27 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:28 [PDB$SEED] Files:1 Time: 1s
Serial Phase #:30 [CDB1_PDB2] Files:1 Time: 0s
***** Catproc PLBs *****
Serial Phase #:31 [CDB1_PDB2] Files:277 Time: 0s
Serial Phase #:32 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:33 [CDB1_PDB2] Files:1 Time: 1s
Serial Phase #:30 [PDB$SEED] Files:1 Time: 0s
***** Catproc PLBs *****

```

```

Serial Phase #:31 [PDB$SEED] Files:277 Time: 0s
Serial Phase #:32 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:33 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:34 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:35 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:34 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:35 [PDB$SEED] Files:1 Time: 1s
***** Catproc DataPump *****
Serial Phase #:36 [CDB1_PDB2] Files:4 Time: 0s
Restart Phase #:37 [CDB1_PDB2] Files:1 Time: 1s
***** Catproc DataPump *****
Serial Phase #:36 [PDB$SEED] Files:4 Time: 0s
Restart Phase #:37 [PDB$SEED] Files:1 Time: 0s
***** Catproc SQL *****
Parallel Phase #:38 [CDB1_PDB2] Files:13 Time: 0s
Restart Phase #:39 [CDB1_PDB2] Files:1 Time: 0s
***** Catproc SQL *****
Parallel Phase #:38 [PDB$SEED] Files:13 Time: 0s
Restart Phase #:39 [PDB$SEED] Files:1 Time: 1s
Parallel Phase #:40 [CDB1_PDB2] Files:11 Time: 0s
Restart Phase #:41 [CDB1_PDB2] Files:1 Time: 1s
Parallel Phase #:40 [PDB$SEED] Files:11 Time: 0s
Restart Phase #:41 [PDB$SEED] Files:1 Time: 0s
Parallel Phase #:42 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:43 [PDB$SEED] Files:1 Time: 0s
Parallel Phase #:42 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:43 [CDB1_PDB2] Files:1 Time: 1s
***** Final Catproc scripts *****
Serial Phase #:44 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:45 [PDB$SEED] Files:1 Time: 1s
***** Final Catproc scripts *****
Serial Phase #:44 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:45 [CDB1_PDB2] Files:1 Time: 0s
***** Final RDBMS scripts *****
Serial Phase #:46 [PDB$SEED] Files:1 Time: 0s
***** Upgrade Component Start *****
Serial Phase #:47 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:48 [PDB$SEED] Files:1 Time: 0s
***** Final RDBMS scripts *****
Serial Phase #:46 [CDB1_PDB2] Files:1 Time: 0s
***** Upgrade Component Start *****
Serial Phase #:47 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:48 [CDB1_PDB2] Files:1 Time: 1s
***** Upgrading Java *****
Serial Phase #:49 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:50 [PDB$SEED] Files:1 Time: 1s
***** Upgrading Java *****
Serial Phase #:49 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:50 [CDB1_PDB2] Files:1 Time: 0s
***** Upgrading XDK *****
Serial Phase #:51 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:52 [PDB$SEED] Files:1 Time: 1s
***** Upgrading XDK *****
Serial Phase #:51 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:52 [CDB1_PDB2] Files:1 Time: 0s
***** Upgrading APS,OLS,DV,CONTEXT *****
Serial Phase #:53 [CDB1_PDB2] Files:1 Time: 0s
***** Upgrading XDB *****
Restart Phase #:54 [CDB1_PDB2] Files:1 Time: 1s
***** Upgrading APS,OLS,DV,CONTEXT *****
Serial Phase #:53 [PDB$SEED] Files:1 Time: 0s

```

```

***** Upgrading XDB *****
Restart Phase #:54 [PDB$SEED] Files:1 Time: 1s
Serial Phase #:56 [CDB1_PDB2] Files:3 Time: 0s
Serial Phase #:57 [CDB1_PDB2] Files:2 Time: 0s
Parallel Phase #:58 [CDB1_PDB2] Files:11 Time: 0s
Parallel Phase #:59 [CDB1_PDB2] Files:24 Time: 0s
Serial Phase #:60 [CDB1_PDB2] Files:4 Time: 0s
Serial Phase #:61 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:62 [CDB1_PDB2] Files:30 Time: 0s
Serial Phase #:63 [CDB1_PDB2] Files:1 Time: 0s
Parallel Phase #:64 [CDB1_PDB2] Files:6 Time: 0s
Serial Phase #:65 [CDB1_PDB2] Files:2 Time: 0s
Serial Phase #:66 [CDB1_PDB2] Files:3 Time: 0s
Restart Phase #:67 [CDB1_PDB2] Files:1 Time: 1s
Serial Phase #:56 [PDB$SEED] Files:3 Time: 0s
Serial Phase #:57 [PDB$SEED] Files:2 Time: 0s
Parallel Phase #:58 [PDB$SEED] Files:11 Time: 0s
Parallel Phase #:59 [PDB$SEED] Files:24 Time: 0s
Serial Phase #:60 [PDB$SEED] Files:4 Time: 0s
Serial Phase #:61 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:62 [PDB$SEED] Files:30 Time: 0s
Serial Phase #:63 [PDB$SEED] Files:1 Time: 0s
Parallel Phase #:64 [PDB$SEED] Files:6 Time: 0s
Serial Phase #:65 [PDB$SEED] Files:2 Time: 0s
Serial Phase #:66 [PDB$SEED] Files:3 Time: 0s
Restart Phase #:67 [PDB$SEED] Files:1 Time: 0s
***** Upgrading CATJAVA,OWM,MGW,RAC *****
Serial Phase #:68 [CDB1_PDB2] Files:1 Time: 0s
***** Upgrading ORDIM *****
Restart Phase #:69 [CDB1_PDB2] Files:1 Time: 0s
***** Upgrading CATJAVA,OWM,MGW,RAC *****
Serial Phase #:68 [PDB$SEED] Files:1 Time: 0s
***** Upgrading ORDIM *****
Restart Phase #:69 [PDB$SEED] Files:1 Time: 1s
Serial Phase #:71 [CDB1_PDB2] Files:1 Time: 0s
Parallel Phase #:72 [CDB1_PDB2] Files:2 Time: 0s
Serial Phase #:73 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:74 [CDB1_PDB2] Files:1 Time: 1s
Serial Phase #:71 [PDB$SEED] Files:1 Time: 0s
Parallel Phase #:72 [PDB$SEED] Files:2 Time: 0s
Serial Phase #:73 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:74 [PDB$SEED] Files:1 Time: 0s
Parallel Phase #:75 [CDB1_PDB2] Files:2 Time: 0s
Serial Phase #:76 [CDB1_PDB2] Files:2 Time: 0s
***** Upgrading SDO *****
Restart Phase #:77 [CDB1_PDB2] Files:1 Time: 1s
Parallel Phase #:75 [PDB$SEED] Files:2 Time: 0s
Serial Phase #:76 [PDB$SEED] Files:2 Time: 0s
***** Upgrading SDO *****
Restart Phase #:77 [PDB$SEED] Files:1 Time: 1s
Serial Phase #:79 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:80 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:81 [CDB1_PDB2] Files:1 Time: 0s
Parallel Phase #:82 [CDB1_PDB2] Files:3 Time: 0s
Serial Phase #:83 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:84 [CDB1_PDB2] Files:1 Time: 0s
Parallel Phase #:85 [CDB1_PDB2] Files:4 Time: 0s
Serial Phase #:86 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:87 [CDB1_PDB2] Files:3 Time: 0s
Restart Phase #:88 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:79 [PDB$SEED] Files:1 Time: 0s

```

```

Serial Phase #:80 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:81 [PDB$SEED] Files:1 Time: 0s
Parallel Phase #:82 [PDB$SEED] Files:3 Time: 0s
Serial Phase #:83 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:84 [PDB$SEED] Files:1 Time: 0s
Parallel Phase #:85 [PDB$SEED] Files:4 Time: 0s
Serial Phase #:86 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:87 [PDB$SEED] Files:3 Time: 0s
Restart Phase #:88 [PDB$SEED] Files:1 Time: 1s
Serial Phase #:89 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:90 [CDB1_PDB2] Files:1 Time: 1s
Serial Phase #:89 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:90 [PDB$SEED] Files:1 Time: 0s
***** Upgrading Misc. ODM, OLAP *****
Serial Phase #:91 [CDB1_PDB2] Files:1 Time: 0s
***** Upgrading APEX *****
Restart Phase #:92 [CDB1_PDB2] Files:1 Time: 0s
***** Upgrading Misc. ODM, OLAP *****
Serial Phase #:91 [PDB$SEED] Files:1 Time: 0s
***** Upgrading APEX *****
Restart Phase #:92 [PDB$SEED] Files:1 Time: 1s
Serial Phase #:93 [PDB$SEED] Files:1 Time: 0s
Restart Phase #:94 [PDB$SEED] Files:1 Time: 1s
Serial Phase #:93 [CDB1_PDB2] Files:1 Time: 0s
Restart Phase #:94 [CDB1_PDB2] Files:1 Time: 0s
***** Final Component scripts *****
Serial Phase #:95 [CDB1_PDB2] Files:1 Time: 0s
***** Final Upgrade scripts *****
Serial Phase #:96 [CDB1_PDB2] Files:1 Time: 0s
***** Migration *****
Serial Phase #:97 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:98 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:99 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:100 [CDB1_PDB2] Files:1 Time: 0s
***** Post Upgrade *****
Serial Phase #:101 [CDB1_PDB2] Files:1 Time: 0s
***** Summary report *****
Serial Phase #:102 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:103 [CDB1_PDB2] Files:1 Time: 0s
Serial Phase #:104 [CDB1_PDB2] Files:1 Time: 0s

```

```

-----
Phases [0-104] End Time:[2015_10_09 18:52:04]
Container Lists Inclusion:[CDB1_PDB2] Exclusion:[NONE]
-----

```

```

Time: 0s
***** Final Component scripts *****
Serial Phase #:95 [PDB$SEED] Files:1 Time: 0s
***** Final Upgrade scripts *****
Serial Phase #:96 [PDB$SEED] Files:1 Time: 0s
***** Migration *****
Serial Phase #:97 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:98 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:99 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:100 [PDB$SEED] Files:1 Time: 0s
***** Post Upgrade *****
Serial Phase #:101 [PDB$SEED] Files:1
Grand Total Time: 17s [CDB1_PDB2]

```

```

LOG FILES: (/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb2*.log)

```

```

Time: 0s
***** Summary report *****
Serial Phase #:102 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:103 [PDB$SEED] Files:1 Time: 0s
Serial Phase #:104 [PDB$SEED] Files:1 Time: 0s

-----
Phases [0-104] End Time:[2015_10_09 18:52:04]
Container Lists Inclusion:[PDB$SEED] Exclusion:[NONE]
-----

Total Upgrade Time: [0d:0h:0m:17s]

Grand Total Time: 17s [PDB$SEED]

LOG FILES: (/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrpdb_seed*.log)

Total Upgrade Time: [0d:0h:0m:17s]

Start processing of CDB1_PDB3
[/ade_autofs/dd19_db/RDBMS/MAIN/LINUX.X64/151007/perl/bin/perl catctl.pl -L
plist.txt -E -n 2 -N 2 -I -i cdb1_pdb3 -c 'CDB1_PDB3' -l /u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122 catupgrd.sql]

Start processing of CDB1_PDB4
[/ade_autofs/dd19_db/RDBMS/MAIN/LINUX.X64/151007/perl/bin/perl catctl.pl -L
plist.txt -E -n 2 -N 2 -I -i cdb1_pdb4 -c 'CDB1_PDB4' -l /u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122 catupgrd.sql]

Argument list for [catctl.pl]
Run in c = CDB1_PDB3
Do not run in C = 0
Input Directory d = 0
Echo OFF e = 1
Simulate E = 1
Log Id i = cdb1_pdb3
Child Process I = 1
Log Dir l = /u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122
Priority List Name L = plist.txt
Upgrade Mode active M = 0
SQL Process Count n = 2
SQL PDB Process Count N = 2
Open Mode Normal o = 0
Reverse Order r = 0
Start Phase p = 0
End Phase P = 0
Script s = 0
Serial Run S = 0
RO User Tablespaces T = 0
Display Phases y = 0
Debug catcon.pm z = 0
Debug catctl.pl Z = 0

catctl.pl VERSION: [12.2.0.1.0]

Argument list for [catctl.pl]
Run in c = CDB1_PDB4

```

```

Do not run in          C = 0
Input Directory        d = 0
Echo OFF               e = 1
Simulate               E = 1
Log Id                 i = cdb1_pdb4
Child Process          I = 1
Log Dir                l = /u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122
Priority List Name     L = plist.txt
Upgrade Mode active   M = 0
SQL Process Count     n = 2
SQL PDB Process Count N = 2
Open Mode Normal      o = 0
Reverse Order         r = 0
Start Phase           p = 0
End Phase             P = 0
Script                s = 0
Serial Run            S = 0
RO User Tablespaces  T = 0
Display Phases        y = 0
Debug catcon.pm       z = 0
Debug catctl.pl       Z = 0

```

catctl.pl VERSION: [12.2.0.1.0]

```

orahome = [/u01/app/oracle]
orahome = [/u01/app/oracle]
/u01/app/oracle/12.1.0/CDB1/bin/orabasehome = [/u01/app/oracle]
catctlGetOrabase = [/u01/app/oracle]

```

Analyzing file ./catupgrd.sql

```

Log file directory = [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122]

```

```

catcon: ALL catcon-related output will be written to [/u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122/catupgrdcdb1_pdb3_catcon_12150.lst]
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb3*.log] files for output generated by scripts
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb3_*.lst] files for spool files, if any
/u01/app/oracle/12.1.0/CDB1/bin/orabasehome = [/u01/app/oracle]
catctlGetOrabase = [/u01/app/oracle]

```

Analyzing file ./catupgrd.sql

```

Log file directory = [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122]

```

```

catcon: ALL catcon-related output will be written to [/u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122/catupgrdcdb1_pdb4_catcon_12152.lst]
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb4*.log] files for output generated by scripts
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb4_*.lst] files for spool files, if any

```

```

Number of Cpus        = 2

Number of Cpus        = 2
DATABASE NAME         = dbopens

```


DATABASE NAME = dbopens

DataBase Version = 12.2.0.1.0

DataBase Version = 12.2.0.1.0

Generated PDB Inclusion:[CDB1_PDB3]

Generated PDB Inclusion:[CDB1_PDB4]

CDB\$ROOT Open Mode = [OPEN MIGRATE]

 Phases [0-104] Start Time:[2015_10_09 18:52:10]

Container Lists Inclusion:[CDB1_PDB3] Exclusion:[NONE]

***** Executing Change Scripts *****

Serial Phase #:0 [CDB1_PDB3] Files:1 Time: 0s

***** Catalog Core SQL *****

Serial Phase #:1 [CDB1_PDB3] Files:5 Time: 0s

Restart Phase #:2 [CDB1_PDB3] Files:1 Time: 0s

***** Catalog Tables and Views *****

Parallel Phase #:3 [CDB1_PDB3] Files:20 Time: 0s

Restart Phase #:4 [CDB1_PDB3] Files:1 CDB\$ROOT Open Mode = [OPEN MIGRATE]

 Phases [0-104] Start Time:[2015_10_09 18:52:10]

Container Lists Inclusion:[CDB1_PDB4] Exclusion:[NONE]

***** Executing Change Scripts *****

Serial Phase #:0 [CDB1_PDB4] Files:1 Time: 0s

***** Catalog Core SQL *****

Serial Phase #:1 [CDB1_PDB4] Files:5 Time: 0s

Restart Phase #:2 [CDB1_PDB4] Files:1 Time: 0s

***** Catalog Tables and Views *****

Parallel Phase #:3 [CDB1_PDB4] Files:20 Time: 0s

Restart Phase #:4 [CDB1_PDB4] Files:1 Time: 1s

***** Catalog Final Scripts *****

Serial Phase #:5 [CDB1_PDB3] Files:5 Time: 0s

***** Catproc Start *****

Serial Phase #:6 [CDB1_PDB3] Files:1 Time: 0s

***** Catproc Types *****

Serial Phase #:7 [CDB1_PDB3] Files:4 Time: 0s

Restart Phase #:8 [CDB1_PDB3] Files:1 Time: 1s

***** Catalog Final Scripts *****

Serial Phase #:5 [CDB1_PDB4] Files:5 Time: 0s

***** Catproc Start *****

Serial Phase #:6 [CDB1_PDB4] Files:1 Time: 0s

***** Catproc Types *****

Serial Phase #:7 [CDB1_PDB4] Files:4 Time: 0s

Restart Phase #:8 [CDB1_PDB4] Files:1 Time: 0s

***** Catproc Tables *****

Parallel Phase #:9 [CDB1_PDB3] Files:69 Time: 0s

Restart Phase #:10 [CDB1_PDB3] Files:1 Time: 0s

***** Catproc Tables *****

Parallel Phase #:9 [CDB1_PDB4] Files:69 Time: 0s

Restart Phase #:10 [CDB1_PDB4] Files:1 Time: 1s

***** Catproc Package Specs *****

Serial Phase #:11 [CDB1_PDB3] Files:1 Time: 0s

Restart Phase #:12 [CDB1_PDB3] Files:1 Time: 1s

***** Catproc Package Specs *****

Serial Phase #:11 [CDB1_PDB4] Files:1 Time: 0s

Restart Phase #:12 [CDB1_PDB4] Files:1 Time: 0s

***** Catproc Procedures *****

```

Parallel Phase #:13 [CDB1_PDB4] Files:94 Time: 0s
Restart Phase #:14 [CDB1_PDB4] Files:1 Time: 0s
***** Catproc Procedures *****
Parallel Phase #:13 [CDB1_PDB3] Files:94 Time: 0s
Restart Phase #:14 [CDB1_PDB3] Files:1 Time: 1s
Parallel Phase #:15 [CDB1_PDB4] Files:116 Time: 0s
Restart Phase #:16 [CDB1_PDB4] Files:1 Time: 1s
Parallel Phase #:15 [CDB1_PDB3] Files:116 Time: 0s
Restart Phase #:16 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:17 [CDB1_PDB3] Files:10 Time: 0s
Restart Phase #:18 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:17 [CDB1_PDB4] Files:10 Time: 0s
Restart Phase #:18 [CDB1_PDB4] Files:1 Time: 1s
***** Catproc Views *****
Parallel Phase #:19 [CDB1_PDB3] Files:33 Time: 0s
Restart Phase #:20 [CDB1_PDB3] Files:1 Time: 1s
***** Catproc Views *****
Parallel Phase #:19 [CDB1_PDB4] Files:33 Time: 0s
Restart Phase #:20 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:21 [CDB1_PDB4] Files:3 Time: 0s
Restart Phase #:22 [CDB1_PDB4] Files:1 Time: 1s
Serial Phase #:21 [CDB1_PDB3] Files:3 Time: 0s
Restart Phase #:22 [CDB1_PDB3] Files:1 Time: 1s
Parallel Phase #:23 [CDB1_PDB4] Files:23 Time: 0s
Restart Phase #:24 [CDB1_PDB4] Files:1 Time: 0s
Parallel Phase #:23 [CDB1_PDB3] Files:23 Time: 0s
Restart Phase #:24 [CDB1_PDB3] Files:1 Time: 1s
Parallel Phase #:25 [CDB1_PDB4] Files:14 Time: 0s
Restart Phase #:26 [CDB1_PDB4] Files:1 Time: 1s
Parallel Phase #:25 [CDB1_PDB3] Files:14 Time: 0s
Restart Phase #:26 [CDB1_PDB3] Files:1 Time: 0s
***** Catproc CDB Views *****
Serial Phase #:27 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:28 [CDB1_PDB4] Files:1 Time: 0s
***** Catproc CDB Views *****
Serial Phase #:27 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:28 [CDB1_PDB3] Files:1 Time: 1s
Serial Phase #:30 [CDB1_PDB4] Files:1 Time: 0s
***** Catproc PLBs *****
Serial Phase #:31 [CDB1_PDB4] Files:277 Time: 0s
Serial Phase #:32 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:33 [CDB1_PDB4] Files:1 Time: 1s
Serial Phase #:30 [CDB1_PDB3] Files:1 Time: 0s
***** Catproc PLBs *****
Serial Phase #:31 [CDB1_PDB3] Files:277 Time: 0s
Serial Phase #:32 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:33 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:34 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:35 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:34 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:35 [CDB1_PDB3] Files:1 Time: 1s
***** Catproc DataPump *****
Serial Phase #:36 [CDB1_PDB4] Files:4 Time: 0s
Restart Phase #:37 [CDB1_PDB4] Files:1 Time: 1s
***** Catproc DataPump *****
Serial Phase #:36 [CDB1_PDB3] Files:4 Time: 0s
Restart Phase #:37 [CDB1_PDB3] Files:1 Time: 0s
***** Catproc SQL *****
Parallel Phase #:38 [CDB1_PDB3] Files:13 Time: 0s
Restart Phase #:39 [CDB1_PDB3] Files:1 Time: 0s
***** Catproc SQL *****

```

```

Parallel Phase #:38 [CDB1_PDB4] Files:13 Time: 0s
Restart Phase #:39 [CDB1_PDB4] Files:1 Time: 1s
Parallel Phase #:40 [CDB1_PDB3] Files:11 Time: 0s
Restart Phase #:41 [CDB1_PDB3] Files:1 Time: 1s
Parallel Phase #:40 [CDB1_PDB4] Files:11 Time: 0s
Restart Phase #:41 [CDB1_PDB4] Files:1 Time: 0s
Parallel Phase #:42 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:43 [CDB1_PDB3] Files:1 Time: 0s
Parallel Phase #:42 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:43 [CDB1_PDB4] Files:1 Time: 1s
***** Final Catproc scripts *****
Serial Phase #:44 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:45 [CDB1_PDB3] Files:1 Time: 1s
***** Final Catproc scripts *****
Serial Phase #:44 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:45 [CDB1_PDB4] Files:1 Time: 0s
***** Final RDBMS scripts *****
Serial Phase #:46 [CDB1_PDB3] Files:1 Time: 0s
***** Upgrade Component Start *****
Serial Phase #:47 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:48 [CDB1_PDB3] Files:1 Time: 0s
***** Final RDBMS scripts *****
Serial Phase #:46 [CDB1_PDB4] Files:1 Time: 0s
***** Upgrade Component Start *****
Serial Phase #:47 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:48 [CDB1_PDB4] Files:1 Time: 1s
***** Upgrading Java *****
Serial Phase #:49 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:50 [CDB1_PDB3] Files:1 Time: 1s
***** Upgrading Java *****
Serial Phase #:49 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:50 [CDB1_PDB4] Files:1 Time: 0s
***** Upgrading XDK *****
Serial Phase #:51 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:52 [CDB1_PDB4] Files:1 Time: 0s
***** Upgrading XDK *****
Serial Phase #:51 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:52 [CDB1_PDB3] Files:1 Time: 1s
***** Upgrading APS,OLS,DV,CONTEXT *****
Serial Phase #:53 [CDB1_PDB4] Files:1 Time: 0s
***** Upgrading XDB *****
Restart Phase #:54 [CDB1_PDB4] Files:1 Time: 1s
***** Upgrading APS,OLS,DV,CONTEXT *****
Serial Phase #:53 [CDB1_PDB3] Files:1 Time: 0s
***** Upgrading XDB *****
Restart Phase #:54 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:56 [CDB1_PDB3] Files:3 Time: 0s
Serial Phase #:57 [CDB1_PDB3] Files:2 Time: 0s
Parallel Phase #:58 [CDB1_PDB3] Files:11 Time: 0s
Parallel Phase #:59 [CDB1_PDB3] Files:24 Time: 0s
Serial Phase #:60 [CDB1_PDB3] Files:4 Time: 0s
Serial Phase #:61 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:62 [CDB1_PDB3] Files:30 Time: 0s
Serial Phase #:63 [CDB1_PDB3] Files:1 Time: 0s
Parallel Phase #:64 [CDB1_PDB3] Files:6 Time: 0s
Serial Phase #:65 [CDB1_PDB3] Files:2 Time: 0s
Serial Phase #:66 [CDB1_PDB3] Files:3 Time: 0s
Restart Phase #:67 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:56 [CDB1_PDB4] Files:3 Time: 0s
Serial Phase #:57 [CDB1_PDB4] Files:2 Time: 0s
Parallel Phase #:58 [CDB1_PDB4] Files:11 Time: 0s

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Parallel Phase #:59 [CDB1_PDB4] Files:24 Time: 0s
Serial Phase #:60 [CDB1_PDB4] Files:4 Time: 0s
Serial Phase #:61 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:62 [CDB1_PDB4] Files:30 Time: 0s
Serial Phase #:63 [CDB1_PDB4] Files:1 Time: 0s
Parallel Phase #:64 [CDB1_PDB4] Files:6 Time: 0s
Serial Phase #:65 [CDB1_PDB4] Files:2 Time: 0s
Serial Phase #:66 [CDB1_PDB4] Files:3 Time: 0s
Restart Phase #:67 [CDB1_PDB4] Files:1 Time: 1s
***** Upgrading CATJAVA,OWM,MGW,RAC *****
Serial Phase #:68 [CDB1_PDB4] Files:1 Time: 0s
***** Upgrading ORDIM *****
Restart Phase #:69 [CDB1_PDB4] Files:1 Time: 1s
***** Upgrading CATJAVA,OWM,MGW,RAC *****
Serial Phase #:68 [CDB1_PDB3] Files:1 Time: 0s
***** Upgrading ORDIM *****
Restart Phase #:69 [CDB1_PDB3] Files:1 Time: 1s
Serial Phase #:71 [CDB1_PDB3] Files:1 Time: 0s
Parallel Phase #:72 [CDB1_PDB3] Files:2 Time: 0s
Serial Phase #:73 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:74 [CDB1_PDB3] Files:1 Time: 1s
Serial Phase #:71 [CDB1_PDB4] Files:1 Time: 0s
Parallel Phase #:72 [CDB1_PDB4] Files:2 Time: 0s
Serial Phase #:73 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:74 [CDB1_PDB4] Files:1 Time: 0s
Parallel Phase #:75 [CDB1_PDB4] Files:2 Time: 0s
Serial Phase #:76 [CDB1_PDB4] Files:2 Time: 0s
***** Upgrading SDO *****
Restart Phase #:77 [CDB1_PDB4] Files:1 Time: 0s
Parallel Phase #:75 [CDB1_PDB3] Files:2 Time: 0s
Serial Phase #:76 [CDB1_PDB3] Files:2 Time: 0s
***** Upgrading SDO *****
Restart Phase #:77 [CDB1_PDB3] Files:1 Time: 1s
Serial Phase #:79 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:80 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:81 [CDB1_PDB4] Files:1 Time: 0s
Parallel Phase #:82 [CDB1_PDB4] Files:3 Time: 0s
Serial Phase #:83 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:84 [CDB1_PDB4] Files:1 Time: 0s
Parallel Phase #:85 [CDB1_PDB4] Files:4 Time: 0s
Serial Phase #:86 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:87 [CDB1_PDB4] Files:3 Time: 0s
Restart Phase #:88 [CDB1_PDB4] Files:1 Time: 1s
Serial Phase #:79 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:80 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:81 [CDB1_PDB3] Files:1 Time: 0s
Parallel Phase #:82 [CDB1_PDB3] Files:3 Time: 0s
Serial Phase #:83 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:84 [CDB1_PDB3] Files:1 Time: 0s
Parallel Phase #:85 [CDB1_PDB3] Files:4 Time: 0s
Serial Phase #:86 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:87 [CDB1_PDB3] Files:3 Time: 0s
Restart Phase #:88 [CDB1_PDB3] Files:1 Time: 1s
Serial Phase #:89 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:90 [CDB1_PDB3] Files:1 Time: 1s
Serial Phase #:89 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:90 [CDB1_PDB4] Files:1 Time: 0s
***** Upgrading Misc. ODM, OLAP *****
Serial Phase #:91 [CDB1_PDB3] Files:1 Time: 0s
***** Upgrading APEX *****
Restart Phase #:92 [CDB1_PDB3] Files:1 Time: 0s

```

```

***** Upgrading Misc. ODM, OLAP *****
Serial Phase #:91 [CDB1_PDB4] Files:1 Time: 0s
***** Upgrading APEX *****
Restart Phase #:92 [CDB1_PDB4] Files:1 Time: 1s
Serial Phase #:93 [CDB1_PDB3] Files:1 Time: 0s
Restart Phase #:94 [CDB1_PDB3] Files:1 Time: 1s
Serial Phase #:93 [CDB1_PDB4] Files:1 Time: 0s
Restart Phase #:94 [CDB1_PDB4] Files:1 Time: 0s
***** Final Component scripts *****
Serial Phase #:95 [CDB1_PDB4] Files:1 Time: 0s
***** Final Upgrade scripts *****
Serial Phase #:96 [CDB1_PDB4] Files:1 Time: 0s
***** Migration *****
Serial Phase #:97 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:98 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:99 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:100 [CDB1_PDB4] Files:1 Time: 0s
***** Post Upgrade *****
Serial Phase #:101 [CDB1_PDB4] Files:1 Time: 0s
***** Summary report *****
Serial Phase #:102 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:103 [CDB1_PDB4] Files:1 Time: 0s
Serial Phase #:104 [CDB1_PDB4] Files:1 Time: 0s

```

```

-----
Phases [0-104] End Time:[2015_10_09 18:52:27]
Container Lists Inclusion:[CDB1_PDB4] Exclusion:[NONE]
-----

```

Grand Total Time: 17s [CDB1_PDB4]

LOG FILES: (/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/catupgrdcdb1_pdb4*.log)

```

Total Upgrade Time: [0d:0h:0m:17s]
Time: 0s

```

```

***** Final Component scripts *****
Serial Phase #:95 [CDB1_PDB3] Files:1 Time: 0s
***** Final Upgrade scripts *****
Serial Phase #:96 [CDB1_PDB3] Files:1 Time: 0s
***** Migration *****
Serial Phase #:97 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:98 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:99 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:100 [CDB1_PDB3] Files:1 Time: 0s
***** Post Upgrade *****
Serial Phase #:101 [CDB1_PDB3] Files:1 Time: 0s
***** Summary report *****
Serial Phase #:102 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:103 [CDB1_PDB3] Files:1 Time: 0s
Serial Phase #:104 [CDB1_PDB3] Files:1 Time: 0s

```

```

-----
Phases [0-104] End Time:[2015_10_09 18:52:27]
Container Lists Inclusion:[CDB1_PDB3] Exclusion:[NONE]
-----

```

Grand Total Time: 17s [CDB1_PDB3]

LOG FILES: (/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/catupgrdcdb1_pdb3*.log)

```

Total Upgrade Time:          [0d:0h:0m:17s]

Start processing of CDB1_PDB1
[/ade_autofs/dd19_db/RDBMS/MAIN/LINUX.X64/151007/perl/bin/perl catctl.pl -L
plist.txt -E -n 2 -N 2 -I -i cdb1_pdb1 -c 'CDB1_PDB1' -l /u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122 catupgrd.sql]

Start processing of CDB1_PDB5
[/ade_autofs/dd19_db/RDBMS/MAIN/LINUX.X64/151007/perl/bin/perl catctl.pl -L
plist.txt -E -n 2 -N 2 -I -i cdb1_pdb5 -c 'CDB1_PDB5' -l /u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122 catupgrd.sql]

Argument list for [catctl.pl]
Run in                c = CDB1_PDB1
Do not run in         C = 0
Input Directory       d = 0
Echo OFF              e = 1
Simulate              E = 1
Log Id                i = cdb1_pdb1
Child Process         I = 1
Log Dir               l = /u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122
Priority List Name     L = plist.txt
Upgrade Mode active   M = 0
SQL Process Count     n = 2
SQL PDB Process Count N = 2
Open Mode Normal     o = 0
Reverse Order         r = 0
Start Phase           p = 0
End Phase             P = 0
Script                s = 0
Serial Run            S = 0
RO User Tablespaces  T = 0
Display Phases        y = 0
Debug catcon.pm       z = 0
Debug catctl.pl       Z = 0

catctl.pl VERSION: [12.2.0.1.0]

Argument list for [catctl.pl]
Run in                c = CDB1_PDB5
Do not run in         C = 0
Input Directory       d = 0
Echo OFF              e = 1
Simulate              E = 1
Log Id                i = cdb1_pdb5
Child Process         I = 1
Log Dir               l = /u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122
Priority List Name     L = plist.txt
Upgrade Mode active   M = 0
SQL Process Count     n = 2
SQL PDB Process Count N = 2
Open Mode Normal     o = 0
Reverse Order         r = 0
Start Phase           p = 0
End Phase             P = 0
Script                s = 0

```

```

Serial Run          S = 0
RO User Tablespaces T = 0
Display Phases     y = 0
Debug catcon.pm    z = 0
Debug catctl.pl    Z = 0

```

```
catctl.pl VERSION: [12.2.0.1.0]
```

```

orahome = [/u01/app/oracle]
orahome = [/u01/app/oracle]
/u01/app/oracle/12.1.0/CDB1/bin/orabasehome = [/u01/app/oracle]
catctlGetOrabase = [/u01/app/oracle]

```

```
Analyzing file ./catupgrd.sql
```

```

Log file directory = [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122]

```

```

catcon: ALL catcon-related output will be written to [/u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122/catupgrdcdb1_pdb1_catcon_14178.lst]
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb1*.log] files for output generated by scripts
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb1_*.lst] files for spool files, if any
/u01/app/oracle/12.1.0/CDB1/bin/orabasehome = [/u01/app/oracle]
catctlGetOrabase = [/u01/app/oracle]

```

```
Analyzing file ./catupgrd.sql
```

```

Log file directory = [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/
upgrade20151009185122]

```

```

catcon: ALL catcon-related output will be written to [/u01/app/oracle/12.1.0/CDB1/
cfgtoollogs/dbopens/upgrade20151009185122/catupgrdcdb1_pdb5_catcon_14180.lst]
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb5*.log] files for output generated by scripts
catcon: See [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb5_*.lst] files for spool files, if any

```

```

Number of Cpus      = 2
Number of Cpus      = 2
DATABASE NAME       = dbopens

```

```
DATABASE NAME      = dbopens
```

```

DataBase Version    = 12.2.0.1.0
DataBase Version    = 12.2.0.1.0
Generated PDB Inclusion:[CDB1_PDB5]
Generated PDB Inclusion:[CDB1_PDB1]
CDB$ROOT Open Mode = [OPEN MIGRATE]

```

```

-----
Phases [0-104]      Start Time:[2015_10_09 18:52:32]
Container Lists Inclusion:[CDB1_PDB5] Exclusion:[NONE]
-----

```

```

***** Executing Change Scripts *****
Serial Phase #:0    [CDB1_PDB5] Files:1    Time: 0s
***** Catalog Core SQL *****
Serial Phase #:1    [CDB1_PDB5] Files:5    Time: 0s

```

```

Restart Phase #:2      [CDB1_PDB5] Files:1 CDB$ROOT Open Mode = [OPEN MIGRATE]

-----
Phases [0-104]          Start Time:[2015_10_09 18:52:32]
Container Lists Inclusion:[CDB1_PDB1] Exclusion:[NONE]
-----

***** Executing Change Scripts *****
Serial Phase #:0      [CDB1_PDB1] Files:1 Time: 0s
***** Catalog Core SQL *****
Serial Phase #:1      [CDB1_PDB1] Files:5 Time: 0s
Restart Phase #:2     [CDB1_PDB1] Files:1 Time: 0s
***** Catalog Tables and Views *****
Parallel Phase #:3    [CDB1_PDB5] Files:20 Time: 0s
Restart Phase #:4     [CDB1_PDB5] Files:1 Time: 0s
***** Catalog Tables and Views *****
Parallel Phase #:3    [CDB1_PDB1] Files:20 Time: 0s
Restart Phase #:4     [CDB1_PDB1] Files:1 Time: 1s
***** Catalog Final Scripts *****
Serial Phase #:5      [CDB1_PDB1] Files:5 Time: 0s
***** Catproc Start *****
Serial Phase #:6      [CDB1_PDB1] Files:1 Time: 0s
***** Catproc Types *****
Serial Phase #:7      [CDB1_PDB1] Files:4 Time: 0s
Restart Phase #:8     [CDB1_PDB1] Files:1 Time: 1s
***** Catalog Final Scripts *****
Serial Phase #:5      [CDB1_PDB5] Files:5 Time: 0s
***** Catproc Start *****
Serial Phase #:6      [CDB1_PDB5] Files:1 Time: 0s
***** Catproc Types *****
Serial Phase #:7      [CDB1_PDB5] Files:4 Time: 0s
Restart Phase #:8     [CDB1_PDB5] Files:1 Time: 0s
***** Catproc Tables *****
Parallel Phase #:9    [CDB1_PDB1] Files:69 Time: 0s
Restart Phase #:10   [CDB1_PDB1] Files:1 Time: 0s
***** Catproc Tables *****
Parallel Phase #:9    [CDB1_PDB5] Files:69 Time: 0s
Restart Phase #:10   [CDB1_PDB5] Files:1 Time: 1s
***** Catproc Package Specs *****
Serial Phase #:11     [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:12   [CDB1_PDB5] Files:1 Time: 1s
***** Catproc Package Specs *****
Serial Phase #:11     [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:12   [CDB1_PDB1] Files:1 Time: 0s
***** Catproc Procedures *****
Parallel Phase #:13   [CDB1_PDB1] Files:94 Time: 0s
Restart Phase #:14   [CDB1_PDB1] Files:1 Time: 0s
***** Catproc Procedures *****
Parallel Phase #:13   [CDB1_PDB5] Files:94 Time: 0s
Restart Phase #:14   [CDB1_PDB5] Files:1 Time: 1s
Parallel Phase #:15   [CDB1_PDB1] Files:116 Time: 0s
Restart Phase #:16   [CDB1_PDB1] Files:1 Time: 1s
Parallel Phase #:15   [CDB1_PDB5] Files:116 Time: 0s
Restart Phase #:16   [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:17     [CDB1_PDB1] Files:10 Time: 0s
Restart Phase #:18   [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:17     [CDB1_PDB5] Files:10 Time: 0s
Restart Phase #:18   [CDB1_PDB5] Files:1 Time: 1s
***** Catproc Views *****
Parallel Phase #:19   [CDB1_PDB1] Files:33 Time: 0s
Restart Phase #:20   [CDB1_PDB1] Files:1 Time: 1s
***** Catproc Views *****

```



```

Parallel Phase #:19 [CDB1_PDB5] Files:33 Time: 0s
Restart Phase #:20 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:21 [CDB1_PDB5] Files:3 Time: 0s
Restart Phase #:22 [CDB1_PDB5] Files:1 Time: 1s
Serial Phase #:21 [CDB1_PDB1] Files:3 Time: 0s
Restart Phase #:22 [CDB1_PDB1] Files:1 Time: 1s
Parallel Phase #:23 [CDB1_PDB5] Files:23 Time: 0s
Restart Phase #:24 [CDB1_PDB5] Files:1 Time: 0s
Parallel Phase #:23 [CDB1_PDB1] Files:23 Time: 0s
Restart Phase #:24 [CDB1_PDB1] Files:1 Time: 1s
Parallel Phase #:25 [CDB1_PDB1] Files:14 Time: 1s
Parallel Phase #:25 [CDB1_PDB5] Files:14 Time: 0s
Restart Phase #:26 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:26 [CDB1_PDB5] Files:1 Time: 0s
***** Catproc CDB Views *****
Serial Phase #:27 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:28 [CDB1_PDB1] Files:1 Time: 0s
***** Catproc CDB Views *****
Serial Phase #:27 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:28 [CDB1_PDB5] Files:1 Time: 1s
Serial Phase #:30 [CDB1_PDB5] Files:1 Time: 0s
***** Catproc PLBs *****
Serial Phase #:31 [CDB1_PDB5] Files:277 Time: 0s
Serial Phase #:32 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:33 [CDB1_PDB5] Files:1 Time: 1s
Serial Phase #:30 [CDB1_PDB1] Files:1 Time: 0s
***** Catproc PLBs *****
Serial Phase #:31 [CDB1_PDB1] Files:277 Time: 0s
Serial Phase #:32 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:33 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:34 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:35 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:34 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:35 [CDB1_PDB1] Files:1 Time: 1s
***** Catproc DataPump *****
Serial Phase #:36 [CDB1_PDB5] Files:4 Time: 0s
Restart Phase #:37 [CDB1_PDB5] Files:1 Time: 1s
***** Catproc DataPump *****
Serial Phase #:36 [CDB1_PDB1] Files:4 Time: 0s
Restart Phase #:37 [CDB1_PDB1] Files:1 Time: 0s
***** Catproc SQL *****
Parallel Phase #:38 [CDB1_PDB5] Files:13 Time: 0s
Restart Phase #:39 [CDB1_PDB5] Files:1 Time: 0s
***** Catproc SQL *****
Parallel Phase #:38 [CDB1_PDB1] Files:13 Time: 0s
Restart Phase #:39 [CDB1_PDB1] Files:1 Time: 1s
Parallel Phase #:40 [CDB1_PDB5] Files:11 Time: 0s
Restart Phase #:41 [CDB1_PDB5] Files:1 Time: 1s
Parallel Phase #:40 [CDB1_PDB1] Files:11 Time: 0s
Restart Phase #:41 [CDB1_PDB1] Files:1 Time: 0s
Parallel Phase #:42 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:43 [CDB1_PDB5] Files:1 Time: 1s
Parallel Phase #:42 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:43 [CDB1_PDB1] Files:1 Time: 1s
***** Final Catproc scripts *****
Serial Phase #:44 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:45 [CDB1_PDB5] Files:1 Time: 0s
***** Final Catproc scripts *****
Serial Phase #:44 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:45 [CDB1_PDB1] Files:1 Time: 0s
***** Final RDBMS scripts *****

```

```

Serial Phase #:46 [CDB1_PDB5] Files:1 Time: 0s
***** Upgrade Component Start *****
Serial Phase #:47 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:48 [CDB1_PDB5] Files:1 Time: 1s
***** Final RDBMS scripts *****
Serial Phase #:46 [CDB1_PDB1] Files:1 Time: 0s
***** Upgrade Component Start *****
Serial Phase #:47 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:48 [CDB1_PDB1] Files:1 Time: 1s
***** Upgrading Java *****
Serial Phase #:49 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:50 [CDB1_PDB5] Files:1 Time: 0s
***** Upgrading Java *****
Serial Phase #:49 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:50 [CDB1_PDB1] Files:1 Time: 1s
***** Upgrading XDK *****
Serial Phase #:51 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:52 [CDB1_PDB5] Files:1 Time: 1s
***** Upgrading XDK *****
Serial Phase #:51 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:52 [CDB1_PDB1] Files:1 Time: 0s
***** Upgrading APS,OLS,DV,CONTEXT *****
Serial Phase #:53 [CDB1_PDB5] Files:1 Time: 0s
***** Upgrading XDB *****
Restart Phase #:54 [CDB1_PDB5] Files:1 Time: 0s
***** Upgrading APS,OLS,DV,CONTEXT *****
Serial Phase #:53 [CDB1_PDB1] Files:1 Time: 0s
***** Upgrading XDB *****
Restart Phase #:54 [CDB1_PDB1] Files:1 Time: 1s
Serial Phase #:56 [CDB1_PDB1] Files:3 Time: 0s
Serial Phase #:57 [CDB1_PDB1] Files:2 Time: 0s
Parallel Phase #:58 [CDB1_PDB1] Files:11 Time: 0s
Parallel Phase #:59 [CDB1_PDB1] Files:24 Time: 0s
Serial Phase #:60 [CDB1_PDB1] Files:4 Time: 0s
Serial Phase #:61 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:62 [CDB1_PDB1] Files:30 Time: 0s
Serial Phase #:63 [CDB1_PDB1] Files:1 Time: 0s
Parallel Phase #:64 [CDB1_PDB1] Files:6 Time: 0s
Serial Phase #:65 [CDB1_PDB1] Files:2 Time: 0s
Serial Phase #:66 [CDB1_PDB1] Files:3 Time: 0s
Restart Phase #:67 [CDB1_PDB1] Files:1 Time: 1s
Serial Phase #:56 [CDB1_PDB5] Files:3 Time: 0s
Serial Phase #:57 [CDB1_PDB5] Files:2 Time: 0s
Parallel Phase #:58 [CDB1_PDB5] Files:11 Time: 0s
Parallel Phase #:59 [CDB1_PDB5] Files:24 Time: 0s
Serial Phase #:60 [CDB1_PDB5] Files:4 Time: 0s
Serial Phase #:61 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:62 [CDB1_PDB5] Files:30 Time: 0s
Serial Phase #:63 [CDB1_PDB5] Files:1 Time: 0s
Parallel Phase #:64 [CDB1_PDB5] Files:6 Time: 0s
Serial Phase #:65 [CDB1_PDB5] Files:2 Time: 0s
Serial Phase #:66 [CDB1_PDB5] Files:3 Time: 0s
Restart Phase #:67 [CDB1_PDB5] Files:1 Time: 1s
***** Upgrading CATJAVA,OWM,MGW,RAC *****
Serial Phase #:68 [CDB1_PDB1] Files:1 Time: 0s
***** Upgrading ORDIM *****
Restart Phase #:69 [CDB1_PDB1] Files:1 Time: 1s
***** Upgrading CATJAVA,OWM,MGW,RAC *****
Serial Phase #:68 [CDB1_PDB5] Files:1 Time: 0s
***** Upgrading ORDIM *****
Restart Phase #:69 [CDB1_PDB5] Files:1 Time: 0s

```

```

Serial Phase #:71 [CDB1_PDB1] Files:1 Time: 0s
Parallel Phase #:72 [CDB1_PDB1] Files:2 Time: 0s
Serial Phase #:73 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:74 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:71 [CDB1_PDB5] Files:1 Time: 0s
Parallel Phase #:72 [CDB1_PDB5] Files:2 Time: 0s
Serial Phase #:73 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:74 [CDB1_PDB5] Files:1 Time: 1s
Parallel Phase #:75 [CDB1_PDB1] Files:2 Time: 0s
Serial Phase #:76 [CDB1_PDB1] Files:2 Time: 0s
***** Upgrading SDO *****
Restart Phase #:77 [CDB1_PDB1] Files:1 Time: 1s
Parallel Phase #:75 [CDB1_PDB5] Files:2 Time: 0s
Serial Phase #:76 [CDB1_PDB5] Files:2 Time: 0s
***** Upgrading SDO *****
Restart Phase #:77 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:79 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:80 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:81 [CDB1_PDB1] Files:1 Time: 0s
Parallel Phase #:82 [CDB1_PDB1] Files:3 Time: 0s
Serial Phase #:83 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:84 [CDB1_PDB1] Files:1 Time: 0s
Parallel Phase #:85 [CDB1_PDB1] Files:4 Time: 0s
Serial Phase #:86 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:87 [CDB1_PDB1] Files:3 Time: 0s
Restart Phase #:88 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:79 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:80 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:81 [CDB1_PDB5] Files:1 Time: 0s
Parallel Phase #:82 [CDB1_PDB5] Files:3 Time: 0s
Serial Phase #:83 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:84 [CDB1_PDB5] Files:1 Time: 0s
Parallel Phase #:85 [CDB1_PDB5] Files:4 Time: 0s
Serial Phase #:86 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:87 [CDB1_PDB5] Files:3 Time: 0s
Restart Phase #:88 [CDB1_PDB5] Files:1 Time: 1s
Serial Phase #:89 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:90 [CDB1_PDB1] Files:1 Time: 1s
Serial Phase #:89 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:90 [CDB1_PDB5] Files:1 Time: 0s
***** Upgrading Misc. ODM, OLAP *****
Serial Phase #:91 [CDB1_PDB1] Files:1 Time: 0s
***** Upgrading APEX *****
Restart Phase #:92 [CDB1_PDB1] Files:1 Time: 1s
***** Upgrading Misc. ODM, OLAP *****
Serial Phase #:91 [CDB1_PDB5] Files:1 Time: 0s
***** Upgrading APEX *****
Restart Phase #:92 [CDB1_PDB5] Files:1 Time: 1s
Serial Phase #:93 [CDB1_PDB1] Files:1 Time: 0s
Restart Phase #:94 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:93 [CDB1_PDB5] Files:1 Time: 0s
Restart Phase #:94 [CDB1_PDB5] Files:1 Time: 1s
***** Final Component scripts *****
Serial Phase #:95 [CDB1_PDB1] Files:1 Time: 0s
***** Final Upgrade scripts *****
Serial Phase #:96 [CDB1_PDB1] Files:1 Time: 0s
***** Migration *****
Serial Phase #:97 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:98 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:99 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:100 [CDB1_PDB1] Files:1 Time: 0s

```

```

***** Post Upgrade *****
Serial Phase #:101 [CDB1_PDB1] Files:1 Time: 0s
***** Summary report *****
Serial Phase #:102 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:103 [CDB1_PDB1] Files:1 Time: 0s
Serial Phase #:104 [CDB1_PDB1] Files:1 Time: 0s

-----
Phases [0-104] End Time:[2015_10_09 18:52:50]
Container Lists Inclusion:[CDB1_PDB1] Exclusion:[NONE]
-----

Grand Total Time: 18s [CDB1_PDB1]

LOG FILES: (/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb1*.log)

Total Upgrade Time: [0d:0h:0m:18s]
Time: 1s
***** Final Component scripts *****
Serial Phase #:95 [CDB1_PDB5] Files:1 Time: 0s
***** Final Upgrade scripts *****
Serial Phase #:96 [CDB1_PDB5] Files:1 Time: 0s
***** Migration *****
Serial Phase #:97 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:98 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:99 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:100 [CDB1_PDB5] Files:1 Time: 0s
***** Post Upgrade *****
Serial Phase #:101 [CDB1_PDB5] Files:1 Time: 0s
***** Summary report *****
Serial Phase #:102 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:103 [CDB1_PDB5] Files:1 Time: 0s
Serial Phase #:104 [CDB1_PDB5] Files:1 Time: 0s

-----
Phases [0-104] End Time:[2015_10_09 18:52:50]
Container Lists Inclusion:[CDB1_PDB5] Exclusion:[NONE]
-----

Grand Total Time: 18s [CDB1_PDB5]

LOG FILES: (/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrdcdb1_pdb5*.log)

Total Upgrade Time: [0d:0h:0m:18s]

Run file is [/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catctl_priority_run.lst]
1,CDB$ROOT
-----
3,PDB$SEED
3,CDB1_PDB2
-----
4,CDB1_PDB3
4,CDB1_PDB4
-----
5,CDB1_PDB1
5,CDB1_PDB5
-----

```

```
Time: 19s For CDB$ROOT
Time: 68s For PDB(s)
```

```
Grand Total Time: 87s
```

```
LOG FILES: (/u01/app/oracle/12.1.0/CDB1/cfgtoollogs/dbopens/upgrade20151009185122/
catupgrd*.log)
```

```
Grand Total Upgrade Time: [0d:0h:1m:27s]
```

In this example, at the conclusion of the upgrade log, you can see that CDB\$ROOT is upgraded first. After the CDB\$ROOT upgrade is completed, the Parallel Upgrade Utility carries out the following concurrent upgrades of PDBs, in accordance with the priority settings in the priority list:

1. PDB\$SEED and CDB1_PDB2
2. CDB1_PDB3 and CDB1_PDB4
3. CDB1_PDB1 and CDB1_PDB5

Related Topics:

[About the Parallel Upgrade Utility for Oracle Database \(CATCTL.PL and DBUPGRADE\)](#) (page 3-3)

[Parallel Upgrade Utility \(catctl.pl\) Parameters](#) (page 3-6)

2.8.2 Upgrade Oracle Call Interface (OCI) and Precompiler Applications

Upgrade any Oracle Call Interface (OCI) and precompiler applications that you plan to use with the new release of Oracle Database.

Oracle recommends that you test these applications on a test database before you upgrade your current production database.

Related Topics:

[About Upgrading Precompiler and OCI Applications in Oracle Database](#) (page 5-7)

2.9 About Upgrading Oracle Grid Infrastructure

Review these topics if your Oracle Database installations are on Oracle Grid Infrastructure, so that your upgrade plan must include an Oracle Grid Infrastructure upgrade.

Oracle Database installations on Oracle Grid Infrastructure (Oracle Clusterware and Oracle Automatic Storage Management) cannot be a later version than Oracle Grid Infrastructure. Upgrade Oracle Grid Infrastructure first before upgrading Oracle Databases installed on Oracle Grid Infrastructure. This requirement applies both to single-instance and to Oracle Real Application Clusters (Oracle RAC) Oracle Database installations.

[Oracle Grid Infrastructure and Oracle Clusterware Upgrade Recommendations](#) (page 2-76)

Review these user, path, group, and memory requirements and recommendations for Oracle Grid Infrastructure, Oracle ASM, and Oracle Real Application Clusters upgrades.

[Oracle Clusterware Must Be Running on Local Node When Upgrading](#)
(page 2-78)

Understand Oracle Clusterware upgrade changes for rolling upgrades, and use this procedure to ensure that Oracle Clusterware is started on the local node.

[About Upgrading an Oracle Real Application Clusters \(Oracle RAC\) Database with DBUA](#) (page 2-78)

Oracle recommends that you use Database Upgrade Assistant (DBUA) to upgrade an existing Oracle RAC database to the current release of Oracle Database.

[Upgrading Inaccessible Nodes](#) (page 2-78)

Use this procedure to upgrade inaccessible nodes if you are using the `force cluster upgrade` command.

[About Requirements for Time Synchronization on Oracle RAC](#) (page 2-79)

Oracle Clusterware for Oracle Database 12c requires time synchronization across all nodes within a cluster when Oracle RAC is deployed.

[Recommendations for Upgrading Oracle RAC and Oracle Databases That Use ASM](#) (page 2-79)

Oracle ASM upgrade procedures are changed in current Oracle ASM releases.

[About Upgrading System Authentication for Oracle ASM Instances](#) (page 2-80)

For Oracle Automatic Storage Management (Oracle ASM) environments, you can create shared ASM password files.

2.9.1 Oracle Grid Infrastructure and Oracle Clusterware Upgrade Recommendations

Review these user, path, group, and memory requirements and recommendations for Oracle Grid Infrastructure, Oracle ASM, and Oracle Real Application Clusters upgrades.

You must install Oracle Clusterware and Oracle Real Application Clusters (Oracle RAC) into separate, new homes from the existing installation homes. Separate Grid homes and Oracle homes for Oracle Grid Infrastructure and Oracle RAC reduces the downtime required to upgrade a node in the cluster, and facilitates the provisioning of clusters within an enterprise. Reducing planned outage time required for cluster upgrades helps to meet availability service levels, and also enables you to provide a standard installation across the enterprise.

- To upgrade Oracle Database, you must install the Oracle Grid Infrastructure software into a new Grid home, and install Oracle Database 12c software into the new Oracle home. This also applies to Oracle Grid Infrastructure for a standalone server (Oracle Restart). You can upgrade from supported releases only.
- On Windows x64 platforms, to upgrade Oracle Clusterware from releases 10.2.0.5 or 11.1.0.7 to release 12.1, you must perform an interim upgrade to 11.2.0.4 for Oracle Clusterware. After upgrading Oracle Clusterware to release 11.2.0.4, you must move the Oracle Cluster Registry (OCR) and voting files (VDSK) to Oracle ASM. You can then upgrade Oracle Clusterware release 11.2.0.4 to release 12.1.
- If you are upgrading an Oracle Database release 10.2.0.5 or release 11.1.0.7 environment that stores Oracle Clusterware files on OCFS on Windows or RAW devices, then you cannot directly upgrade to Oracle Database 12c.

- For Oracle Database release 10.2.0.5, either all Oracle software installations were owned by the Oracle user, typically `oracle`, or Oracle Database software was owned by the user `oracle`, and Oracle Clusterware software was owned by a separate user, typically `crsuser`.
- Starting with Oracle Database release 11.1, the user account that owns the release 10.2.0.5 Oracle Clusterware software must perform the Oracle Clusterware release 11.1.0.7 upgrade. The user account that is performing this upgrade must also be the user that owns the ASM home of the earlier release. If the earlier ASM home has a different owner, then you must change the installation owner user account for the Oracle ASM software to be the same user account that owns the Oracle Clusterware Oracle home (CRS home). You must complete this change before you perform the upgrade.
- For Oracle Database releases 11.1.07 and 10.2.0.5, if your configuration does not include Oracle ASM, then you must shut down the cluster synchronization services (CSS) daemon and delete the CSS service from the system by running the `localconfig` command with the `delete` option. For example:

```
ORACLE_HOME/bin/localconfig delete
```

- When upgrading Oracle Clusterware, OUI automatically calls Oracle ASM Configuration Assistant (ASMCA) to perform the upgrade of the Oracle Automatic Storage Management component in the Oracle Grid Infrastructure home. The Grid Infrastructure home can be local to each node.
- On Linux platform installations, Oracle recommends that you use HugePages to obtain the best performance for Oracle Databases. When you upgrade Oracle Grid Infrastructure and Oracle Databases on servers that have HugePages enabled, Oracle recommends that you review your HugePages memory allocation requirements.

Oracle Grid Infrastructure installations include the Grid Infrastructure Management Repository (GIMR). When HugePages is configured on cluster member nodes, the GIMR system global area (SGA) is installed into HugePages memory. The GIMR SGA occupies up to 1 GB of HugePages memory. Oracle Grid Infrastructure starts up before Oracle Databases installed on the cluster.

If your cluster member node operating system memory allocations to HugePages are insufficient for the size of the SGAs for all of the Oracle Database instances on the cluster, then you may find that one or more of your Oracle Database SGAs are mapped to regular pages, instead of Huge Pages, which reduces expected performance. To avoid this issue, when you plan your upgrade, ensure that the memory you reserve for HugePages is large enough to accommodate your memory requirements.

- For a single-instance configuration, Oracle ASM and Oracle Restart run from the Oracle Grid Infrastructure home. Oracle ASM and Oracle Restart are upgraded to Oracle Grid Infrastructure 12c at the same time.
- You must ensure that the database compatibility attribute for Oracle ASM disk groups matches the compatibility parameter that is set in `init.ora`.

See Also:

Oracle Grid Infrastructure Installation Guide for your operating system and go to the appendix for complete information on how to perform Oracle Clusterware and Oracle Automatic Storage Management upgrades

2.9.2 Oracle Clusterware Must Be Running on Local Node When Upgrading

Understand Oracle Clusterware upgrade changes for rolling upgrades, and use this procedure to ensure that Oracle Clusterware is started on the local node.

Starting with Oracle Database 12c, non-rolling upgrades for Oracle Real Application Clusters require Oracle Clusterware on the local node to be up and running. The Oracle Clusterware stack on the local node must be running.

With earlier releases of Oracle Database, selecting the non-rolling option for the cluster meant that OUI set `ISROLLING` to `false` for all stack shutdowns before the upgrade process started. With this option, if any of the cluster nodes was up, then `ISROLLING` was set to `true`. However, in Oracle Database 12c, rolling means that the local stack is up before upgrade, and that the other stacks must be shut down. Only in this circumstance OUI sets `ISROLLING` to `false`.

1. Run the OUI installer on the node where the Oracle Clusterware stack is running or open a terminal.
2. Log in as root or Administrator.
3. Change directory (`cd`) to the Oracle Clusterware home (Grid home), and start Oracle Clusterware by entering the following command:

```
# crsctl start crs
```

2.9.3 About Upgrading an Oracle Real Application Clusters (Oracle RAC) Database with DBUA

Oracle recommends that you use Database Upgrade Assistant (DBUA) to upgrade an existing Oracle RAC database to the current release of Oracle Database.

DBUA guides you through the upgrade process and configures your database for the new release. DBUA automates the upgrade process and makes appropriate recommendations for configuration options such as tablespaces and online redo log files.

If you are manually upgrading an Oracle RAC database, then you perform most upgrade actions on only one node of the system. Note that in some steps you must perform actions on multiple cluster member nodes.

See Also:

Oracle Grid Infrastructure Installation Guide for your operating system

2.9.4 Upgrading Inaccessible Nodes

Use this procedure to upgrade inaccessible nodes if you are using the `force cluster upgrade` command.

Starting with Oracle Database 12c, you can join inaccessible nodes, as an alternative to deleting the nodes, which was the required method in earlier releases for inaccessible nodes. Before you join nodes, the new Oracle Database 12c software must already be installed on the nodes.

Run the following command on the inaccessible or unreachable nodes to upgrade and join them into the cluster.

```
$ rootupgrade.sh -join -existingnode upgraded_node
```

In this command, the *upgraded_node* variable refers to one node in the cluster that has already been upgraded. The `-existingNode` argument must specify the upgraded node.

See Also:

Oracle Grid Infrastructure Installation Guide for your platform for information about the `force cluster upgrade` procedure

2.9.5 About Requirements for Time Synchronization on Oracle RAC

Oracle Clusterware for Oracle Database 12c requires time synchronization across all nodes within a cluster when Oracle RAC is deployed.

There are two options for time synchronization:

- Your operating system-configured network time protocol (NTP)
or
- Oracle Cluster Time Synchronization Service

See Also:

Oracle Grid Infrastructure Installation Guide for your operating system for information on configuring NTP and Oracle Cluster Time Synchronization Service

2.9.6 Recommendations for Upgrading Oracle RAC and Oracle Databases That Use ASM

Oracle ASM upgrade procedures are changed in current Oracle ASM releases.

Oracle ASM is installed when you install the Oracle Grid Infrastructure components. Oracle ASM shares an Oracle home with Oracle Clusterware when installed in a cluster with Oracle RAC or with Oracle Restart on a standalone server. Before the new Oracle Database software can be installed on the system, the root script for upgrading Oracle Grid Infrastructure starts Oracle ASM Configuration Assistant (ASMCA) to upgrade Oracle ASM to the new release.

If you have an existing Oracle ASM instance, then you can either upgrade it when you install Oracle Grid Infrastructure, or you can upgrade it after the installation, using ASMCA. When you install the new software for Oracle Database 12c, Oracle Universal Installer (OUI) runs the root script `root.sh` when it detects a cluster. OUI provides an option to automate the root script execution tasks on the nodes of the cluster. You are prompted to provide information and passwords to enable OUI to run the `root.sh`

script automatically. You now have an option to automate the `root . sh` script execution tasks on the nodes of the cluster.

2.9.7 About Upgrading System Authentication for Oracle ASM Instances

For Oracle Automatic Storage Management (Oracle ASM) environments, you can create shared ASM password files.

The password file is created by the `ORAPWD` utility. Oracle recommends that you use the `SYSASM` privilege to separate database management and storage management responsibilities. Also, you have the option to create separate operating system credentials for Oracle ASM and each database. This separation allows for an even greater division of database management and storage management responsibilities. For instance, if there are n databases using Oracle ASM on a given node, then you can configure $n + 1$ sets of operating system credentials groups whose members have `SYS` privileges: one `OSDBA` group for each database with `SYSDBA` privileges, and one `OSASM` group for the Oracle ASM instance with `SYSASM` privileges.

See Also:

Oracle Automatic Storage Management Administrator's Guide for more information about managing a shared password file in a disk group

Oracle Automatic Storage Management Administrator's Guide for more information about system authentication for Oracle ASM

2.10 Required Task to Preserve Downgrade Capability

To preserve the option to downgrade after upgrading your database to Oracle 12c release 2 (12.2), install the patch for bug 20898997 in your source `ORACLE_HOME`.

As part of your preupgrade plan, check your release to ensure that you can downgrade from an Oracle Database 12c release 2 (12.2) upgrade. To ensure that you can carry out a downgrade, you must have patch 20898997 installed in source `ORACLE_HOME`.

If your source Oracle Database Oracle home is not patched with patch 20898997, then it does not affect the upgrade. However, if you decide to downgrade the database, then the downgrade can fail. You receive an error message similar to the following:

```
ORA-00600: internal error code, arguments: [8153]
```

There is no workaround to continue the downgrade.

To ensure that you can downgrade your database, complete the following procedure:

1. Log in to your existing Oracle Database instance.
2. Run the following `Opatch` command on your existing Oracle Database home:

```
$ORACLE_HOME/OPatch/opatch lsinventory -bugs_fixed |grep -i "20898997"
```

A successful result is similar to the following:

```
Sub-patch 20898997; "XMLTYPESUP: QCTOXSNLB SHOULD NOT CHECK AGAINST SNAPSHOT SIZE"
```

If you do not see that the patch is installed, then proceed to the next step.

3. Log in to My Oracle Support with your support credentials.
4. Enter "20898997" into the Knowledge Base Search field.
5. Download the patch and patch Readme for your platform, and follow the instructions to install the patch on your database instance.
6. If you are patching more than one database, then repeat this procedure for each database instance before upgrading.

2.11 Requirements for Upgrading Databases That Use Oracle Label Security and Oracle Database Vault

You must complete these tasks before starting an upgrade with a database using Oracle Label Security or Oracle Database Vault.

[Audit Table Preupgrade and Archive Requirements](#) (page 2-81)

For Oracle Database releases earlier than 12.1 using Oracle Label Security and Oracle Database Vault, you must run the OLS preprocess script before you upgrade.

[Running `olspreupgrade.sql` on Oracle Database Release 11.2](#) (page 2-82)

If Oracle Label Security is installed in the earlier release that you are upgrading, then you must run the OLS preprocess `olspreupgrade.sql` script.

2.11.1 Audit Table Preupgrade and Archive Requirements

For Oracle Database releases earlier than 12.1 using Oracle Label Security and Oracle Database Vault, you must run the OLS preprocess script before you upgrade.

If you are upgrading from a database earlier than Oracle Database release 12.1 that uses Oracle Label Security (OLS) and Oracle Database Vault, then you must first run the OLS preprocess script, `olspreupgrade.sql`, to process the `aud$` table contents. The OLS upgrade moves the `aud$` table from the `SYSTEM` schema to the `SYS` schema. The `olspreupgrade.sql` script is a preprocessing script required for this move.

Caution:

Running the `olspreupgrade.sql` script before upgrading is mandatory for upgrading databases earlier than Oracle Database release 12.1 that use Oracle Label Security and Oracle Database Vault. Once you have upgraded to Oracle Database release 12.1, you do not have to perform the OLS preprocessing procedure going forward to patch or upgrade the database.

The `olspreupgrade.sql` script creates a temporary table `PREUPG_AUD$` in the `SYS` schema and moves the `SYSTEM.aud$` records to `SYS.PREUPG_AUD$`. As a safety measure, Oracle recommends that you archive your audit trail before running the `olspreupgrade.sql` script. If Oracle Label Security is installed on your database, and you are upgrading from an earlier release, then you must run the OLS preprocess script before upgrading.

See Also:

Oracle Database Security Guide for information about archiving audit trails

Oracle Label Security Administrator's Guide for information about the OLS preprocess script

2.11.2 Running `olspreupgrade.sql` on Oracle Database Release 11.2

If Oracle Label Security is installed in the earlier release that you are upgrading, then you must run the OLS preprocess `olspreupgrade.sql` script.

If Oracle Database Vault is not installed with your release 11.2 database, then you can skip steps 2, 3, 6, and 7 in this section.

To run the OLS preprocess script on a release 11.2 database before upgrading:

1. Copy the `ORACLE_HOME/rdbms/admin/olspreupgrade.sql` script from the newly installed Oracle home to the Oracle home of the database that you want to upgrade.
2. Start SQL*Plus and connect as DVOWNER to the database that you want to upgrade.
3. Run the following statement:

```
SQL> GRANT DV_PATCH_ADMIN to SYS;
```

4. At the system prompt, connect SYS as SYSDBA:

```
CONNECT SYS AS SYSDBA
```

5. Run the OLS preprocess script:

```
ORACLE_HOME/rdbms/admin/olspreupgrade.sql
```

You may continue to run your applications on the database while the OLS preprocess script is running.

6. After the `olspreupgrade.sql` completes its run successfully, start SQL*Plus and connect to the database as DVOWNER.
7. Run the following SQL statement:

```
SQL> REVOKE DV_PATCH_ADMIN from SYS;
```

2.12 Requirement for Upgrading Databases that Use Oracle Warehouse Builder (OWB)

Select one of these three procedures to upgrade Oracle Database deployments with OWB release 11.2.0.3 and later.

OWB releases earlier than release 11.2.0.3 do not work with Oracle Database 12c.

OWB is not installed as part of the software for Oracle Database 12c, and OWB components that may exist in earlier releases are not upgraded as part of the Oracle Database upgrade process. However, you can use OWB release 11.2.0.3 with Oracle Database 12c.

[Add Oracle Database 12c Access to Existing standalone OWB 11.2.0.3 Installation](#) (page 2-83)

Use this patch update procedure to enable you to use Oracle Warehouse Builder (OWB) 11.2.0.3 with Oracle Database 12c.

[Keep Existing OWB 11.2.0.3 Installation In-place with Oracle Database Release 11.2.0.3](#) (page 2-83)

Use this procedure to retain Oracle Database Warehouse Builder (OWB) on a platform where a standalone installation is not available.

[Use the Standalone OWB 11.2.0.3 Installation Where Available](#) (page 2-84)

Use this procedure to install the standalone Oracle Warehouse Builder (OWB) software in a separate Oracle home.

2.12.1 Add Oracle Database 12c Access to Existing standalone OWB 11.2.0.3 Installation

Use this patch update procedure to enable you to use Oracle Warehouse Builder (OWB) 11.2.0.3 with Oracle Database 12c.

If you have an existing standalone OWB 11.2.0.3 installation, then you can enable Oracle Database 12c to access OWB.

To add Oracle Database 12c access to an existing standalone OWB 11.2.0.3 installation:

1. Stop all OWB applications from running: the OWB Runtime service, Browser, and Name Address server.
2. Install Oracle Database 12c software and follow the database upgrade instructions.
3. Apply OWB Cumulative patch 16568042 to the OWB release 11.2.0.3 installation. (You can patch OWB either before or after installing Oracle Database 12c.)

To obtain the patch, go to My Oracle Support, , click **Patches**, and search for patch request number 16568042:

<http://support.oracle.com>

4. Follow in-place migration steps in the patch README.txt file.
5. Continue to run OWB release 11.2.0.3 from the standalone Oracle home.

2.12.2 Keep Existing OWB 11.2.0.3 Installation In-place with Oracle Database Release 11.2.0.3

Use this procedure to retain Oracle Database Warehouse Builder (OWB) on a platform where a standalone installation is not available.

If OWB release 11.2.0.3 is running on a platform where a standalone installation is not available (for example, Solaris, HP, AIX and other platforms), then you must keep the Oracle Database release 11.2.0.3 software in its existing Oracle home (in-place) after you migrate to Oracle Database 12c.

1. Stop all OWB applications from running: the OWB Runtime service, Browser, and Name Address server.
2. Install Oracle Database 12c software and follow database upgrade instructions.

3. After you have installed Oracle Database 12c, leave the existing Oracle Database release 11.2.0.3 home in place. You run OWB from the Oracle Database release 11.2.0.3 Oracle home.
4. Apply patch 16568042 to the Oracle Database release 11.2.0.3 Oracle home. This patches the OWB installation. You can patch OWB either before or after you install Oracle Database 12c.

To obtain the patch, go to My Oracle Support, click **Patches**, and search for patch request number 16568042:

<http://support.oracle.com>

5. Follow in-place migration steps in the patch README.txt file.
6. Run OWB from the integrated Oracle Database release 11.2.0.3 Oracle home.

2.12.3 Use the Standalone OWB 11.2.0.3 Installation Where Available

Use this procedure to install the standalone Oracle Warehouse Builder (OWB) software in a separate Oracle home.

If OWB 11.2.0.3 is running on a platform where a standalone installation is available (for example, on Linux and Windows), then you can install the standalone OWB software in a separate Oracle home, and then remove Oracle Database release 11.2.0.3 software and Oracle home.

1. Stop all OWB applications from running: the OWB Runtime service, Browser, and Name Address server.
2. Install the OWB standalone client into its own OWB home directory.
3. Copy the entire `owb/bin/admin` directory from the old OWB installation to the new OWB installation's `owb/bin/admin` directory. This step ensures all files and subdirectories are copied to the new OWB location.
4. Run the following SQL statement as the OWBSYS user to reset the Control Center home value. Enter from the directory location for the new `OWB_HOME` when prompted:

```
sqlplus OWBSYS/OWBSYS_PASSWORD
% New_OW_HOME/owb/UnifiedRepos/reset_owbcc_home.sql
```

5. Install Oracle Database 12c software and follow database upgrade instructions.
6. Apply OWB Cumulative patch 16568042 to the OWB standalone release 11.2.0.3 installation. (You can patch OWB either before or after installing Oracle Database 12c.)

To obtain the patch, go to My Oracle Support, click **Patches**, and search for patch request number 16568042:

<http://support.oracle.com>

7. Follow in-place migration steps in the patch README.txt file.
8. Run OWB release 11.2.0.3 from the standalone Oracle home location.

Upgrading Oracle Database

Oracle provides a comprehensive set of tools for upgrading Oracle Database with minimal downtime and for migrating your applications to the new release.

Caution:

If you retain the old Oracle software, then never start the upgraded database with the old Oracle software. Only start the database with the executables in the new Oracle Database installation.

Topics:[Backing Up Oracle Database for Upgrading](#) (page 3-2)

Use this procedure to back up your existing Oracle Database before you attempt an upgrade.

[Upgrading with Parallel Upgrade Utility \(catctl.pl and dbupgrade Shell Command\)](#) (page 3-3)

This section describes how to use the Parallel Upgrade Utility (catctl.pl) to run manual upgrades using parallel processing, inclusion and exclusion lists, and other features to manage your upgrade.

[Upgrading with Oracle Database Upgrade Assistant \(DBUA\)](#) (page 3-11)

Database Upgrade Assistant (DBUA) provides a graphical user interface to guide you through the upgrade of Oracle Database. DBUA works for CDB and non-CDB database systems.

[Upgrade Scenarios for Non-CDB Oracle Databases](#) (page 3-33)

Review these topics to understand the upgrade scenarios and procedures for non-CDB Oracle Databases

[Example of Manual Upgrade of Windows Non-CDB Oracle Database 11.2.0.3](#) (page 3-47)

These examples show the steps to complete preupgrade checks, upgrade, and postupgrade checks for an Oracle Database 11g release 2 (11.2.0.3) upgrade to Oracle Database 12c release 2 (12.2).

[Manual Upgrade Scenarios for Multitenant Architecture Oracle Databases](#) (page 3-67)

Review these topics to understand the manual upgrade scenarios and procedures for Oracle Database deployed with multitenant architecture.

[Improvements to Data Dictionary Upgrade and Upgrade Status Displays](#)
(page 3-91)

Oracle Database 12c includes improvements to the upgrade process, and to how upgrade status appears for the upgraded database.

[About Dbupgrade Scripts and catupgrd.sql in Earlier Releases of Oracle Database](#) (page 3-92)

The function of the `catupgrd.sql` script is replaced by the Parallel Upgrade Utility, `catctl.pl`, and the `dbupgrade` and `dbupgrade.cmd` scripts.

[About Transporting and Upgrading a Database \(Full Transportable Export/Import\)](#) (page 3-93)

You can use file-based or nonfile-based modes for transporting data.

[About Log File Location and DIAGNOSTIC_DEST](#) (page 3-93)

The location of the Automatic Diagnostic Repository (ADR) and the diagnostic log files created by the upgrade scripts can vary, depending on your environment variables and parameter settings.

[Troubleshooting the Upgrade for Oracle Database](#) (page 3-95)

Use these troubleshooting tips to address errors or issues that you may encounter while upgrading your database.

[Rerunning Upgrades for Oracle Database](#) (page 3-110)

Use these options to rerun upgrades.

[Restarting the Upgrade from a Specific Phase that Failed Using -p](#) (page 3-118)

Use this option to complete an upgrade after fixing errors.

3.1 Backing Up Oracle Database for Upgrading

Use this procedure to back up your existing Oracle Database before you attempt an upgrade.

Oracle recommends that you back up your Oracle database after you run the Pre-Upgrade Information Tool and cleanly shut down the database. To minimize downtime, you may perform an online backup or create a guaranteed restore point. Database Upgrade Assistant (DBUA) enables you to specify your backup and restore point.

Caution:

Before you make any changes to the Oracle software, Oracle recommends that you create a backup of the Oracle software and databases. For Oracle software running on Windows operating systems, you must also take a backup of the Windows registry. Without a registry backup, you cannot restore the Oracle software to a working state if the upgrade to Oracle Database 12c fails and you want to revert to the previous software installation.

1. Sign on to Oracle RMAN:

```
rman "target / nocatalog"
```

2. Run the following RMAN commands:

```
RUN  
{
```



```

ALLOCATE CHANNEL chan_name TYPE DISK;
BACKUP DATABASE FORMAT 'some_backup_directory%U' TAG before_upgrade;
BACKUP CURRENT CONTROLFILE FORMAT 'controlfile location and name';
}

```

See Also:

- *Oracle Database Backup and Recovery User's Guide* for information about online backups and backup mode
- *Oracle Database Backup and Recovery User's Guide* for information about Flashback Database and restore points
- *Oracle Database Backup and Recovery User's Guide* for more information about performing RMAN backups

3.2 Upgrading with Parallel Upgrade Utility (catctl.pl and dbupgrade Shell Command)

This section describes how to use the Parallel Upgrade Utility (`catctl.pl`) to run manual upgrades using parallel processing, inclusion and exclusion lists, and other features to manage your upgrade.

[About the Parallel Upgrade Utility for Oracle Database \(CATCTL.PL and DBUPGRADE\)](#) (page 3-3)

The Parallel Upgrade Utility (`catctl.pl`, and the `dbupgradescript`) enable you to upgrade simultaneously components that do not require upgrades to occur in a specific order.

[General Steps for Running the Parallel Upgrade Utility](#) (page 3-4)

Review to obtain an overview of how to use the Parallel Upgrade Utility for Oracle Database.

[Parallel Upgrade Utility \(catctl.pl\) Parameters](#) (page 3-6)

Control how the Parallel Upgrade Utility (`catctl.pl`) runs. You can also use these arguments to run the `dbupgrade` shell command.

[Example of Using the Parallel Upgrade Utility](#) (page 3-9)

Use this example to understand how you can run the parallel upgrade utility manually to perform upgrades.

3.2.1 About the Parallel Upgrade Utility for Oracle Database (CATCTL.PL and DBUPGRADE)

The Parallel Upgrade Utility (`catctl.pl`, and the `dbupgradescript`) enable you to upgrade simultaneously components that do not require upgrades to occur in a specific order.

Oracle Database 12c release 1 (12.1) introduced the Parallel Upgrade Utility, `catctl.pl`. This utility reduces the total amount of time it takes to perform an upgrade by loading the database dictionary in parallel, and by using multiple SQL processes to upgrade the database. Performing parallel upgrades of components enables you to take advantage of your CPU capacity. Oracle continues to make improvements to the upgrade process to simplify both manual upgrades, and

upgrades performed with the Database Upgrade Assistant (DBUA). DBUA and the manual upgrade procedures take advantage of the new Parallel Upgrade Utility.

You can run a shell command, `dbupgrade`, which starts up `catctl.pl` from the command line, instead of requiring you to run it from Perl.

The `dbupgrade` shell command is located in the file path `$ORACLE_HOME/rdbms/bin` on Linux and UNIX, and `%ORACLE_HOME%\rdbms\bin` on Windows. You can provide any command arguments that are valid for `catctl.pl` to the shell command. Either run the command directly from the new Oracle home path, or set a user environment variable to point to the file path.

For example:

Running with default values:

```
$ ./dbupgrade
```

Running to specify a log directory placed in `/tmp`:

```
$ ./dbupgrade -l /tmp
```

In Oracle Database 12c release 2 (12.2), you can run the Parallel Upgrade Utility using priority lists. For example:

```
$ ./dbupgrade -L priority_list_name
```

When you use a priority list, you can include or exclude a specific list of PDBs in your upgrade.

You can also run the Parallel Upgrade Utility using priority emulation, so that you can see how the priority list is read and carried out, without actually performing the upgrade. For example:

```
$ ./dbupgrade -E
```

Related Topics:

[Example of Testing Upgrades Using Priority List Emulation](#) (page 2-49)

3.2.2 General Steps for Running the Parallel Upgrade Utility

Review to obtain an overview of how to use the Parallel Upgrade Utility for Oracle Database.

The Parallel Upgrade Utility (`catctl.pl`, which you can start with the shell command `dbupgrade`) loads the data dictionary and components in parallel. Loading in parallel reduces the overall upgrade time. Before running the Parallel Upgrade Utility, follow the procedures for backing up your database that you normally do before upgrading. Also, as a prerequisite, you must run the Pre-Upgrade Information Tool to identify any problems that a database administrator must address before the upgrade proceeds.

The general steps for upgrading your database with the Parallel Upgrade Utility are as follows:

1. Back up your current database.
2. Install the Oracle Database 12c software for the new release.
3. Ensure that the Pre-Upgrade Information Tool (`preupgrade.jar`) has run on the source database, and that any issues reported by the tool are addressed.

4. Start SQL*Plus From the directory `ORACLE_HOME/rdbms/admin`.
5. Log in to a user account with SYSDBA system privileges, and connect to the database that you want to upgrade:

```
CONNECT / AS SYSDBA
```

6. Start the database in upgrade mode. Use the command for your configuration type.

Multitenant container database (CDB):

```
SQL> startup upgrade;
SQL> alter pluggable database all open upgrade;
```

Non-CDB:

```
SQL> startup upgrade
```

Note:

The UPGRADE keyword performs operations that prepare the environment for the upgrade.

You may be required to use the `PFILE` option in your startup command to specify the location of your initialization parameter file.

When you start the database in upgrade mode, only queries on fixed views execute without errors until after the `catctl.pl` script is run. Before you run `catctl.pl`, you receive an error if you try to use PL/SQL, or if you try to run queries on any other view.

If errors appear listing desupported initialization parameters, then make a note of the desupported initialization parameters, and continue with the upgrade. Remove the desupported initialization parameters the next time you shut down the database.

7. Exit SQL*Plus.
8. Run the Parallel Upgrade Utility from the new Oracle home.

You can run the utility as a shell command (`dbupgrade` on Linux and UNIX, and `dbupgrade.cmd` on Windows) or you can run it as a Perl command (`catctl.pl`).

For example, on Linux and UNIX:

```
cd $ORACLE_HOME/bin
./dbupgrade
```

For example, on Windows:

```
cd %ORACLE_HOME%\bin
dbupgrade
```

The Parallel Upgrade Utility starts the upgrade process.

Note:

The Parallel Upgrade Utility uses other files to carry out the upgrade. On Linux/UNIX systems, these files include `catconst.pm`, `catcom.pm`, `sqlpatch`, `sqlpatch.pl` or `sqlpatch.pm`, and `orahome` on Linux/UNIX systems. On Windows systems, these files include `orahome.exe`. Do not change or remove these files.

See Also:

Oracle Database Administrator's Guide for information about specifying initialization parameters at startup and the initialization parameter file

3.2.3 Parallel Upgrade Utility (catctl.pl) Parameters

Control how the Parallel Upgrade Utility (`catctl.pl`) runs. You can also use these arguments to run the `dbupgrade` shell command.

Note:

The shell command utility `dbupgrade` starts `catctl.pl`. The `dbupgrade` utility resides in the `ORACLE_HOME/bin` directory. You can use the shell command utility to start the Parallel Upgrade Utility at the command prompt. You can either run the utility using default values, or you can use `catctl.pl` input parameters to specify Parallel Upgrade Utility arguments.

Table 3-1 Parallel Upgrade Utility (catctl.pl) Parameters

| Parameter | Description |
|-----------------|---|
| <code>-c</code> | <p>Specifies a space-delimited inclusion list for PDBs that you want to upgrade. For example, in an Oracle Multitenant deployment with PDB1, PDB2, PDB3, and PDB4, include PDB1 and PDB2, but exclude the PDBs not named. PDB 1 and PDB 2 are upgraded, but PDB 3 and PDB4 are not upgraded.</p> <p>Linux and UNIX (use single quotes):</p> <pre>-c 'PDB1 PDB2'</pre> <p>Windows (use double quotes):</p> <pre>-c "PDB1 PDB2"</pre> |

Table 3-1 (Cont.) Parallel Upgrade Utility (catctl.pl) Parameters

| Parameter | Description |
|-----------|--|
| -c | <p>Specifies a space-delimited exclusion list for PDBs that you want to upgrade. For example, in an Oracle Multitenant deployment with PDB1, PDB2, PDB3, and PDB4, you can use an exclusion list to exclude PDB1 and PDB2, but include the PDBs not named. PDB1 and PDB2 are not upgraded, but PDB3 and PDB4 are upgraded.</p> <p>Linux and UNIX (use single quotes):</p> <pre>-c 'PDB1 PDB2'</pre> <p>Windows (use double quotes):</p> <pre>-c "PDB1 PDB2"</pre> <p>Note: -c and -C are mutually exclusive.</p> <p>-C 'CATCTL_LISTONLY' is an option that specifies that the Parallel Upgrade Utility processes only the PDBs in a priority list. Use this option with the -L parameter, specifying a list.</p> |
| -d | Specifies the location of the directory containing the files that you want processed. |
| -e | Sets echo OFF while running the scripts. The default is echo ON. |
| -E | <p>Enables you to run an upgrade emulation.</p> <p>You can use the -E parameter to run the Parallel Upgrade Utility in emulation mode to test how priority lists run, or to test how other upgrade parameter selections are carried out during an upgrade. For example, you can run an upgrade emulation to obtain more information about how the resource allocation choices you make using the -n and -N parameters are carried out.</p> <p>To carry out an upgrade emulation, complete all upgrade preparations before you run the Parallel Upgrade Utility, and then run the command using -E.</p> <p>When you run the Parallel Upgrade Utility with the -E parameter, and call a priority list as part of the command using the -L parameter, the utility writes the upgrade order to the file <code>catctl_priority_run.lst</code>. This list is placed in the file path that you specify by the -l parameter, or in the default log file area if you do not specify a different output file path.</p> |
| -F | <p>Forces a cleanup of previous upgrade errors.</p> <p>Non-CDB databases require only the -F parameter. For CDBs, use this option with a space-delimited inclusion list, which you specify with -c.</p> |
| -i | Specifies an identifier to use when creating spool log files. |
| -l | <p>Specifies the location for the directory to use for spool log files.</p> <p>The default location is <code>Oracle_base/cfgtoollogs/dbname/upgradedatetime</code>. The <i>date</i> and <i>time</i> strings are in the character string format <code>YYYYMMDDHHMMSC</code>, in which <i>YYYY</i> designates the year, <i>MM</i> designates the month, <i>DD</i> designates the day, <i>HH</i> designates the hour, <i>MM</i> designates the minute, and <i>SC</i> designates the second.</p> <p>Oracle strongly recommends that you do not write log files to the <code>/admin</code> directory.</p> |

Table 3-1 (Cont.) Parallel Upgrade Utility (catctl.pl) Parameters

| Parameter | Description |
|-----------|---|
| -L | <p>Upgrades PDBs using a priority list during an Oracle Database 12.2 upgrade, and specifies the priority list name. The priority list updates priority status in the database during upgrade. This priority listing is maintained in future upgrades.</p> <p>By default the CDB\$ROOT and PDB\$SEED databases are always processed first. They are processed first even if they are not added to a priority list. All PDBs in the priority list are processed before PDBs not in the priority list.</p> |
| -M | <p>Keeps CDB\$ROOT in UPGRADE mode while the PDBs are upgraded. For non-CDBs, this parameter is ignored.</p> <p>During CDB upgrades, using this parameter setting places the CDB and all its PDBs in upgrade mode, which can reduce total upgrade time. However, you cannot bring up any of the PDBs until the CDB and all its PDBs are upgraded.</p> <p>By default, if you do not use the -M parameter setting, then CDB\$ROOT is upgraded and restarted in normal mode, and the normal background processes are started. As each PDB is upgraded, you can bring the PDB online while other PDBs are still being upgraded.</p> |
| -n | <p>Specifies the number of processes to use for parallel operations.</p> <p>Non-CDBs: The -n parameter specifies the number of SQL processes to use when upgrading the database.</p> <p>Multitenant architecture databases (CDBs): The number of PDBs upgraded concurrently is controlled by the value of the -n parameter. Multiple PDB upgrades are processed together. Starting in Oracle Database 12c, the default value for multitenant architecture databases is the number of CPUs on your system. A <code>cpu_count</code> equal to 24 equates to a default value of 24 for -n.</p> <p>Values for the -n parameter:</p> <p>Non-CDBs: The maximum value for -n is 8. The minimum value is 1. The default value is 4.</p> <p>Multitenant architecture databases (CDBs): The maximum value for -n is unlimited. The minimum value is 4. The maximum PDB upgrades running concurrently is the value of -n divided by the value of -N.</p> |
| -N | <p>Specifies the number of SQL processors to use when upgrading PDBs. For non-CDBs, this parameter is ignored.</p> <p>For CDBs, the maximum value is 8. The minimum value is 1. The default value is 2.</p> |
| -P | Restarts from the specified phase. When you re-run an upgrade, it does not restart phases already completed successfully. |
| -P | Stops from the specified phase. |
| -R | Resumes the upgrade from a failed phase. Using the -R parameter enables the upgrade to resume at the point of failure, so that only the missing upgrade phases are rerun. |
| -s | Names the SQL script that initializes sessions. |

Table 3-1 (Cont.) Parallel Upgrade Utility (catctl.pl) Parameters

| Parameter | Description |
|-----------|---|
| -S | Specifies serial upgrade instead of parallel. Starting with Oracle Database 12.2, catupgrd.sql is no longer supported using the -S option. |
| -T | Takes offline user schema-based table spaces. |
| -u | Specifies user name, and prompts for password. |
| -y | Displays phases only. |
| -z | Turns on production debugging information for catcon.pm. |
| -Z | Turns on debug tracing information for catctl.pl. For example, to set the number to 1, enter -Z 1. |

3.2.4 Example of Using the Parallel Upgrade Utility

Use this example to understand how you can run the parallel upgrade utility manually to perform upgrades.

The Parallel Upgrade Utility (catctl.pl) is integrated with DBUA. However, you can run the Parallel Upgrade Utility using the command-line script dbupgrade. Run the Parallel Upgrade Utility using the command-line parameters to specify how you want the upgrade to run. For example, to run the utility in serial mode instead of using parallel operations, specify the -n 1 option.

Example 3-1 Running Parallel Upgrade Utility with Parameters for CDB and Non-CDB Databases

If you use the option -n 4 when you run the Parallel Upgrade Utility, then the upgrade process creates catupgrd0.log, catupgrd1.log, catupgrd2.log, and catupgrd3.log. Check all of the catupgrd#.log files to confirm that the upgrade succeeded. If the upgrade failed, and you fix issues and run the Parallel Upgrade Utility again, then the previous log files are overwritten, unless you specify a different log directory by using the -l parameter.

For example:

```
cd $ORACLE_HOME/bin
dbupgrade -n 4 -l $ORACLE_HOME/diagnostics
```

Example 3-2 Running Parallel Upgrades on Multiple Pluggable Databases (PDBs) Using Parallel Upgrade Utility

These examples show how parameter settings change the way that the Parallel Upgrade Utility performs the upgrade on multiple PDBs.

Note:

In your upgrade plans, be aware of the following:

- The CDB\$ROOT defaults to a minimum value of 4 SQL processes, and to a maximum value of 8
 - The default value for `-N` is 2.
 - PDB\$SEED always counts as one (1) PDB in the upgrade cycles
 - The default for the Parallel Upgrade Utility parameter `-n` is the value of the CPU_COUNT parameter
-
-

In the following examples, the system is an Oracle Multitenant Oracle Database system that has a CPU_COUNT value of 24.

Run the Parallel Upgrade Utility without specifying values for the parameters `-n` and `-N` (that is, accept the default value of `-N`, which is 2, and accept the default value of `-n` as the CPU_COUNT parameter value, which is 24). The following parallel processing occurs:

- 12 PDBs are upgraded in parallel (CPU_COUNT divided by 2)
- 2 parallel processes run for each PDB

Specify the value of `-n` as 64, and `-N` as 4. The following parallel processing occurs:

- 16 PDBs are upgraded together (64 divided by 4)
- 4 parallel processes run for each PDB

Specify the value of `-n` as 20, and `-N` as 2. The following parallel processing occurs:

- 10 PDBs are upgraded together (20 divided by 2)
- 2 parallel processes run for each PDB

Specify the value of `-n` as 10, and `-N` as 4. The following parallel processing occurs:

- 2 PDBs are upgraded together (10 divided by 4), rounded down.
- 4 parallel processes run for each PDB

Do not specify the value of `-n` (that is, accept the default value of `-n`, which is the value of the CPU_COUNT parameter), and specify the value of `-N` as 1. The following parallel processing occurs:

- 24 PDBs are upgraded together (CPU_COUNT value divided by 1)
- 1 process runs for each PDB

Specify a value for `-n` as 20, and do not specify the value for `-N` (that is, accept the default value of `-N`, which is 2). The following parallel processing occurs:

- 10 PDBs are upgraded together (20 divided by 2)
- 2 parallel processes run for each PDB

3.3 Upgrading with Oracle Database Upgrade Assistant (DBUA)

Database Upgrade Assistant (DBUA) provides a graphical user interface to guide you through the upgrade of Oracle Database. DBUA works for CDB and non-CDB database systems.

Note:

You can start DBUA in silent mode, which does not present a user interface. Silent mode can be useful for large roll-outs and scripts.

[Recommendations for Using DBUA](#) (page 3-11)

Review this topic to use Database Upgrade Assistant (DBUA) for multitenant architecture and non-CDB Oracle Database upgrades.

[About Stopping DBUA When Upgrading](#) (page 3-12)

You must complete an upgrade manually if you stop DBUA.

[How DBUA Processes the Upgrade for Oracle Database](#) (page 3-12)

DBUA may be started as part of the database software installation, and you can also start it manually.

[Upgrade Scripts Started by DBUA](#) (page 3-13)

During the upgrade, DBUA automatically runs the appropriate upgrade scripts to automate the upgrade and minimize downtime.

[Using DBUA to Upgrade the Database on Linux, UNIX, and Windows Systems](#) (page 3-13)

To upgrade a database using the DBUA graphical user interface, perform these steps from within the new Oracle home.

[Moving a Database from an Existing 12c Oracle Home](#) (page 3-25)

Use this procedure to migrate Oracle Database 12c databases to another Oracle Database 12c home.

[Using DBUA in Silent Mode to Upgrade Oracle Database](#) (page 3-27)

Related Topics:

[Using DBUA in Silent Mode to Upgrade Oracle Database](#) (page 3-27)

3.3.1 Recommendations for Using DBUA

Review this topic to use Database Upgrade Assistant (DBUA) for multitenant architecture and non-CDB Oracle Database upgrades.

You can use DBUA to upgrade multitenant architecture container databases (CDB), pluggable databases (PDBs), and non-CDB databases. The procedures are the same, but the choices you must make and the behavior of DBUA are different, depending on the type of upgrade:

Note:

Starting with Oracle Database 12c, release 1 (12.1), non-CDB architecture is deprecated. It can be desupported in a future release.

- For all upgrades, before using DBUA to upgrade your system, Oracle strongly recommends that you run the Pre-Upgrade Information Tool manually. DBUA runs the Pre-Upgrade Information Tool as part of the prerequisite checks it performs before starting the upgrade. However, to reduce downtime, Oracle recommends that you run the Pre-Upgrade Information Tool as part of your upgrade planning, so that you can analyze the database, and take proactive steps before your planned upgrade date.
- To use guaranteed restore points, ensure that the database ARCHIVE LOG and FLASHBACK modes are on during upgrade. You can confirm that they are on by entering the following SQL command:

```
SQL> select log_mode,flashback_on from v$database;
```
- If the database instance is not running, then DBUA tries to start the instance. If the instance is up and running, then DBUA connects to it.
- If you restore your database manually (not using DBUA), then before starting DBUA, remove the `welcome_SID.txt` file, which is located in the directory `ORACLE_HOME/cfgtoollogs/dbua/logs/`. If DBUA finds this file, then DBUA starts in a re-run operation.
- Restore scripts generally enable you to restore your database (Non-CDB single instance, high availability, or Oracle RAC) back to the earlier release and earlier Oracle home location. However, if you have registered your database with Oracle Internet Directory (OID), then the restore script cannot unregister Oracle Internet Directory. You must log in as an authorized user, and unregister the later release database manually.
- If Oracle Database Vault is enabled, then review in this document “Requirement for Upgrading Oracle Databases That Use Oracle Database Vault”.

See Also:

Oracle Database Concepts for an overview and documentation roadmap for working with a CDB and PDBs

3.3.2 About Stopping DBUA When Upgrading

You must complete an upgrade manually if you stop DBUA.

If you stop the upgrade, but do not restore the database, then you cannot continue to upgrade using DBUA. You must instead continue the upgrade using the manual (command line) upgrade procedure. You cannot go back to the original Oracle Database server unless you restore your database.

Related Topics:

[Manually Upgrading a Multitenant Container Oracle Database \(CDB\)](#)
(page 3-68)

3.3.3 How DBUA Processes the Upgrade for Oracle Database

DBUA may be started as part of the database software installation, and you can also start it manually.

If you installed the software for Oracle Database 12c and specified that you are upgrading an existing Oracle database, then DBUA starts automatically. You can also start DBUA independently after the installation is completed.

While the upgrade is in process, DBUA shows the upgrade progress for each component. DBUA writes detailed trace and log files and produces a complete HTML report for later reference. To enhance security, DBUA automatically locks new user accounts in the upgraded database. DBUA then proceeds to create new configuration files (parameter and listener files) in the new Oracle home.

DBUA does not begin the upgrade process until all of the pre-upgrade steps are completed.

Related Topics:

[Rerunning Upgrades for Oracle Database](#) (page 3-110)

[Tasks to Prepare for Oracle Database Upgrades](#) (page 2-2)

3.3.4 Upgrade Scripts Started by DBUA

During the upgrade, DBUA automatically runs the appropriate upgrade scripts to automate the upgrade and minimize downtime.

During the prerequisite phase, DBUA runs the Pre-Upgrade Information Tool script, and uses the following logic to modify or create new required tablespaces:

- If the data files are auto-extensible and have enough disk space to grow, then DBUA continues with the upgrade.
- If the data files are not auto-extensible, then DBUA prompts you and makes the files auto-extensible.
- If the tablespaces are auto-extensible and the `MAXSIZE` initialization parameter needs adjustment, then DBUA prompts you to for this adjustment, and adjusts the `MAXSIZE` parameter.
- If there is not enough disk space to grow, then DBUA prompts you to create space by adding more data files. DBUA does not automatically add new data files, because DBUA cannot determine where to create the files.

DBUA addresses many issues found during the prerequisite phase. For example, DBUA can ensure that the correct time zone file is used, and make ACL adjustments for network access control lists.

During the upgrade phase, DBUA runs `catctl.pl`, which runs the upgrade processes in parallel instead of serially. Parallel runs optimize utilization of CPU resources to hasten the upgrade and minimize downtime.

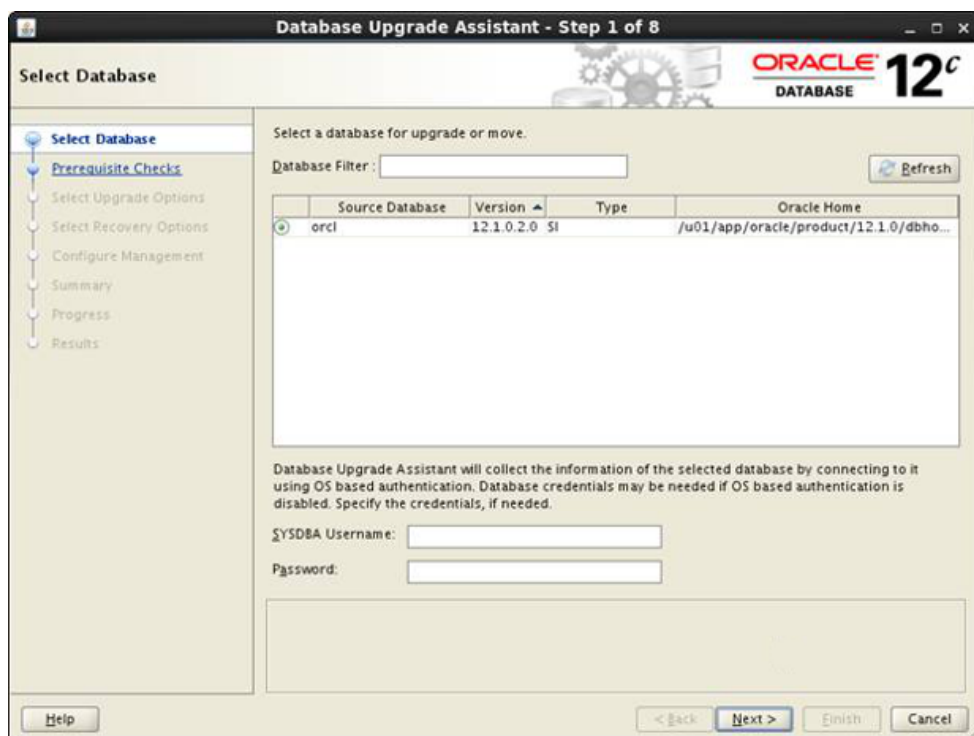
3.3.5 Using DBUA to Upgrade the Database on Linux, UNIX, and Windows Systems

To upgrade a database using the DBUA graphical user interface, perform these steps from within the new Oracle home.

On Windows systems, run DBUA either as an Oracle Database administrative user (a user with the OS-assigned `ORA_DBA` role), or the Oracle installation owner account installation.

1. Start Database Upgrade Assistant (DBUA) from the Oracle home where the new database software is installed. The dbua executable is located in the directory path `ORACLE_HOME/bin`.
 - On Linux or UNIX platforms, log in as a user with SYSDBA privileges, and enter the following command at a system prompt in the new home for Oracle Database 12c:


```
./dbua
```
 - On Windows operating systems, select **Start**, then **Programs**, then **Oracle HOME_NAME**, then **Configuration and Migration Tools**, and then **Database Upgrade Assistant**.
2. The Select Database window displays. If you have earlier release Oracle Database installations, then these installations are listed as available to upgrade.



If you need help on any DBUA window, or if you want to consult more documentation about DBUA, then click **Help** to open the online help.

Enter the SYSDBA user name and password for the database that you select. If you run DBUA from a user account that does not have SYSDBA privileges, or if the source database does not have operating system authentication, then you must enter the user name and password credentials to enable SYSDBA privileges for the selected database.

Click **Next** after making your selection.

Note:

- You can select only one database at a time.
- With single-instance upgrades, if the database does not appear in the list, then check to see if an entry with the database name exists in `etc/oratab`. If the database is not listed there, then direct DBUA to upgrade particular databases:
 - If your single-instance database is not listed in `/etc/oratab`, and DBUA can connect to the database, then you can direct DBUA to upgrade that database explicitly by starting DBUA using the command-line arguments `-sid Oracle_SID` and `-oracleHome Oracle_home` as a command-line argument. For example:

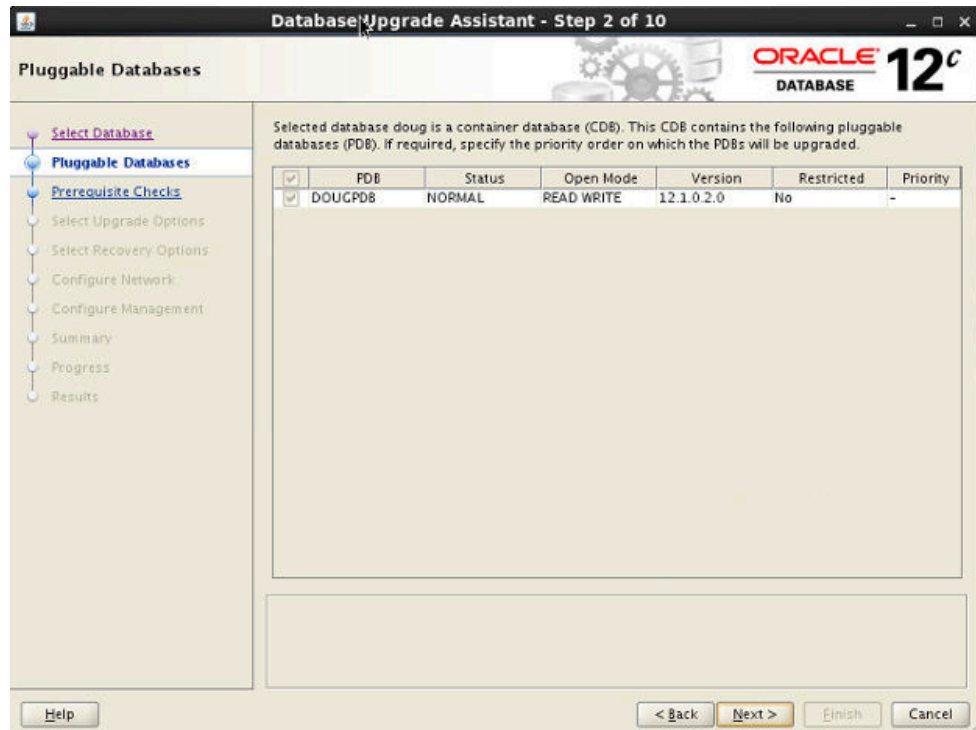

```
dbua -sid mydb -oracleHome /u01/app/oracle/12.1.0/dbhome1
```
- Oracle Real Application Clusters (Oracle RAC) upgrades: If the database does not appear on the list, then enter the following `crsctl` command to check for Oracle RAC instances:


```
crsctl status resource -t
```

You can also enter the following command to check for a particular Oracle RAC database, where `db_name` is the Oracle RAC database name:

```
crsctl status resource ora.db_name.db
```
- On Microsoft Windows, the following security changes affect authentication and user accounts:
 - Starting with Oracle Database 12c, for security reasons, Windows NTS authentication using the NTLM protocol is no longer supported. Kerberos authentication is the only supported authentication. In this release, NTS does not work either in Windows NT domains, or in domains with Windows NT controllers.
 - Starting with Oracle Database 12c, Oracle uses standard Microsoft Windows user accounts instead of the Windows LocalSystem account to run Oracle database services. Reducing the account access privileges for the Oracle installation owner provides better security on Microsoft Windows.

-
3. If the selected database is a multitenant container database (CDB), then DBUA displays the Pluggable Databases window. The Pluggable Databases window lists the pluggable databases contained in the CDB. The listed PDBs are upgraded as part of the upgrade for the selected CDB.

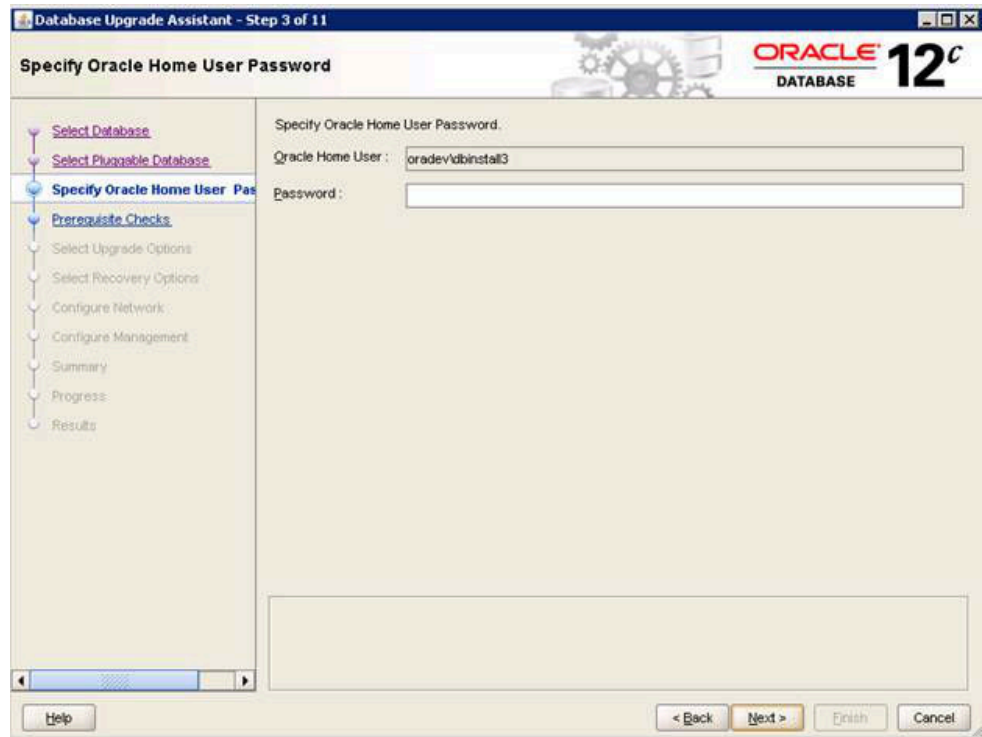


Starting in release 12.2, you can select the upgrade priority for PDBs. Click in the priority column for each PDB, and enter a numeric value for upgrade priority, where 1 is upgraded first, 2 is upgraded second, and so on.

By default, CDB\$ROOT, PDB\$SEED, and all PDBs that are plugged into the CDB are upgraded. If you do not want some PDBs to be upgraded at this time, then unplug those PDBs.

When you have completed selecting PDBs and upgrade priorities, click **Next**.

4. Windows platforms only: If the upgrade target home is a secure home that is associated with an Oracle home user, then the Specify Oracle Home User Password window opens. For other platforms, proceed to the next step.

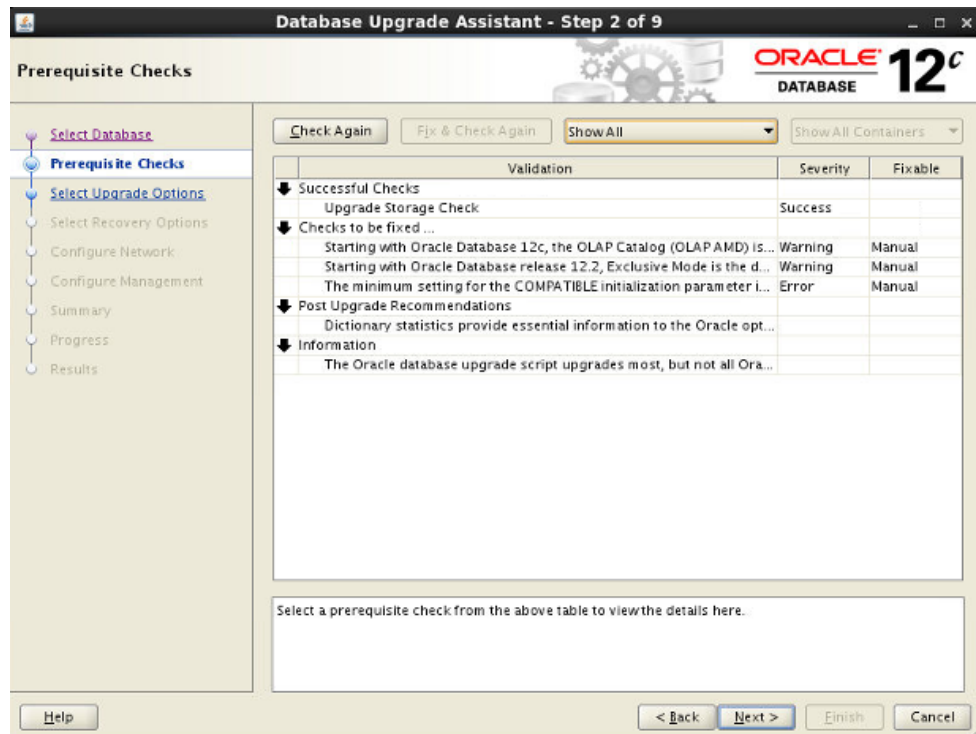


Provide the Oracle home user name, and provide the password for this user account, and click **Next**.

5. The Prerequisite Checks window opens. DBUA analyzes the databases, performing pre-upgrade checks and displaying warnings as necessary. The following is a list of examples of DBUA checks and actions DBUA performs on the database:
 - Empty database recycle bin.
 - Identify invalid objects.
 - Identify deprecated and desupported initialization parameters.
 - Identify time zone data file version.

The analysis takes several minutes to complete.

When DBUA finishes its analysis, the Prerequisite Checks window displays.



The Prerequisite Checks window shows that the checks DBUA has completed, and the severity of any errors discovered. When DBUA finds errors, it indicates which errors are fixable, and what action you can take to correct the error.

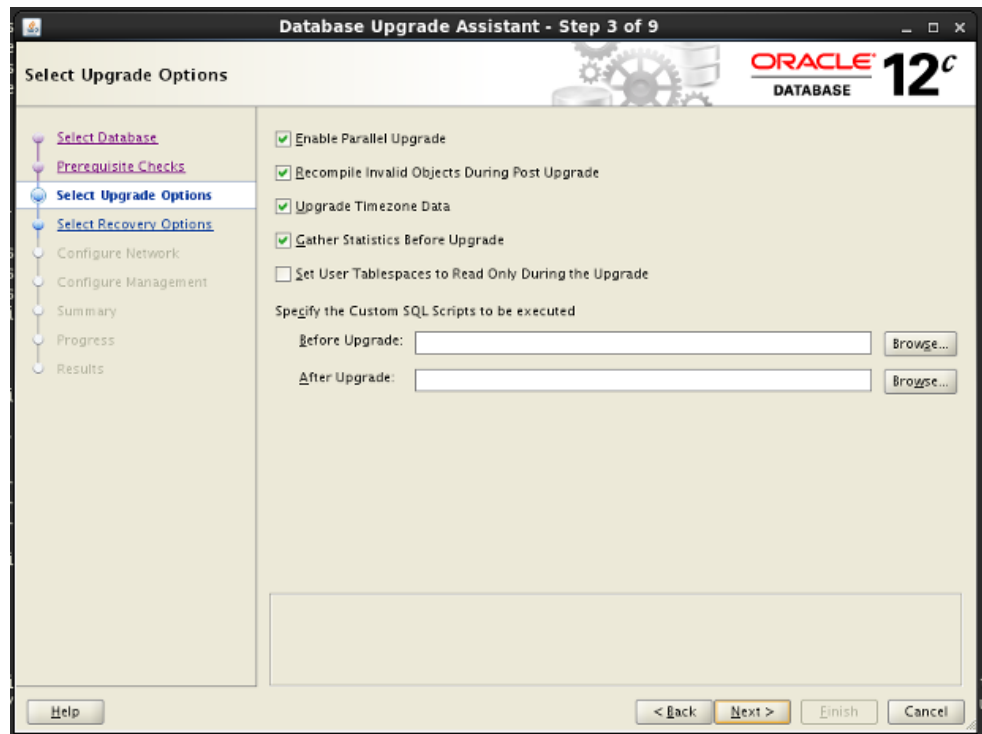
Select **Fix & Check Again** if any errors that DBUA can fix appear.

If DBUA detects errors that it cannot correct, then fix the cause of the error manually, and select **Check Again**.

If DBUA finds no errors or warnings, then the DBUA automatically bypasses this window and proceeds to the Select Options Configuration window.

When you have fixed detected errors, click **Next**.

6. The Select Options Configuration window displays.



This window provides the following options:

Enable Parallel Upgrade.

Select this option to enable parallelism during the upgrade process. Running upgrade processes in parallel reduces the time required to perform the upgrade, based on the number of CPUs available to handle the running of scripts and processes simultaneously.

Recompile Invalid Objects During Post Upgrade.

This option recompiles all invalid PL/SQL modules after the upgrade is complete. If you do not have DBUA recompile invalid objects in its post-upgrade phase, then you must manually recompile invalid objects after the database is upgraded.

Upgrade Time Zone Data.

This option updates the time zone data file for this release. If you do not select this option, then you must update the time zone configuration file manually after the upgrade.

Gather Statistics Before Upgrade.

This option gathers statistics about your existing databases before running the upgrade.

Set User Tablespaces to Read Only During the Upgrade.

Select this option to prevent user attempts to write to tablespaces during the upgrade.

Enable Password Profile for Administrative Users.

Select this option to set up a password profile to enforce password management practices for administrative users.

Specify custom SQL scripts to be executed.

If you want to run custom SQL scripts as part of your upgrade, then select this box. As needed, click **Browse** for the **Before Upgrade** or **After Upgrade** input fields. Navigate to the location where your custom SQL scripts are located.

When you have made your selections, click **Next**.

7. The Select Recovery Options window appears. To recover the database if a failure occurs during upgrade, select from one of the following options:

- **Use RMAN Backup**

You can create a new offline RMAN backup, or use an existing backup. Click **Browse** to specify a path for the backup.

- **Use Latest Available RMAN Backup**

You can use an existing backup. Click **View/Edit Restore** to select the backup that you want to use.

- **Use Flashback and Guaranteed Restore Point.**

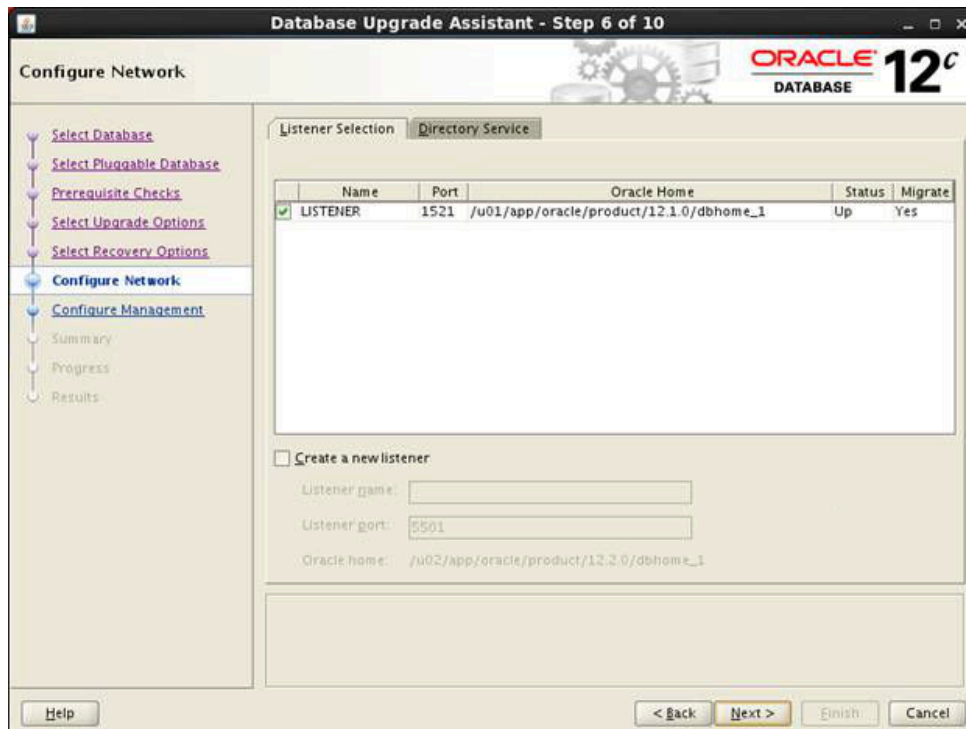
You can create a new Guaranteed Restore Point, or use an existing one. If you use an existing restore point, then click the selection field to select the restore point that you want to use.

- **I have my own backup and restore strategy.**

Select this option only if you have a third-party backup solution in place for your existing database.

When you have made your selections, click **Next**.

8. For single-instance database installations, the Configure Network window opens. Select one or more listeners from the source Oracle home that you want to migrate to the new upgraded Oracle home, or create a new listener during installation.



The Listener Selection area of the Network Configuration window shows a table with the following columns:

- **Select column.** Select the listeners that you want to update.
- **Name.** This column shows listener names.
- **Port.** This column shows the ports on which listeners are configured.
- **Oracle Home.** This column shows the Oracle home where listeners are configured.
- **Status.** This column shows the listener status (up or down).
- **Migrate.** Select this column, and choose **Yes** to migrate, or **No** to not migrate.

You can also select to create a new listener. If you create a new listener, then provide the listener name, the Oracle home where you want it placed, and the port that you want to configure the listener to monitor.

After you make your choices, DBUA completes the following steps for any listeners that you migrate:

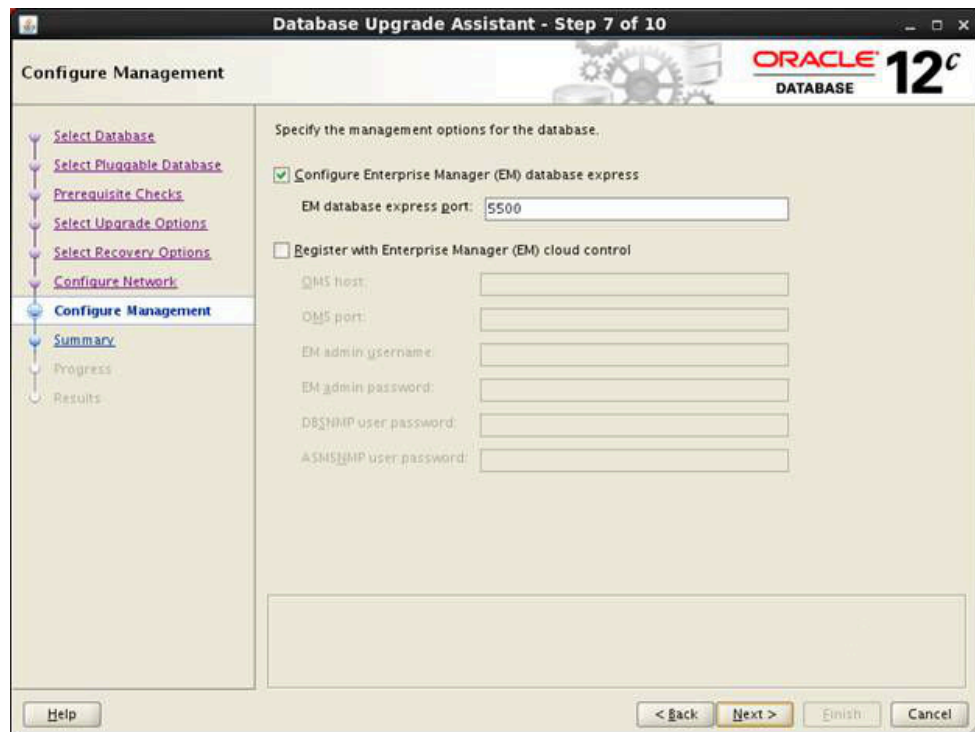
- a. DBUA adds the selected listener to the `listener.ora` file of the target Oracle home, and starts it.
- b. DBUA removes the entry of the upgraded database from the old (source) `listener.ora` file.
- c. DBUA reloads the `listener.ora` file in both the source and target Oracle Database environments.

Note:

If there are other databases registered with the same listener, then their new client connection requests can be affected during listener migration.

Click **Next** when you have completed your choices.

9. The Configure Management Options window appears. In the Configure Management window, select the management options:



- **Configure Enterprise Manager (EM) Database Express**

Oracle Enterprise Manager Database Express is a web-based database management application that is built into Oracle Database 12c. EM Express replaces the DB Control component that was available in releases 10g and 11g. Enter the EM Database Express Port number. For example: 5502.

- **Register with Enterprise Manager (EM) Cloud Control**

Registering with Oracle Enterprise Manager Cloud Control adds the database and its related entities, such as Listener, Oracle ASM disk groups, and Oracle Clusterware, as targets that you can manage with EM Cloud Control.

If you select this option, then you must provide information in the following fields:

- OMS Host
- OMS Port
- EM Admin Username
- EM Admin Password
- DBSNMP User Password

When you have completed entering information, click **Next**.

10. The Summary window opens. The Summary window shows the information that you have provided for the upgrade. Scroll down the list to review the information. The summary includes information such as the following:

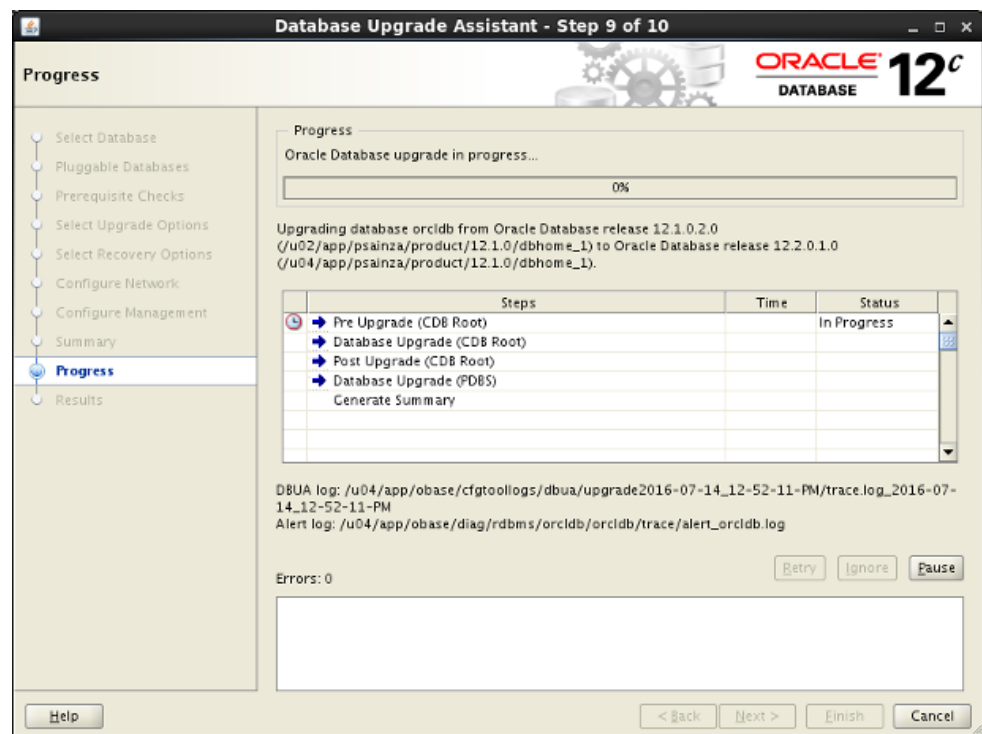
- Source Database
- Target Database

- Pluggable Databases
- Pre-Upgrade Checks
- Initialization Parameters changes
- Timezone Upgrade

To ensure that the selections are the ones you want, check your selections. Then either select a link to the item that you want to change, or click **Back** to go to earlier pages, or select **Finish**:

- if you see information in the Summary window that you want to correct, then click a link on an item that you want to update, or click **Back** to navigate backward through the DBUA configuration interview. Make
- Click **Finish** if the information that you see in the Summary window is correct. The upgrade begins after you select **Finish**.

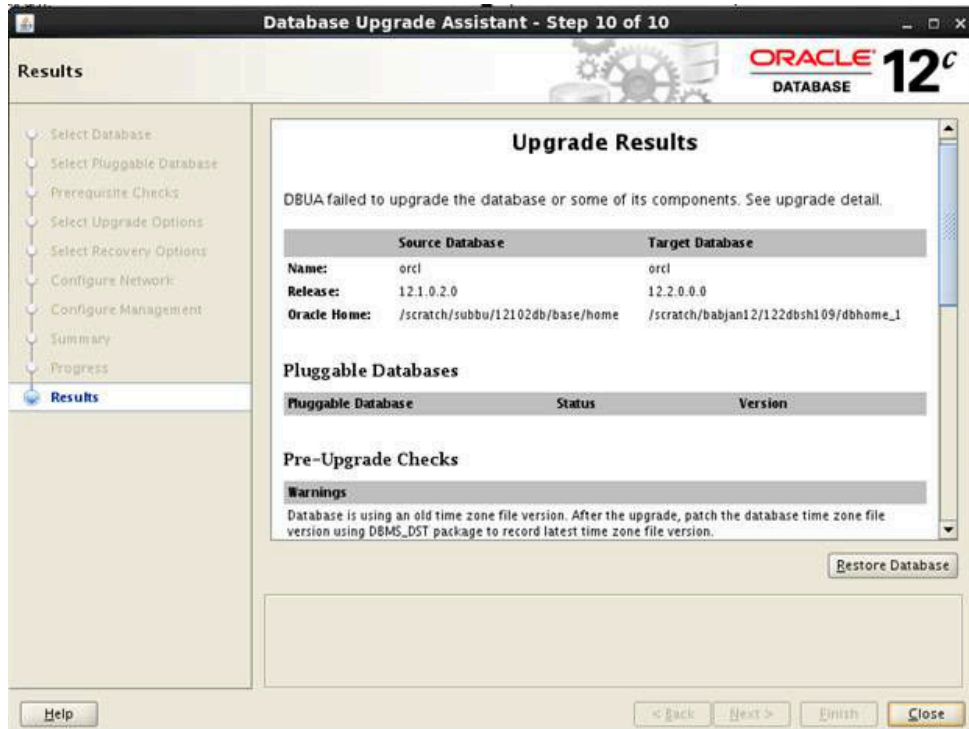
The Progress window displays with the progress bar, as DBUA begins the upgrade. The Progress window displays a table that shows the steps DBUA is completing during the upgrade. This table shows the time duration, and the upgrade steps status as the upgrade proceeds. DBUA provides a **Stop** button in case you must cancel the upgrade at this point.



When the upgrade has progressed through finishing the upgrade of the CDB root and each PDB seed, the Progress window marks the status as **Finished**.

11. After the upgrade is complete, the Results window opens. The Results window displays information about the original database, and about the upgraded database. The Upgrade Results report and it also shows changes that DBUA made to the initialization parameters. If you are upgrading a multitenant architecture database, then the Results window also shows pluggable databases, and the directory where log files are stored after the upgrade. Scroll down to see more

details about preupgrade checks. If the upgrade is successful, then the Upgrade Results field reports the results, and you do not see warning messages. If the upgrade was unsuccessful, as this example image shows, then the **Restore Database** button is displayed on the lower right corner below the display field. You can click this button to start a database restoration.



12. Optional: Examine the log files to obtain more details about the upgrade process. If the Oracle base environment variable is set, then the DBUA log files are located in the path `/ORACLE_BASE/cfgtoollogs/dbua/upgradesession_timestamp/SID`. If Oracle base is not set, then the DBUA log files are located in the path `/ORACLE_HOME/cfgtoollogs/dbua/upgradesession_timestamp/SID`

Note:

An HTML version of the Upgrade Results window is also saved in the log files directory. You can click the links in this HTML window to view the log windows in your browser.

If you are satisfied with the upgrade results, then click **Close** to quit DBUA.

13. After your upgrade is completed, carry out post-upgrade procedures described in this book. When you have completed post-upgrade procedures, your upgraded database is ready to use.

Caution:

To prevent unauthorized use of the database, Oracle recommends that you change all user passwords immediately after you upgrade your database.

If the default security settings for Oracle Database 12c are in place, then passwords must be at least eight characters. Passwords such as `welcome` and `oracle` are not allowed.

Related Topics:

[Post-Upgrade Tasks for Oracle Database](#) (page 4-1)

3.3.6 Moving a Database from an Existing 12c Oracle Home

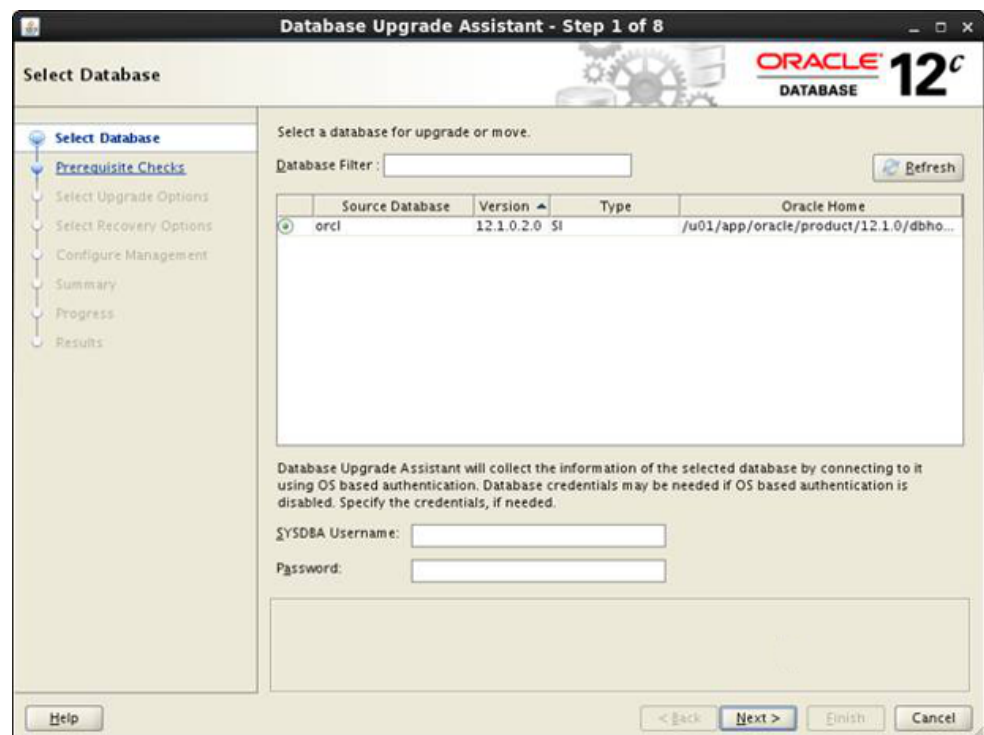
Use this procedure to migrate Oracle Database 12c databases to another Oracle Database 12c home.

You can use Database Upgrade Assistant (DBUA) to migrate Oracle Database 12c databases from an existing 12c Oracle home to another 12c Oracle home.

1. Start DBUA.

DBUA opens the Select Database window.

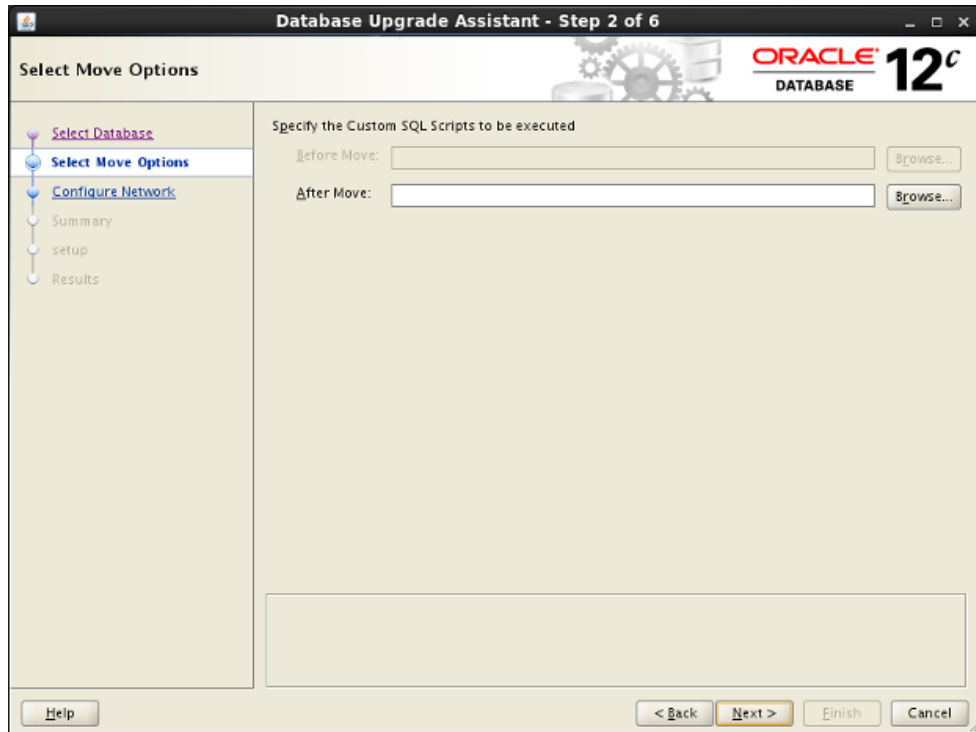
All databases on the server are listed. DBUA indicates the type of operation that you can perform for each database (upgrade, move, in place), depending on the database release and location.



Select a database that you want to move to the new Oracle home. If you have not enabled operating system authentication for the database, then provide the SYSDBA user name and password for the database that you select.

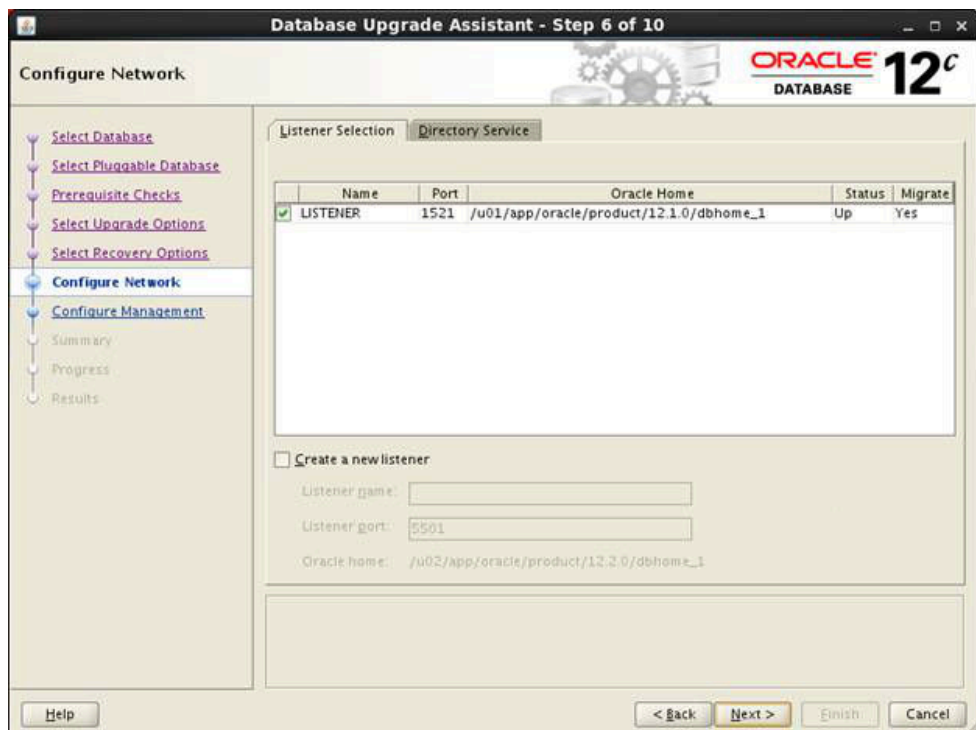
Click **Next**. The Move Database Options window appears.

- In the Select Move Options window, you can specify custom SQL scripts that you want to run after moving the database, and identify where the files are located.



Click **Next**. The Configure Network window appears.

- On single-instance systems, you can either select an existing listener, or create a new listener. If you create a new listener, then you must provide a listener name, and a port number for the listener.



Click **Next**. The Database Move Summary window appears.

4. Review the summary for the move operation and click **Next**. The Progress window appears, which shows DBUA processes as it moves the database.
5. When the move operation completes, click **Finish**.

3.3.7 Using DBUA in Silent Mode to Upgrade Oracle Database

When you start DBUA with the `-silent` command line option, DBUA operates in silent mode. In silent mode, DBUA does not present a user interface. DBUA writes messages (including information, errors, and warnings) to a log file in `ORACLE_HOME/cfgtools/dbua/upgradesession_timestamp`, where `session_timestamp` represents the timestamp for the upgrade that DBUA has run. Oracle strongly recommends that you read the resulting DBUA log files to ensure a successful upgrade.

[Running DBUA in Silent Mode](#) (page 3-27)

Use this procedure to start DBUA in noninteractive (or “silent”) mode.

[DBUA Command-Line Syntax for Silent Mode](#) (page 3-27)

Use this syntax to run Database Upgrade Assistant (DBUA) by using the `-silent` option.

3.3.7.1 Running DBUA in Silent Mode

Use this procedure to start DBUA in noninteractive (or “silent”) mode.

1. To start DBUA in silent mode, enter the `dbua -silent -sid` command. The command starts DBUA in silent mode, and identifies the database that you want to upgrade.

For example, enter the following command, where the database name is ORCL:

```
dbua -silent -sid ORCL &
```

3.3.7.2 DBUA Command-Line Syntax for Silent Mode

Use this syntax to run Database Upgrade Assistant (DBUA) by using the `-silent` option.

Purpose

When you run DBUA by using the command-line option, you can specify all valid DBUA options in a script form. The script form enables you to avoid entering configuration information in a graphic user interface dialog.

File Path

`$ORACLE_HOME/directory_name`

Syntax

```
dbua [ -silent ] [ -sid SID ] [-oracleHome Oraclehome_path_and_name] [-oracleBase Oraclebase_path_and_name]
[-asmsnmpPassword - password]
[-auditFileDest - Database_Audit_File_path]
[-backupLocation - backup_directory_filepath]
[-changeUserTablespacesReadOnly - [true | false]]
```

```

[-createGRP - true | false]
[-createListener - true | false] [- listener_name:listener_port]]
[-dbName - database_name]
[-dbsnmpPassword - password]
[-diagnosticDest - database_diagnostic_path]
[-disableArchiveLogMode - true | false]
[-disableUpgradeScriptLogging - true | false]
][-emConfiguration - [DBEXPRESS | CENTRAL | BOTH | NONE]
[-emExpressPort - port]
[-emPassword - password]
[-emUser - Enterprise_Manager_Admin_User]
[-enablePasswordProfile - true | false]
[-gatheringStatistics - true | false]
[-ignorePreReqs - true | false]
[-ignoreScriptErrors - true | false]
[-initParam - initname=value,initname=value,initname=value, . . .]
[-initParamsEscapeChar - character]
[-keepDeprecatedParams - true | false]
[-keepHiddenParams - true | false]
[-listeners -
listenerName:Oracle_home,listenerName:Oracle_home,listenerName:Oracle_home,. . .]
[-localRacSid - localSID]
[-logDir - custom_log_path]
[-newGlobalDbName - GlobalDBname](Oracle Express Edition upgrades only)
[-newSid - sid] (Oracle Express Edition upgrades only)
[-omsHost - Enterprise_Management_Server_Hostname]
[-omsPort - Enterprise_Management_Server_port]
[-oracleHome - Oracle_DB_Oracle_home]
[-oracleHomeUserPassword - Oracle_home_installation_owner_password]
[-pdbs - pdb-A,pdb-B,pdb-C, . . . | ALL | NONE]

[-pdbsWithPriority - pdb-A:1,pdb-B:2,pdb-C:3, . . . ]
[-performFixUp - true | false]
[-postUpgradeScripts - filepath/script1,filepath/script2, . . .]
[-preUpgradeScripts - filepath/script1,filepath/script2, . . .]

[-recompile_invalid_objects - true | false]
[-sid - SID]
[-sysDBAPassword - SYSDBA_UserName_password]
[-sysDBAUserName - SYSDBA_UserName_password]
[-upgrade_parallelism - cpu_number_for_parallel_upgrade]
[-upgradeTimezone - true | false]
[-useExistingBackup - true | false]
[-useGRP - true | false]
    
```

Options

The following table lists DBUA command-line options:

Table 3-2 DBUA Command-Line Syntax for Silent Mode

| Command Option | Description |
|------------------|---|
| -asmsnmpPassword | Specifies the password for the ASMSNMP user. |
| -auditFileDest | Specifies the Oracle Database Audit File Destination. |

Table 3-2 (Cont.) DBUA Command-Line Syntax for Silent Mode

| Command Option | Description |
|--------------------------------|--|
| -backupLocationoption | Specifies the directory where you want your database backed up before starting the upgrade. |
| -changeUserTablespacesReadOnly | Options <code>true</code> <code>false</code> . When <code>true</code> , changes the user tablespaces to read-only during the upgrade. |
| -createGRP | When <code>true</code> , specifies that DBUA creates a guaranteed restore point when the database is in archive log and flashback mode. |
| -createListener | Options <code>true</code> <code>false</code> . When <code>true</code> , specifies to create a listener in the new Oracle home release. Provide the listener name and port in the format <code>listener_name:listener_port</code> |
| -dbName | Specifies the database name that you want to upgrade. |
| -dbsnmpPassword | Specifies the DBSNMP user password |
| -diagnosticDest | Specifies the Oracle Database Diagnostic Destination |
| -disableArchiveLogMode | Options <code>true</code> <code>false</code> . When <code>true</code> , turns off Archiving and Flashback Logging during the upgrade. |
| -disableUpgradeScriptLogging | Options <code>true</code> <code>false</code> . By default, this option is <code>true</code> . When set to <code>false</code> , disables the detailed log generation for running SQL scripts during the upgrade process. |
| -emConfiguration | Options <code>DBEXPRESS</code> <code>CENTRAL</code> <code>BOTH</code> <code>NONE</code> . Specify the type of Oracle Enterprise Manager deployment that you want to implement with the upgrade. |
| -emExpressPort | Specifies the Enterprise Manager Express port. |
| -emPassword | Specifies the Enterprise Manager Administrator user password. |
| -emUser | Specifies the Enterprise Manager user with Administrator privileges to add or modify targets. |

Table 3-2 (Cont.) DBUA Command-Line Syntax for Silent Mode

| Command Option | Description |
|-------------------------------------|--|
| <code>-enablePasswordProfile</code> | When <code>true</code> , enables the password profile for administrative users as part of the database upgrade. |
| <code>-gatheringStatistics</code> | Options <code>true</code> <code>false</code> . When <code>true</code> , DBUA gathers database statistics before upgrading the database. |
| <code>-ignorePreReqs</code> | Options <code>true</code> <code>false</code> . When <code>true</code> , DBUA ignores error conditions in pre-upgrade checks. |
| <code>-ignoreScriptErrors</code> | Options <code>true</code> <code>false</code> . When <code>true</code> , DBUA ignores ORA- errors when you run custom scripts. |
| <code>-initParam</code> | Specifies a comma-delimited list of initialization parameter values, using the format <code>name=value, name=value</code> |
| <code>-initParamsEscapeChar</code> | Specifies an escape character for commas when an initialization parameter has multiple values. If you do not specify an escape character, then the default escape character is a backslash [<code>/</code>]. |
| <code>-keepDeprecatedParams</code> | Options <code>true</code> <code>false</code> . When <code>true</code> , DBUA retains deprecated parameters during database upgrade. |
| <code>-keepHiddenParams</code> | Options <code>true</code> <code>false</code> . When <code>true</code> , DBUA retains hidden parameters during database upgrade. |

Table 3-2 (Cont.) DBUA Command-Line Syntax for Silent Mode

| Command Option | Description |
|----------------------------|--|
| -listeners | <p>Migrates and registers specified existing earlier-release listeners with the upgraded database. Specify listeners using one of the following options: listener names, or a comma-delimited list in the format <i>listenerName:Oraclehome</i>.</p> <ul style="list-style-type: none"> A comma-delimited list of listener names, in the following format: <code>-listenerName1, listenerName2, listenerName3</code> A comma-delimited list of listener names qualified by Oracle homes, in the following format: <code>-listeners listenerName1:Oracle_home_path, -listeners listenerName2:Oracle_home_path</code> <p>When you select this option, DBUA searches for the specified listeners in the following order: In the Oracle Grid Infrastructure home (Grid home), in the target home, and then in the source home.</p> |
| -localListenerWithoutAlias | Sets LOCAL_LISTENER without using the TNS alias. |
| -localRacSid | If the Oracle RAC database is not registered in the cluster Oracle Cluster Registry (OCR), then this option specifies the local System Identifier (SID) of an Oracle Real Application Clusters (Oracle RAC) database. |
| -logDir | Specifies the path to a custom log directory. |
| -newGlobalDbName | Specifies a new Global Database Name. You can use this option only with Oracle Express Edition upgrades. |
| -newSid | Specifies a new System Identifier (SID). You can use this option only with Oracle Express Edition upgrades. |
| -omsHost | Specifies the Oracle Enterprise Manager management server host name. |
| -omsPort | Specifies the Oracle Enterprise Manager management server port number. |
| -oracleHome | Specifies the Oracle home path of the database. |

Table 3-2 (Cont.) DBUA Command-Line Syntax for Silent Mode

| Command Option | Description |
|---|---|
| <code>-oracleHomeUserPassword</code> | Specifies the password for the Oracle installation owner for the Oracle Database that you are upgrading. |
| <code>-pdbs</code> | Specifies which PDBs are upgraded. Specify your choice with the following options: <ul style="list-style-type: none"> • A comma-delimited list of the names of pluggable databases (PDBs) that you want DBUA to upgrade with the CDB. • <code>ALL</code>, which designates that you want all the PDBs upgraded with the CDB. • <code>NONE</code>, which designates that you want only the CDB upgraded. None of the PDBs are upgraded. |
| <code>-pdbsWithPriority</code> | Specifies the priority order in which you want DBUA to upgrade PDBs. Specify the priority order with a comma-delimited list of pluggable database (PDB) names in the following format, where 1 is the top priority: <code>pdb-A:1,pdb-B:2,pdb-C:3</code> . In this example, PDB-A is upgraded first, and <code>pdb-C</code> is upgraded last. |
| <code>-performFixUp</code> | Options <code>true false</code> . When <code>true</code> , DBUA is enabled to perform fixups during silent upgrade mode. |
| <code>-postUpgradeScripts</code> | Specifies SQL scripts that you want to run after DBUA completes the upgrade. Provide a comma-delimited list of scripts with their complete file paths. |
| <code>preUpgradeScripts</code> | Specifies SQL scripts that you want to run before DBUA completes the upgrade. Provide a comma-delimited list of SQL scripts with their complete filepaths. |
| <code>-recompile_invalid_objects</code> | Options <code>true false</code> . When <code>true</code> , DBUA recompiles invalid objects as part of the upgrade. |
| <code>-sid</code> | Specifies the system identifier (SID) of the database that you want to upgrade. |
| <code>-sysDBAPassword</code> | Specifies the password for the user name you designate as the SYSDBA privileges user with <code>sysDBAUserName</code> . |
| <code>-sysDBAUserName</code> | Specifies a user name that is granted the SYSDBA system privilege for the database. |

Table 3-2 (Cont.) DBUA Command-Line Syntax for Silent Mode

| Command Option | Description |
|----------------------|---|
| -upgrade_parallelism | Specifies the number of CPUs that you want DBUA to use for parallel upgrading. |
| -upgradeTimezone | Options true false. When true, DBUA upgrades the Oracle Database time zone files. |
| -useExistingBackup | When true, specifies that DBUA uses an existing RMAN backup to restore the database. |
| -useGRP | Options true false. When true, specifies that DBUA uses a named guaranteed restore point to restore the database. |

Examples**Example 3-3 Selecting a Database for Upgrade with DBUA**

The following command selects the database `orcl` for upgrade:

```
dbua -sid orcl
```

Note:

You can use DBUA commands to set passwords. If the default Oracle Database security settings are in place, then passwords must be at least eight characters, and passwords such as `welcome` and `oracle` are not allowed.

Example 3-4 Selecting a Database for Upgrade with DBUA Using Noninteractive ("Silent") Option

The following command selects the database `orcl` for upgrade using the noninteractive ("silent") option:

```
dbua -silent -sid orcl
```

See Also:

Oracle Database Security Guide for more information about default Oracle Database security settings

3.4 Upgrade Scenarios for Non-CDB Oracle Databases

Review these topics to understand the upgrade scenarios and procedures for non-CDB Oracle Databases

Note:

Starting with Oracle Database 12c, release 1 (12.1), non-CDB architecture is deprecated. It can be desupported in a future release. Oracle Database deployed with the multitenant architecture is the default configuration option. All Oracle Database releases earlier than Oracle Database 12c release 1 (12.1.0.1) use non-CDB architecture.

Caution:

You cannot downgrade a database after you have set the compatible initialization parameter to 12.1.0.2. Only if the compatibility is set to 12.1.0.1 will a downgrade be possible for a pluggable database (PDB), and there may still be restrictions on downgrading.

Oracle strongly recommends that you upgrade your source and target databases to the most recent bundle patch or patch set update (BP or PSU) before starting an upgrade, and before starting a downgrade.

[About Upgrading Non-CDB Oracle Databases](#) (page 3-34)

You can upgrade non-CDB Oracle Databases using either Oracle Database Upgrade Assistant (DBUA), or using a manual upgrade procedure.

[Manually Upgrading Non-CDB Architecture Oracle Databases](#) (page 3-35)

This procedure provides steps for upgrading non-CDB architecture Oracle Databases.

[Upgrading a Non-CDB Oracle Database To a PDB on a CDB](#) (page 3-40)

Use this procedure to upgrade an earlier release non-CDB architecture Oracle Database, making it a Pluggable Database (PDB) and plugging the PDB into a container database (CDB).

[Upgrading a Non-CDB Oracle Database Using Rapid Home Provisioning](#) (page 3-42)

Starting with Oracle Database 12c release 2 (12.2), you can use Rapid Home Provisioning (RHP) to upgrade an earlier release Non-CDB Oracle Database.

[Variables for Using ORADIM When Upgrading Oracle Database on Windows](#) (page 3-46)

Review these variables if you want to use the ORADIM utility for upgrading Oracle Database on Windows systems.

3.4.1 About Upgrading Non-CDB Oracle Databases

You can upgrade non-CDB Oracle Databases using either Oracle Database Upgrade Assistant (DBUA), or using a manual upgrade procedure.

A non-CDB architecture Oracle Database cannot use the multitenant architecture, and does not contain pluggable databases (PDBs). You can upgrade the database either by using Oracle Database Upgrade Assistant (DBUA), or by performing a manual upgrade.

Related Topics:

[Upgrading with Oracle Database Upgrade Assistant \(DBUA\)](#) (page 3-11)

[Manually Upgrading Non-CDB Architecture Oracle Databases](#) (page 3-35)

[Downgrading Oracle Database to an Earlier Release](#) (page 6-1)

3.4.2 Manually Upgrading Non-CDB Architecture Oracle Databases

This procedure provides steps for upgrading non-CDB architecture Oracle Databases.

Note:

Starting with Oracle Database 12c, release 1 (12.1), non-CDB architecture is deprecated. It can be desupported in a future release.

You must complete the following steps before using this procedure:

- Install the software for Oracle Database 12c
 - Prepare the new Oracle home
 - Run the Pre-Upgrade Information Tool
1. If you have not done so, run the Pre-Upgrade Information Tool. Review the Pre-Upgrade Information tool output and correct all issues noted in the output before proceeding.
 2. Ensure that you have a proper backup strategy in place.
 3. If you have not done so, prepare the new Oracle home.
 4. (Conditional) For Oracle RAC environments only, enter the following commands to set the initialization parameter value for CLUSTER_DATABASE to FALSE:

```
ALTER SYSTEM SET CLUSTER_DATABASE=FALSE SCOPE=SPFILE;
```

5. Shut down the database. For example:


```
SQL> SHUTDOWN IMMEDIATE
```
6. If your operating system is Windows, then complete the following steps:
 - a. Stop the OracleServiceSID Oracle service of the database you are upgrading, where SID is the instance name. For example, if your SID is ORCL, then enter the following at a command prompt:


```
C:\> NET STOP OracleServiceORCL
```
 - b. Delete the Oracle service at a command prompt using ORADIM. Refer to your platform guide for a complete list of the ORADIM syntax and commands. For example, if your SID is ORCL, then enter the following command.


```
C:\> ORADIM -DELETE -SID ORCL
```
 - c. Create the service for the new release Oracle Database at a command prompt using the ORADIM command of the new Oracle Database release.

For example:

```
C:\> ORADIM -NEW -SID SID -SYSPWD PASSWORD -MAXUSERS USERS
      -STARTMODE AUTO -PFILE ORACLE_HOME\DATABASE\INITSID.ORA
```

Most Oracle Database services log on to the system using the privileges of the Oracle software installation owner. The service runs with the privileges of this user. The ORADIM command prompts you to provide the password to this user account. You can specify other options using ORADIM.

In the following example, if your *SID* is ORCL, your *password* (SYSPWD) is TWxy5791, the maximum number of users (MAXUSERS) is 10, and the Oracle home path is C:\ORACLE\PRODUCT\12.2.0\DB, then enter the following command:

```
C:\> ORADIM -NEW -SID ORCL -SYSPWD TWxy5791 -MAXUSERS 10
      -STARTMODE AUTO -PFILE C:\ORACLE\PRODUCT\12.2.0\DB\DATABASE\INITORCL.ORA
```

ORADIM writes a log file to the ORACLE_HOME\database directory. The log file contains the name of the PDB in the multitenant container database.

Note: If you use an Oracle Home User account to own the Oracle home, then the ORADIM command prompts you for that user name and password.

7. If your operating system is Linux or UNIX, then perform the following checks:
 - a. Your ORACLE_SID is set correctly
 - b. The oratab file points to the new Oracle home
 - c. The following environment variables point to the new Oracle Database directories:
 - ORACLE_HOME
 - PATH
 - d. Any scripts that clients use to set the \$ORACLE_HOME environment variable must point to the new Oracle home.

Note:

If you are upgrading an Oracle Real Application Clusters database, then perform these checks on all Oracle Grid Infrastructure nodes where the Oracle Real Application Clusters database has instances configured.

See Also:

Oracle Database and Oracle Clusterware installation guides for your platform to obtain operating system-specific information about setting environment variables.

8. Log in to the system as the Oracle installation owner for the new Oracle Database release.
9. Start SQL*Plus in the new Oracle home from the path *oracle_home/rdbms/admin* directory.

For example:

```
$ cd $ORACLE_HOME/rdbms/admin
$ pwd
/u01/app/oracle/product/12.2.0/dbhome_1/rdbms/admin
$ SQLPLUS
```

10. Copy the SPFILE.ORA or INIT.ORA file from the old Oracle home to the new Oracle home.
11. Connect to the database that you want to upgrade using an account with SYSDBA privileges:

```
SQL> CONNECT / AS SYSDBA
```

12. Start the non-CDB Oracle Database in upgrade mode:

```
SQL> startup upgrade
```

If errors appear listing desupported initialization parameters, then make a note of the desupported initialization parameters and continue with the upgrade. Remove the desupported initialization parameters the next time you shut down the database.

Note:

Starting up the database in UPGRADE mode enables you to open a database based on an earlier Oracle Database release. It also restricts log-ins to AS SYSDBA sessions, disables system triggers, and performs additional operations that prepare the environment for the upgrade.

13. Exit SQL*Plus.

For example:

```
SQL> EXIT
```

14. Run the Parallel Upgrade Utility (`catctl.pl`) script, using the upgrade options that you require for your upgrade.

Starting with Oracle Database 12c release 2 (12.2), you can run the Parallel Upgrade Utility as a command-line shell command by using the `dbupgrade` shell command. For example:

```
$ ./dbupgrade -oracleHome /u01/app/oracle/12.1.0/dbhome_1
```

Note:

- When you run the Parallel Upgrade Utility command, use the `-d` option to specify the directory that contains the files you want to process, and use the `-l` option to specify the directory you want to use for spool log files.
-
-

15. The upgraded database is shut down after running the Parallel Upgrade Utility command. Restart the instance to reinitialize the system parameters for normal operation. For example:

```
SQL> STARTUP
```

This restart, following the database shutdown performed as part of the Parallel Upgrade Utility script, flushes all caches, clears buffers, and performs other housekeeping activities. These measures are an important final step to ensure the integrity and consistency of the upgraded Oracle Database software.

Note:

If you encountered a message listing desupported initialization parameters when you started the database, then remove the desupported initialization parameters from the parameter file before restarting. If necessary, convert the SPFILE to a PFILE, so that you can edit the file to delete parameters.

16. Run `catcon.pl` to start `utlrlp.sql`, and to recompile any remaining stored PL/SQL and Java code.

For example:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b utlrlp -d ''.''' utlrlp.sql
```

Because you run the command using `-b utlrlp`, the log file `utlrlp0.log` is generated as the script is run. The log file provides results of the recompile.

17. Run `postupgrade_fixups.sql`. For example:

```
SQL> @postupgrade_fixups.sql
```

18. Run `utlu122s.sql` to verify that all issues have been fixed.

For example:

```
SQL> @$ORACLE_HOME/rdbms/admin/utlu122s.sql
```

The log file `utlu122s0.log` is generated as the script is run, which provides the upgrade results. You can also review the upgrade report in `upg_summary.log`.

To see information about the state of the database, run `utlu122s.sql` as many times as you want, at any time after the upgrade is completed. If the `utlu122s.sql` script returns errors, or shows components that do not have the status `VALID`, or if the version listed for the component is not the most recent release, then refer to the troubleshooting section in this guide.

19. Ensure that the time zone data files are current by using the `DBMS_DST` PL/SQL package to upgrade the time zone file. You can also make this adjustment after the upgrade. If you update the time zone, then you must update the time zone in both `CDB$ROOT` and the PDBs. You can also make this adjustment after the upgrade.

20. Exit from SQL*Plus

For example:

```
SQL> EXIT
```

21. (Conditional) If you are upgrading an Oracle Real Application Clusters database, then use the following command syntax to upgrade the database configuration in Oracle Clusterware:

```
srvctl upgrade database -db db-unique-name -oraclehome oraclehome
```

where `db-unique-name` is the database name assigned to it (not the instance name), and `oraclehome` is the Oracle home location in which the database is

being upgraded. The SRVCTL utility supports long GNU-style options, in addition to short CLI options used in earlier releases.

22. (Conditional) For Oracle RAC environments only, after you have upgraded all nodes, enter the following commands to set the initialization parameter value for CLUSTER_DATABASE to TRUE, and start the database, where *db_unique_name* is the name of the Oracle RAC database:

```
ALTER SYSTEM SET CLUSTER_DATABASE=TRUE SCOPE=SPFILE;  
srvctl start database -db db_unique_name
```

Your database is now upgraded. You are ready to complete post-upgrade procedures.

Note:

Oracle Warehouse Builder (OWB) components are not upgraded as part of the Oracle Database upgrade process. Oracle Warehouse Builder is not installed as part of Oracle Database 12c.

Caution:

If you retain the old Oracle software, then never start the upgraded database with the old software. Only start Oracle Database using the start command in the new Oracle Database home.

Before you remove the old Oracle environment, relocate any data files in that environment to the new Oracle Database environment.

See Also:

Oracle Database Administrator's Guide for information about relocating data files

Related Topics:

[Using the Pre-Upgrade Information Tool for Oracle Database](#) (page 2-35)

[Pre-Upgrade Information Tool Warnings and Recommendations for Oracle Database](#) (page 2-42)

[Backing Up Oracle Database for Upgrading](#) (page 3-2)

[Installing the New Oracle Database Software](#) (page 2-15)

[Preparing the New Oracle Home for Upgrading](#) (page 2-32)

[Variables for Using ORADIM When Upgrading Oracle Database on Windows](#) (page 3-46)

[Parallel Upgrade Utility \(catctl.pl\) Parameters](#) (page 3-6)

[General Steps for Running the Parallel Upgrade Utility](#) (page 3-4)

[Running the postupgrade_fixups.sql Script](#) (page 4-20)

[Troubleshooting the Upgrade for Oracle Database](#) (page 3-95)

[Post-Upgrade Tasks for Oracle Database](#) (page 4-1)

[Requirement for Upgrading Databases that Use Oracle Warehouse Builder \(OWB\)](#) (page 2-82)

3.4.3 Upgrading a Non-CDB Oracle Database To a PDB on a CDB

Use this procedure to upgrade an earlier release non-CDB architecture Oracle Database, making it a Pluggable Database (PDB) and plugging the PDB into a container database (CDB).

You can upgrade earlier releases of Oracle Database using either DBUA or the Parallel Upgrade Utility, and then make the upgraded database a Pluggable Database (PDB). You can then plug the upgraded database into a multitenant container database (CDB).

The following procedure assumes the following conditions:

- You have completed all pre-upgrade procedures described in Oracle Database documentation for your operating system.
- The earlier database and the upgraded database are located on the same system.
- The data files remain in the same location before and after upgrade.

If the data files have been copied to a different location (for example, stored with Oracle ASM), then you must specify the parameter `SOURCE_FILE_NAME_CONVERT` in step 8.

1. Install the new Oracle Database 12c software.
2. Upgrade the database as described in this guide.
3. Set the `COMPATIBLE` parameter to 12.0.0, if you have not already done so as part of the upgrade process.
4. Use the following SQL command to ensure that the database is in read-only mode:

```
SQL> startup mount
SQL> alter database open read only;
```

5. Ensure that the prerequisites for plugging an unplugged PDB are met.
6. Create the XML file for the PDB. The root name for the XML file matches the name of the PDB. In the following syntax example, the value for *path* is the location where the XML is saved, and *myPDB.xml* is the name of the pluggable database file. You can choose where you want to place the file.

```
SQL> exec DBMS_PDB.DESCRIBE('path/myPDB.xml');
```

For example, where *path* is `/home/oracle`, and *myPDB* is `salespdb`:

```
SQL> exec DBMS_PDB.DESCRIBE('/home/oracle/salespdb.xml');
```

7. Use the following command to shut down the database in the old (source) Oracle home:

```
SQL> SHUTDOWN IMMEDIATE
```

8. Change directory to the new Oracle home, and run the `DBMS_PDB.CHECK_PLUG_COMPATIBILITY` function.

When you run the function, set the following parameters:

- `pdb_descr_file` Set this parameter to the full path to the XML file.
- `pdb_name` Specify the name of the new PDB. If this parameter is omitted, then the PDB name in the XML file is used.

For example, to determine if a PDB described by the file `/disk1/usr/salespdb.xml` is compatible with the current CDB, run the following PL/SQL block from the new Oracle home:

```
sqlplus / as sysdba
SQL> set serveroutput on
SQL> r
 1 DECLARE
 2     compatible CONSTANT VARCHAR2(3) :=
 3 CASE DBMS_PDB.CHECK_PLUG_COMPATIBILITY(
 4     pdb_descr_file => '/home/oracle/ORAOP2.xml',
 5     pdb_name       => 'SALESPDB')
 6 WHEN TRUE THEN 'YES'
 7 ELSE 'NO'
 8 END;
 9 BEGIN
10     DBMS_OUTPUT.PUT_LINE(compatible);
11* END;
YES
```

PL/SQL procedure successfully completed.

If the output is `YES`, then the PDB is compatible, and you can continue with the next step.

If the output is `NO`, then the PDB is not compatible, and you can check the `PDB_PLUG_IN_VIOLATIONS` view to see why it is not compatible.

9. Use the following command syntax to create the pluggable database, and to plug the database into the CDB:

```
SQL> CREATE PLUGGABLE DATABASE SALESPDB USING 'pathmyPDB.xml' NOCOPY TEMPFILE
REUSE;
```

The following example shows the command to create the pluggable database `salespdb`:

```
SQL> CREATE PLUGGABLE DATABASE salespdb USING '/home/oracle/salespdb.xml' NOCOPY
TEMPFILE REUSE;
```

You can use any name for your PDB, but the name you use must be unique within this CDB. `TEMPFILE REUSE` specifies that the existing `TEMP` tablespaces can be reused.

When this SQL command completes, the following message should appear:

```
Pluggable database created.
```

The upgraded database is now a PDB, and it is ready for you to place in a CDB.

Caution:

Oracle strongly recommends that you have a valid backup in place before you use the NOCOPY option. If this command fails, for whatever reason, then your database can become damaged and unrecoverable.

10. Connect to the PDB using the following command:

```
SQL> ALTER SESSION set container=salespdb;
```

11. Convert the dictionary to the PDB type. From the admin directory, run the `noncdb_to_pdb.sql` script. You must run this script before you can open the PDB for the first time.

For example:

```
@$ORACLE_HOME/rdbms/admin/noncdb_to_pdb.sql
```

Note:

Be aware that the runtime of this script can vary from several minutes to over an hour, depending on the number and type of objects in the new PDB dictionary that must be converted.

12. Start up and open the new PDB in read/write mode. You must open the new PDB in read/write mode for Oracle Database to complete the integration of the new PDB into the CDB.

For example, because you have already set the PDB container to `salespdb`, enter the following command to start the PDB:

```
SQL> STARTUP
```

13. Back up the PDB with RMAN (Recovery Manager).

Oracle strongly recommends that you perform a backup of the PDB using RMAN, because you can no longer use the ARCHIVELOG and backups that you took from the database before converting it to a PDB.

Caution:

You must perform an immediate backup to ensure recoverability.

Related Topics:

Oracle Database Backup and Recovery User's Guide

Oracle Database Administrator's Guide

[The COMPATIBLE Initialization Parameter in Oracle Database](#) (page 1-12)

Review to understand how to set the COMPATIBLE initialization parameter for non-CDB and multitenant architecture containers.

3.4.4 Upgrading a Non-CDB Oracle Database Using Rapid Home Provisioning

Starting with Oracle Database 12c release 2 (12.2), you can use Rapid Home Provisioning (RHP) to upgrade an earlier release Non-CDB Oracle Database.

You upgrade a database with Rapid Home Provisioning by creating a working copy of Oracle Database 12.2.0.1, and using the command `rhptl upgrade database` to upgrade the earlier release Oracle Database. The upgrade is an out-of-place upgrade. After the upgrade is complete, listeners and other initialization variables are set to point to the new Oracle home.

Note:

To use Rapid Home Provisioning, you must upgrade an Oracle Database that is Oracle Database 11g release 2 (11.2.0.3), or a later release. Install the new release of Oracle Database, and then create a gold image from that new release.

Use this overview of the steps to understand how to upgrade a non-CDB Oracle Database 11g release 2 (11.2.0.3) by using Rapid Home Provisioning:

1. Install an Oracle Database 12c release 2 (12.2) Oracle Database.
2. Patch, test, and configure the database to your specifications for a standard operating environment (SOE).
3. Create an RHP Gold Image from the SOE release 12.2 Oracle Database home.
4. Complete an Oracle Grid Infrastructure 12c release 2 (12.2) upgrade on the servers where the databases you want to upgrade are located. You can complete this upgrade by using Rapid Home Provisioning.
5. Deploy a working copy of the release 12.2 Oracle Database RHP gold image to the servers with release 11.2.0.3 Oracle Databases that you want to upgrade.
6. Run the Rapid Home Provisioning command `rhptl upgrade database`. This command use the 12.2 RHP gold image to upgrade the earlier release databases. You can upgrade one, many or all the Oracle Database 11.2.0.3 instances on the servers provisioned with Oracle Database 12c release 2 (12.2) gold images.

Example 3-5 Upgrading Non-CDB 11.2.0.3 to 12.2.0.1 PDB on a CDB

This example shows the command and the screen output for an upgrade from Oracle Database 11g release 2 (11.2.0.3) to Oracle Database 12c releases 2 (12.2.0.1):

```
[Wed Jun 01 02:19:43][gridusr@example.com:/u01/app/grid/bin]$ date;./rhptl add
workingcopy -workingcopy db12c -image db12c -oraclebase /u01/app/oraInventory -user
dbusr -node node3 -root -path /u01/app/rachome/122/dbhome_1 -storagetype LOCAL
Wed Jun  1 03:15:03 PDT 2016
Enter user "root" password:
server17.example.com: Storing metadata in repository for working copy "db12c" ...
server17.example.com: Connecting to node node3 ...
server17.example.com: Starting transfer for remote copy ...
server17.example.com: Starting clone operation...
server17.example.com: Using inventory file /etc/oraInst.loc to clone ...
server13: Starting Oracle Universal Installer...
server13:
server13: Checking Temp space: must be greater than 500 MB.   Actual 13485 MB
Passed
server13: Checking swap space: must be greater than 500 MB.   Actual 13653 MB
Passed
server13: Preparing to launch Oracle Universal Installer from /tmp/
```

```
OraInstall2016-06-01_10-20-22AM. Please wait ...You can find the log of this install
session at:
server13: /u01/app/rachome/oraInventory/logs/cloneActions2016-06-01_10-20-22AM.log
server13: ..... 5% Done.
server13: ..... 10% Done.
server13: ..... 15% Done.
server13: ..... 20% Done.
server13: ..... 25% Done.
server13: ..... 30% Done.
server13: ..... 35% Done.
server13: ..... 40% Done.
server13: ..... 45% Done.
server13: ..... 50% Done.
server13: ..... 55% Done.
server13: ..... 60% Done.
server13: ..... 65% Done.
server13: ..... 70% Done.
server13: ..... 75% Done.
server13: ..... 80% Done.
server13: ..... 85% Done.
server13: .....
server13: Copy files in progress.
server13:
server13: Copy files successful.
server13:
server13: Link binaries in progress.
server13:
server13: Link binaries successful.
server13:
server13: Setup files in progress.
server13:
server13: Setup files successful.
server13:
server13: Setup Inventory in progress.
server13:
server13: Setup Inventory successful.
server13:
server13: Finish Setup successful.
server13: The cloning of db12c was successful.
server13: Please check '/u01/app/rachome/oraInventory/logs/
cloneActions2016-06-01_10-20-22AM.log' for more details.
server13:
server13: Setup Oracle Base in progress.
server13:
server13: Setup Oracle Base successful.
server13: ..... 95% Done.
server13:
server13: As a root user, execute the following script(s):
server13: 1. /u01/app/rachome/122/dbhome_1/root.sh
server13:
server13:
server13: ..... 100% Done.
server17.example.com: Successfully executed clone operation.
server17.example.com: Executing root script on nodes server13.
server13: Check /u01/app/rachome/122/dbhome_1/install/
root_node3_2016-06-01_10-22-13-284882809.log for the output of root script
server17.example.com: Successfully executed root script on nodes server13.
server17.example.com: Working copy creation completed.
```

```
[crsusr@rwsdcvm17 bin]$ date;./rhpctl upgrade database -sourcehome /u01/app/rachome/
dbusr/product/11.2.0/dbhome_1 -destwc wcldb12c -dbname t2db -root -targetnode
node33Wed Jun 1 05:38:52 PDT 2016
Enter user "root" password:
server17.example.com: Connecting to node node3 ...
server17.example.com: Starting to upgrade database from path "/u01/app/rachome/dbusr/
product/11.2.0/dbhome_1" to path "/u01/app/rachome/122/dbhome_2" on node "node3"
server13: Logs directory: /u01/app/oraInventory/cfgtoollogs/dbua/
upgrade2016-06-01_12-38-46-PM
server13: Preupgrade generated files:
server13: /u01/app/oraInventory/cfgtoollogs/dbua/upgrade2016-06-01_12-38-46-PM/
t2db/preupgrade.log
server13: /u01/app/oraInventory/cfgtoollogs/dbua/upgrade2016-06-01_12-38-46-PM/
t2db/preupgrade_fixups.sql
server13: /u01/app/oraInventory/cfgtoollogs/dbua/upgrade2016-06-01_12-38-46-PM/
t2db/postupgrade_fixups.sql
server13: Gathering Dictionary Statistics
server13: 12% complete
server13: Pre Upgrade Step
server13: 15% complete
server13: 25% complete
server13: Configure Database in 12.2.0.1.0 Oracle Home
server13: 37% complete
server13: Database Components Upgrade
server13: 37% complete
server13: 38% complete
server13: 38% complete
server13: 38% complete
server13: 38% complete
server13: 39% complete
server13: 39% complete
server13: 39% complete
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server13: 45% complete
server13: 45% complete
server13: 45% complete
server13: 45% complete
server13: 46% complete
server13: 46% complete
server13: 46% complete
```

```
server13: 47% complete
server13: 47% complete
server13: 47% complete
server13: 47% complete
server13: 48% complete
server13: 48% complete
server13: 48% complete
server13: 48% complete
server13: 49% complete
server13: 49% complete
server13: 49% complete
server13: 49% complete
server13: 50% complete
server13: Recompile Invalid Objects
server13: 62% complete
server13: Timezone Upgrade
server13: 75% complete
server13: Executing Post Upgrade Tasks
server13: 76% complete
server13: 77% complete
server13: 87% complete
server13: Generate Summary
server13: Database upgrade has been completed successfully, and the database is
ready to use.
server13: 100% complete
server17.example.com: Completed the upgrade database operation

[Wed Jun 01 07:51:58][dbusr@server13:/u01/app/rachome/122/dbhome_2/bin][1]$ export
ORACLE_HOME=/u01/app/rachome/122/dbhome_2
[Wed Jun 01 07:52:38][dbusr@node3:/u01/app/rachome/122/dbhome_2/bin][0]$ export
ORACLE_SID=t2db
[Wed Jun 01 07:52:59][dbusr@node3:/u01/app/rachome/122/dbhome_2/bin][0]$ ./sqlplus /
as sysdba

SQL*Plus: Release 12.2.0.1.0 Production on Wed Jun 1 07:53:19 2016

Copyright (c) 1982, 2016, Oracle. All rights reserved.

Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit Production

SQL>
```

3.4.5 Variables for Using ORADIM When Upgrading Oracle Database on Windows

Review these variables if you want to use the ORADIM utility for upgrading Oracle Database on Windows systems.

On Windows platforms, ORADIM provides a command-line interface to manually perform administrative tasks for Windows databases and services. Database Configuration Assistant (DBCA) provides a graphical user interface to perform the same tasks. The variables for ORADIM that you must know about when upgrading Oracle Database include the SID of the database you are upgrading, the new Oracle home location, and the password for the new database instance. Also, ORADIM writes a log file to the ORACLE_HOME\database directory.

The following table describes the variables for using ORADIM when upgrading:

Table 3-3 ORADIM Variables and Functions

| ORADIM Variable | Description |
|--------------------|--|
| <i>SID</i> | The same SID name as the SID for the database that you are upgrading |
| <i>PASSWORD</i> | The password for the new Oracle Database 12c database instance. This is the password for the user connected with SYSDBA privileges. The -SYSPWD option is required. The default Oracle Database 12c security settings require that passwords must be at least eight characters. You are not permitted to use passwords such as <code>welcome</code> and <code>oracle</code> . |
| <i>USERS</i> | The password for the new Oracle Database 12c database instance. This is the password for the user connected with SYSDBA privileges. The -SYSPWD option is required. The default Oracle Database 12c security settings require that passwords must be at least eight characters. You are not permitted to use passwords such as <code>welcome</code> and <code>oracle</code> . |
| <i>ORACLE_HOME</i> | The Oracle home location for Oracle Database 12c. Ensure that you specify the full path name with the -PFILE option, including the drive letter of the Oracle home location. |

See Also:

Oracle Database Platform Guide for Microsoft Windows for complete information about using ORADIM to administer a database instance

Oracle Database Security Guide for more information about security settings.

Oracle Database Administrator's Guide for information about specifying initialization parameters at startup and the initialization parameter file

3.5 Example of Manual Upgrade of Windows Non-CDB Oracle Database 11.2.0.3

These examples show the steps to complete preupgrade checks, upgrade, and postupgrade checks for an Oracle Database 11g release 2 (11.2.0.3) upgrade to Oracle Database 12c release 2 (12.2).

The specific examples in these topics show an upgrade on the Microsoft Windows platform. They use tools specific to the Windows environment. However, these example provide an overview of a manual installation experience.

[Preparing to Upgrade Windows Non-CDB Using Command-Line Utilities](#) (page 3-48)

This example shows the preupgrade steps to carry out before upgrading a Non-CDB Oracle Database 11g release 2 (11.2.0.3) to a Non-CDB Oracle Database 12c release 2 (12.2).

[Manually Upgrading Windows Non-CDB Using Command-Line Utilities](#) (page 3-54)

These examples show upgrade steps to upgrade a Non-CDB Oracle Database 11g release 2 (11.2.0.3) to a Non-CDB Oracle Database 12c release 2 (12.2).

[Running Postupgrade Fixup Scripts After Upgrading from 11.2.0.1 to 12.2](#) (page 3-60)

These examples show the process of running the `postupgrade_fixups.sql` script for Non-CDB to Non-CDB upgrades.

3.5.1 Preparing to Upgrade Windows Non-CDB Using Command-Line Utilities

This example shows the preupgrade steps to carry out before upgrading a Non-CDB Oracle Database 11g release 2 (11.2.0.3) to a Non-CDB Oracle Database 12c release 2 (12.2).

This procedure provides an example of how to use command-line utilities to prepare your system to carry out a manual upgrade of a Non-CDB Oracle Database to a current release Non-CDB Oracle Database on Windows. In this example, the Oracle Database that you are upgrading is Oracle Database 11g release 2 (11.2.0.3). The upgrade is to Oracle Database 12c release 2 (12.2.0.1).

Log in as a user that is a member of the `ORA_DBA` group. Oracle recommends that you install Oracle Database 12c release 2 (12.2.0.1) binaries on the server. Refer to the Oracle Database installation guide for Windows to complete that procedure.

The Preupgrade consists of the following steps:

1. Reset the user environment variables from the 12.2 Oracle home to the 11.2.0.3 Oracle home for the Oracle Installation Owner User Account (Oracle user).
2. Test the connection to the 11.2.0.3 Oracle Database.
3. Run the Pre-Upgrade Information Tool on the 11.2.0.3 Oracle Database home.
4. Review the Pre-Upgrade Information Tool log (`preupgrade.log`). If there are `preupgrade_fixups.sql` scripts that you must run, then run them. In this example, we show manual fixes for the following errors:
 - Oracle Enterprise Manager is present (`em_present`).
 - The OLAP catalog is present (`amd_exists`).
 - The `ADMINISTER DATABASE TRIGGER` privilege must be granted (`trgowner_no_admndbtrg`).
 - Materialized views are not refreshed (`mv_refresh`).
 - Oracle Application Express is not upgraded (`apex_upgrade_msg`).
5. Run `preupgrade_fixups.sql` scripts.
6. Back up your database.

These examples use the following systems, paths, and users:

Oracle Database 11g release 2 (11.2.0.3)

- Oracle Installation Owner user account: `oracle1`, which is a member of the `ORA_DBA` group.
- Oracle home: `C:\app\oracle\product\11.2.0\dbhome_1`

Oracle Database 12c release 2 (11.2.0.3)

- Oracle Installation Owner user account: oracle2, which is a member of the ORA_DBA group.
- Oracle home: C:\app\oracle1\product\12.2.0\dbhome_1

Example 3-6 Resetting the User Environment Variables

This example shows how to change the environment variables from values set for the 12.2.0.1 installation:

```
C:\app\oracle1\product\12.2.0\dbhome_1\rdbms\admin>set ORACLE_HOME=C:\app
\oracle2\product\11.2.0\dbhome_1
C:\app\oracle1\product\12.2.0\dbhome_1\rdbms\admin>set ORACLE_SID=orcl11
```

Example 3-7 Testing the Connection to the Database

This example shows how to test the connection to the database, and ensure that you are connecting to the release 11.2.0.3 database that you want to upgrade.

```
C:\app\oracle1\product\12.2.0\dbhome_1\rdbms\admin>sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production on Tue Jul 5 12:14:49 2016

Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL> select version from v$instance;

VERSION
-----
11.2.0.3.0

SQL>
```

Example 3-8 Running the Pre-Upgrade Information Tool (preupgrade.jar)

This example shows how to run the tool using the command `java -jar %ORACLE_HOME12.2%\rdbms\admin\preupgrade.jar`.

The Preupgrade Information Tool prints the path to the log file, and prints the path to the fixup scripts. By default, these fixup scripts are placed in %ORACLE_BASE%.

```
C:\app\oracle1\product\12.2.0\dbhome_1\rdbms\admin>java -jar preupgrade.jar

Preupgrade generated files:
C:\app\oracle2\cfgtoollogs\orcl11\preupgrade\preupgrade.log
C:\app\oracle2\cfgtoollogs\orcl11\preupgrade\preupgrade_fixups.sql
C:\app\oracle2\cfgtoollogs\orcl11\preupgrade\postupgrade_fixups.sql
C:\app\oracle1\product\12.2.0\dbhome_1\rdbms\admin>
```

Example 3-9 Reviewing the Pre-Upgrade Information Tool Log (preupgrade.log)

In this example, the log file `preupgrade.log` is generated in the following path: `C:\app\oracle2\cfgtoollogs\orcl11\preupgrade\preupgrade.log`.

The log file can direct you to run some SQL fixup files manually. If it directs you to run SQL files, then copy these files to the earlier release 11.2.0.3 Oracle home, and then run the scripts.

Example 3-10 Running the Preupgrade Fixup SQL script (preupgrade_fixups.sql)

```
C:\app\oracle1\product\12.2.0\dbhome_1\rdbms\admin>sqlplus / as sysdba @C:\app
\oracle2\cfgtoollogs\orcl11\preupgrade\preupgrade_fixups.sql

SQL*Plus: Release 11.2.0.3.0 Production on Tue Jul 5 12:34:08 2016

Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

Executing Oracle PRE-Upgrade Fixup Script

Auto-Generated by:      Oracle Preupgrade Script
                        Version: 12.2.0.1.0 Build: 1
Generated on:          2016-07-05 12:18:06

Source Database:       ORCL11
Source Database Version: 11.2.0.3.0
For Upgrade to Version: 12.2.0.1.0
                        Fixup

Check Name              Status  Further DBA Action
-----
em_present              Failed  Manual fixup recommended.
amd_exists              Failed  Manual fixup recommended.
dictionary_stats       Failed  Manual fixup recommended.
trgowner_no_admndbtrg  Failed  Manual fixup recommended.
mv_refresh              Failed  Manual fixup recommended.
apex_upgrade_msg       Failed  Manual fixup recommended.

PL/SQL procedure successfully completed.
```

In this example, some automatic checks failed, and required manual fixups. Refer to the examples that follow to see how to perform manual fixups.

Example 3-11 Manually Removing Oracle Enterprise Manager (em_present)

The `preupgrade_fixups.sql` log file provides you with instructions to remove Oracle Enterprise Manager manually (`em_present`):

```
+ Remove the EM repository.

- Copy the rdbms/admin/emremove.sql script from the target 12.2.0.1.0
ORACLE_HOME into the source 11.2.0.3.0 ORACLE_HOME.

Step 1: If database control is configured, stop EM Database Control,
using the following command

    $> emctl stop dbconsole

Step 2: Connect to the database using the SYS account AS SYSDBA

    SET ECHO ON;
    SET SERVEROUTPUT ON;

    @emremove.sql
    ...
    ...
```


...

Execution:

Step 1 - Stop dbconsole:

```
C:\app\oracle1\product\12.1.0\dbhome_1\rdbms\admin> emctl stop dbconsole

Oracle Enterprise Manager 11g Database Control Release 11.2.0.3.0
Copyright (c) 1996, 2011 Oracle Corporation. All rights reserved.
https://db01.example.com:1158/em/console/aboutApplication
The OracleDBConsoleorcl11 service is stopping.....
The OracleDBConsoleorcl11 service was stopped successfully.
```

Step 2 - Remove em (provide credentials if needed)

...
...
...

```
Dropping synonym : SETEMVIEWUSERCONTEXT ...
Dropping synonym : SMP_EMD_AVAIL_OBJ ...
Dropping synonym : SMP_EMD_DELETE_REC_ARRAY ...
Dropping synonym : SMP_EMD_INTEGER_ARRAY ...
Dropping synonym : SMP_EMD_INTEGER_ARRAY_ARRAY ...
Dropping synonym : SMP_EMD_NVPAIR ...
Dropping synonym : SMP_EMD_NVPAIR_ARRAY ...
Dropping synonym : SMP_EMD_STRING_ARRAY ...
Dropping synonym : SMP_EMD_STRING_ARRAY_ARRAY ...
Dropping synonym : SMP_EMD_TARGET_OBJ ...
Dropping synonym : SMP_EMD_TARGET_OBJ_ARRAY ...
Finished phase 5
Starting phase 6 : Dropping Oracle Enterprise Manager related other
roles ...
Finished phase 6
The Oracle Enterprise Manager related schemas and objects are dropped.
Do the manual steps to studown the DB Control if not done before running
this
script and then delete the DB Control configuration files

PL/SQL procedure successfully completed.

SQL>
```

Example 3-12 Manually Removing the OLAP Catalog (amd_exists)

The `preupgrade_fixups.sql` log file provides you with instructions to remove the OLAP catalog manually (`amd_exists`):

```
+ Remove OLAP Catalog by running the 11.2.0.3.0 SQL script
  $ORACLE_HOME/olap/admin/catnoamd.sql script.
```

The OLAP Catalog component, AMD, exists in the database.

```
sqlplus / as sysdba @"%ORACLE_HOME%\olap\admin\catnoamd.sql
...
...
...

Synonym dropped.

User dropped.
```

Role dropped.

SQL>

Example 3-13 Gathering Current Dictionary Statistics (dictionary_stats)

The `preupgrade_fixups.sql` log file provides you with instructions to gather directory statistics (`dictionary_stats`).

+ Gather dictionary statistics prior to database upgrade in off-peak time using:

```
EXECUTE dbms_stats.gather_dictionary_stats;
```

```
SQL> EXECUTE dbms_stats.gather_dictionary_stats;
```

PL/SQL procedure successfully completed.

Example 3-14 Granting the ADMINISTER DATABASE TRIGGER privilege (trgowner_no_admndbtrg)

The `preupgrade_fixups.sql` log file provides you with instructions to grant the ADMINISTER DATABASE TRIGGER privilege (`trgowner_no_admndbtrg`):

+ Directly grant ADMINISTER DATABASE TRIGGER privilege to the owner of the trigger or drop and re-create the trigger with a user that was granted directly with such. You can list those triggers using "SELECT OWNER, TRIGGER_NAME FROM DBA_TRIGGERS WHERE BASE_OBJECT_TYPE='DATABASE' AND OWNER NOT IN (SELECT GRANTEE FROM DBA_SYS_PRIVS WHERE PRIVILEGE='ADMINISTER DATABASE TRIGGER')"

```
SQL> SELECT OWNER,
2         TRIGGER_NAME FROM DBA_TRIGGERS WHERE
BASE_OBJECT_TYPE='DATABASE' AND
3         OWNER NOT IN (SELECT GRANTEE FROM DBA_SYS_PRIVS WHERE
4         PRIVILEGE='ADMINISTER DATABASE TRIGGER');
```

| OWNER | TRIGGER_NAME |
|-------|-----------------------|
| MDSYS | SDO_DROP_USER |
| MDSYS | SDO_ST_SYN_CREATE |
| MDSYS | SDO_TOPO_DROP_FTBL |
| MDSYS | SDO_GEOR_BDDL_TRIGGER |
| MDSYS | SDO_GEOR_ADDL_TRIGGER |
| MDSYS | SDO_NETWORK_DROP_USER |

6 rows selected.

```
SQL> grant ADMINISTER DATABASE TRIGGER to MDSYS;
```

Grant succeeded.

Example 3-15 Refreshing Materialized Views (mv_refresh)

The `preupgrade_fixups.sql` log file provides you with instructions to refresh materialized views (`mv_refresh`):

+ Please make sure that all the MVs are refreshed and `sys.sumdelta$` becomes empty before doing upgrade, unless you have strong business reasons not to do so. You can use `dbms_mview.refresh()` to refresh the MVs except those stale ones to be kept due to business need. If there

are any stale MVs depending on changes in sys.sumdelta\$, do not truncate it, because doing so will cause wrong results after refresh.

```
SQL> declare
  2 num_failures integer(3) :=0;
  3 begin
  4 DBMS_MVIEW.REFRESH_ALL_MVIEWS(num_failures,'C',' ', TRUE, FALSE);
  5 end;
  6 /
```

PL/SQL procedure successfully completed.

```
SQL> select count(1) from sumdelta$;
```

```
      COUNT(1)
-----
           0
```

```
SQL>
```

Example 3-16 Upgrading Oracle Application Express (apex_upgrade_msg)

The preupgrade_fixups.sql log file recommends to you that you can upgrade Oracle Application Express (apex_upgrade_msg). Running this upgrade can reduce the downtime required for the Oracle Database upgrades. The log file provides you with information about how to complete that upgrade:

+ Consider upgrading APEX manually, before the database upgrade.

The database contains APEX version 3.2.1.00.12 and will need to be upgraded to at least version 5.0.4.00.11.

To reduce database upgrade time, you can upgrade APEX manually before the database upgrade. Refer to My Oracle Support Note 1088970.1 for information on APEX installation upgrades.

Download: <http://www.oracle.com/technetwork/developer-tools/apex/downloads/index.html> provide credentials.

Then go to: <http://www.oracle.com/technetwork/developer-tools/apex/application-express/upgrade-apex-for-xe-154969.html> and
https://docs.oracle.com/cd/E59726_01/install.50/e39144/toc.htm
to guide you to do the upgrade.

Once downloaded, please go to the directory and unzip the files, run the apex upgrade from there.

```
...
...
12:07:41 Completing registration process. 12:07:41
12:07:41 Validating installation. 12:07:41
...Starting validation 12:07:41
...Database user "SYS", database schema "APEX_050000", user# "90"
12:07:41
...272 packages
...265 package bodies
...465 tables
...8 functions
...16 procedures
...4 sequences
...497 triggers
```

```
...1582 indexes
...255 views
...0 libraries
...14 types
...5 type bodies
...0 operators
...0 index types
...Begin key object existence check 12:07:53
...Completed key object existence check 12:07:54
...Setting DBMS Registry 12:07:54
...Setting DBMS Registry Complete 12:07:54
...Exiting validate 12:07:54
```

PL/SQL procedure successfully completed.

timing for: Validate Installation
Elapsed: 00:00:13.00

Session altered.

timing for: Complete Installation
Elapsed: 00:18:40.49

...
...

Caution:

After you complete preupgrade steps, Oracle recommends that you back up your database before proceeding with the upgrade.

Related Topics:

[Backing Up Oracle Database for Upgrading](#) (page 3-2)

3.5.2 Manually Upgrading Windows Non-CDB Using Command-Line Utilities

These examples show upgrade steps to upgrade a Non-CDB Oracle Database 11g release 2 (11.2.0.3) to a Non-CDB Oracle Database 12c release 2 (12.2).

After you complete running preupgrade steps, you can upgrade the Non-CDB Oracle Database to the new release Non-CDB Oracle Database. Before starting the upgrade, you must stop the database services. You can stop database services either by using command-line commands, or by using Microsoft Windows PowerShell scripting.

The sequence of steps to complete the upgrade is as follows:

1. Stop the database service, using either command-line commands, or PowerShell.
2. Delete the database service from the earlier release Oracle home.
3. Stop the listener from the earlier release Oracle home
4. Set the environment variables to the new Oracle home.
5. Copy database files, such as `tnsnames.ora`, `listener.ora`, password files, wallets, and other similar files to the new Oracle home.

6. Copy the PFILE to the new Oracle Database Oracle home, and create a new service using the Oracle Database binary in the new Oracle home. (In this example, we assume that the PFILE is compatible. It is possible that your PFILE is not compatible with the new release.)
7. Start the database upgrade.
8. Complete the post-upgrade steps.

Example 3-17 Stopping the Database Service Using Command-Line Commands

1. If you do not know the service name, then identify the service name.

```
c:\apex\apex>sc query type= service | find /i "orcl11"
SERVICE_NAME: OracleServiceORCL11
DISPLAY_NAME: OracleServiceORCL11
```

2. Using the service name, find out what the status is of the service.

```
c:\apex\apex>sc query OracleServiceORCL11

SERVICE_NAME: OracleServiceORCL11
        TYPE               : 10  WIN32_OWN_PROCESS
        STATE                : 4   RUNNING
                        (STOPPABLE, PAUSABLE,
ACCEPTS_SHUTDOWN)
        WIN32_EXIT_CODE      : 0   (0x0)
        SERVICE_EXIT_CODE   : 0   (0x0)
        CHECKPOINT          : 0x0
        WAIT_HINT           : 0x0
```

3. Stop the service

```
c:\apex\apex>sc stop OracleServiceORCL11

SERVICE_NAME: OracleServiceORCL11
        TYPE               : 10  WIN32_OWN_PROCESS
        STATE                : 3   STOP_PENDING
                        (STOPPABLE, PAUSABLE,
ACCEPTS_SHUTDOWN)
        WIN32_EXIT_CODE      : 0   (0x0)
        SERVICE_EXIT_CODE   : 0   (0x0)
        CHECKPOINT          : 0x5
        WAIT_HINT           : 0x15f90
```

4. Wait for a few minutes, and then check the status.

```
c:\apex\apex>sc query OracleServiceORCL11

SERVICE_NAME: OracleServiceORCL11
        TYPE               : 10  WIN32_OWN_PROCESS
        STATE                : 1   STOPPED
        WIN32_EXIT_CODE      : 0   (0x0)
        SERVICE_EXIT_CODE   : 0   (0x0)
        CHECKPOINT          : 0x0
        WAIT_HINT           : 0x0
```

After the services are stopped, you can proceed to delete the services.

Example 3-18 Stopping the Database Service Using Microsoft Windows PowerShell Scripting

1. Check the status of the service.

```
PS C:\app\oraclbm\cfgtoollogs\orcl\preupgrade> Get-Service | Where-Object
{$_ .displayName.Contains("ORCL11")}
```

| Status | Name | DisplayName |
|---------|--------------------|----------------------------------|
| Stopped | OracleJobSchedu... | OracleJobSchedulerORCL11 |
| Running | OracleServiceOR... | OracleServiceORCL11 |
| Running | OracleVssWriter... | Oracle ORCL11 VSS Writer Service |

2. Stop the service.

```
PS C:\app\oraclbm\cfgtoollogs\orcl\preupgrade> Get-Service | Where-Object
{$_ .displayName.Contains("ORCL11")} | Stop-Ser
vice
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
WARNING: Waiting for service 'OracleServiceORCL11
(OracleServiceORCL11)' to stop...
```

After the services are stopped, you can proceed to delete the database service.

Example 3-19 Deleting the Database Service from the Earlier Release Oracle Home

For Oracle Database 11g release 2 (11.2.0.3) on Windows, use ORADIM from the earlier release Oracle home. ORADIM is a Windows-specific utility that you can use to administer the Windows service.

```
c:\apex\apex>oradim -delete -sid orcl11
Unable to stop service, OS Error = 1062
Instance deleted.
```

Example 3-20 Stopping the Listener for the Earlier Release Oracle Home

```
c:\apex\apex>lsnrctl status
```

```
LSNRCTL for 64-bit Windows: Version 11.2.0.3.0 - Production on 13-
JUL-2016 13:58:52
```

```

Copyright (c) 1991, 2011, Oracle. All rights reserved.

Connecting to (DESCRIPTION=(ADDRESS=(PROTOCOL=IPC)(KEY=EXTPROC1522)))
STATUS of the LISTENER
-----
Alias                LISTENER
Version              TNSLSNR for 64-bit Windows: Version 11.2.0.3.0
- Production
Start Date           05-JUL-2016 10:01:30
Uptime               8 days 3 hr. 57 min. 23 sec
Trace Level          off
Security             ON: Local OS Authentication
SNMP                 OFF
Listener Parameter File C:\app\oracle2\product\11.2.0\dbhome_1\network
\admin\listener.ora
Listener Log File    C:\app\oracle2\diag\tnslsnr\slc01auu\listener
>alert\log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(PIPENAME=\\.\pipe
\EXTPROC1522ipc)))
  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=db01.example.com)
(PORT=1522)))
Services Summary...
Service "CLRExtProc" has 1 instance(s).
  Instance "CLRExtProc", status UNKNOWN, has 1 handler(s) for this
service...
The command completed successfully

c:\apex\apex>lsnrctl stop

LSNRCTL for 64-bit Windows: Version 11.2.0.3.0 - Production on 13-
JUL-2016 13:59:00

Copyright (c) 1991, 2011, Oracle. All rights reserved.

Connecting to (DESCRIPTION=(ADDRESS=(PROTOCOL=IPC)(KEY=EXTPROC1522)))
The command completed successfully

```

Example 3-21 Setting the environment variables to the new Oracle home

```

c:\apex\apex>set ORACLE_HOME=C:\app\oracle1\product\12.2.0\dbhome_1

c:\apex\apex>SET PATH=%ORACLE_HOME%\BIN;%PATH%

c:\apex\apex>SET ORACLE_SID=ORCL11

```

Example 3-22 Copying the PFILE to the New Oracle home, and Creating a New Service Using the New Oracle Database binary

This example shows how to use the Windows-specific ORADIM utility to create a new database service. In this example, the PFILE from the earlier release is compatible with the new release.

```

c:\apex\apex>C:\app\oracle1\product\12.2.0\dbhome_1\bin\oradim -new -sid orcl11 -
syspwd
My-sys-password -maxusers 1000 -startmode auto -pfile C:\app\oracle1\product
\12.2.0\dbhome_1\database\initorcl11.ora

```

```

Enter password for Oracle service user:
Instance created.

```

Example 3-23 Starting the Database Upgrade

Start the upgrade using the Parallel Upgrade Utility.

Note:

You can find that you have to change the folder symbolic links on the PFILE for paths such as DIAGNOSTIC_DEST. If this is the case, then you see errors such as the following examples:

```
ORA-48173: error checking directory existence during ADR initialization [C:\app\oracle2\diag\rdbms\orcl11]
ORA-00205: error in identifying control file, check alert log for more info
```

If you see these errors, then grant permissions to the user on the earlier release Oracle home, and on all the related folders with inheritance. Make this change also on any access control list (ACL) that the database accesses, such as wallet files. This step is particularly necessary if you are using the earlier release Oracle home as an ORADATA location.

If you are using the built-in account, then the service runs as LocalSystem. If you are using a virtual account, then services run using the Windows virtual accounts, with names derived from the service name. If the Oracle Database release 2 (12.2) binaries owner is a virtual account, then you must add that virtual account to the group `ORA_Homename_SVCAACCTS`, instead of adding the Oracle Home User.

Oracle Database 12c release 2 (12.2) includes a new shell script, `dbupgrade`. The shell script calls the Parallel Upgrade Utility (`catctl.pl`), so that you can run the upgrade as a command. This example shows the upgrade of Oracle Database from release 11.2.0.4 to release 12.2. The upgrade time for your system can vary from the results in this example.

```
C:\app\oracle1\product\12.2.0\dbhome_1\bin>dbupgrade
...
...
...
C:\app\oracle1\product\12.2.0\dbhome_1\bin>REM Batch file to execute
catctl.pl

Argument list for [C:\app\oracle1\product\12.2.0\dbhome_1\rdbms\admin
\catctl.pl]
Run in                c = 0
Do not run in         C = 0
Input Directory       d = 0
Echo OFF              e = 1
Simulate              E = 0
Forced cleanup        F = 0
Log Id                i = 0
Child Process         I = 0
Log Dir               l = c:\temp2
Priority List Name    L = 0
Upgrade Mode active   M = 0
SQL Process Count    n = 4
SQL PDB Process Count N = 0
Open Mode Normal     o = 0
Start Phase          p = 0
End Phase            P = 0
Reverse Order        r = 0
AutoUpgrade Resume   R = 0
```



```

Script                s = 0
Serial Run            S = 0
RO User Tablespaces  T = 0
Display Phases       y = 0
Debug catcon.pm      z = 0
Debug catctl.pl      Z = 0

catctl.pl VERSION: [12.2.0.1.0]
STATUS: [production]
BUILD: [RDBMS_MAIN_WINDOWS.X64_160624]

C:\app\oracle1\product\12.2.0\dbhome_1\rdbms\admin\orahome.exe = [C:\
\app\oracle1\product\12.2.0\dbhome_1]
C:\app\oracle1\product\12.2.0\dbhome_1\bin\orabasehome.exe = [C:\app
\oracle1\product\12.2.0\dbhome_1]
catctlGetOrabase = [C:\app\oracle1\product\12.2.0\dbhome_1]

Analyzing file C:\app\oracle1\product\12.2.0\dbhome_1\rdbms\admin
\catupgrd.sql

Log file directory = [c:\temp2]

catcon: ALL catcon-related output will be written to [c:\temp2/
catupgrd_catcon_3252.lst]
catcon: See [c:\temp2\catupgrd*.log] files for output generated by
scripts

catcon: See [c:\temp2\catupgrd_*.lst] files for spool files, if any

Number of Cpus        = 2
Database Name         = orcl11
DataBase Version      = 11.2.0.3.0
Parallel SQL Process Count = 4
Components in [orcl11]
    Installed [APEX APS CATALOG CATJAVA CATPROC CONTEXT JAVAVM ORDIM
OWM SDO XDB XML XOQ]
    Not Installed [DV EM MGW ODM OLS RAC WK]

-----
Phases [0-109]          Start Time:[2016_07_13 15:49:40]
-----
***** Executing Change Scripts *****
Serial  Phase #:0      [orcl11] Files:1

...
...
...
-----
Phases [0-109]          End Time:[2016_07_13 16:53:27]
-----

Grand Total Time: 3830s

LOG FILES: (c:\temp2\catupgrd*.log)

Upgrade Summary Report Located in:
c:\temp2\upg_summary.log

Grand Total Upgrade Time: [0d:1h:3m:50s]

```

Example 3-24 Completing the Post-Upgrade Checks

Start the upgraded Oracle Database, and check the version and status.

```
C:\app\oracle1\product\12.2.0\dbhome_1\bin>sqlplus / as sysdba

SQL*Plus: Release 12.2.0.1.0 Production on Thu Jul 14 09:38:50 2016

Copyright (c) 1982, 2016, Oracle. All rights reserved.

Connected to an idle instance.

SQL> startup
ORACLE instance started.

Total System Global Area 1828716544 bytes
Fixed Size 8740096 bytes
Variable Size 503317248 bytes
Database Buffers 1308622848 bytes
Redo Buffers 8036352 bytes
Database mounted.
Database opened.
SQL> select open_mode from v$database;

OPEN_MODE
-----
READ WRITE

SQL> select version from v$instance;

VERSION
-----
12.2.0.1.0

SQL>
```

After the upgrade is complete, carry out post-upgrade checks to ensure that objects are valid, and that there are no remaining issues.

3.5.3 Running Postupgrade Fixup Scripts After Upgrading from 11.2.0.1 to 12.2

These examples show the process of running the `postupgrade_fixups.sql` script for Non-CDB to Non-CDB upgrades.

The examples show an upgrade from a Non-CDB Oracle Database 11g release 2 (11.2.0.3) to a Non-CDB Oracle Database 12c release 2 (12.2).

Example 3-25 Running the Postupgrade Fixups Script

Run the `postupgrade_fixups.sql` script that you generated with the Pre-Upgrade Information Tool in the earlier release Oracle home before starting the upgrade:

```
SQL> @C:\app\oracle\cfgtoollogs\orcl11\preupgrade\postupgrade_fixups.sql

SQL> REM

SQL> REM Oracle POST-Upgrade Fixup Script

SQL> REM

SQL> REM Auto-Generated by: Oracle Preupgrade Script
```

```

SQL> REM      Version: 12.2.0.1.0 Build: 1
SQL> REM      Generated on:          2016-07-05 12:18:07
SQL> REM
SQL> REM      Source Database:        ORCL11
SQL> REM      Source Database Version: 11.2.0.3.0
SQL> REM      For Upgrade to Version:  12.2.0.1.0
SQL> REM
SQL>
SQL> REM
SQL> REM      Setup Environment
SQL> REM
SQL> REM
SQL> SET ECHO OFF SERVEROUTPUT ON FORMAT WRAPPED TAB OFF LINESIZE
200;

```

Executing Oracle POST-Upgrade Fixup Script

Auto-Generated by: Oracle Preupgrade Script

Version: 12.2.0.1.0 Build: 1

Generated on: 2016-07-05 12:18:07

Source Database: ORCL11

Source Database Version: 11.2.0.3.0

For Upgrade to Version: 12.2.0.1.0

Fixup

| Check Name | Status | Further DBA Action |
|----------------------|--------|---------------------------|
| depend_usr_tables | Failed | Manual fixup recommended. |
| old_time_zones_exist | Failed | Manual fixup recommended. |
| post_dictionary | Failed | Manual fixup recommended. |
| fixed_objects | Passed | None |
| upg_by_std_upgrd | Passed | None |

PL/SQL procedure successfully completed.

Elapsed: 00:00:11.26

```
SQL>
```

In this example, the `postupgrade_fixup.sql` script could not complete three fixes, so you are instructed to carry out manual fixups. This outcome is normal. To carry out the manual fixups, look at the log file, `preupgrade.log`. It contains instructions and script information for how to run manual fixup scripts. These fixup scripts are generated for you by the `postupgrade_fixups.sql` script. Follow the instructions provided in the log file to fix the issues.

Example 3-26 Manual Fixup Instructions for Oracle-Maintained Types In User Tables (`depend_usr_tables`)

+ If you use the `-T` option for the database upgrade, then run

```
@?/rdbms/admin/utluptabdata.sql after the upgrade is complete, to
VALIDATE and UPGRADE any user tables affected by changes to
Oracle-Maintained
types.
```

```
SQL> @C:\app\oracle\product\12.2.0\dbhome_1\rdbms\admin\utluptabdata.sql
```

```
PL/SQL procedure successfully completed.
```

```
SQL>
```

Example 3-27 Manual Fixup Instructions for Time Zone Version (`old_time_zones_exist`)

+ Upgrade the database time zone version using the `DBMS_DST` package.

```
The database is using timezone datafile version 14 and the target
12.2.0.1.0 database ships with timezone datafile version 26.
Oracle recommends using the most recent timezone data. For
further
information, refer to My Oracle Support Note 1585343.1
```

```
SQL> @C:\Users\oracle\Downloads
\DBMS_DST_scriptsV1.9\DBMS_DST_scriptsV1.9\countstatsTSTZ.sql
```

```
.
Amount of TSTZ data using num_rows stats info in DBA_TABLES.
```

```
.
For SYS tables first...
```

```
Note: empty tables are not listed.
```

```
Stat date - Owner.TableName.Columnname - num_rows
```

```
05/07/2016 - SYS.AQ$_ALERT_QT_S.CREATION_TIME - 5
```

```
...

Total numrow of SYS TSTZ columns is : 14652

There are in total 154 non-SYS TSTZ columns.

.

...

For non-SYS tables ...

Note: empty tables are not listed.

...

...

Stat date - Owner.Tablename.Columnname - num_rows

Total numrow of non-SYS TSTZ columns is : 17

There are in total 32 non-SYS TSTZ columns.

Total Minutes elapsed : 0

SQL>

SQL> spool upg_tzv_check.log

SQL> @C:\Users\oracle\Downloads
\DBMS_DST_scriptsV1.9\DBMS_DST_scriptsV1.9\upg_tzv_check.sql

INFO: Starting with RDBMS DST update preparation.

INFO: NO actual RDBMS DST update will be done by this script.

INFO: If an ERROR occurs the script will EXIT sqlplus.

INFO: Doing checks for known issues ...

INFO: Database version is 12.2.0.1 .

INFO: Database RDBMS DST version is DSTv14 .

INFO: No known issues detected.

INFO: Now detecting new RDBMS DST version.

A prepare window has been successfully started.

INFO: Newest RDBMS DST version detected is DSTv26 .

INFO: Next step is checking all TSTZ data.

INFO: It might take a while before any further output is seen ...

A prepare window has been successfully ended.
```

```
found.          INFO: A newer RDBMS DST version than the one currently used is
                INFO: Note that NO DST update was yet done.
                INFO: Now run upg_tzv_apply.sql to do the actual RDBMS DST update.
                INFO: Note that the upg_tzv_apply.sql script will
                INFO: restart the database 2 times WITHOUT any confirmation or
prompt.         SQL> spool
off            SQL> @C:\Users\oracle\Downloads
               \DBMS_DST_scriptsV1.9\DBMS_DST_scriptsV1.9\upg_tzv_apply.sql
                INFO: If an ERROR occurs the script will EXIT sqlplus.
                INFO: The database RDBMS DST version will be updated to DSTv26 .
                WARNING: This script will restart the database 2 times
                WARNING: WITHOUT asking ANY confirmation.
                WARNING: Hit control-c NOW if this is not intended.
                INFO: Restarting the database in UPGRADE mode to start the DST
upgrade.       Database closed.
                Database dismounted. <----- you might need to wait a couple
of minutes and hit enter a couple of times.
                ORACLE instance shut down.
                ORACLE instance started.
                Total System Global Area 1828716544 bytes
                Fixed Size          8740096 bytes
                Variable Size       503317248 bytes
                Database Buffers    1308622848 bytes
                Redo Buffers         8036352 bytes
                Database mounted.
                Database opened.
                INFO: Starting the RDBMS DST upgrade.
                INFO: Upgrading all SYS owned TSTZ data.
                INFO: It might take time before any further output is seen ...
<----- you might need to wait a couple of minutes
```

```

and hit enter a couple of times.

An upgrade window has been successfully started.

INFO: Restarting the database in NORMAL mode to upgrade non-SYS
TSTZ data.

Database closed.

Database dismounted.

ORACLE instance shut down.

ORACLE instance started.

Total System Global Area 1828716544 bytes
Fixed Size                  8740096 bytes
Variable Size               503317248 bytes
Database Buffers           1308622848 bytes
Redo Buffers                8036352 bytes

Database mounted.

Database opened.    ... <----- you might need to wait a couple
of minutes and hit enter a couple of times.

INFO: Upgrading all non-SYS TSTZ data.

INFO: It might take time before any further output is seen ...

INFO: Do NOT start any application yet that uses TSTZ data! ...
<----- you might need to wait a couple of minutes
and hit enter a couple of times.

INFO: Next is a list of all upgraded tables:

Table list: "IX"."AQ$_ORDERS_QUEUE_TABLE_L"

Number of failures: 0

Table list: "IX"."AQ$_ORDERS_QUEUE_TABLE_S"

Number of failures: 0

Table list: "IX"."AQ$_STREAMS_QUEUE_TABLE_L"

Number of failures: 0

Table list: "IX"."AQ$_STREAMS_QUEUE_TABLE_S"

Number of failures: 0

Table list: "APEX_050000"."WWV_FLOW_DEBUG_MESSAGES"

Number of failures: 0

```

```
Table list: "APEX_050000"."WWV_FLOW_DEBUG_MESSAGES2"
Number of failures: 0
Table list: "APEX_050000"."WWV_FLOW_FEEDBACK"
Number of failures: 0
Table list: "APEX_050000"."WWV_FLOW_FEEDBACK_FOLLOWUP"
Number of failures: 0
Table list: "APEX_050000"."WWV_FLOW_WORKSHEET_NOTIFY"
Number of failures: 0
Table list: "GSMADMIN_INTERNAL"."AQ$_CHANGE_LOG_QUEUE_TABLE_L"
Number of failures: 0
Table list: "GSMADMIN_INTERNAL"."AQ$_CHANGE_LOG_QUEUE_TABLE_S"
Number of failures: 0
INFO: Total failures during update of TSTZ data: 0 .
An upgrade window has been successfully ended.
INFO: Your new Server RDBMS DST version is DSTv26 .
INFO: The RDBMS DST update is successfully finished.
INFO: Make sure to exit this sqlplus session.
INFO: Do not use it for timezone related selects.

SQL>
```

Example 3-28 Manual Fixup for Refreshing Dictionary Statistics (post_dictionary)

+ Gather dictionary statistics after the upgrade using the command:

```
EXECUTE DBMS_STATS.GATHER_DICTIONARY_STATS;
```

This recommendation is given for all preupgrade runs.

```
SQL> EXECUTE DBMS_STATS.GATHER_DICTIONARY_STATS;
```

```
PL/SQL procedure successfully completed.
```

```
SQL>
```


3.6 Manual Upgrade Scenarios for Multitenant Architecture Oracle Databases

Review these topics to understand the manual upgrade scenarios and procedures for Oracle Database deployed with multitenant architecture.

Starting with Oracle Database 12c, multitenant architecture enables Oracle Database deployments using multitenant container databases (CDB) that contain pluggable databases (PDBs). All Oracle Database releases earlier than Oracle Database 12c release 1 (12.1.0.1) use non-CDB architecture.

Caution:

You cannot downgrade a database after you have set the compatible initialization parameter to 12.1.0.2. Only if the compatibility is set to 12.1.0.1 will a downgrade be possible for a pluggable database (PDB), and there may still be restrictions on downgrading.

Oracle strongly recommends that you upgrade your source and target databases to the most recent bundle patch set update (BP, PSU) before starting an upgrade, and before starting a downgrade.

[About Oracle Multitenant Oracle Database Upgrades](#) (page 3-68)

You can upgrade Oracle Databases installed on multitenant architecture either in parallel, or in sequence.

[Manually Upgrading a Multitenant Container Oracle Database \(CDB\)](#) (page 3-68)

The procedure in this section provides steps for upgrading a CDB manually.

[About Upgrading PDBs Using the Parallel Upgrade Utility with Priority Lists](#) (page 3-73)

In Oracle Database 12.2, you can upgrade PDBs using a priority list to upgrade a set of PDBs ahead of other PDBs, and you can modify that upgrade priority.

[About PDB Upgrades Using Priority Lists, Inclusion Lists, and Exclusion Lists](#) (page 3-75)

Starting in Oracle Database 12c release 2 (12.2), you can use inclusion and exclusion lists with priority lists to control how your PDBs are upgraded.

[Upgrading Multitenant Architecture In Parallel](#) (page 3-80)

Use this technique to upgrade Oracle Database release 12c (12.1.0.1 and later releases) by upgrading container databases (CDBs), and then upgrading multiple pluggable databases (PDBs) in parallel.

[Upgrading Multitenant Architecture Sequentially Using Unplug-Plug](#) (page 3-86)

Use this technique to upgrade Oracle Database release 12c (12.1.0.1 and later releases) by unplugging pluggable databases (PDBs) in earlier release container databases (CDBs), and plugging into later release CDBs

See Also:

Oracle Database Concepts for an overview of multitenant architecture

Oracle Database Administrator's Guide for complete information about creating and configuring a CDB

3.6.1 About Oracle Multitenant Oracle Database Upgrades

You can upgrade Oracle Databases installed on multitenant architecture either in parallel, or in sequence.

Starting with Oracle Database 12c release 1 (12.1), Oracle provides multitenant architecture, which enables the creation and administration of pluggable databases (PDBs) in a container database (CDB). You can upgrade multitenant architecture systems using either Oracle Database Upgrade Assistant (DBUA), or using the Parallel Upgrade Utility to carry out manual upgrades.

There are two techniques for upgrading Oracle Databases using the multitenant architecture:

- In parallel. With this technique, you carry out one upgrade operation that upgrades the CDB, and then upgrades the PDBs in parallel.
- Sequentially. With this technique, you install a new release CDB, prepare and unplug PDBs from the earlier release CDB, plug the PDBs into a later release CDB, and then complete the upgrade for each PDB.

The following sections provide a high-level summary of each upgrade technique.

Upgrading Oracle Multitenant In Parallel

With the In Parallel technique, you first upgrade CDB\$ROOT using the Parallel Upgrade Utility (catctl.pl), using parameters to set the degree of parallel processing and availability:

- The `-n` parameter defines how many parallel processes run the upgrade, up to 8.
- The `-M` parameter determines if the CDB\$ROOT stays in UPGRADE mode through the entire upgrade, or becomes available for access after the CDB upgrade is complete. If you do not run the upgrade with the `-M` parameter, then when the CDB\$ROOT upgrade is complete, PDBs then become available for access as soon as each PDB completes its upgrade. If you run the upgrade with the `-M` parameter, then CDB\$ROOT stays in UPGRADE mode, and PDBs do not become available until upgrade of all PDBs is complete.

Upgrading Oracle Multitenant In Sequence

With the In Sequence technique, you install the new release multitenant architecture CDB. Next, in the earlier release multitenant architecture CDB, you issue SQL commands to run preupgrade scripts to prepare one or more PDBs to upgrade, and shut them down. You then unplug PDBs, plug them into the new release multitenant architecture CDB, and complete the upgrade sequentially for each PDB.

3.6.2 Manually Upgrading a Multitenant Container Oracle Database (CDB)

The procedure in this section provides steps for upgrading a CDB manually.

You must complete the following steps before using this procedure:

- Install the software for Oracle Database 12c
- Prepare the new Oracle home
- Run the Pre-Upgrade Information Tool

Oracle Database 12c introduces multitenant architecture, which enables Oracle Database to function as a multitenant container database (CDB) with pluggable databases. You can upgrade the CDB using DBUA, and in the process, upgrade all the pluggable databases attached to the CDB at the same time. Or, after you install the software for Oracle Database 12c and prepare the new Oracle home, you can proceed with a manual, command-line upgrade.

1. If you have not done so, run the Pre-Upgrade Information Tool. Review the Pre-Upgrade Information tool output and correct all issues noted in the output before proceeding.
2. Back up the source database.
3. If you have not done so, prepare the new Oracle home.
4. Shut down the database. (The syntax is the same for a non-CDB and a CDB.)

```
SQL> SHUTDOWN IMMEDIATE
```

Note:

To close a PDB, you can specify it from the CDB root: `alter pluggable database PDBname close.`

5. If your operating system is Windows, then complete the following steps:
 - a. Stop the OracleService *SID* Oracle service of the database you are upgrading, where *SID* is the instance name. For example, if your *SID* is ORCL, then enter the following at a command prompt:


```
C:\> NET STOP OracleServiceORCL
```
 - b. Delete the Oracle service at a command prompt using ORADIM.

If your *SID* is ORCL, then enter the following command, substituting your *SID* for *SID*.

```
C:\> ORADIM -DELETE -SID ORCL
```
 - c. Create the service for the new release Oracle Database at a command prompt using the ORADIM command of the new Oracle Database release.

For example:

```
C:\> ORADIM -NEW -SID SID -SYSPWD PASSWORD -MAXUSERS USERS
        -STARTMODE AUTO -PFILE ORACLE_HOME\DATABASE\INITSID.ORA
```

Most Oracle Database services log on to the system using the privileges of the Oracle Home User. The service runs with the privileges of this user. The ORADIM command prompts you for the password to this user account. You can specify other options using ORADIM.

In this example, if your *SID* value is ORCL, your *password* (SYSPWD) value is TWxy5791, the maximum number of users (MAXUSERS) value is 10, and the

Oracle home path is `C:\ORACLE\PRODUCT\12.2.0\DB`, then enter the following command:

```
C:\> ORADIM -NEW -SID ORCL -SYSPWD TWxy5791 -MAXUSERS 10  
-STARTMODE AUTO -PFILE C:\ORACLE\PRODUCT\12.2.0\DB\DATABASE\INITORCL.ORA
```

ORADIM writes a log file to the `ORACLE_HOME\database` directory. The log file contains the name of the PDB in the multitenant database.

6. If your operating system is Linux or UNIX, then perform the following checks:
 - a. Your `ORACLE_SID` is set correctly
 - b. The `oratab` file points to the Oracle home for Oracle Database 12c
 - c. The following environment variables point to the Oracle Database 12c directories:
 - `ORACLE_HOME`
 - `PATH`
 - d. Any scripts that clients use to set `$ORACLE_HOME` environment variable must point to the new Oracle home.

Note:

If you are upgrading an Oracle Real Application Clusters database, then perform these checks on all nodes where the Oracle Real Application Clusters database has instances configured.

See Also:

Oracle Database and Oracle Clusterware installation guides for information about setting other important environment variables on your operating system

7. Log in to the system as the owner of the Oracle home under the new Oracle Database release.
8. Start SQL*Plus in the new Oracle home from the path `Oracle_home/rdbms/admin` directory.

For example:

```
$ cd $ORACLE_HOME/rdbms/admin  
$ pwd  
/u01/app/oracle/product/12.2.0/dbhome_1/rdbms/admin  
$ sqlplus
```
9. Connect to the database that you want to upgrade using an account with SYSDBA privileges:

```
SQL> CONNECT / AS SYSDBA
```
10. Start the CDB in upgrade mode:

```
SQL> startup upgrade
```

11. Start the instance by issuing the following command in SQL*Plus:

```
SQL> alter pluggable database all open upgrade;
```

If errors appear listing desupported initialization parameters, then make a note of the desupported initialization parameters and continue with the upgrade. Remove the desupported initialization parameters the next time you shut down the database.

Note:

Starting up the database in UPGRADE mode does the following:

- Starts up the database with a new version of the Oracle Database instance
- Restricts logins to SYSDBA
- Disables system triggers
- Performs additional operations that prepare the database for upgrades

12. Exit SQL*Plus before proceeding to the next step.

For example:

```
SQL> EXIT
```

13. To upgrade an entire CDB, run the Parallel Upgrade Utility (catctl.pl) from the new Oracle home. The Parallel Upgrade Utility provides parallel upgrade options that reduce downtime. You can run the command by using the command-line script dbupgrade from the new Oracle home.

For example:

Linux:

```
cd $ORACLE_HOME/bin
./dbupgrade
```

Windows:

```
cd %ORACLE_HOME%\bin
dbupgrade
```

Note:

- Use the `-d` option to specify the directory that contains the files that you want to process. Use the `-l` option to specify the directory that you want to use for spool log files.
- If you are upgrading an entire CDB, and there are errors in CDB\$ROOT, then the upgrade aborts.

14. To upgrade a subset of PDBs within a CDB, specify either an inclusion list, or an exclusion list.

- This example for a Linux or UNIX system uses an inclusion list to upgrade PDB1 only:

```
cd $ORACLE_HOME/bin
./dbupgrade -c 'PDB1'
```

- This example for a Windows system uses an exclusion list to upgrade everything in the CDB except PDB1:

```
cd $ORACLE_HOME\bin
dbupgrade -C "PDB1"
```

Note:

You can upgrade an individual PDB by unplugging it from the earlier release CDB, and plugging it into a later release CDB.

For Windows, when you run the `dbupgrade` command with the inclusion (`-c`) or the exclusion (`-C`) options, you must specify the option with quotes around the CDB root name and PDB seed name.

For example:

```
... -C "CDB$ROOT PDB$SEED"
```

15. For CDBs, log in to the CDB as SYSDBA and run the command `alter pluggable database all open` to make databases available for recompiling code. For example:

```
$ sqlplus / as sysdba

SQL> alter pluggable database all open;
```

16. Run `catcon.pl`. This command starts `utlrlp.sql` and recompiles any remaining stored PL/SQL and Java code.

For example:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b utlrlp -d ''.''' utlrlp.sql
```

Because you run the command using `-b utlrlp0`, the log file `utlrlp0.log` is generated with the recompile results.

17. Run `postupgrade_fixups.sql`.

For example:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b postupgrade_fixups -d ''.'''
postupgrade_fixups.sql
```

18. Run `utlu122s.sql`. This command verifies that all issues are fixed.

For example, in a CDB:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b utlu122s -d ''.''' utlu122s.sql
```

Because you run the command using `-b utlu122s`, the log file `utlu122s0.log` is generated with the upgrade results. You can review the `upg_summary.log` file to review the upgrade report.

To see information about the state of the database, run `utlu122s.sql` as many times as you want, at any time after you complete the upgrade. If the `utlu122s.sql` script returns errors, or if it shows components that are not marked as `VALID`, or if the SQL script you run is not from the most recent release, then refer to the troubleshooting section in this guide.

19. Ensure that the time zone data files are current by using the `DBMS_DST` PL/SQL package to upgrade the time zone file. You can also update the time zone after the upgrade. If you update the time zone, then you must update the time zone in both `CDB$ROOT` and the PDBs.

20. Exit SQL*Plus.

For example:

```
SQL> EXIT
```

21. (Conditional) If you are upgrading an Oracle Real Application Clusters database, then use the following command syntax to upgrade the database configuration in Oracle Clusterware:

```
$ srvctl upgrade database -db db-unique-name -oraclehome oraclehome
```

In this example, *db-unique-name* is the assigned database name (not the instance name), and *oraclehome* is the Oracle home location in which the database is being upgraded. The `SRVCTL` utility supports long GNU-style options, in addition to the short CLI options used in earlier releases.

Your database is now upgraded. You are ready to complete post-upgrade procedures.

Note:

Oracle Warehouse Builder (OWB) components are not upgraded as part of the Oracle Database upgrade process. Oracle Warehouse Builder is not installed as part of Oracle Database 12c. Upgrade Oracle Warehouse Builder separately.

Caution:

If you retain the old Oracle software, then never start the upgraded database with the old software. Only start Oracle Database using the start command in the new Oracle Database home.

Before you remove the old Oracle environment, relocate any data files in that environment to the new Oracle Database environment.

See Also:

Oracle Database Administrator's Guide for information about relocating data files

3.6.3 About Upgrading PDBs Using the Parallel Upgrade Utility with Priority Lists

In Oracle Database 12.2, you can upgrade PDBs using a priority list to upgrade a set of PDBs ahead of other PDBs, and you can modify that upgrade priority.

Priority lists enable you to group and upgrade PDBs according to their priority. A priority list is a text file with comma-delimited lists defining the order of upgrade priority, and the PDBs in each numeric priority group. You run the Parallel Upgrade Utility (`dbupgrade`, `dbupgrade.cmd`, or `catctl.pl`) using the `-L` option to run the upgrade using a priority list, and to call that list as the upgrade runs.

Create the list using the following format. In this format example, the variable *numeral* is a numeric value, and *pdbx* is the name of a PDB.

```
Number, Pdb
numeral,pdb1,pdb2,pdb3
numeral,pdb4
numeral,pdb5,pdb6,pdb7,pdb8
.
.
.
```

The numeral represents the priority for the PDB.

PDB priorities are as follows:

1. CDB\$ROOT: Priority 1. Upgrading the container database first is a mandatory priority. You cannot change the priority for the container database upgrade. CDB\$ROOT is always processed first.
2. PDB\$SEED: Priority 1. Upgrading the PDB seed database is a mandatory priority. You cannot change the priority for the PDB seed upgrade. PDB\$SEED always upgraded after CDB\$ROOT, and with the first batch of PDB upgrades.
3. Priority List 1 PDBs: Priority 1 is the highest user-selected priority. These PDBs are upgraded second after CDB\$ROOT, in the batch where the PDB\$SEED PDB is upgraded.
4. Priority List 2 PDBs: Priority 2 is the second-highest priority PDB set. These PDBs are upgraded after the Priority 1 PDBs.
5. Priority List 3 PDBs: Priority 3 is the third-highest priority PDB set. These PDBS are upgraded after priority 2 PDBs.
6. Priority List 4 PDBs: Priority 4 is the fourth-highest priority PDB set. These PDBS are upgraded after priority 3 PDBs.
7. Priority List 5 PDBs: Priority 5 is the fifth-highest priority PDB set. These PDBS are upgraded after priority 4 PDBs.
8. Priority List 6 PDBs: Priority 6 is the sixth-highest priority PDB set. These PDBS are upgraded after priority 7 PDBs.

When you run the Parallel Upgrade Utility, the following processing rules apply:

- CDB\$ROOT and PDB\$SEED are always processed first, even if they are not present in the priority list.
- All PDBs that are in priority lists are processed in order of priority
- Any PDBs that are not listed in priority lists are processed after the PDBs named in the priority list.

For example:

```
Number, Pdb
1,sales1,region2,receivables1
2,sales2
3,dss1,region3,region2,dss2,dss3
```

Use the following syntax to run the Parallel Upgrade utility using a priority list:


```
dbupgrade -L priority_list_name
```

For example, to run the Parallel Upgrade Utility on a Windows system using the Parallel Upgrade Utility batch command and a priority list named `My122Upgrade`, enter the following command:

```
C:\>\u01\app\12.2.0.0\db_home1\rdbms\admin\dbupgrade -L My122Upgrade
```

After you complete a 12.2 upgrade using a priority list to set upgrade priorities, these PDB priority states are maintained in the CDB for the PDBs. The next upgrade honors the priorities set for the PDBs in the 12.2 upgrade.

Use the following SQL command syntax to change PDB upgrade priority states, where *PDBName* is the name of the PDB whose upgrade priority you want to change, and *PDBPriorityNumber* is the new priority value you want to assign:

```
SQL> alter session set container = CDB$ROOT
SQL> alter pluggable database PDBName upgrade priorityPDBPriorityNumber
```

For example:

```
SQL> alter session set container = CDB$ROOT
SQL> alter pluggable database region2 upgrade priority 2
```

In this example, the PDB named `region 2` that was set to upgrade priority 1 in the previous example is changed to upgrade priority 2.

3.6.4 About PDB Upgrades Using Priority Lists, Inclusion Lists, and Exclusion Lists

Starting in Oracle Database 12c release 2 (12.2), you can use inclusion and exclusion lists with priority lists to control how your PDBs are upgraded.

Upgrade Processing and Lists

The following terms designate types of upgrade list processing:

- **Priority lists:** Comma-delimited lists that designate the upgrade priority of PDBs in the list.
- **Inclusion lists:** Comma-delimited lists that designate PDBs that you want to upgrade. PDBs in these lists are upgraded after the PDBs listed in priority lists.
- **Exclusion lists:** Comma-delimited lists that designate PDBs that you do not want to be upgraded.

You can use inclusion lists and exclusion lists in the following ways:

- On their own, to include or exclude a set of PDBs from an upgrade
- In conjunction with priority lists to provide detailed specifications for the order in which PDBs are upgraded, and which PDBs are excluded from an upgrade.

When inclusion lists are used with priority lists, the PDBs listed in inclusion lists are upgraded according to the priority value they are assigned in the priority lists. PDBs listed in inclusion lists but not listed in priority lists are upgraded after all PDBs in the priority lists are upgraded.

When exclusion lists are used with priority lists, the PDBs listed in exclusion lists are not upgraded.

Note:

Create priority lists using a plain text editor, such as `vi` on Linux and UNIX, or Notepad on Windows.

In the examples in this topic, the `cpu_count` value is equal to 2.

Upgrade Priority using Default Processing

Default processing is the upgrade processing that is carried out if you do not designate how you want to upgrade PDBs in your CDBs using lists.

With default processing, CDB\$ROOT is upgraded, and then PDB\$SEED. Depending on the degree of parallelism you set, one or more PDBs may be updated in parallel with PDB\$SEED. As upgrades complete, PDBs are upgraded as upgrade processors become available.

The examples that follow use the following multitenant configuration of CDB and PDBs:

```
CDB$ROOT
PDB$SEED
CDB1_PDB1
CDB1_PDB2
CDB1_PDB3
CDB1_PDB4
CDB1_PDB5
```

In default processing, you specify no preference for which PDBs you want upgraded or excluded from upgrade. With default processing, CDB\$ROOT is upgraded first, and PDB\$SEED is updated in the first group of PDBs upgraded.

Example 3-29 Specifying Complete PDB Upgrade Priority

The following example of a priority list, where the priority setting for all PDBs is set by the list:

```
1,CDB$ROOT
1,PDB$SEED
1,CDB1_PDB1
1,CDB1_PDB2
2,CDB1_PDB3
2,CDB1_PDB4
3,CDB1_PDB5
```

Here is another way of writing the same list, in which you group PDBs in priority order:

```
1,CDB$ROOT
1,PDB$SEED
1,CDB1_PDB1,CDB1_PDB2
2,CDB1_PDB3,CDB1_PDB4
3,CDB1_PDB5
```

In the preceding example, the PDBs listed in priority 1 are CDB1_PDB1 and CDB1_PDB2. These PDBs are upgraded before CDB1_PDB3 and CDB1_PDB4.

Here is another way of writing the same list, using container ID values (`CON_ID`) to set the priority order:

```

1,CDB$ROOT
1,PDB$SEED
1,3,4
2,5,6
3,7

```

In the preceding example, the PDBs listed in priority 1 are CDB1_PDB1 (identified by CON_ID 3) and CDB1_PDB2 (identified by CON_ID 4). These PDBs are upgraded before CDB1_PDB3 (CON_ID 5) and CDB1_PDB4 (CON_ID 6).

When you use CON_IDs to specify priority, the first number specifies the priority of the group of PDBs. The second value or number specifies the PDBs (by CON_ID) number that are in that priority grouping. CDB\$ROOT is always updated first, and PDB\$SEED is always updated in the first upgrade priority group.

These examples all show a priority list upgrade with the following characteristics:

- Exclusion processing: None
- Inclusion processing: None
- Default processing: None

The upgrade order is carried out in the following sequence:

1. CDB\$ROOT
2. PDB\$SEED, CDB1_PDB1
3. CDB1_PDB2, CDB1_PDB3
4. CDB1_PDB4, CDB1_PDB5

Example 3-30 Specifying a Priority Subset of PDBs, and Upgrading Other PDBs with Default Processing

The following example specifies a priority list called `priority.lst`, which specifies a subset of PDBs for upgrade:

```

catctl -L priority.lst catupgrd.sql
1,CDB$ROOT
1,PDB$SEED
1,CDB1_PDB1,CDB1_PDB2

```

This example shows a priority list upgrade with the following characteristics:

- Exclusion processing: None
- Inclusion processing: None
- Default processing: CDB1_PDB3,CDB1_PDB4,CDB1_PDB5

The upgrade order is carried out in the following sequence:

1. CDB\$ROOT
2. PDB\$SEED, CDB1_PDB1
3. CDB1_PDB2, CDB1_PDB3
4. CDB1_PDB4, CDB1_PDB5

Example 3-31 Specifying a Priority Subset of PDBs, and Upgrading Other PDBs with an Inclusion List

The following example specifies a priority list called `priority.lst`, which specifies a priority subset of PDBs for upgrade:

```
catctl -L priority.lst -c 'CDB1_PDB2 CDB1_PDB4 CDB1_PDB5' catupgrd.sql
```

This command refers to the following priority list:

```
1,CDB$ROOT
1,PDB$SEED
1,CDB1_PDB2,CDB1_PDB4
2.CDB1_PDB5
```

This example shows a priority list upgrade with the following characteristics:

- Exclusion processing: None
- Inclusion processing: CDB1_PDB2 CDB1_PDB4 CDB1_PDB5
- Default processing: None

The upgrade order is carried out in the following sequence:

1. CDB1_PDB2, CDB1_PDB4
2. CDB1_PDB5

The Parallel Upgrade Utility processes only the PDBs that are in the inclusion list, and in the order of the priority list.

Example 3-32 Specifying a Priority Subset of PDBs, and Excluding CDB\$ROOT with an Exclusion List

The following example runs `catctl` using a priority list called `priority.lst`. Because this command runs with the `-C` option, it excludes `CDB$ROOT` from the upgrade:

```
catctl -L priority.lst -C 'CDB$ROOT' catupgrd.sql
```

This is the priority list:

```
1,CDB$ROOT
1,PDB$SEED
1,CDB1_PDB1,CDB1_PDB2
2,CDB1_PDB3,CDB1_PDB4
3,CDB1_PDB5
```

The upgrades are processed using the priority list to specify upgrade priority.

- Inclusion processing: None
- Exclusion processing: CDB\$ROOT
- Priority processing: PDB\$SEED, CDB1_PDB1, CDB1_PDB2, CDB1_PDB3, CDB1_PDB4, CDB1_PDB5

Because `CDB$ROOT` is excluded, the priority processing shifts. The upgrade order is carried out in the following sequence:

1. PDB\$SEED, CDB_PDB1

2. CDB_PDB2, CDB_PDB3
3. CDB1_PDB4, CDB1_PDB5

Example 3-33 Specifying an Exclusion List using CATCTL_LISTONLY

The following example specifies a priority list called `priority.lst`, which specifies a subset of PDBs for upgrade. With the `CATCTL_LISTONLY` option, PDBs that are not in the priority list are excluded from the upgrade:

```
catctl -L priority.lst -C 'CATCTL_LISTONLY' catupgrd.sql
```

Priority list:

```
1,CDB$ROOT
1,PDB$SEED
1,CDB1_PDB1,CDB1_PDB2
2,CDB1_PDB3
3,CDB1_PDB5
```

- Exclusion processing: `CATCTL_LISTONLY` (Only process inclusion priority list)
- Inclusion processing: None
- Default processing: None

The upgrade order is carried out in the following sequence:

1. CDB\$ROOT
2. PDB\$SEED, CDB1_PDB1, CDB1_PDB2
3. CDB1_PDB3, CDB1_PDB5

Note:

Specifying the keyword `CATCTL_LISTONLY` in the exclusion list turns the priority list into an inclusion priority list. Only PDBs in the list are processed. No default processing occurs in this scenario, so in this example, `CDB1_PDB4` is not processed.

Example 3-34 Specifying a Priority List using CON_ID Values

The following example specifies a priority list called `priority.lst`, which specifies a subset of PDBs for upgrade:

```
catctl -L priority.lst -C 'CATCTL_LISTONLY' catupgrd.sql
```

The upgrade order is determined by the priority list priority number. In the list called by the `-L` parameter, `priority.lst`, the numbers following the upgrade priority number are the `CON_ID` values associated with PDB names:

```
1,3,4
2,5,CDB1_PDB4
3,7
```

In the preceding list example, note that you can use a mix of `CON_ID` numbers and PDB names.

The PDBs listed in priority 3 are CDB1_PDB1 (identified by CON_ID 3) and CDB1_PDB2 (identified by CON_ID 4). These PDBs are upgraded before CDB1_PDB3 (CON_ID 5), CDB1_PDB4, which is identified by name, and CDB1_PDB5 (CON_ID 7).

- Exclusion processing: `-C CATCTL_LISTONLY` (Only process PDBs in the inclusion priority list)
- Exclusion Processing: None
- Inclusion processing: Specified in `priority.lst`
- Default processing: CDB\$ROOT, PDB\$SEED

The upgrade order is determined by the priority list, which uses the CON_ID numbers associated with the PDB.

1. CDB\$ROOT
2. PDB\$SEED, CDB1_PDB1
3. CDB1_PDB2, CDB1_PDB3
4. CDB1_PDB4, CDB1_PDB5

Note:

This example demonstrates the use of CON_IDs to specify the PDBs, and omits CDB\$ROOT and PDB\$SEED from the priority list. CDB\$ROOT and PDB \$SEED are processed using default processing.

3.6.5 Upgrading Multitenant Architecture In Parallel

Use this technique to upgrade Oracle Database release 12c (12.1.0.1 and later releases) by upgrading container databases (CDBs), and then upgrading multiple pluggable databases (PDBs) in parallel.

[About Upgrading Pluggable Databases \(PDBs\) In Parallel](#) (page 3-80)

Using the In-Parallel technique, you can upgrade the CDB, and then immediately upgrade PDBs using parallel SQL processors.

[Upgrading Multitenant Container Databases In Parallel](#) (page 3-82)

Use this technique to upgrade CDB\$ROOT, PDB\$SEED, and all PDBs in the CDB in one upgrade operation.

3.6.5.1 About Upgrading Pluggable Databases (PDBs) In Parallel

Using the In-Parallel technique, you can upgrade the CDB, and then immediately upgrade PDBs using parallel SQL processors.

Container databases (CDBs) can contain zero, one, or more pluggable databases (PDBs). If you use the In Parallel upgrade technique, then you can use the upgrade automation features built into the Parallel Upgrade Utility (`catctl.pl`) to update the CDB and all of its PDBs in the same upgrade window. The In Parallel technique runs upgrade processes in parallel, based on the resource settings you provide. If you choose to use all of your available system resources for upgrade, then parallel processing is limited only by your system CPU power, and the number of cores.

For example, you can use the In-Parallel technique to patch all of your PDBs at the same time with one bundle patch or patch set update (BP or PSU). You can also upgrade the entire multitenant architecture to a later release, including CDB\$ROOT, PDB\$SEED, and all of the PDBs plugged into the CDB, using parallel processing to limit your downtime.

Note:

The advantage of this technique is simplicity and ease of maintenance that it provides. However, you must plan your upgrade window to accommodate a common downtime for all of the database services that the PDBs on the CDB are providing.

You can upgrade the entire multitenant architecture database in parallel using Parallel Upgrade Utility (`catctl.pl`), which you can start from the command line using the `dbupgrade` shell script. The following syntax shows the key parameters for in-parallel processing:

```
dbupgrade [-M] -n [-N]
```

- `-M` specifies if CDB\$ROOT is kept in upgrade mode, or if it becomes available when it completes upgrade:
 - If you run the Parallel Upgrade Utility with the `-M` parameter, then the upgrade places CDB\$ROOT and all of its PDBs in upgrade mode, which may reduce total upgrade time. However, you cannot bring up any of the PDBs until the CDB and all of its PDBs are upgraded.
 - If you do not run the Parallel Upgrade Utility with the `-M` parameter, then CDB\$ROOT is upgraded and restarted in normal mode, and the normal background processes are started. As each PDB is upgraded, you can bring each PDB online while other PDBs are still being upgraded.
- `-n` specifies the number of in-parallel PDB upgrade processors.

The number of PDBs upgraded concurrently is controlled by the value you provide for the `-n` parameter.

Starting in Oracle Database 12c, the default value for Oracle Multitenant databases is the number of CPUs on your system. A `cpu_count` value equal to 24 equates to a default value of 24 for `-n`. The maximum value is now unlimited. The minimum value is 4. The maximum PDB upgrades running concurrently is the value of `-n` divided by the value of `-N`.

- `-N` Specifies the number of SQL processors to use when upgrading PDBs. The maximum value is 8. The minimum value is 1. If you do not specify a value for `-N`, then the default value is 2.

The following is a high-level list of actions during the In Parallel PDB upgrade technique:

1. Make sure that your backup strategy is complete.
2. Copy and run the preupgrade scripts from the new Oracle Database release, and fix any issues that they uncover.
3. Run the Parallel Upgrade Utility. In sequence, the following upgrades are carried out:

- a. Cycle 1: CDB\$ROOT is upgraded to the new Oracle release
- b. Cycle 2: PDB\$SEED...cycle x : PDBs are upgraded in parallel, with the number of cycles of upgrades as determined by the parameter settings you provide.

If you do not specify $-M$, then PDBs become available to bring online as they complete upgrade.

4. Complete post-upgrade steps.

3.6.5.2 Upgrading Multitenant Container Databases In Parallel

Use this technique to upgrade CDB\$ROOT, PDB\$SEED, and all PDBs in the CDB in one upgrade operation.

Oracle recommends that you use this approach if you can schedule downtime, because it provides a direct procedure for upgrades and simplicity of maintenance. Using this procedure upgrades in parallel all the PDBs in the multitenant architecture container database, depending on your server's available processors (CPUs).

Note:

When you upgrade the entire container using the In Parallel upgrade method, all the PDBs must be down. Perform the upgrade in a scheduled upgrade window so that you can bring all the PDBs down.

Caution:

- Always create a backup of existing databases before starting any configuration change.
 - You cannot downgrade a database after you have set the compatible initialization parameter to 12.1.0.2. Only if the compatibility is set to 12.1.0.1 will a downgrade be possible for a pluggable database (PDB), and there may still be restrictions on downgrading.
 - Oracle strongly recommends that you upgrade your source and target databases to the most recent bundle patch or patch set update (BP or PSU) before starting an upgrade, and before starting a downgrade.
-
-

1. Ensure that you have a proper backup strategy in place.
2. (Conditional) For Oracle RAC environments only, enter the following commands to set the initialization parameter value for CLUSTER_DATABASE to FALSE:

```
ALTER SYSTEM SET CLUSTER_DATABASE=FALSE SCOPE=SPFILE;
```

Restart the database after changing the CLUSTER_DATABASE parameter.

3. Open all PDBs.

For example:

```
SQL> alter pluggable database all open;
```

4. Run the Pre-Upgrade Information Tool (preupgrade.jar), using the following syntax:


```
/java -jar $New_release_Oracle_home/rdbms/admin/
preupgrade.jar [TERMINAL|FILE|DIR outputdir] [TEXT|XML] [-c
InclusionListOfPDBs] [-C ExclusionListOfPDBs]
```

Use space-delimitation for lists. On Linux and UNIX, define the list by placing the list inside single quotes: `'`. On Windows systems, define the list by placing the list inside double quotes `"`.

For example, run the following command to run the Pre-Upgrade Information tool on PDBs PDB1 through PDB25, where you have set up an environment variable `$ORACLE_HOME_12.1` for your Oracle Database Oracle home in `/u01/app/oracle/product/12.1.0/dbhome_1/`, and you have set up an environment variable `$ORACLE_HOME_12.2` for your new Oracle Database Oracle home in `/u01/app/oracle/product/12.2.0/dbhome_1/`:

Linux and UNIX:

```
java -jar $ORACLE_HOME_12.2/rdbms/admin/preupgrade.jar \
-c 'pdb1 pdb2 pdb3 pdb4 pdb5 pdb6 pdb7 pdb8 pdb9 pdb10 pdb11 pdb12 pdb13\
pdb14 pdb15 pdb16 pdb17 pdb18 pdb19 pdb20 pdb21 pdb22 pdb23 pdb24 pdb25'
```

Windows:

```
java -jar %ORACLE_HOME_12.2%/rdbms/admin/preupgrade.jar \
-c "pdb1 pdb2 pdb3 pdb4 pdb5 pdb6 pdb7 pdb8 pdb9 pdb10 pdb11 pdb12 pdb13\
pdb14 pdb15 pdb16 pdb17 pdb18 pdb19 pdb20 pdb21 pdb22 pdb23 pdb24 pdb25"
```

Note:

You must use Java 1.5 or later to run the Pre-Upgrade Information tool. By default, the Java releases in Oracle Database releases that you can upgrade directly support the tool.

5. Read any generated fixup scripts and log files.

By default, if `ORACLE_BASE` is defined, then the fixup files are placed in one of the following paths:

- Linux and UNIX:
`$ORACLE_BASE/cfgtoollogs/db_unique_name/preupgrade`
- Windows
`%ORACLE_BASE%\cfgtoollogs\db_unique_name\preupgrade`

If `ORACLE_BASE` is not defined, then fixup files are placed in one of the following paths:

- Linux and UNIX:
`$ORACLE_HOME/cfgtoollogs/db_unique_name/preupgrade`
- Windows:
`%ORACLE_HOME%\cfgtoollogs\db_unique_name\preupgrade`

On multitenant architecture Oracle Databases, the Pre-Upgrade Information Tool also creates a consolidated `preupgrade_fixups.sql` script. You can run the consolidated fixup script by using `catcon.pl`. The consolidated fixup script runs

on every container that was open at the time that you ran the `preupgrade.jar` command.

6. Run the `preupgrade_fixups` script, or individual PDB scripts. The `preupgrade_fixups` SQL scripts resolve some of the issues reported by the `preupgrade` script.

On multitenant environment Oracle Database deployments, you can run `preupgrade_fixupspdb-name.sql` scripts on the source database, where `pdb-name` is the PDB name. If you generate fixup scripts for PDBs, then the PDB name is added to the fixup filename.

In addition to the individual PDB fixup scripts, you can use `catcon.pl` to run the consolidated `preupgrade_fixups.sql` script. The consolidated script runs on every container that was open at the time that you ran `preupgrade.jar`.

Note:

Because `$` is a reserved symbol on operating systems, the fixup script for PDB `$SEED` is `preupgrade_fixups_pdb_seed.sql`.

Complete any other preupgrade tasks that the Pre-Upgrade Information Tool identifies.

7. Switch to the new `$ORACLE_HOME`, and set any other needed environment variables.
8. Connect with SQL*Plus:

```
sqlplus / as sysdba
```

9. Bring the CDB\$ROOT instance into upgrade mode:

```
STARTUP UPGRADE
```

10. Bring all PDBs into upgrade mode:

```
ALTER PLUGGABLE DATABASE ALL OPEN UPGRADE;
```

11. Check the status of PDBs to confirm that they are ready to upgrade:

```
SHOW PDBS
```

For all PDBs, ensure that the status is set to `MIGRATE`.

12. Exit from SQL*Plus, and change directory to the new Oracle home `$ORACLE_HOME/rdbms/admin`:

```
SQL> EXIT  
$ ORACLE_HOME/bin
```

13. Start the upgrade using the Parallel Upgrade Utility (`catctl.pl`, using the shell command `dbupgrade`), where `-d` specifies the location of the directory:

```
dbupgrade -d $ORACLE_HOME/rdbms/admin
```

If you do not specify any parameters, then the Parallel Upgrade Utility runs the upgrade in parallel on the number of PDBs equivalent to the number of CPUs divided by 2. On a server with 64 CPUs, 64 divided by 2 equals 32 PDBs upgraded

in parallel, carried out with two SQL processors for each PDB. CDB\$ROOT remains in NORMAL mode for the duration of the upgrade.

14. Open all PDBs, so that you can recompile the databases:

```
ALTER PLUGGABLE DATABASE ALL OPEN;
```

15. Exit from SQL*Plus, and change directory to the new Oracle home path

```
$ORACLE_HOME/rdbms/admin:
```

```
SQL> EXIT
cd $ORACLE_HOME/rdbms/admin
```

16. Run the `catcon.pl` script and the `postupgrade_fixups.sql` script that is supplied with the new release Oracle Database.

The following example shows the command strings for running `catcon.pl`, using the `-n` parameter to specify one parallel processor for each PDB, using the `-d` parameter to specify the path where the preupgrade script that you want to run is located, using the `-l` parameter to specify the location where you want the scripts to place log files, and using the `-b` flag to specify the log file prefixes for the `postupgrade_fixups.sql` script:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -n 1 -d \
$ORACLE_HOME/cfgtoollogs/cdbupgr/preupgrade -l /home/oracle/upgrDBA -b \
postupgrade_fixups postupgrade_fixups.sql
```

17. Run the `catcon.pl` script:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b utlrp -d ''.''' utlrp.sql
```

The `catcon.pl` script runs `utlrp.sql` from the `$ORACLE_HOME/rdbms/admin` directory.

The script recompiles any remaining stored PL/SQL and Java code. Note the following conditions of this use case:

- The `-n` parameter is set to 1, so the script runs each PDB recompilation in sequence.
- Expect a time delay for the serial recompilation of PDBs to complete. Depending on the number of PDBs that you are upgrading, the recompilation can extend significantly beyond the time required for the upgrade scripts to complete.

18. Run `postupgrade_fixups.sql`.

Non-CDB:

```
SQL> @rdbms/admin/postupgrade_fixups.sql
```

CDB:

```
$ORACLE_HOME/perl/bin /perl catcon.pl -n1 -e -b postupgradefixups -d ''.'''
postupgradefixups.sql
```

19. Run `utlu122s.sql` to verify that all issues have been fixed.

Non-CDB:

```
SQL> @rdbms/admin/utlu122s.sql
```

CDB:

```
$ORACLE_HOME/perl/bin /perl catcon.pl -nl -e -b utlu122s -d ''.''' utlu122s.sql
```

When you use `catcon.pl` to run `utlu122s.sql`, the log file `utlu122s0.log` is generated. The log file provides the upgrade results. You can also review the upgrade report, `upg_summary.log`.

To see information about the state of the database, run `utlu122s.sql` as many times as you want, at any time after the upgrade is completed. If the `utlu122s.sql` script returns errors, or shows components that do not have the status `VALID`, or if the version listed for the component is not the most recent release, then perform troubleshooting.

- 20.** (Conditional) For Oracle RAC environments only, enter the following commands to set the initialization parameter value for `CLUSTER_DATABASE` to `TRUE`, and to start the Oracle RAC database, where `dbname` is the name of the Oracle RAC database:

```
ALTER SYSTEM SET CLUSTER_DATABASE=TRUE SCOPE=SPFILE;  
srvctl start database -db db_unique_name
```

Your database is now upgraded.

Note:

Oracle Warehouse Builder (OWB) components are not upgraded as part of the Oracle Database upgrade process. Oracle Warehouse Builder is not installed as part of Oracle Database 12c.

Caution:

If you retain the old Oracle software, then never start the upgraded database with the old software. Only start Oracle Database using the start command in the new Oracle Database home.

Before you remove the old Oracle environment, relocate any data files in that environment to the new Oracle Database environment.

See Also:

Oracle Database Administrator's Guide for information about relocating data files

Related Topics:

[Requirement for Upgrading Databases that Use Oracle Warehouse Builder \(OWB\)](#) (page 2-82)

3.6.6 Upgrading Multitenant Architecture Sequentially Using Unplug-Plug

Use this technique to upgrade Oracle Database release 12c (12.1.0.1 and later releases) by unplugging pluggable databases (PDBs) in earlier release container databases (CDBs), and plugging into later release CDBs

About Upgrading Pluggable Databases (PDBs) Sequentially (page 3-87)

Using the unplug-plug technique, you upgrade PDBs after you upgrade the CDB. Use this overview to understand PDB sequential upgrades.

Unplugging the Earlier Release PDB from the Earlier Release CDB (page 3-88)

Unplugging the PDB is the first of three upgrade tasks.

Plugging in the Earlier Release PDB to the Later Release CDB (page 3-89)

Plugging the PDB from the earlier release PDB to the later release CDB is the second of three upgrade tasks.

Upgrading the Earlier Release PDB to the Later Release (page 3-89)

In the third of three PDB upgrade steps, you upgrade the earlier-release PDB to the release level of the CDB.

Use Inclusion or Exclusion Lists for PDB Upgrades (page 3-90)

If you want to upgrade a subset of earlier release PDBs, then use inclusion or exclusion lists to avoid reupgrading the CDB or PDBs that are at the new release level.

3.6.6.1 About Upgrading Pluggable Databases (PDBs) Sequentially

Using the unplug-plug technique, you upgrade PDBs after you upgrade the CDB. Use this overview to understand PDB sequential upgrades.

Container databases (CDBs) can contain zero, one, or more pluggable databases (PDBs). You can upgrade one PDB without upgrading the whole CDB. For example, you can unplug a PDB from a release 12.1.0.2 CDB, plug it into a release 12.2.0.1 CDB, and then upgrade that PDB to release 12.2.0.1.

Starting with Oracle Database 12.2, you can use DBUA to upgrade PDBs, or upgrade PDBs manually. You can upgrade the CDB and all PDBs (an In Parallel manual upgrade), or you can upgrade the CDB, and then upgrade PDBs sequentially (a Sequential manual upgrade).

The following is a high-level list of the steps required for sequential PDB upgrades:

1. Unplug the earlier release PDB from the earlier release CDB.
2. Drop the PDB from the CDB.
3. Plug the earlier release PDB into the later release CDB.
4. Upgrade the earlier release PDB to a later release.

Starting in Oracle Database 12c release 2 (12.2), you can provide lists to the Parallel Upgrade Utility to upgrade PDBs:

- Priority lists, to set the order in which PDBs are upgraded
- Inclusion lists, which enable you to designate a set of PDBs to upgrade after the PDBs listed in the priority list are upgraded
- Exclusion lists, which enable you to designate a set of PDBs that are not upgraded

Note:

A PDB cannot be recovered unless it is backed up. After upgrading using the method of creating a CDB and plugging in a PDB, be sure to back up the PDB.

Related Topics:

Oracle Database Backup and Recovery User's Guide

Oracle Database Administrator's Guide

[Manually Upgrading a Multitenant Container Oracle Database \(CDB\)](#) (page 3-68)

3.6.6.2 Unplugging the Earlier Release PDB from the Earlier Release CDB

Unplugging the PDB is the first of three upgrade tasks.

1. Run the Pre-Upgrade Information Tool on the PDB.

For example, where the PDB named `salespdb` is running in the CDB in `$ORACLE_HOME_12.1`:

```
$ORACLE_HOME_12.1/jdk/bin/java -jar
$ORACLE_HOME_12.2/rdbms/admin/preupgrade.jar dir /tmp -c salespdb
```

2. Run `preupgrade_fixups.sql` on your source database.

For example:

```
CONNECT / AS SYSDBA
SQL> ALTER SESSION SET CONTAINER=SALESPDB;

SQL> @/tmp/preupgrade_fixups_salespdb.sql
```

3. Close the PDB you want to unplug.

For example, use the following command to close the PDB `salespdb`:

```
SQL> alter pluggable database salespdb close;
```

4. Follow all recommendations listed in `preupgrade.log`.

5. Log back in to `CDB$ROOT`:

```
CONNECT / AS SYSDBA
SQL> ALTER SESSION SET CONTAINER=CDB$ROOT;
```

6. Unplug the earlier release PDB using the following SQL command syntax, where `pdb` is the name of the PDB, and `path` is the location of the PDB XML file:

```
alter pluggable database pdb unplug into 'path/pdb.xml';
```

For example, where the `pdb` name is `salespub` and `path` is `/home/oracle/salespdb.xml`:

```
SQL> alter pluggable database salespdb unplug into '/home/oracle/salespdb.xml';
```

The following response displays when the command is completed:

```
Pluggable database altered
```

7. Drop the pluggable database `SALESPDB`, but keep data files.

Oracle recommends that you drop `SALESPDB` after this procedure to clean up leftover information in the CDB views, and to help to avoid future issues. As a best practice guideline, back up your PDB in the destination CDB first, and then issue the `DROP` command on the source.

Caution:

After you drop the PDB from its original CDB, you cannot revert to it using previously taken backup, because the DROP command removes backup files.

To drop the pluggable database, enter the following command:

```
SQL> drop pluggable database salespdb keep datafiles;
```

8. Exit.

3.6.6.3 Plugging in the Earlier Release PDB to the Later Release CDB

Plugging the PDB from the earlier release PDB to the later release CDB is the second of three upgrade tasks.

This procedure example shows how to plug in a PDB when you are using Oracle-Managed Files. Refer to *Oracle Database Administrator's Guide* for additional information about plugging in PDBs.

1. Connect to the later release CDB.
2. Plug in the earlier release PDB using the following SQL command, where *pdb* is the name of the PDB, and *path* is the path where the PDB XML file is located:

```
create pluggable database pdb using 'path/pdb.xml';
```

For example:

```
SQL> create pluggable database salespdb using '/home/oracle/salespdb.xml';
```

The following response displays when the command is completed:

```
Pluggable database created.
```

Note:

When you plug in an earlier release PDB, the PDB is in restricted mode. You can only open the PDB for upgrade.

Related Topics:

Oracle Database Administrator's Guide

3.6.6.4 Upgrading the Earlier Release PDB to the Later Release

In the third of three PDB upgrade steps, you upgrade the earlier-release PDB to the release level of the CDB.

1. If needed, switch to the PDB that you want to upgrade. For example, enter the following command to switch to the PDB *salespdb*:

```
SQL> alter session set container=salespdb;
```

2. Open the PDB in UPGRADE mode.

```
SQL> alter pluggable database open upgrade;
```

3. Upgrade the PDB using the Parallel Upgrade Utility command (*catctl.pl*, or the shell utility *dbupgrade*).

When you upgrade a PDB, you use the commands you normally use with the Parallel Upgrade Utility. However, you also add the option `-c PDBname` to specify which PDB you are upgrading. Capitalize the name of your PDB as shown in the following example using the PDB named `salespdb`:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catctl.pl -d \
$ORACLE_HOME/rdbms/admin -c 'SALESPDB' -l $ORACLE_BASE catupgrd.sql
```

4. Review results.

The default file path for the logs is in the path `Oracle_base/cfgtoollogs/dbname/upgradedatetime`, where `Oracle_base` is the Oracle base path, `dbname` is the database name, and `upgradedatetime` is the date and time for the upgrade. The date and time strings are in the character string format `YYYYMMDDHHMMSC`, in which `YYYY` designates the year, `MM` designates the month, `DD` designates the day, `HH` designates the hour, `MM` designates the minute, and `SC` designates the second.

For example:

```
$ORACLE_BASE/cfgtoollogs/salespdb/upgrade20160815120001/upg_summary.log
```

5. Log in to SQL*Plus, and open the PDB to execute post-upgrade fixups, and to recompile the INVALID objects in the database:

```
SQL> STARTUP;
SQL> ALTER SESSION SET CONTAINER=SALESPDB;
```

6. Use the utility `catcon.pl` to run the script `postupgrade_fixups.sql`:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -c 'SALESPDB' -n 1 -e -b postfixups -d
''.''' /tmp/cfgtoollogs/SALESPDB/preupgrade/postupgrade_fixups.sql
```

7. Use the utility `catcon.pl` to run `utlrb.sql` from the `$ORACLE_HOME/rdbms/admin` directory:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -c 'SALESPDB' -n 1 -e -b comp -d ''.'''
utlrb.sql
```

The script recompiles INVALID objects in the database.

Related Topics:

[Parallel Upgrade Utility \(catctl.pl\) Parameters](#) (page 3-6)

3.6.6.5 Use Inclusion or Exclusion Lists for PDB Upgrades

If you want to upgrade a subset of earlier release PDBs, then use inclusion or exclusion lists to avoid reupgrading the CDB or PDBs that are at the new release level.

Oracle recommends that you record the containers that you upgrade, and use inclusion or exclusion lists to exclude these containers from successive bulk upgrades. Excluding upgraded containers from successive bulk upgrades ensures that the upgrade only runs on PDBs that require the upgrade. Avoiding reupgrades minimizes the overall upgrade time, and avoids unnecessary unavailability.

For example: If you have installed Oracle Database 12c release 12.2.0.1, then the containers `CDB$ROOT`, `PDB$SEED`, and any other PDBs created when the CDB was created, are part of the new release multitenant architecture. If you upgraded a CDB, and at the same time upgraded a set of PDBs to release 12.2.0.1, then you do not need to upgrade either the CDB containers or the upgraded PDBs again.

In either case, when you plug in earlier release PDBs and then upgrade them, upgrade the PDBs with either an exclusion list, or an inclusion list:

- Use an inclusion list to specify the only the set of PDBs that you want to upgrade
- Use an exclusion list to exclude the CDB and PDB containers that are already upgraded

If you do not use an inclusion list or an exclusion list to limit the upgrade scope, then the Parallel Upgrade Utility (`catctl.pl`) attempts to upgrade the entire CDB, not just the PDBs that require the upgrade. During that upgrade process, your system undergoes needless downtime. The inclusion list and the exclusion list options are mutually exclusive.

3.7 Improvements to Data Dictionary Upgrade and Upgrade Status Displays

Oracle Database 12c includes improvements to the upgrade process, and to how upgrade status appears for the upgraded database.

[Upgrading the Data Dictionary in Parallel with Parallel Upgrade Utility](#) (page 3-91)

Upgrading the data dictionary in Oracle Database is now done in parallel with the Parallel Upgrade Utility, which speeds up the upgrade process.

[Change to Upgrade Status Setting](#) (page 3-91)

Starting in Oracle Database 12c release 1 and later releases, the meaning of the UPGRADED status has changed.

[Change to Status After Running the Re-compilation `utlrp.sql` Script](#) (page 3-92)

The meaning of the VALID status has changed in Oracle Database 12c.

3.7.1 Upgrading the Data Dictionary in Parallel with Parallel Upgrade Utility

Upgrading the data dictionary in Oracle Database is now done in parallel with the Parallel Upgrade Utility, which speeds up the upgrade process.

Instead of one SQL process loading the data dictionary, you can now have multiple processes, depending on your server's CPU capacity. The Parallel Upgrade Utility (`catctl.pl`, which you can run from the command line using `dbupgrade` on Linux and UNIX, and `dbupgrade.com` on Windows) loads data into the dictionary as fast as possible, and defers any work that can be done in `normal` mode instead of `upgrade` mode. Upgrading the database using the Parallel Upgrade Utility reduces overall downtime.

3.7.2 Change to Upgrade Status Setting

Starting in Oracle Database 12c release 1 and later releases, the meaning of the UPGRADED status has changed.

When the upgrade is complete, and if there are no errors during the upgrade, then the status of the Oracle Server, Oracle Multimedia (ORDIM), Spatial (SDO) and XDB are all set to UPGRADED. This behavior is different from releases earlier than 12.1. In earlier releases, the status of the Oracle Server, Oracle Multimedia (ORDIM), Spatial (SDO) and XDB was set to VALID after upgrading. In 12.1 and later releases, the UPGRADED status indicates that the data dictionary has loaded without any errors. If any errors are logged to `registry$error`, then the status of the upgrade is set to INVALID.

When the upgrade is complete and if there are no errors, then the status of the database is set to `UPGRADED`. This behavior differs from earlier releases where the status of the database was set to `VALID` after upgrading. The `UPGRADED` status indicates that the data dictionary has been loaded without any errors. If any errors are logged to `registry$error`, then the status of the upgrade is set to `INVALID`.

3.7.3 Change to Status After Running the Re-compilation `utlrp.sql` Script

The meaning of the `VALID` status has changed in Oracle Database 12c.

In earlier releases of Oracle Database after upgrading a database, `VALID` meant that all objects in the data dictionary have been recompiled and are ready for use. In Oracle Database 12c, obtaining a `VALID` status has a different meaning. Running the `utlrp.sql` script in *normal* mode, recompiles data dictionary objects and moves the data dictionary from an `UPGRADED` status to a `VALID` status.

Oracle cannot guarantee that the database upgrade is *valid* unless `utlrp.sql` has been run after upgrading and before starting the upgraded database for the first time. Not running `utlrp.sql` after performing an upgrade forces data dictionary objects that you want to compile during their first access. The first user accessing the database suffers the performance cost for each invalid object accessed during this initial access. After these invalid objects are recompiled, normal processing returns. Running `utlrp.sql` ensures that the database is ready for use after upgrading. Any errors found are reported immediately. You can fix them before users of the upgraded database encounter problems.

3.8 About Dbupgrade Scripts and `catupgrd.sql` in Earlier Releases of Oracle Database

The function of the `catupgrd.sql` script is replaced by the Parallel Upgrade Utility, `catctl.pl`, and the `dbupgrade` and `dbupgrade.cmd` scripts.

In earlier releases of Oracle Database, the `catupgrd.sql` Upgrade Utility processed the upgrade. Starting with Oracle Database 12c release 1 (12.1), this script is replaced by the `catctl.pl` Parallel Upgrade Utility, and its command-line script, `dbupgrade`. The Parallel Upgrade Utility provides both parallel processing mode and serial modes.

The `dbupgrade` script calls `catctl.pl` to create and alter a set of data dictionary tables. The upgrade scripts also call `catctl.pl` to upgrade or install the following database components in the new Oracle Database 12c database:

- Oracle Database Catalog Views
- Oracle Database Packages and Types
- JServer JAVA Virtual Machine
- Oracle Database Java Packages
- Oracle XDK
- Oracle Real Application Clusters
- Oracle Workspace Manager
- Oracle Multimedia
- Oracle XML Database

- OLAP Analytic Workspace
- Oracle OLAP API
- Oracle Text
- Oracle Spatial and Graph
- Oracle Data Mining
- Oracle Label Security
- Messaging Gateway
- Oracle Database Vault

3.9 About Transporting and Upgrading a Database (Full Transportable Export/Import)

You can use file-based or nonfile-based modes for transporting data.

The Full Transportable Export/Import feature of Oracle Data Pump provides two options.

- Using a file-based Oracle Data Pump export/import
- Using a nonfile-based network mode Oracle Data Pump import

See Also:

- *Oracle Database Administrator's Guide* for information about transporting a database using an export dump file
 - *Oracle Database Administrator's Guide* for the procedure to transport a database over the network
-
-

3.10 About Log File Location and DIAGNOSTIC_DEST

The location of the Automatic Diagnostic Repository (ADR) and the diagnostic log files created by the upgrade scripts can vary, depending on your environment variables and parameter settings.

See Also:

Oracle Database Administrator's Guide for more information about using the `DIAGNOSTIC_DEST` initialization parameter and the ADR

DIAGNOSTIC_DEST and Automatic Diagnostic Repository (ADR) Home

The `DIAGNOSTIC_DEST` initialization parameter sets the location of the Automatic Diagnostic Repository (ADR), which is a directory structure that is stored outside of the database.

Beginning with Oracle Database 12c release 2, if the `DIAGNOSTIC_DEST` initialization parameter is omitted or left null, then the database uses the Oracle base environment variable to define `DIAGNOSTIC_DEST`.

If you have set the environment variable `ORACLE_BASE`, then `DIAGNOSTIC_DEST` defaults to the directory designated by `ORACLE_BASE`. The generated scripts and log files are created under *Oracle_Base/cfgtoollogs/tool_name/SID/upgraden*, where *n* represents the consecutive number for the upgrade that you performed on this system.

For example, during the upgrade, logs created by DBUA on a system with `ORACLE_BASE` defined appear under the following path:

```
ORACLE_BASE/cfgtoollogs/dbua/SID/upgraden
```

Before running the actual upgrade, DBUA logs are saved under *Oracle_Base/cfgtoollogs/dbua/logs*.

Note:

Beginning with Oracle Database 11g, because all diagnostic data, including the alert log, are stored in the ADR, the initialization parameters `BACKGROUND_DUMP_DEST` and `USER_DUMP_DEST` are deprecated. They are replaced by the initialization parameter `DIAGNOSTIC_DEST`, which identifies the location of the ADR.

Upgrade Script Diagnostic Log Files and Unique Database Name

You can set log file paths when you run the Parallel Upgrade Utility (`catctl1`) by setting the `-l` option to define a log file path.

If you do not set a log file path, then starting with Oracle Database 12c release 2, the Parallel Upgrade Utility attempts to locate a valid path for log files in the following order:

1. If `ORACLE_BASE` is not defined, then the Parallel Upgrade Utility determines the Oracle home from which it is being run, and places log files in the path *Oracle_Base/cfgtoollogs/dbib/upgraden*, where *n* represents the consecutive number for the upgrade that you performed on this system.
2. If there is no `ORACLE_BASE` found on the server, then by default the log files are sent on Linux and UNIX systems to `/tmp`. On Windows systems, the log files are sent by default to the path defined by the `TEMP` environment variable. For example: `C:\TEMP`
3. The Parallel Upgrade Utility obtains the unique database name for the database from the `V$parameter` view to create the directory scheme. The path it creates is as follows where *Oracle_base* is the Oracle base for the Oracle Database installation owner, and *dbname* is the database name obtained from the `V$parameter` view:

```
Oracle_base/cfgtoollogs/dbname/upgrade
```

The first valid path is used for default logging:

```
Oracle_base/cfgtoollogs/dbname/upgrade
Oracle_base/rdbms/log
/tmp
```

3.11 Troubleshooting the Upgrade for Oracle Database

Use these troubleshooting tips to address errors or issues that you may encounter while upgrading your database.

Also review the related links to learn about changes that affect this release, which may be related to errors you receive, and to see how to rerun the upgrade after you resolve errors.

[About Starting Oracle Database in Upgrade Mode](#) (page 3-97)

When you start Oracle Database in upgrade mode, you can only run queries on fixed views. If you attempt to run other views or PL/SQL, then you receive the errors described here.

[Running DBUA with Different ORACLE_HOME Owner](#) (page 3-98)

Review this topic if your Oracle Database homes are owned by different operating system user accounts, or you encounter an `upgrade.xml not found` error.

[Invalid Object Warnings and DBA Registry Errors](#) (page 3-98)

Before you start your upgrade, Oracle strongly recommends that you run the preupgrade information tool (`preupgrd.jar`).

[Invalid Objects and Premature Use of Postupgrade Tool](#) (page 3-99)

Never run the postupgrade status tool for the new Oracle Database 12.2 release (`utlul22s.sql`) until after you complete the upgrade.

[Resolving Oracle Database Upgrade Script Termination Errors](#) (page 3-99)

Review this section if you encounter ORA-00942, ORA-00904, or ORA-01722 errors.

[Troubleshooting Causes of Resource Limits Errors while Upgrading Oracle Database](#) (page 3-99)

Review this section if you encounter ORA-01650, ORA-01651, ORA-01652, ORA-01653, ORA-01654, ORA-01655, ORA-0431, ORA-01562, ORA-19815, or other errors that suggest resource limit errors.

[Resolving SQL*Plus Edition Session Startup Error for Oracle Database](#) (page 3-100)

Use this section to understand and resolve SP2-1540: "Oracle Database cannot startup in an Edition session."

[Error ORA-00020 Maximum Number of Processes Exceeded When Running utlrlp.sql](#) (page 3-101)

This error may indicate that your Oracle configuration does not have sufficient number of processes available for the recompile.

[Fixing ORA-01822 with DBMS_DST Package After Upgrades](#) (page 3-101)

Use this procedure to fix ORA-01822 and ORA-16512 errors involving time zone file mismatches.

[Fixing ORA-28365: Wallet Is Not Open Error](#) (page 3-101)

If you use Oracle wallet with Transparent Data Encryption (TDE), and you use Database Upgrade Assistant (DBUA) to upgrade the database, then you can encounter an ORA-28365 "wallet is not open" error.

[Resolving issues with view CDB_JAVA_POLICY](#) (page 3-102)

If the view CDB_JAVA_POLICY becomes invalid, then use this procedure.

[Continuing Upgrades After Server Restarts \(ADVM/ACFS Driver Error\)](#)
(page 3-102)

On Windows platforms, an error may occur related to ADVM or ACFS drivers if a server restarts during an upgrade.

[Understanding Component Status With the Post-Upgrade Status Tool](#)
(page 3-103)

The Post-Upgrade Status tool, `utl122s.sql`, reports database component status after an upgrade is completed.

[Standard Edition Starter Database and Components with Status OPTION OFF](#)
(page 3-105)

Upgrades of Oracle Database Standard Edition (SE) does not include upgrades of components that are not included with starter databases.

[Adjusting Oracle ASM Password File Location After Upgrade](#) (page 3-105)

You must create a new password file for Oracle ASM after an Oracle Grid Infrastructure upgrade.

[Fixing "Warning XDB Now Invalid" Errors with Pluggable Database Upgrades](#)
(page 3-105)

Review this topic if you encounter "Warning: XDB now invalid, invalid objects found" errors when upgrading pluggable databases (PDBs).

[Fixing ORA-27248: sys.dra_reevaluate_open_failures is running](#) (page 3-106)

Use this procedure to identify DRA_REEVALUATE_OPEN_FAILURES jobs that block upgrades.

[Fixing ORA-22288: File or LOB Operation FILEOPEN Failed Soft Link in Path](#)
(page 3-107)

ORA-22288 occurs when symbolic links are in directory object paths or filenames when opening BFILES.

[Fixing Oracle Database Enterprise User Security, OLS-OID, and Provisioning Profile Error](#) (page 3-107)

Review to understand ORA-16000: database open for read-only access errors.

[Fixing 32K Migration Error with utl32k.sql and MAX_STRING_SIZE](#)
(page 3-107)

Use this procedure to fix ORA-01722: invalid number upgrade errors.

[Recovering from a CRS Shutdown and Oracle ASM Losing Rolling Migration](#)
(page 3-108)

A Cluster Ready Services (CRS) shutdown on all cluster member nodes can place the cluster in a heterogeneous state. Use this procedure to recover from that problem.

[Data Type Versioning Could Cause Cross-Version Replication \(ORA-26656\)](#)
(page 3-109)

Review the user-defined object types affected by versioning.

[Referenced Symbol Count is Undefined Error libclntsh.so.11.1](#) (page 3-109)

Review this topic if you encounter errors that reference `libclntsh.so.11.1` with "referenced symbol count is undefined", "cannot open shared object file", or similar errors.

[Resolving Timestamp Errors Due to ISO 8601 Timestamps](#) (page 3-109)

Review this topic if you encounter timestamp errors with applications after upgrading to Oracle Database 12c release 2 (12.2).

[Fixing Failed Upgrades Where Only Datapatch Fails](#) (page 3-109)

If only datapatch fails during an upgrade, then rerun datapatch directly.

Related Topics:[Deprecated and Desupported Features for Oracle Database 12c](#) (page 8-1)

Oracle Database 12c introduces upgrade behavior changes for your database in addition to new features. Changes in behavior include deprecated and desupported initialization parameters, options, syntax, and the deprecation and desupport of features and components.

[Rerunning Upgrades for Oracle Database](#) (page 3-110)

Use these options to rerun upgrades.

3.11.1 About Starting Oracle Database in Upgrade Mode

When you start Oracle Database in upgrade mode, you can only run queries on fixed views. If you attempt to run other views or PL/SQL, then you receive the errors described here.

When the database is started in upgrade mode, only queries on fixed views execute without errors until after you run the Parallel Upgrade Utility (`catctl.pl` directly, or with the `dbupgrade` script). Before running an upgrade script, queries on any other view or the use of PL/SQL returns an error.

Errors described in this section can occur when you attempt to start the new Oracle Database 12c database. Some of these errors write to the alert log, and not to your session. If you receive any of these errors, then issue the `SHUTDOWN ABORT` command to shut down the database and correct the problem.

- `ORA-00401: the value for parameter compatible is not supported by this release`
The `COMPATIBLE` initialization parameter is set to a value less than `11.2.0`.
- `ORA-39701: database must be mounted EXCLUSIVE for UPGRADE or DOWNGRADE`
The `CLUSTER_DATABASE` initialization parameter is set to `TRUE` instead of `FALSE`.
- `ORA-39700: database must be opened with UPGRADE option`
The `STARTUP` command was issued without the `UPGRADE` keyword.
- `Ora-00704: bootstrap failure`
The path variable can be pointing to the earlier release Oracle home.
- `ORA-00336: log file size xxxx blocks is less than minimum 8192 blocks`

A redo log file size is less than 4 MB.

If errors appear listing desupported initialization parameters, then make a note of the desupported initialization parameters and continue with the upgrade. Remove the desupported initialization parameters the next time you shut down the database.

Related Topics:

<https://support.oracle.com/rs?type=doc&id=1349722.1>

3.11.2 Running DBUA with Different ORACLE_HOME Owner

Review this topic if your Oracle Database homes are owned by different operating system user accounts, or you encounter an `upgrade.xml not found` error.

DBUA upgrades by default assume that both the source (release earlier than Oracle Database 12c) Oracle home and the destination (new 12c) Oracle home are owned by the same user. If each Oracle home is not owned by the same user, then you must change to database file permissions and pass additional parameters to DBUA. If you do not do this, then during upgrade, the DBUA Prerequisite Checks page reports `upgrade.xml not found` errors. You are not permitted to proceed with the upgrade until this error is corrected.

- All Oracle Database installation owners should have the group that you designate as the OINSTALL group (or Oracle Inventory group) as their primary group. Ensure all database files (data files, the redo file, control files, archive log destination, recovery area, SPFILE, and password file) are readable and writable by both the new 12c and pre-12c binary owners. If this is not the case, then confirm that each installation owner has the same group as their primary group, and ensure that members of the OINSTALL group have read/write access to all the earlier release and later release Oracle Database files and directories.
- Run DBUA by specifying the `-logdir` command line option, and provide a directory to which both the new release and earlier release binary owners can write. For example: `/tmp`. DBUA uses the directory you designate with the `logdir` parameter to store the output from the Pre-upgrade Information Tool, and to store any DBUA log files generated during the upgrade. You run the Pre-Upgrade Information tool from the earlier release Oracle Database instance as the earlier release Oracle Database installation owner user account.

For example:

```
dbua -logdir /tmp
```

3.11.3 Invalid Object Warnings and DBA Registry Errors

Before you start your upgrade, Oracle strongly recommends that you run the preupgrade information tool (`preupgrd.jar`).

The preupgrade information tool identifies invalid SYS and SYSTEM objects, as well as other invalid objects. Use `utlrp.sql` to recompile invalid objects. If you fail to do this before an upgrade, then it becomes difficult to determine which objects in your system were invalid before starting the upgrade, and which objects become invalid as a result of the upgrade.

Related Topics:

[Using the Pre-Upgrade Information Tool for Oracle Database](#) (page 2-35)

3.11.4 Invalid Objects and Premature Use of Postupgrade Tool

Never run the postupgrade status tool for the new Oracle Database 12.2 release (`utlul22s.sql`) until after you complete the upgrade.

Oracle recommends that you run the postupgrade status tool only after the upgrade process is complete, and after you have run `utlurp.sql`. If the postupgrade status tool is run before you run `@utlurp.sql`, then the output of tool may not display the accurate final component status value. If the tool is run before running `utlurp.sql`, then the component status values may not properly reflect the final state. You can only determine the final component state after running `utlurp.sql`.

3.11.5 Resolving Oracle Database Upgrade Script Termination Errors

Review this section if you encounter ORA-00942, ORA-00904, or ORA-01722 errors.

If you do not run the Pre-Upgrade Information Tool before starting the upgrade, then the `catctl.pl` and `catupgrd.sql` scripts terminate with errors as follows:

```
ORA-00942: table or view does not exist
ORA-00904: "TZ_VERSION": invalid identifier
ORA-01722: invalid number
```

If you receive any of these errors, then complete the following procedure:

1. Enter a `SHUTDOWN ABORT` command, and wait for the command to complete running.
2. Revert to the original Oracle home directory
3. Run the Pre-Upgrade Information Tool.

Related Topics:

[Pre-Upgrade Information Tool for Oracle Database](#) (page 2-35)

Review these topics to understand and to use the Pre-Upgrade information tool (`preupgrade.jar`).

3.11.6 Troubleshooting Causes of Resource Limits Errors while Upgrading Oracle Database

Review this section if you encounter ORA-01650, ORA-01651, ORA-01652, ORA-01653, ORA-01654, ORA-01655, ORA-0431, ORA-01562, ORA-19815, or other errors that suggest resource limit errors.

If you run out of resources during an upgrade, then increase the resource allocation. After increasing the resource allocation, shut down the instance with `SHUTDOWN ABORT`, and restart the instance in `UPGRADE` mode before re-running the `catupgrd.sql` script.

The resources that generally require increases for a new Oracle Database release are as follows:

- `SYSTEM` and `SYSAUX` tablespaces

If your `SYSTEM` tablespace size is insufficient, then typically you receive the following error message:

ORA-01650: unable to extend rollback segment *string* by *string* in tablespace *string*
 ORA-01651: unable to extend save undo segment by *string* for tablespace *string*
 ORA-01652: unable to extend temp segment by *string* in tablespace *string*
 ORA-01653: unable to extend table *string.string* by *string* in tablespace *string*
 ORA-01654: unable to extend index *string.string* by *string* in tablespace *string*
 ORA-01655: unable to extend cluster *string.string* by *string* in tablespace *string*

To avoid these errors, set `AUTOEXTEND ON MAXSIZE UNLIMITED` for the `SYSTEM` and `SYSAUX` tablespaces.

- Shared memory

In some cases, you may require larger shared memory pool sizes. The error message indicates which shared memory initialization parameter you must increase, in the following format:

ORA-04031: unable to allocate *string* bytes of shared memory
 ("*string*", "*string*", "*string*", "*string*")

See Also:

Oracle Database Administrator's Guide for information about using manual shared memory management

- Rollback segments/undo tablespace

If you are using rollback segments, then you must have a single large (100 MB) `PUBLIC` rollback segment online while the upgrade scripts are being run. Smaller public rollback segments should be taken offline during the upgrade. If your rollback segment size is insufficient, then typically you encounter the following error:

ORA-01562: failed to extend rollback segment number *string*

If you are using an undo tablespace, then be sure it is at least 400 MB.

- Fast Recovery Area

If you are using a Fast Recovery Area and it fills up during the upgrade, then the following error appears in the alert log, followed by suggestions for recovering from the problem:

ORA-19815: WARNING: db_recovery_file_dest_size of *string* bytes is 98.99% used, and has *string* remaining bytes available.

Identify the root cause of the problem, and take appropriate actions to proceed with the upgrade. To avoid issues during the upgrade, increase the amount of space available in your Fast Recovery Area before starting the upgrade.

3.11.7 Resolving SQL*Plus Edition Session Startup Error for Oracle Database

Use this section to understand and resolve SP2-1540: "Oracle Database cannot startup in an Edition session."

If an upgrade script or a command running in SQL*Plus set the `EDITION` parameter, then Oracle Database cannot start properly afterward. When you attempt to start the database, you receive the following error:

SP2-1540: "Oracle Database cannot startup in an Edition session"

To avoid this problem, after running `catupgrd.sql` or any SQL*Plus session where this parameter is changed, exit the SQL*Plus session and restart the instance in a different session.

3.11.8 Error ORA-00020 Maximum Number of Processes Exceeded When Running `utlrp.sql`

This error may indicate that your Oracle configuration does not have sufficient number of processes available for the recompile.

Refer to Oracle documentation for more details about setting the `PROCESSES` parameter.

See Also:

Oracle Database Reference

3.11.9 Fixing ORA-01822 with `DBMS_DST` Package After Upgrades

Use this procedure to fix ORA-01822 and ORA-16512 errors involving time zone file mismatches.

Running the `DBMS_DST` package after upgrading to Oracle Database 12c can result in an ORA-01882: time zone region not found error.

This error is returned if the time zone file version is set incorrectly. An incorrect time zone setting results in the region IDs of several time zone regions being stored incorrectly in the database. For example:

```
ERROR at line 1:
@ ORA-01882: time zone region not found
@ ORA-06512: at "SYS.DBMS_DST", line 113
@ ORA-06512: at "SYS.DBMS_DST", line 1101
@ ORA-06512: at line 1
```

To fix this problem, update the time zone version, and re-run the upgrade.

3.11.10 Fixing ORA-28365: Wallet Is Not Open Error

If you use Oracle wallet with Transparent Data Encryption (TDE), and you use Database Upgrade Assistant (DBUA) to upgrade the database, then you can encounter an ORA-28365 "wallet is not open" error.

To avoid this problem, complete the following tasks before upgrading:

1. Log in as an authorized user.
2. Manually copy the `sqlnet.ora` file, and the wallet file, `ewallet.p12`, to the new release Oracle home.
3. Open the Oracle wallet in mount.

For example:

```
SQL> STARTUP MOUNT;
SQL> ALTER SYSTEM SET ENCRYPTION WALLET OPEN
```

4. Start the upgrade as usual.

3.11.11 Resolving issues with view CDB_JAVA_POLICY

If the view CDB_JAVA_POLICY becomes invalid, then use this procedure.

After an upgrade to Oracle Database 12c release 2 (12.2), or a downgrade from release 12.2 to 12.1, you can encounter issues with the CDB_JAVA_POLICY view. CDB_JAVA_POLICY can become invalid, or it can encounter errors when you use it in a manner that normally works. If this happens, then connect as SYS, and run the following commands.

Non-CDBs:

```
alter session set "_ORACLE_SCRIPT"=true;

exec CDBView.create_cdbview(false, 'SYS', 'dba_java_policy', 'CDB_java_policy');

grant select on SYS.CDB_java_policy to select_catalog_role
/
create or replace public synonym CDB_java_policy for SYS.CDB_java_policy
/
```

Multitenant architecture systems:

Run these same commands, but run them first in CDB\$ROOT, and then in other containers in the CDB.

3.11.12 Continuing Upgrades After Server Restarts (ADVM/ACFS Driver Error)

On Windows platforms, an error may occur related to ADVM or ACFS drivers if a server restarts during an upgrade.

If a server restarts during the upgrade, then you may see one of the following error messages:

```
ACFS-9427: Failed to unload ADVM/ACFS drivers. A system reboot is recommended
```

```
ACFS-9428 Failed to load ADVM/ACFS drivers. A system reboot is recommended.
```

- Cause

The ADVM and ACFS drivers are still in use. You must restart the system to start the new drivers.
- Action

Complete the steps as described in the following procedures.

For nodes other than the first node (the node on which the upgrade is started):

1. Restart the node where the error occurs.
2. Run the root script on that node again.

For first nodes (the node on which the upgrade is started):

1. Complete the upgrade of all other nodes in the cluster.
2. Restart the first node.
3. Run the root script on the first node again.

4. To complete the upgrade, log in as root, and run the script `configToolAllCommands`, located in the path `Grid_home/cfgtoollogs/configToolAllCommands`.

See Also:

Oracle Grid Infrastructure Installation Guide for your operating system for more information about troubleshooting upgrade issues for clusters

3.11.13 Understanding Component Status With the Post-Upgrade Status Tool

The Post-Upgrade Status tool, `utlul22s.sql`, reports database component status after an upgrade is completed.

You can run the Post-Upgrade Status Tool `utlul22s.sql` anytime after upgrade, post-upgrade, or after recompiling invalid objects with `utlrp.sql`.

The following list briefly describes the status values that the Post-Upgrade Status tool reports:

- **INVALID**
When the upgrade completed, some objects for the component remained in an invalid state. If you find no errors in the log file for component upgrades then run the script `utlrp.sql`. Running this script may change the status of invalid components to **VALID** without rerunning the entire upgrade. Check the `DBA_REGISTRY` view after running `utlrp.sql`.
- **VALID**
The component is valid with no errors.
- **LOADING**
The component is loading
- **LOADED**
The component has successfully finished loading.
- **UPGRADING**
The component is in process being upgraded.
- **UPGRADED**
The component has completed upgrading with no errors.
- **DOWNGRADING**
The component is in process being downgraded.
- **DOWNGRADED**
The component has completed downgrading with no errors.
- **REMOVING**
The component is in process being removed.
- **REMOVED**

The component was not upgraded because it was removed from the database.

- `OPTION OFF`

The server option required for the component was not installed or was not linked with the server. Check the `V$OPTION` view and the install logs. Install the component or relink the server with the required option, and then re-run the Parallel Upgrade Utility.

- `NO SCRIPT`

The component upgrade script was not found in `$ORACLE_HOME`. Check the install logs, install the component software, and then re-run the Parallel Upgrade Utility.

Note:

You can run the Parallel Upgrade Utility (`catctl.pl` using the command-line scripts `dbupgrade` on Linux and UNIX, and `dbupgrade.cmd` on Windows).

[Example of an Upgrade Summary Report](#) (page 3-104)

Upgrade summary reports provide information about the upgrade status of components.

Related Topics:

[Scripts for Upgrading Oracle Database](#) (page B-1)

[Change to Upgrade Status Setting](#) (page 3-91)

3.11.13.1 Example of an Upgrade Summary Report

Upgrade summary reports provide information about the upgrade status of components.

After the upgrade completes, starting with Oracle Database 12c release 2, the `utlu1212.sql` script writes a copy of the report using the following write order:

1. `ORACLE_BASE/cfgtoollogs/db_unique_name/upgradeYYMMDDHHMMSC/upg_summary.rpt`
2. `$ORACLE_HOME/rdbms/log/upg_summary.rpt`
3. Linux and UNIX:
`/tmp/upg_summary.rpt`

Windows:

`\TEMP\upg_summary.rpt`

If `utlu122s.sql` cannot create the report under the first directory scheme, then it attempts to write to the second location, and then the third location. If it cannot write to any of these paths, then it does not write an upgrade summary report.

Example 3-35 Upgrade Summary Report for the Post-Upgrade Status Tool

| Component Name | Current Status | Version Number | Elapsed Time HH:MM:SS |
|----------------------------------|----------------|----------------|-----------------------|
| Oracle Server | UPGRADED | 12.2.0.0.0 | 00:14:49 |
| JServer JAVA Virtual Machine | UPGRADED | 12.2.0.0.0 | 00:04:01 |
| Oracle Real Application Clusters | OPTION OFF | 12.2.0.0.0 | 00:00:02 |
| Oracle Workspace Manager | UPGRADED | 12.2.0.0.0 | 00:01:07 |
| OLAP Analytic Workspace | UPGRADED | 12.2.0.0.0 | 00:00:36 |
| Oracle OLAP API | UPGRADED | 12.2.0.0.0 | 00:00:39 |
| Oracle Label Security | UPGRADED | 12.2.0.0.0 | 00:00:15 |
| Oracle XDK | UPGRADED | 12.2.0.0.0 | 00:00:51 |
| Oracle Text | UPGRADED | 12.2.0.0.0 | 00:01:05 |
| Oracle XML Database | UPGRADED | 12.2.0.0.0 | 00:01:45 |
| Oracle Database Java Packages | UPGRADED | 12.2.0.0.0 | 00:00:17 |
| Oracle Multimedia | UPGRADED | 12.2.0.0.0 | 00:04:03 |
| Spatial | UPGRADED | 12.2.0.0.0 | 00:05:13 |
| Oracle Database Vault | UPGRADED | 12.2.0.0.0 | 00:00:28 |
| Final Actions | | | 00:01:29 |
| Post Upgrade | | | 00:02:28 |

Total Upgrade Time: 01:02:01

3.11.14 Standard Edition Starter Database and Components with Status OPTION OFF

Upgrades of Oracle Database Standard Edition (SE) does not include upgrades of components that are not included with starter databases.

When you upgrade Oracle Database Standard Edition (SE) starter databases, the SE server cannot upgrade components that are not included with starter databases, because these components require options that are not installed in the Standard Edition release.

After you upgrade an Oracle Database Standard Edition database, components may have a STATUS value of OPTION OFF in the DBA_REGISTRY view. You may also see invalid objects in the associated component schemas. Oracle Database Upgrade Assistant (DBUA) shows unsuccessful upgrades for these components.

3.11.15 Adjusting Oracle ASM Password File Location After Upgrade

You must create a new password file for Oracle ASM after an Oracle Grid Infrastructure upgrade.

The Oracle ASM password file location is not shown in the command output when you run `srvctl config asm` after a Grid Infrastructure upgrade. The location of the password file is not automatically passed to the new Oracle ASM disk group. To enable SRVCTL to have the password file location after upgrade, you must advance the diskgroup compatibility setting and create a PWFIL in the disk group. Then SRVCTL reports the configured location of the shared PWFIL.

See Also:

Oracle Automatic Storage Management Administrator's Guide for information about managing shared password files in disk groups

3.11.16 Fixing "Warning XDB Now Invalid" Errors with Pluggable Database Upgrades

Review this topic if you encounter "Warning: XDB now invalid, invalid objects found" errors when upgrading pluggable databases (PDBs).

You can encounter XML object errors when you plug an Oracle Database 12c release 1 (12.1) pluggable database (PDB) into an Oracle Database 12c release 2 (12.2) multitenant container database (CDB).

Common objects (objects with `sharing= 'METADATA LINK'` in `dba_objects`) are created by registering system-generated names in an object-relational XML schema. Those common types are created by registering some ORDSYS schemas with object-relational storage.

The names of these common objects are system-generated, and the names generated in release 12.1 can be different from the names used for these objects in release 12.2. Because of these possible name changes, the release 12.1 object types may not have matching common types in the release 12.2 CDB root.

Resolve this issue using the following procedure:

1. Query the view `PDB_PLUG_IN_VIOLATIONS` in the target CDB root to see if there is any action containing `'GetTypeDDL'`

If you find `'GetTypeDDL'` actions, then the upgraded PDB has the common objects issue.

2. Run the PL/SQL packages `SET SERVEROUTPUT ON` and `exec xdb.DBMS_XMLSTORAGE_MANAGE.GetTypeDDL` in the target PDB to generate a user-named SQL script (for example, `script1.sql`).
3. Run the script you created in step 2 (for example, `script1.sql` in the source 12.1 CDB to obtain the type creation script for each of the common types for which you are encountering errors
4. Generate another user-named SQL script (for example, `script2.sql`) that contains these creation scripts.
5. Run the script that you created on the source 12.1 CDB (for example, `script2.sql`) in the target PDB.

The script that you generate from the release 12.1 source CDB type creation scripts generates all of these objects in the target PDB. Making these common objects available in the target PDB should eliminate the invalid XDB errors.

3.11.17 Fixing ORA-27248: sys.dra_reevaluate_open_failures is running

Use this procedure to identify `DRA_REEVALUATE_OPEN_FAILURES` jobs that block upgrades.

During an upgrade, if `DBUA` fails with the error `ORA-27248: sys.dra_reevaluate_open_failures is running`, then the job `DRA_REEVALUATE_OPEN_FAILURES` is running, which causes upgrade failures. Ensure that the job is stopped before continuing the upgrade.

In a job definition, if `ALLOW_RUNS_IN_RESTRICTED_MODE` is set to `TRUE`, and the job owner is permitted to log in during restricted mode, then that job is permitted to run when the database is in restricted or upgrade mode. The default setting for this parameter is `FALSE`.

Use the following query to see the state of any running jobs:

```
SQL> select OBJECT_NAME, Owner, OBJECT_TYPE from dba_objects where object_name like '%DRA_REEVA%';
```


3.11.18 Fixing ORA-22288: File or LOB Operation FILEOPEN Failed Soft Link in Path

ORA-22288 occurs when symbolic links are in directory object paths or filenames when opening BFILES.

When you create a directory object or BFILE objects, you must meet the following conditions.

- The operating system file must not be a symbolic or hard link.
- The operating system directory path named in the Oracle DIRECTORY object must be an existing operating system directory path.
- The operating system directory path named in the Oracle DIRECTORY object should not contain any symbolic links in its components.

When a BFILE is opened, the entire directory path and filename is checked. If any symbolic link is found, then you receive the following error.

```
ORA-22288: file or LOB operation FILEOPEN failed soft link in path
```

To resolve this error, remove symbolic links, and comply with other requirements for creating BFILES.

Related Topics:

Oracle Database SecureFiles and Large Objects Developer's Guide

3.11.19 Fixing Oracle Database Enterprise User Security, OLS-OID, and Provisioning Profile Error

Review to understand ORA-16000: database open for read-only access errors.

After upgrading databases that use OLS and a standby database, you may see ORA-16000 (database open for read-only access). After switchover, update the Provisioning profile with the connect information of the new primary. If you do not update the Provisioning profile, then the policies continue to be propagated to the new standby (old primary) and the database continues to fail with ORA-16000 errors.

See Also:

Oracle Database Enterprise User Security Administrator's Guide for information about the additional steps required for upgrading Oracle Database from release 10g (10.1) and higher to Oracle Database 12c

3.11.20 Fixing 32K Migration Error with utl32k.sql and MAX_STRING_SIZE

Use this procedure to fix ORA-01722: invalid number upgrade errors.

If the initialization parameter MAX_STRING_SIZE is set to EXTENDED, but the 32K migration that the utl32k.sql script carries out is not completed, then the database upgrade fails with the following error:

```
SELECT TO_NUMBER('32K_MIGRATION_NOT_COMPLETED')
*
```

```
ERROR at line 1:
ORA-01722: invalid number
```

The database upgrade does not automatically run the `utl32k.sql` script, and does not perform the 32K migration.

Complete the upgrade and the 32K migration by using this manual procedure:

1. Reset the initialization parameter `MAX_STRING_SIZE` to `STANDARD`.
2. Restart the database in `UPGRADE` mode.
3. Rerun the upgrade using the manual procedure.
4. After the database is upgraded, set the initialization parameter `MAX_STRING_SIZE` to `EXTENDED`.
5. Restart the database in `UPGRADE` mode.
6. Run the SQL script `./rdbms/admin/utl32k.sql`.

After you run the `utl32k.sql` script, the upgraded database completes the 32K migration and supports the `EXTENDED` parameter.

3.11.21 Recovering from a CRS Shutdown and Oracle ASM Losing Rolling Migration

A Cluster Ready Services (CRS) shutdown on all cluster member nodes can place the cluster in a heterogeneous state. Use this procedure to recover from that problem.

Oracle Automatic Storage Management (Oracle ASM) loses the rolling migration state if CRS shuts down on all nodes. This CRS shutdown can create a heterogeneous state, so that you cannot restart all cluster member nodes. You cannot start two nodes of different versions in the cluster. If you attempt to start nodes running different versions of Oracle ASM, then one of the sets of heterogeneous nodes running Oracle ASM nodes fails, generating either ORA-15153 or ORA-15163 error messages.

Consider the following scenario of four nodes (node1, node2, node3, and node4) that are at Oracle Database release 11.2.0.2 and being upgraded to release 12.1.0.2.

- Node1 and node2 are upgraded to 12.1.0.2 and running.
- Node3 and node 4 are still at 11.2.0.2 and running.
- Now consider that there is an outage where all CRS stacks are down, which leaves the cluster in a heterogeneous state (that is, two nodes at 11.2.0.2 and two nodes at 12.1.0.2).

Using this scenario as an example, complete the following procedure:

1. Restart only the nodes that are in the earlier release. In this scenario, start the nodes in release 11.2.0.2 (node3 or node4, or both).
2. run the following SQL command on the Oracle ASM instance on node3 or node4 before starting any 12.1.0.2 node:

```
ALTER SYSTEM START ROLLING MIGRATION TO '12.1.0.2'
```

3. Continue the documented upgrade procedure from the point of failure.

3.11.22 Data Type Versioning Could Cause Cross-Version Replication (ORA-26656)

Review the user-defined object types affected by versioning.

Release 12.1.0.2 introduces versioning of data types that can be attributes of Oracle object types (reference Bug 18897657). Because of this feature, cross-version replication between release 12.1.0.1 and release 12.1.0.2 databases may be affected, resulting in ORA-26656 errors.

If any user-defined object types contain attributes of DATE, TIMESTAMP, TIMESTAMP WITH TIME ZONE, TIMESTAMP WITH LOCAL TIME ZONE, BINARY_FLOAT, BINARY_DOUBLE, NCHAR, NVARCHAR2, NCLOB, ANYDATA, and similar objects, then you must apply the mandatory Patch Set Update 18038108 to all release 12.1.0.1 instances.

3.11.23 Referenced Symbol Count is Undefined Error libclntsh.so.11.1

Review this topic if you encounter errors that reference `libclntsh.so.11.1` with "referenced symbol count is undefined", "cannot open shared object file", or similar errors.

During an upgrade to Oracle Database 12c, client applications linked against the `libclntsh.so.11.1` file may fail to run on Oracle Solaris, HP-UX Itanium or IBM AIX platforms. In that event, you see error messages similar to the following:

```
referenced symbol count is undefined
```

Workaround

Relink affected client applications against the new `libclntsh.so.12.2` file.

3.11.24 Resolving Timestamp Errors Due to ISO 8601 Timestamps

Review this topic if you encounter timestamp errors with applications after upgrading to Oracle Database 12c release 2 (12.2).

ISO 8601 is an international standard for exchanging date and time-related data, established by the International Organization for Standardization (ISO), and the International Electrotechnical Commission (IEC). The purpose of this standard is to provide a common international standard for representing dates and times, to avoid misinterpretation of dates and times with data used between countries using different conventions for writing numeric dates and times. For example:

```
2015-09-23T19:25:25.123456+00:00
```

Oracle recommends that you use this standard.

By default, the initialization parameter `UNIFORM_LOG_TIMESTAMP_FORMAT` is set to `TRUE`. If using the ISO 8601 standard causes scripts to break, then you can set `UNIFORM_LOG_TIMESTAMP_FORMAT` to `FALSE` to cause the Oracle Database 12.2 release to revert to the timestamp format used in Oracle Database 12.1. After you change the initialization parameter, fix your scripts so that they can use ISO 8601 timestamps. When your scripts can use the ISO 8601 standard, change the parameter back to the default value of `TRUE`.

3.11.25 Fixing Failed Upgrades Where Only Datapatch Fails

If only datapatch fails during an upgrade, then rerun datapatch directly.

The Datapatch script, `datapatch.pl`, is a PERL script. In some patching operations, the final post-upgrade patches may not run, due to errors such as ORA-20001. If only the Datapatch script fails, then you do not need to run the upgrade again to fix this issue. Instead, run `datapatch.pl` directly.

To fix a failed datapatch, log in as the Oracle user, and complete this procedure:

1. Change directory to Opatch inside the upgraded Oracle home.

```
$ cd $ORACLE_HOME/OPatch
```

2. Run the datapatch command.

```
$ ./datapatch -verbose
```

3.12 Rerunning Upgrades for Oracle Database

Use these options to rerun upgrades.

[About Rerunning Upgrades for Oracle Database](#) (page 3-110)

Oracle provides the features listed here to rerun or restart Oracle Database upgrades, including after failed phases.

[Rerunning Upgrades with the Upgrade \(catctl.pl\) Script](#) (page 3-111)

You can fix upgrade issues and then rerun the upgrade with the `catctl.pl` script, or the `dbupgrade` shell command.

[Options for Rerunning the Upgrade for Multitenant Databases \(CDBs\)](#) (page 3-113)

There are four options you can use to rerun upgrades on multitenant database architecture (CDBs) for Oracle Database 12c release 2 (12.2).

3.12.1 About Rerunning Upgrades for Oracle Database

Oracle provides the features listed here to rerun or restart Oracle Database upgrades, including after failed phases.

Parallel Upgrade Utility and Restarts or Reruns

You can re-run or restart Oracle Database upgrade phases by using either Database Upgrade Assistant (DBUA), or by using the Parallel Upgrade Utility (`catctl.pl`) script. You can also run commands on PDBs that failed to upgrade in an initial attempt, so that you can complete the upgrade.

Parallel Upgrade Utility Resume Option

Oracle Database 12c release 2 (12.2) includes a new Resume option for Parallel Upgrade Utility. This option is available for both CDBs and Non-CDBs. You are not required to identify failed or incomplete phases when you rerun or restart the upgrade. When you use the Parallel Upgrade Utility using the resume option (`-R`), the utility automatically detects phases from the previous upgrade that are not completed successfully. The Parallel Upgrade Utility then reruns or restarts just these phases that did not complete successfully, so that the upgrade is completed. Bypassing steps that already completed successfully reduces the amount of time it takes to rerun the upgrade.

To use the Resume option, run the Parallel Upgrade Utility using the `-R` parameter. For example:

```
$ORACLE_HOME/perl/bin/perl catctl.pl -L plist.txt -n 4 -N 2 -R -l $ORACLE_HOME/
cfgtoollogs catupgrd.sql
```

You can rerun the entire upgrade at any time, regardless of which phase you encountered a failure in your upgrade. If you plan to rerun the entire upgrade, instead of rerunning only failed phases, then run the Parallel Upgrade Utility without using the Resume (-R) option.

3.12.2 Rerunning Upgrades with the Upgrade (catctl.pl) Script

You can fix upgrade issues and then rerun the upgrade with the `catctl.pl` script, or the `dbupgrade` shell command.

Note:

Starting with Oracle Database 12c, release 1 (12.1), non-CDB architecture is deprecated. It can be desupported in a future release.

1. Shut down the database. For a non-CDB and a CDB, the syntax is the same.

```
SQL> SHUTDOWN IMMEDIATE
```

2. Restart the database in UPGRADE mode.

For a non-CDB:

```
SQL> STARTUP UPGRADE
```

For a CDB:

```
SQL> STARTUP UPGRADE
```

```
SQL> alter pluggable database all open upgrade;
```

3. Rerun the Parallel Upgrade utility (`catctl.pl`, or `dbupgrade` shell command).

You can rerun the Parallel Upgrade Utility as many times as necessary.

With CDBs, you can use the Resume option (-R) to rerun the Parallel Upgrade Utility. The script resumes the upgrades from failed phases.

For example:

```
$ORACLE_HOME/perl/bin/perl catctl.pl -n 4 -R -l $ORACLE_HOME/cfgtoollogs
catupgrd.sql
```

You can also provide the name of one or more specific PDBs on which you want to rerun the upgrade.

For example, this command reruns the upgrade on the PDB named `cdb1_pdb1`:

```
$ORACLE_HOME/perl/bin/perl catctl.pl -n 4 -R -l $ORACLE_HOME/cfgtoollogs -c
'cdb1_pdb1' catupgrd.sql
```

You can use the `dbupgrade` shell command to run the same commands:

```
dbupgrade -n 4 -R -l $ORACLE_HOME/diagnostics catupgrd.sql
```

```
dbupgrade -n 4 -R -l $ORACLE_HOME/diagnostics -c 'cdb1_pdb1' catupgrd.sql
```

4. Run `utlu122s.sql`, the Post-Upgrade Status Tool, which provides a summary of the status of the upgrade in the spool log. You can run `utlu122s.sql` any time before or after you complete the upgrade, but not during the upgrade.

In a non-CDB:

```
SQL> @$ORACLE_HOME/rdbms/admin/utlu122s.sql
```

In a CDB:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b utlu122s -d ''.''' utlu122s.sql
```

If the `utlu122s.sql` script returns errors or shows components that are not `VALID` or not the most recent release, then follow troubleshooting procedures for more information.

5. Run `utlrlp.sql` to recompile any remaining stored PL/SQL and Java code.

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b utlrlp -d ''.''' utlrlp.sql
```

The script generates the log file `utlrlp0.log`, which shows the results of the re-compilations.

Use the following SQL commands to verify that all expected packages and classes are valid,

In a single PDB (`cdb1_pdb1` in this example), open the PDB in normal mode as follows:

```
alter pluggable database cdb1_pdb1 open;
```

Run `catcon.pl` to start `utlrlp.sql` in the PDB to recompile any remaining stored PL/SQL and Java code. Use the following syntax:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b utlrlp -d ''.''' -c 'cdb1_pdb1' utlrlp.sql
```

In a non-CDB:

```
SQL> SELECT count(*) FROM dba_invalid_objects;
SQL> SELECT distinct object_name FROM dba_invalid_objects;
```

In an entire CDB:

```
SQL> ALTER SESSION SET CONTAINER = "CDB$ROOT"
SQL> SELECT count(*) FROM dba_invalid_objects;
SQL> SELECT distinct object_name FROM dba_invalid_objects;
SQL> ALTER SESSION SET CONTAINER = "PDB$SEED"
SQL> SELECT count(*) FROM dba_invalid_objects;
SQL> SELECT distinct object_name FROM dba_invalid_objects;
SQL> ALTER SESSION SET CONTAINER = "cdb1_pdb1"
SQL> SELECT count(*) FROM dba_invalid_objects;
SQL> SELECT distinct object_name FROM dba_invalid_objects;
```

6. Run `utlu122s.sql` again to verify that all issues have been fixed.

In a non-CDB:

```
SQL> @$ORACLE_HOME/rdbms/admin/utlu122s.sql
```

In a CDB:

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b utlu122s -d ''.''' utlu122s.sql
```

7. Exit `SQL*Plus`.
8. If you are upgrading a cluster database from release 11.2, then upgrade the database configuration in Oracle Clusterware using the following command

syntax, where *db-unique-name* is the database name assigned to it (not the instance name), and *Oracle_home* is the Oracle home location in which the database is being upgraded.

```
$ srvctl upgrade database -d db-unique-name -o Oracle_home
```

Your database is now upgraded to Oracle Database 12c. You are ready to complete post-upgrade tasks for Oracle Database.

Related Topics:

[Options for Rerunning the Upgrade for a Multitenant Database \(CDB\)](#)
(page 3-113)

There are four options you can use to rerun upgrades on multitenant database architecture (CDBs) for Oracle Database 12c release 2 (12.2).

[Troubleshooting the Upgrade for Oracle Database](#) (page 3-95)

Use these troubleshooting tips to address errors or issues that you may encounter while upgrading your database.

[Post-Upgrade Tasks for Oracle Database](#) (page 4-1)

After you upgrade Oracle Database, complete required post-upgrade tasks, and consider recommendations for the new release.

3.12.3 Options for Rerunning the Upgrade for Multitenant Databases (CDBs)

There are four options you can use to rerun upgrades on multitenant database architecture (CDBs) for Oracle Database 12c release 2 (12.2).

[Rerun the Entire Upgrade for the CDB](#) (page 3-113)

If several different issues occur during the first upgrade attempt, then use this procedure to re-run the entire upgrade.

[Rerun the Upgrade Only on Specified CDBs](#) (page 3-114)

You can rerun upgrades on specified multitenant containers by running the Parallel Upgrade Utility with either the Resume option (-R), or with the exclusion list option (-C).

[Rerun the Upgrade While Other PDBs Are Online](#) (page 3-115)

You can rerun PDB upgrades by using the Parallel Upgrade Utility Resume option, or by explicitly including or excluding online PDBs using with inclusion or exclusion lists.

[Rerun the Upgrade Using an Inclusion List to Specify a CDB or PDBs](#)
(page 3-117)

Use this example as a model for rerunning an upgrade on a PDB by using an inclusion list.

3.12.3.1 Rerun the Entire Upgrade for the CDB

If several different issues occur during the first upgrade attempt, then use this procedure to re-run the entire upgrade.

This example demonstrates running the upgrade again on the CDB\$ROOT, PDB\$SEED and all PDBs after correcting for a problem occurring during the initial upgrade attempt, such as running out of shared pool.

1. Start the upgrade again. For example:

```
SQL> startup upgrade;
alter pluggable database all open upgrade;
```

2. Run the Parallel Upgrade Utility (`catctl.pl`, or the `dbupgrade` shell script. For example:

```
cd $ORACLE_HOME/bin/
./dbupgrade -d $ORACLE_HOME/rdbms/admin -l $ORACLE_HOME/rdbms/log
```

The upgrade runs again on all the containers, including `CDB$ROOT`, `PDB$SEED`, and all PDBs in the CDB.

3.12.3.2 Rerun the Upgrade Only on Specified CDBs

You can rerun upgrades on specified multitenant containers by running the Parallel Upgrade Utility with either the Resume option (`-R`), or with the exclusion list option (`-C`).

In both the examples that follow, the multitenant container database contains five PDBs. All upgrades ran successfully except for `CDB1_PDB1` and `CDB1_PDB2`, which failed with an upgrade error. To run the upgrade on these two containers, you shut down the entire multitenant database and restart only the PDBs you want to upgrade.

Note:

Parallel Upgrade Utility parameters are case-sensitive.

Example 3-36 Rerunning Upgrades With the Resume Option

You can use the Parallel Upgrade Utility Resume parameter option `-R` to rerun the upgrade only on one or more multitenant containers (CDBs).

In the following example, the upgrade script detects that it should run on `CDB1_PDB1` and `CDB1_PDB2` containers only.

1. Shut down the multitenant database, start up the database in upgrade mode, and then start up the PDBs on which the upgrade did not complete. For example:

```
SQL> shutdown immediate;
startup upgrade;
alter pluggable database CDB1_PDB1 open upgrade;
alter pluggable database CDB1_PDB2 open upgrade;
```

2. Show the CDB and PDB status:

```
SQL> show pdbs
```

| CON_ID | CON_NAME | OPEN MODE | RESTRICTED |
|--------|-----------|-----------|------------|
| 2 | PDB\$SEED | MIGRATE | YES |
| 3 | CDB1_PDB1 | MIGRATE | YES |
| 4 | CDB1_PDB2 | MIGRATE | YES |
| 5 | CDB1_PDB3 | MOUNTED | |
| 6 | CDB1_PDB4 | MOUNTED | |
| 7 | CDB1_PDB5 | MOUNTED | |

3. Rerun the upgrade. The upgrade automatically detects from the previous upgrade logs that `CDB$ROOT` and `PDB$SEED` are upgraded successfully. The upgrade bypasses `CDB$ROOT` and `PDB$SEED`, and only runs on `CDB1_PDB1` and `CDB_PDB2`. The command example here is for Linux/UNIX systems:


```
cd $ORACLE_HOME/bin
./dbupgrade -d $ORACLE_HOME/rdbms/admin -l $ORACLE_HOME/cfgtoollogs -R
```

The Parallel Upgrade Utility completes the upgrade on CDB1_PDB1 and CDB1_PDB2.

Example 3-37 Rerunning Upgrades With an Exclusion List

An exclusion list contains containers that you do not want to upgrade. An exclusion list uses the Parallel Upgrade Utility `-C` parameter option. Run the Parallel Upgrade utility by changing directory to `Oracle_home/rdbms/admin/` and running the utility in Perl using `catctl.pl`, or by changing directory to `Oracle_home/bin` and running the command-line script, `dbupgrade -C`. This method is useful when you have many PDBs on which you want to rerun the upgrade.

In this following example, you provide an exclusion list to exclude the upgrade script from running on containers where you do not require it to run.

1. Shut down the multitenant database, start up the database in upgrade mode, and then start up the PDBs on which the upgrade did not complete. For example:

```
SQL> shutdown immediate;
      startup upgrade;
      alter pluggable database CDB1_PDB1 open upgrade;
      alter pluggable database CDB1_PDB2 open upgrade;
```

2. Show the CDB and PDB status:

```
SQL> show pdbs
```

| CON_ID | CON_NAME | OPEN MODE | RESTRICTED |
|--------|-----------|-----------|------------|
| 2 | PDB\$SEED | MIGRATE | YES |
| 3 | CDB1_PDB1 | MIGRATE | YES |
| 4 | CDB1_PDB2 | MIGRATE | YES |
| 5 | CDB1_PDB3 | MOUNTED | |
| 6 | CDB1_PDB4 | MOUNTED | |
| 7 | CDB1_PDB5 | MOUNTED | |

3. Rerun the upgrade, excluding CDB\$ROOT and PDB\$SEED from the upgrade in a space-delimited exclusion list that you specify with single quote marks. The command example here is for Linux/UNIX systems:

```
$ORACLE_HOME/bin/dbupgrade -d $ORACLE_HOME/rdbms/admin -l $ORACLE_HOME/rdbms/log
-C 'CDB$ROOT PDB$SEED'
```

The upgrade reruns, and completes on CDB1_PDB1 and CDB1_PDB2.

Note:

For Windows, you must specify the `-C` option exclusion list by using with double quote marks to specify the exclusion list. For example:

```
... -C "CDB$ROOT PDB$SEED"
```

3.12.3.3 Rerun the Upgrade While Other PDBs Are Online

You can rerun PDB upgrades by using the Parallel Upgrade Utility Resume option, or by explicitly including or excluding online PDBs using with inclusion or exclusion lists.

Use these examples as a model for running upgrades on PDBs, where you want to rerun upgrades on some PDBs while other PDBs are open.

In the examples, the upgrade failed in containers CDB1_PDB1 and CDB1_PDB2, but succeeded in containers CDB1_PDB3, CDB1_PDB4, and CDB1_PDB5.

You start up CDB\$ROOT in normal mode. You find that the following containers are online: CDB1_PDB3, CDB1_PDB4, and CDB1_PDB5. You review the upgrade logs for CDB1_PDB3, CDB1_PDB4, and CDB1_PDB5 and bring these containers online.

Example 3-38 Rerunning Upgrades on PDBs Using the Resume Option

The following example shows how to complete the upgrade for CDB1_PDB1 and CDB1_PDB2 by using the Parallel Upgrade Utility Resume option. The Resume option excludes PDBs that are already upgraded:

1. Bring up CDB\$ROOT in normal mode, and open CDB1_PDB1 and CDB1_PDB2 in upgrade mode. CDB1_PDB3, CDB1_PDB4, CDB1_PDB5 are in normal mode. For example:

```
SQL> startup;
      alter pluggable database CDB1_PDB1 open upgrade;
      alter pluggable database CDB1_PDB2 open upgrade;
      alter pluggable database cdb1_pdb3 open;
      alter pluggable database cdb1_pdb4 open;
      alter pluggable database cdb1_pdb5 open;
```

2. Use the SQL command `show pdbs` to show the status of PDBs. For example:

```
SQL> show pdbs
```

| CON_ID | CON_NAME | OPEN MODE | RESTRICTED |
|--------|-----------|------------|------------|
| 2 | PDB\$SEED | READ ONLY | NO |
| 3 | CDB1_PDB1 | MIGRATE | YES |
| 4 | CDB1_PDB2 | MIGRATE | YES |
| 5 | CDB1_PDB3 | READ WRITE | NO |
| 6 | CDB1_PDB4 | READ WRITE | NO |
| 7 | CDB1_PDB5 | READ WRITE | NO |

3. Rerun the upgrade, excluding CDB\$ROOT from the upgrade, using the Parallel Upgrade Utility command-line script `dbupgrade`.

```
cd $ORACLE_HOME/bin
./dbupgrade -d $ORACLE_HOME/rdbms/admin/ -l $ORACLE_HOME/cfgtoollogs -R
```

Because you run the upgrade using the Resume option, the Parallel Upgrade Utility checks the logs and identifies that CDB1_PDB1 and CDB1_PDB2 are the only two containers in CDB1 that are not upgraded. The upgrade script runs on just those two PDBs. The upgrade does not rerun on PDB\$SEED, CDB\$ROOT, CDB_PDB3, CDB_PDB4, and CDB_PDB5.

Example 3-39 Rerunning Upgrades on PDBs Using Exclusion Lists

The following example shows how to complete the upgrade for CDB1_PDB1 and CDB1_PDB2 by using an exclusion list to exclude the PDBs on which you do not want the upgrade script to run:

1. Bring up CDB\$ROOT in normal mode, and open CDB1_PDB1 and CDB1_PDB2 in upgrade mode. CDB1_PDB3, CDB1_PDB4, CDB1_PDB5 are in normal mode. For example:

```
SQL> startup;
      alter pluggable database CDB1_PDB1 open upgrade;
      alter pluggable database CDB1_PDB2 open upgrade;
      alter pluggable database cdb1_pdb3 open;
      alter pluggable database cdb1_pdb4 open;
      alter pluggable database cdb1_pdb5 open;
```

2. Use the SQL command `show pdbs` to show the status of PDBs. For example:

```
SQL> show pdbs
```

| CON_ID | CON_NAME | OPEN MODE | RESTRICTED |
|--------|-----------|------------|------------|
| 2 | PDB\$SEED | READ ONLY | NO |
| 3 | CDB1_PDB1 | MIGRATE | YES |
| 4 | CDB1_PDB2 | MIGRATE | YES |
| 5 | CDB1_PDB3 | READ WRITE | NO |
| 6 | CDB1_PDB4 | READ WRITE | NO |
| 7 | CDB1_PDB5 | READ WRITE | NO |

3. Rerun the upgrade, excluding CDB\$ROOT from the upgrade, using the Parallel Upgrade Utility command-line script `dbupgrade`:

```
cd $ORACLE_HOME/bin
./dbupgrade -d $ORACLE_HOME/rdbms/admin -l $ORACLE_HOME/cfgtoollogs -R -C 'CDB
$ROOT'
```

The Parallel Upgrade Utility runs with the Resume option (`-R`), and identifies from the logs that CDB1_PDB1 and

CDB1_PDB2 have not completed the upgrade. Because the Parallel Upgrade Utility runs with the Exclude option (`-C`), and you specify that CDB\$ROOT is excluded, the upgrade script is also explicitly excluded from running on CDB\$ROOT.

For Windows, when you run the Parallel Upgrade Utility with the Exclude option (`-C`), you must specify the targets `-C` option using double quotes around the CDB root name and PDB seed name. For example:

```
. . . -C "CDB$ROOT PDB$SEED"
```

4. The upgrade reruns and completes on CDB1_PDB1 and CDB1_PDB2.

3.12.3.4 Rerun the Upgrade Using an Inclusion List to Specify a CDB or PDBs

Use this example as a model for rerunning an upgrade on a PDB by using an inclusion list.

You can use an inclusion list to specify a list of CDBs and PDBs where you want to rerun an upgrade, and exclude nodes not on the inclusion list. Specify the inclusion list by running the Parallel Upgrade Utility with the inclusion option (`-c`), followed by a space-delimited list designated by single quotes of the containers that you want to upgrade.

In the examples, the upgrade failed in containers CDB1_PDB1 and CDB1_PDB2, but succeeded in containers CDB1_PDB3, CDB1_PDB4, and CDB1_PDB5. You start up CDB\$ROOT in normal mode. You find that the following containers are online: CDB1_PDB3, CDB1_PDB4, and CDB1_PDB5. You review the upgrade logs for CDB1_PDB3, CDB1_PDB4, and CDB1_PDB5 and bring these containers online.

Example 3-40 Rerunning Upgrades on PDBs Using an Inclusion List

For example:

1. Bring up CDB\$ROOT in normal mode, and open CDB1_PDB1 and CDB1_PDB2 in upgrade mode. CDB1_PDB3, CDB1_PDB4, CDB1_PDB5 are in normal mode. For example:

```
SQL> startup;
      alter pluggable database CDB1_PDB1 open upgrade;
      alter pluggable database CDB1_PDB2 open upgrade;
      alter pluggable database cdb1_pdb3 open;
      alter pluggable database cdb1_pdb4 open;
      alter pluggable database cdb1_pdb5 open;
```

2. Use the SQL command `show pdbs` to show the status of PDBs. For example:

```
SQL> show pdbs
```

| CON_ID | CON_NAME | OPEN MODE | RESTRICTED |
|--------|-----------|------------|------------|
| 2 | PDB\$SEED | READ ONLY | NO |
| 3 | CDB1_PDB1 | MIGRATE | YES |
| 4 | CDB1_PDB2 | MIGRATE | YES |
| 5 | CDB1_PDB3 | READ WRITE | NO |
| 6 | CDB1_PDB4 | READ WRITE | NO |
| 7 | CDB1_PDB5 | READ WRITE | NO |

3. Rerun the Parallel Upgrade Utility with the inclusion (-c) option, followed by a space-delimited inclusion list that you specify with single quote marks. This option runs the upgrade only on the PDBs that you list in the inclusion list.

For example:

```
cd $ORACLE_HOME/bin
./dbupgrade -d $ORACLE_HOME/rdbms/admin -l ORACLE_HOME/cfgtoollogs -R -c
'CDB1_PDB1 CDB1_PDB2'
```

For Windows, when you run the Parallel Upgrade Utility with the inclusion option, you must specify the -c option targets by using double quotes around the inclusion list. For example:

```
. . . -C "CDB1_PDB1 CDB1_PDB2"
```

4. The upgrade reruns and completes on CDB1_PDB1 and CDB1_PDB2.

3.13 Restarting the Upgrade from a Specific Phase that Failed Using -p

Use this option to complete an upgrade after fixing errors.

You can run the Parallel Upgrade Utility (`catctl.p1`, or the shell scripts `dbupgrade` or `dbupgrade.cmd`) with the `-p` option to rerun an upgrade and skip upgrade phases that already have run successfully. You can also rerun the upgrade on one phase to test the fix for failed phases.

To determine the phase number to restart, examine the upgrade log to identify where the first error occurred, and in what phase. You can then fix the cause of the error, and test the fix or rerun the upgrade to completion.

[Reviewing CDB Log Files for Failed Phases](#) (page 3-119)

Identify your log file location, and review the CDB and PDB log files.

[Reviewing Non-CDB Log Files for Failed Phases](#) (page 3-119)

Identify your log file location, and review the Non-CDB log files.

[Procedure for Finding and Restarting Multitenant Upgrades from a Failed Phase](#) (page 3-119)

To restart a multitenant upgrade from a failed phase, first identify which PDB created the error and then search its appropriate log file for the error.

3.13.1 Reviewing CDB Log Files for Failed Phases

Identify your log file location, and review the CDB and PDB log files.

The location of the Automatic Diagnostic Repository (ADR) and the diagnostic log files created by the upgrade scripts can vary, depending on your environment variables and parameter settings.

You can set log file paths when you run the Parallel Upgrade Utility (`catct1`) by setting the `-l` option to define a log file path.

Log files for CDB\$ROOT (CDBs) can span from `catupgrd0...catupgrd7.log`. Log files for pluggable databases (PDBs) are identified by the PDB container name (`dbname`), and span from `catupgrdpdbname0...catupgrdpdbname7.log`.

Related Topics:

[About Log File Location and DIAGNOSTIC_DEST](#) (page 3-93)

3.13.2 Reviewing Non-CDB Log Files for Failed Phases

Identify your log file location, and review the Non-CDB log files.

The location of the Automatic Diagnostic Repository (ADR) and the diagnostic log files created by the upgrade scripts can vary, depending on your environment variables and parameter settings.

You can set log file paths when you run the Parallel Upgrade Utility (`catct1`) by setting the `-l` option to define a log file path.

Note:

Starting with Oracle Database 12c, release 1 (12.1), non-CDB architecture is deprecated. It can be desupported in a future release.

Log files can span from `catupgrd0...catupgrd7.log`.

Related Topics:

[About Log File Location and DIAGNOSTIC_DEST](#) (page 3-93)

3.13.3 Procedure for Finding and Restarting Multitenant Upgrades from a Failed Phase

To restart a multitenant upgrade from a failed phase, first identify which PDB created the error and then search its appropriate log file for the error.

To identify the PDB that caused a multitenant upgrade failure, look at the upgrade summary report, or review `catupgrd0.log`; this log contains the upgrade summary report at the end of the file.

Use this procedure to check each log file looking for errors.

1. Locate log files with errors.

For example:

Linux and UNIX

```
$ grep -i 'error at line' catupgrd*.log
```

Windows

```
C:\> find /I "error at line" catupgrd*.log
```

The `grep` or `find` command displays the filenames of log files in which an error is found.

2. Check each log file that has an error and identify where the first error occurred. Use the text editor of your choice to review each log file. Search for the first occurrence of the phrase `error at line`. When you find the phrase, then search backwards from the error (reverse search) for `PHASE_TIME__START`.

For example:

```
PHASE_TIME__START 15 15-01-16 08:49:41
```

The number after `PHASE_TIME__START` is the phase number where the error has occurred. In this example, the phase number is 15.

Each log file can have an error in it. Repeat checking for the phrase `PHASE_TIME__START`, and identify the phase number with errors for each log file that contains an error, and identify the log file that contains the lowest phase number.

The log file that contains the lowest phase number is restart phase number, which is the phase number from which you restart the upgrade.

For example:

```
catupgrd0.log error occurred in phase 15:
```

```
PHASE_TIME__START 15 15-01-16 08:49:41
```

```
catupgrd1.log error occurred in phase 19:
```

```
PHASE_TIME__START 19 15-01-16 08:50:01
```

In this example, the restart phase number is 15. Ensure that you identify the first error seen in all the log files, so that you can restart the upgrade from that phase.

3. Restart the upgrade from the failed phase by changing directory to the running the Parallel Upgrade Utility (`catctl.pl`, which you can run from the command line using `dbupgrade` on Linux and UNIX, and `dbupgrade.cmd` on Windows). Use the `-p` flag to indicate that you want to restart the upgrade from a phase, and provide the restart phase number. In multitenant databases, also use the `-c` flag using the syntax `-c 'PDBname'`, where `PDBname` is the name of the PDB where the failure occurred.

For example:

Non-CDB Oracle Database on a Linux or UNIX system:

```
cd $ORACLE_HOME/bin
dbupgrade -p 15
```

PDB in a multitenant Oracle Database (CDB) on a Windows system:

```
cd $ORACLE_HOME/bin
dbupgrade -p 15 -c 'PDB1'
```

In both examples, the upgrade is restarted from phase 15, identified with the `-p` flag. In the multitenant example, the PDB with the error is identified with the `-c` flag.

In these examples, the upgrade starts from phase 15 and runs to the end of the upgrade.

4. (Optional) You can also run the phase that contained an error by specifying a stop phase, using the `-P` flag. Using a stop phase allows the upgrade to just rerun that phase in which the error occurred. You can determine quickly if the error is fixed by running it on the phase with the error, without running the entire upgrade.

For example, using the Perl script Parallel Upgrade Utility command option:

```
cd $ORACLE_HOME/rdbms/admin
$ORACLE_HOME/perl/bin/perl catctl.pl -p 15 -P 15 -c 'PDB1'
```

After you confirm that the error is fixed in the phase with the error, you can then resume the upgrade after that phase.

For example, if you have confirmed that the error in phase 15 of your multitenant database upgrade of PDB1 is fixed, then you can use the following command on Linux and UNIX systems to continue the upgrade at phase 16:

```
cd $ORACLE_HOME/bin dbupgrade -p 16 -c 'PDB1'
```

Post-Upgrade Tasks for Oracle Database

After you upgrade Oracle Database, complete required post-upgrade tasks, and consider recommendations for the new release.

Topics:

[Check the Upgrade With Post-Upgrade Status Tool](#) (page 4-2)

Review the upgrade spool log file and use the Post-Upgrade Status Tool, `utlul22s.sql`.

[How to Show the Current State of the Oracle Data Dictionary](#) (page 4-2)

Use one of three methods to check the state of the Oracle Data Dictionary for diagnosing upgrades and migrations.

[Required Tasks to Complete After Upgrading Oracle Database](#) (page 4-3)

Review and complete these required tasks that are specified for your environment after you complete your upgrade.

[Required Environment Variable Checks After Oracle Grid Infrastructure Upgrades](#) (page 4-15)

Review these topics to understand environment variable changes for Oracle Database and Oracle Grid Infrastructure 12c.

[Role-Allocated Software Owners and Database Upgrade After Oracle ASM Upgrade](#) (page 4-16)

Review these topics if you have an existing Oracle ASM installation that you installed before Oracle Grid Infrastructure and Oracle Database 11g Release 2 (11.2).

[Recommended and Best Practices to Complete After Upgrading Oracle Database](#) (page 4-18)

Oracle recommends that you complete these good practices guidelines for updating Oracle Database. These practices are recommended for both manual and DBUA upgrades.

[Recommended Tasks After Upgrading an Oracle RAC Database](#) (page 4-36)

Decide if you want to configure clients to use SCAN or node listeners for connections.

[Recommended Tasks After Upgrading Oracle ASM](#) (page 4-36)

After you have upgraded Oracle ASM, Oracle recommends that you perform tasks such as resetting the Oracle ASM passwords and configuring disk groups.

[Recommended Tasks After Upgrading Oracle Database Express Edition](#) (page 4-38)

Use DBCA or run manual scripts to install additional components into Oracle Database.

[Oracle Application Express PDB Plugin Considerations](#) (page 4-39)

Review this information if you use multitenant architecture, and after the upgrade, you want to plug in a PDB that contains Oracle Application Express releases 5.0.0, 5.0.1, or 5.0.2.

[Tasks to Complete Only After Manually Upgrading Oracle Database](#) (page 4-39)

After you complete your upgrade, you must perform the tasks described here if you upgrade your database manually instead of using DBUA.

4.1 Check the Upgrade With Post-Upgrade Status Tool

Review the upgrade spool log file and use the Post-Upgrade Status Tool, `utlu122s.sql`.

The Post-Upgrade Status Tool is a SQL script that is included with Oracle Database. You run the Post-Upgrade Status Tool in the environment of the new release. You can run the Post-Upgrade Status Tool at any time after you upgrade the database.

4.2 How to Show the Current State of the Oracle Data Dictionary

Use one of three methods to check the state of the Oracle Data Dictionary for diagnosing upgrades and migrations.

Running the `dbupgdiag.sql` Script

The `dbupgdiag.sql` script collects upgrade and migration diagnostic information about the current state of the data dictionary.

You can run the script in SQL*Plus both before the upgrade on the source database, and after the upgrade on the upgraded database as the SYS user. Refer to My Oracle Support note 556610.1 for more information about using the `dbupgdiag.sql` script to collect upgrade and migrate diagnostic information.

Running a SQL Query on `DBA_REGISTRY`

To show the current state of the dictionary, perform a SQL query similar to the following example:

```
SQL> spool /tmp/regInvalid.out
SQL> set echo on
-- query registry
SQL> set lines 80 pages 100
SQL> select substr(comp_id,1,15) comp_id,substr(comp_name,1,30)
       comp_name,substr(version,1,10) version,status
from dba_registry order by modified;
```

Running a Query to Check for Invalid Objects

To query invalid objects, perform a SQL query similar to the following example:

```
SQL> select owner, object_name, object_type from dba_invalid_objects order by owner,
object_type;
```

After you have upgraded the database, and you have run `utlvp.sql`, this view query should return no rows. All objects should be valid.

Related Topics:

<https://support.oracle.com/rs?type=doc&id=556610.1>

4.3 Required Tasks to Complete After Upgrading Oracle Database

Review and complete these required tasks that are specified for your environment after you complete your upgrade.

You must complete these postupgrade tasks after you upgrade Oracle Database. You must complete these tasks both when you perform the upgrade manually, and when you upgrade by using Database Upgrade Assistant (DBUA).

[Setting Environment Variables on Linux and UNIX Systems After Manual Upgrades](#) (page 4-5)

If you performed a manual upgrade of Oracle Database, then you must ensure that required operating system environment variables point to the directories of the new Oracle Database release.

[Recompiling All Invalid Objects](#) (page 4-5)

Oracle recommends you run the `utlirp.sql` script after you install, patch, or upgrade a database, to identify and recompile invalid objects.

[Recompiling All Invalid Objects on Multitenant Architecture Databases](#) (page 4-6)

On multitenant architecture Oracle Databases, after upgrading, Oracle recommends that you recompile invalid objects using the `catcon Perl` script.

[Track Invalid Object Recompilation Progress](#) (page 4-6)

Use these SQL queries to track the progress of `utlirp.sql` script recompilation of invalid objects.

[Running OPatch Commands After Upgrading Oracle Database](#) (page 4-7)

After you upgrade Oracle Database, you must run OPatch commands from the new Oracle home.

[Setting oratab and Scripts to Point to the New Oracle Location After Upgrading Oracle Database](#) (page 4-7)

You must set scripts to point to the new Oracle home location.

[Check PL/SQL Packages and Dependent Procedures](#) (page 4-7)

Packages that you installed in the earlier release Oracle Database may not be upgraded automatically in the new release, which may affect applications.

[Upgrading Tables Dependent on Oracle-Maintained Types](#) (page 4-8)

Starting with Oracle Database 12c release 2 (12.2), you must manually upgrade user tables that depend on Oracle-Maintained types.

[Enabling the New Extended Data Type Capability](#) (page 4-8)

Enabling a system to take advantage of the new extended data types requires specific upgrade actions.

[Adjusting Minimum and Maximum for Parallel Execution Servers](#) (page 4-9)

You may need to adjust the `PARALLEL_MIN_SERVERS` default setting, depending on your environment.

[About Recovery Catalog Upgrade After Upgrading Oracle Database](#) (page 4-9)

If you use a version of the recovery catalog schema that is older than that required by the RMAN client, then you must upgrade it.

[Upgrading the Time Zone File Version After Upgrading Oracle Database](#)
(page 4-9)

If the Pre-Upgrade Information Tool instructs you to upgrade the time zone files after completing the database upgrade, then use the DBMS_DST PL/SQL package to upgrade the time zone file.

[Upgrading Statistics Tables Created by the DBMS_STATS Package After Upgrading Oracle Database](#) (page 4-10)

If you created statistics tables using the DBMS_STATS.CREATE_STAT_TABLE procedure, then upgrade these tables by running DBMS_STATS.UPGRADE_STAT_TABLE.

[Upgrading Externally Authenticated SSL Users After Upgrading Oracle Database](#) (page 4-10)

If you are upgrading from Oracle9i Release 2 (9.2) or Oracle Database 10g Release 1 (10.1), and you are using externally authenticated SSL users, then you must run the SSL external users conversion (extusrupgrade) script to upgrade those users.

[Configuring the FTP and HTTP Ports and HTTP Authentication for Oracle XML DB](#) (page 4-11)

Database Creation Assistant (DBCA) does not configure ports for Oracle XML DB on Oracle Database 12c.

[Install Oracle Text Supplied Knowledge Bases After Upgrading Oracle Database](#)
(page 4-12)

Regenerate user extensions to Oracle Text after upgrading.

[Rebuild Oracle Text Indexes Using AUTO_LEXER](#) (page 4-12)

If you are upgrading Oracle Text from releases earlier than Oracle Database 12c, then review this topic.

[Update Oracle Application Express Configuration After Upgrading Oracle Database](#) (page 4-13)

Oracle Application Express affects upgrade procedures, depending on the Oracle Application Express release and your database installation type.

[Configure Access Control Lists \(ACLs\) to External Network Services](#)
(page 4-14)

Oracle Database 12c includes fine-grained access control to the UTL_TCP, UTL_SMTP, UTL_MAIL, UTL_HTTP, or UTL_INADDR packages.

[Enabling Oracle Database Vault After Upgrading Oracle Database](#) (page 4-14)

Starting with Oracle Database 12c release 2 (12.2), you can upgrade the database without disabling Oracle Database Vault. However, if you disabled Oracle Database Vault, then you must enable it manually after an upgrade.

[Check for the SQLNET.ALLOWED_LOGON_VERSION Parameter Behavior](#)
(page 4-14)

Connections to Oracle Database from clients earlier than release 10g fail with the error ORA-28040: No matching authentication protocol.

4.3.1 Setting Environment Variables on Linux and UNIX Systems After Manual Upgrades

If you performed a manual upgrade of Oracle Database, then you must ensure that required operating system environment variables point to the directories of the new Oracle Database release.

If you are upgrading a cluster database, then perform these checks on all nodes on which the cluster database has instances configured.

Confirm that the following environment variables point to the directories of the new Oracle home:

- ORACLE_HOME
- PATH

Note:

DBUA automatically makes necessary changes to Oracle environment variables.

See Also:

- *Oracle Database Administrator's Guide* for information about setting environment variables for Oracle Database
 - *Oracle Database Installation Guide* for your operating system for information about setting other environment variables that affect Oracle Database single-instance Oracle Databases
 - *Oracle Grid Infrastructure Installation Guide* for your operating system for information about setting other environment variables that affect Oracle Real Application Clusters Oracle Databases, and other deployments on Oracle Grid Infrastructure clusters
-
-

4.3.2 Recompiling All Invalid Objects

Oracle recommends you 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. Run the script immediately after installation, to ensure that users do not encounter invalid objects.

1. Start SQL*Plus:

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

2. 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 both the number 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.

4.3.3 Recompiling All Invalid Objects on Multitenant Architecture Databases

On multitenant architecture Oracle Databases, after upgrading, Oracle recommends that you recompile invalid objects using the `catcon` Perl script.

Use the `catcon.pl` utility to run `utlrp.sql` on all containers in your container database (CDB).

The `catcon.pl` script runs `utlrp.sql` from the `$ORACLE_HOME/rdbms/admin` directory. The script recompiles any remaining stored PL/SQL and Java code.

Example 4-1 *Running the utlrp.sql Script On All Containers in the CDB With the CATCON Utility*

```
$ORACLE_HOME/perl/bin/perl catcon.pl -n 1 -e -b utlrp -d ''.''' utlrp.sql
```

Note the following conditions of this use case:

- The `-n` parameter is set to 1, so the script runs each PDB recompilation in sequence.
- Expect a time delay for the serial recompilation of PDBs to complete. Depending on the number of PDBs that you are upgrading, the recompilation can extend significantly beyond the time required for the upgrade scripts to complete.

4.3.4 Track Invalid Object Recompilation Progress

Use these SQL queries to track the progress of `utlrp.sql` script recompilation of invalid objects.

Oracle recommends that you run the `utlrp.sql` script after upgrade to recompile invalid objects. You can run SQL queries to monitor the script.

Example 4-2 *Number of Invalid Objects Remaining*

Enter this query to return the number of remaining invalid objects. This number decreases over time as the `utlrp.sql` script runs.

```
SELECT COUNT(*) FROM obj$ WHERE status IN (4, 5, 6);
```

Example 4-3 *Number of Objects Recompiled*

Enter this query to return the number of objects that `utlrp.sql` has compiled. This number increases over time as the script runs.

```
SELECT COUNT(*) FROM UTL_RECOMP_COMPILED;
```

Example 4-4 *Number of Objects Recompiled with Errors*

Enter this query to return the number of objects that `utlrp.sql` has compiled with errors.

```
select COUNT(DISTINCT(obj#)) "OBJECTS WITH ERRORS" from utl_recomp_errors;
```

If the number is higher than expected, then examine the error messages reported with each object. If you see errors due to system misconfiguration or resource constraints, then fix the cause of these errors, and run `utlrp.sql` again.

4.3.5 Running OPatch Commands After Upgrading Oracle Database

After you upgrade Oracle Database, you must run OPatch commands from the new Oracle home.

OPatch is a Java-based utility that you install with Oracle Universal Installer. Opatch is platform-independent. It runs on all supported operating systems. Another version of OPatch, called standalone OPatch, is also available. It runs on Oracle homes without Oracle Universal Installer.

Patches are a small collection of files copied over to an existing installation. They are associated with particular versions of Oracle products. When applied to the correct version of an installed product, patches result in an upgraded version of the product.

Run OPatch to Check the Oracle Database Inventory

Log in as the Oracle installation owner, and run the `lsinventory` command from the new Oracle home. The command generates an accurate and complete inventory of the Oracle software installed on the system:

```
opatch lsinventory -patch
```

Obtain Interim Patches

Oracle releases interim patches frequently, either to fix a bug, or to fix a set of bugs. You can obtain interim patches by specifying the patch identifier in My Oracle Support.

Related Topics:

<https://support.oracle.com/rs?type=doc&id=756671.1>

4.3.6 Setting oratab and Scripts to Point to the New Oracle Location After Upgrading Oracle Database

You must set scripts to point to the new Oracle home location.

After you upgrade Oracle Database to a new release, you must ensure that your `oratab` file and any client scripts that set the value of `ORACLE_HOME` point to the new Oracle home that is created for the new Oracle Database 12c release. DBUA automatically points `oratab` to the new Oracle home. However, you must check client scripts regardless of the method you use to upgrade.

See Also:

Oracle Database Administrator's Guide for information about setting operating system environment variables

4.3.7 Check PL/SQL Packages and Dependent Procedures

Packages that you installed in the earlier release Oracle Database may not be upgraded automatically in the new release, which may affect applications.

After the upgrade, check to ensure that any packages that you have used in your own scripts, or that you call from your scripts, are available in the new release. Testing procedures dependent on packages should be part of your upgrade plan.

Code in database applications can reference objects in the connected database. For example, Oracle Call Interface (OCI) and precompiler applications can submit anonymous PL/SQL blocks. Triggers in Oracle Forms applications can reference a schema object. Such applications are dependent on the schema objects they reference. Dependency management techniques vary, depending on the development environment. Oracle Database does not automatically track application dependencies.

Related Topics:

Oracle Database Administrator's Guide

4.3.8 Upgrading Tables Dependent on Oracle-Maintained Types

Starting with Oracle Database 12c release 2 (12.2), you must manually upgrade user tables that depend on Oracle-Maintained types.

If your database has user tables that are dependent on Oracle-Maintained types (for example, AQ queue tables), then run the `utluptabdata.sql` command after the upgrade to carry out ALTER TABLE UPGRADE on any user tables affected by changes in Oracle-Maintained types. This change in behavior enables user tables to remain in READ-ONLY state during an upgrade. Users are prevented from logging into applications AS SYSDBA and changing application tables that are dependent on Oracle-Maintained types.

To identify tables that need to be upgraded after the database upgrade, connect AS SYSDBA and run the following query:

```
COLUMN owner FORMAT A30
COLUMN table_name FORMAT A30
SELECT DISTINCT owner, table_name
FROM dba_tab_cols
WHERE data_upgraded = 'NO'
ORDER BY 1,2;
```

This query lists all tables that are not listed as UPGRADED. However, the `utluptabdata.sql` script only upgrades tables that depend on Oracle-Maintained types. If any tables are listed by the query, then run the `utluptabdata.sql` script to perform ALTER TABLE UPGRADE commands on dependent user tables to upgrade these Oracle-Maintained types to the latest version of the type.

You must run the `utluptabdata.sql` script either with a user account with the privileges to ALTER all of the tables dependent on Oracle-Maintained types, or with a user granted the SYSDBA system privileges that is logged in AS SYSDBA.

When the parameter `SERVEROUTPUT` is set to ON, the `utluptabdata.sql` script displays the names of all upgraded tables, and lists any error encountered during the table upgrade. Run the following command to set the server output to ON:

```
SET SERVEROUTPUT ON
@utluptabdata.sql
```

4.3.9 Enabling the New Extended Data Type Capability

Enabling a system to take advantage of the new extended data types requires specific upgrade actions.

Oracle Database 12c introduces `MAX_STRING_SIZE` to control the maximum size of VARCHAR2, NVARCHAR2, and RAW data types in SQL. Setting `MAX_STRING_SIZE = EXTENDED` enables the 32767 byte limit introduced in Oracle Database 12c.

You must set the `COMPATIBLE` initialization parameter to `12.0.0.0` or higher to be able to set `MAX_STRING_SIZE = EXTENDED`.

Caution:

You can change the value of `MAX_STRING_SIZE` from `STANDARD` to `EXTENDED`. However, you cannot change the value of `MAX_STRING_SIZE` from `EXTENDED` to `STANDARD`. By setting `MAX_STRING_SIZE = EXTENDED`, you are taking an explicit action that could introduce application incompatibility in your database.

See Also:

Oracle Database Reference for complete information about `MAX_STRING_SIZE`, including recommendations and procedures

4.3.10 Adjusting Minimum and Maximum for Parallel Execution Servers

You may need to adjust the `PARALLEL_MIN_SERVERS` default setting, depending on your environment.

In Oracle Database 12c the default for `PARALLEL_MIN_SERVERS` changes from 0 to a value depending on your hardware platform, to provide sufficient minimal support for parallel execution. If the new default setting is too high for your environment, then adjust the setting for your requirements. The default for `PARALLEL_MAX_SERVERS` has not changed. If the default in your old environment is unchanged, then you do not need to take further action.

See Also:

Oracle Database Reference for information about `PARALLEL_MIN_SERVERS`

4.3.11 About Recovery Catalog Upgrade After Upgrading Oracle Database

If you use a version of the recovery catalog schema that is older than that required by the RMAN client, then you must upgrade it.

See Also:

- *Oracle Database Backup and Recovery User's Guide* for information on managing an RMAN recovery catalog
 - *Oracle Database Backup and Recovery User's Guide* for complete information about upgrading the recovery catalog and the `UPGRADE CATALOG` command
-
-

4.3.12 Upgrading the Time Zone File Version After Upgrading Oracle Database

If the Pre-Upgrade Information Tool instructs you to upgrade the time zone files after completing the database upgrade, then use the `DBMS_DST` PL/SQL package to upgrade the time zone file.

Oracle Database supplies multiple versions of time zone files. There are two types of file associated with each time zone file: a large file, which contains all the time zones defined in the database, and a small file, which contains only the most commonly used time zones. The large versions are designated as `timezlg_version_number.dat`. The small versions are designated as `timezone_version_number.dat`. The files are located in the `oracore/zoneinfo` subdirectory under the Oracle Database home directory.

Related Topics:

[About Oracle Database Warnings for TIMESTAMP WITH TIME ZONE Data Type](#) (page 2-44)

Oracle Database Globalization Support Guide

<https://support.oracle.com/rs?type=doc&id=1585343.1>

4.3.13 Upgrading Statistics Tables Created by the DBMS_STATS Package After Upgrading Oracle Database

If you created statistics tables using the `DBMS_STATS.CREATE_STAT_TABLE` procedure, then upgrade these tables by running `DBMS_STATS.UPGRADE_STAT_TABLE`.

In the following example, `green` is the owner of the statistics table and `STAT_TABLE` is the name of the statistics table.

```
EXECUTE DBMS_STATS.UPGRADE_STAT_TABLE('green', 'stat_table');
```

Perform this procedure for each statistics table.

See Also:

Oracle Database PL/SQL Packages and Types Reference for information about the `DBMS_STATS` package

4.3.14 Upgrading Externally Authenticated SSL Users After Upgrading Oracle Database

If you are upgrading from Oracle9i Release 2 (9.2) or Oracle Database 10g Release 1 (10.1), and you are using externally authenticated SSL users, then you must run the SSL external users conversion (`extusrupgrade`) script to upgrade those users.

The `extusrupgrade` script has the following syntax, where `ORACLE_HOME` is the Oracle database home, `hostname` is the name of the host on which the database is running, `port_no` is the listener port number, `sid` is the system identifier for the database instance, and `db_admin` is the database administrative user with privileges to modify user accounts.

```
ORACLE_HOME/rdbms/bin/extusrupgrade --dbconnectstring  
hostname:port_no:sid --dbuser db_admin --dbuserpassword  
password -a
```

For example:

```
extusrupgrade --dbconnectstring dlsun88:1521:10gR2 --dbuser system --dbuserpassword  
manager -a
```

Note:

If you are upgrading from Oracle Database 10g Release 2 (10.2) or later, then you are not required to run the `extusrupgrade` script.

See Also:

Oracle Database Enterprise User Security Administrator's Guide for more information about the `extusrupgrade` script

4.3.15 Configuring the FTP and HTTP Ports and HTTP Authentication for Oracle XML DB

Database Creation Assistant (DBCA) does not configure ports for Oracle XML DB on Oracle Database 12c.

Oracle recommends that when you configure ports, you also configure the authentication for HTTP for accessing Oracle XML DB Repository to take advantage of improved security features.

Starting with Oracle Database 12c, Oracle has enhanced database security by supporting digest authentication. Digest authentication is an industry-standard protocol that is commonly used with the HTTP protocol. It is supported by most HTTP clients. Digest authentication ensures that passwords are always transmitted in a secure manner, even when an encrypted (HTTPS) connection is not in use. Support for digest authentication enables organizations to deploy applications that use Oracle XML DB HTTP, without having to worry about passwords being compromised. Digest authentication support in Oracle XML DB also ensures that the Oracle XML DB HTTP server remains compatible with Microsoft Web Folders WebDAV clients.

After installing or upgrading for the new release, you must manually configure the FTP and HTTP ports for Oracle XML DB as follows:

1. Use `DBMS_XDB_CONFIG.setHTTPPort(HTTP port number)` to set the HTTP port for Oracle XML DB:

```
SQL> exec DBMS_XDB_CONFIG.setHTTPPort(port_number);
```

2. Use `DBMS_XDB_CONFIG.setFTPPort(FTP port number)` to set the FTP port for Oracle XML DB:

```
SQL> exec DBMS_XDB_CONFIG.setFTPPort(
port_number);
```

Note:

You can query the port numbers to use for FTP and HTTP in the procedure by using `DBMS_XDB_CONFIG.getFTPPort` and `DBMS_XDB_CONFIG.getHTTPPort` respectively.

3. To see all the used port numbers, query `DBMS_XDB_CONFIG.usedport`.

See Also:

Oracle XML DB Developer's Guide for more information about accessing the Oracle XML DB Repository data using FTP, HTTP, HTTPS, and WebDAV protocols

4.3.16 Install Oracle Text Supplied Knowledge Bases After Upgrading Oracle Database

Regenerate user extensions to Oracle Text after upgrading.

After an upgrade, all user extensions to the Oracle Text supplied knowledge bases must be regenerated. These changes affect all databases installed in the given Oracle home.

The Oracle Text-supplied knowledge bases are part of the companion products for Oracle Database 12c and are not immediately available after an upgrade to Oracle Database 12c. Any Oracle Text features dependent on the supplied knowledge bases which were available before the upgrade do not function after the upgrade. To re-enable such features, you must install the Oracle Text supplied knowledge bases from the installation media.

See Also:

- *Oracle Text Application Developer's Guide* for information about Oracle Text-supplied knowledge bases
 - *Oracle Database Installation Guide* for companion products
-
-

4.3.17 Rebuild Oracle Text Indexes Using AUTO_LEXER

If you are upgrading Oracle Text from releases earlier than Oracle Database 12c, then review this topic.

After you complete your upgrade to Oracle Database 12c release 1, if you use Oracle Text indexes created with AUTO_LEXER, then you must rebuild the indexes for your queries to work.

In addition, you must rebuild indexes that have the following INDEX_STEMS types of BASIC_LEXER set:

- ARABIC
- BOKMAL
- CATALAN
- CROATIAN
- CZECH
- DANISH
- ERIVATIONAL_NEW
- DUTCH_NEW

- ENGLISH_NEW
- FINNISH
- FRENCH_NEW
- GERMAN_NEW
- GREEK
- HEBREW
- HUNGARIAN
- ITALIAN_NEW
- NYNORSK
- POLISH
- PORTUGUESE
- ROMANIAN
- RUSSIAN
- SERBIAN
- SLOVAK
- SLOVENIAN
- SPANISH_NEW
- SWEDISH

4.3.18 Update Oracle Application Express Configuration After Upgrading Oracle Database

Oracle Application Express affects upgrade procedures, depending on the Oracle Application Express release and your database installation type.

If the Oracle Database release that you upgrade includes Oracle Application Express release 3.2 or later, then you do not need to carry out additional configuration after upgrading to Oracle Database 12c. However, if Oracle Application Express is in the registry, so that Oracle Application Express is included in the upgrade, then set the `open_cursors` parameter to a minimum of 200.

If the Oracle Database you upgrade is an Oracle Express Edition database, but it contains an earlier release of Oracle Application Express, then the latest release is automatically installed during the upgrade. You must complete a series of postinstallation steps to configure Application Express for use with the new Oracle Database 12c.

If your database is an Oracle Express Edition database, then it contains an earlier release of Oracle Application Express that is tailored for the Oracle Express Edition environment.

See Also:

- *Oracle Application Express Installation Guide* for postinstallation tasks for Oracle Application Express
 - <http://www.oracle.com/technetwork/developer-tools/apex/overview/index.html> for a description of the differences between Oracle Express Edition and Oracle Application Express
-
-

4.3.19 Configure Access Control Lists (ACLs) to External Network Services

Oracle Database 12c includes fine-grained access control to the UTL_TCP, UTL_SMTP, UTL_MAIL, UTL_HTTP, or UTL_INADDR packages.

If you have applications that use these packages, then after upgrading Oracle Database you must configure network *access control lists* (ACLs) in the database before these packages can work as they did in earlier releases. Without the ACLs, your applications may fail with the error "ORA-24247: network access denied by access control list (ACL)."

See Also:

Oracle Database Security Guide for more complicated situations, such as connecting some users to host A and other users to host B

4.3.20 Enabling Oracle Database Vault After Upgrading Oracle Database

Starting with Oracle Database 12c release 2 (12.2), you can upgrade the database without disabling Oracle Database Vault. However, if you disabled Oracle Database Vault, then you must enable it manually after an upgrade.

Starting with Oracle Database 12c release 2 (12.2), if you have Oracle Database Vault enabled, then you can upgrade the Oracle Database without first disabling Oracle Database Vault. After the upgrade, Oracle Database Vault is enabled by default with the enforcement settings that you had in place before the upgrade.

If you manually disable Oracle Database Vault before the upgrade, then you must enable Oracle Database Vault manually after the upgrade.

If you did not have Oracle Database Vault enabled before the upgrade, then you can enable it manually after the upgrade.

Enable Oracle Database Vault in the upgraded database by using the procedure `dvsys.dbms_macadm.enable_dv()`. Run this procedure with a user account that is granted either `DV_OWNER` or `DV_ADMIN`. After you run the procedure, restart the database instance so that the procedure takes effect.

Related Topics:

Oracle Database Vault Administrator's Guide

4.3.21 Check for the SQLNET.ALLOWED_LOGON_VERSION Parameter Behavior

Connections to Oracle Database from clients earlier than release 10g fail with the error ORA-28040: No matching authentication protocol.

Starting with Oracle Database 12c, the default value for the `SQLNET.ALLOWED_LOGON_VERSION` parameter changes from 8 to 11. The use of this parameter has been deprecated.

`SQLNET.ALLOWED_LOGON_VERSION` is now replaced with the `SQLNET.ALLOWED_LOGON_VERSION_SERVER` and `SQLNET.ALLOWED_LOGON_VERSION_CLIENT` parameters. If you have not explicitly set the `SQLNET.ALLOWED_LOGON_VERSION_SERVER` parameter in the upgraded database, then connections from clients earlier than release 10g fail with the error `ORA-28040: No matching authentication protocol`. For better security, check the password verifiers of your database users, and then configure the database to use the correct password verifier by setting the `SQLNET.ALLOWED_LOGON_VERSION_SERVER` and `SQLNET.ALLOWED_LOGON_VERSION_CLIENT` parameters.

If you have password-protected roles (secure roles) in your existing database, and if you upgrade to Oracle Database 12c with the default `SQLNET.ALLOWED_LOGON_VERSION_SERVER` setting of 11, because those secure roles only have release 10g verifiers, then the password for each secure role must be reset by the administrator so that the secure roles will remain usable after the upgrade.

See Also:

- *Oracle Database Security Guide* for information about ensuring against password security threats
 - *Oracle Database Security Guide* for information about setting the password versions of users
-
-

4.4 Required Environment Variable Checks After Oracle Grid Infrastructure Upgrades

Review these topics to understand environment variable changes for Oracle Database and Oracle Grid Infrastructure 12c.

After upgrading, confirm that your environment variable settings are correct. Oracle ASM is included as part of an Oracle Grid Infrastructure installation. If you upgrade Oracle Clusterware and Oracle ASM for a cluster, then Oracle Clusterware and Oracle ASM are both located in the same home, which is referred to as the *Grid home*.

[User Environment Variables for Grid Infrastructure Installations](#) (page 4-15)

If your operating system is Linux or UNIX, then confirm that your user environment variable settings are correct after performing an upgrade.

4.4.1 User Environment Variables for Grid Infrastructure Installations

If your operating system is Linux or UNIX, then confirm that your user environment variable settings are correct after performing an upgrade.

You can have one installation owner that owns all Oracle software installations, or you can use role-allocated owners. A role-allocated deployment uses a separate software owner for the Grid Infrastructure installation, and separate software owners for one or more Oracle Database installations, so that operating system authenticated system privileges for each individual administration role are limited to a specific area of administration.

If you use a single Oracle installation owner for all installations, then be aware that you should change user environment variables such as `ORACLE_HOME` either to an Oracle Database home, or to the Grid home, depending on the user account you are using is for administering an Oracle Database instance as part of database administration, or administering an Oracle ASM instance as part of storage administration.

If you use role-allocated Oracle installation owners, so that you have a separate owner for the Oracle Grid Infrastructure (Oracle Clusterware and Oracle ASM) software, then set the following environment variables for the Grid Infrastructure installation owner so that they point to the directories of the Oracle ASM home in the Grid home:

- `ORACLE_HOME`
- `PATH`

Also, check that your `oratab` file and any client scripts for Oracle ASM that set the value of `ORACLE_HOME` point to the Oracle ASM home in the Grid home.

Note:

If you are upgrading a clustered Oracle ASM installation to an Oracle Grid Infrastructure for a cluster installation, then perform these checks on all cluster member nodes. DBUA automatically points `oratab` to the new Oracle home. Client scripts must be checked no matter how you upgrade.

Related Topics:

[Oracle Database Installation Guide](#)

[Oracle Grid Infrastructure Installation Guide](#)

4.5 Role-Allocated Software Owners and Database Upgrade After Oracle ASM Upgrade

Review these topics if you have an existing Oracle ASM installation that you installed before Oracle Grid Infrastructure and Oracle Database 11g Release 2 (11.2).

Starting with Oracle Database 11g Release 2 (11.2), Oracle ASM is installed with Oracle Clusterware as part of an Oracle Grid Infrastructure installation. The same Oracle software installation owner account owns both Oracle ASM and Oracle Clusterware. If you have an existing Oracle ASM installation owner that is different from your Oracle Clusterware installation owner, then review these topics and complete required changes to your system.

[About Migrating Operating System Users for Existing Oracle ASM Installation Owners](#) (page 4-17)

Using role-allocated system privileges groups and Oracle installation owners may require you to migrate existing Oracle installation owner users.

[Keeping the Existing User as the Oracle ASM Operating System User](#) (page 4-17)

Use the existing Oracle ASM installation owner to simplify upgrades.

[Changing the Operating System User for Single-Instance Oracle ASM](#) (page 4-17)

Oracle recommends that you change a single-instance deployment to an Oracle Automatic Storage Management (Oracle ASM) deployment on an Oracle Grid Infrastructure cluster.

[Changing the Operating System User for an Oracle RAC Database](#) (page 4-18)

You may need to change the Oracle user for Oracle Real Application Clusters to take advantage of role-allocated system privileges.

4.5.1 About Migrating Operating System Users for Existing Oracle ASM Installation Owners

Using role-allocated system privileges groups and Oracle installation owners may require you to migrate existing Oracle installation owner users.

If you separate the operating system user ownership of the Oracle Grid Infrastructure binaries and the Oracle Database installation owners of one or more databases, then you must migrate the operating system user of an upgraded Oracle ASM or database home. For example, if you are migrating from one software binary owner (such as `oracle`) to multiple role-allocated software owner user accounts (such as `grid`, `oracle1`, `oracle2`), then change the owner of the existing Oracle ASM installation owner to the installation owner that you plan to use for the Oracle Grid Infrastructure installation.

See Also:

Oracle Automatic Storage Management Administrator's Guide for information on making an Oracle ASM disk group compatible with new releases, and for additional information about Oracle ASM upgrades

4.5.2 Keeping the Existing User as the Oracle ASM Operating System User

Use the existing Oracle ASM installation owner to simplify upgrades.

If you are using the same operating system user for your Oracle Grid Infrastructure installation that you used for your existing Oracle ASM installation, then you can run Oracle Universal Installer (OUI) to perform an Oracle Grid Infrastructure installation, and select the upgrade option. OUI automatically upgrades your existing Oracle ASM installation from the earlier release to Oracle Database 12c in the Grid home.

4.5.3 Changing the Operating System User for Single-Instance Oracle ASM

Oracle recommends that you change a single-instance deployment to an Oracle Automatic Storage Management (Oracle ASM) deployment on an Oracle Grid Infrastructure cluster.

When you upgrade to Oracle Grid Infrastructure, Oracle Clusterware and Oracle ASM are owned by the same Oracle installation owner. For example, if your earlier release Oracle ASM installation is installed in Oracle home 4 (OH4), and the operating system installation owner account is `oracle`, then you have to change the Oracle ASM operating system user to `grid`.

A single-instance database using Oracle ASM as its file system enables you separate Oracle Database operating system privileges from Oracle Database privileges. If you have two or more databases using Oracle ASM, then the binaries of each database can

be owned by separate installation owner accounts, providing role separation both for Oracle Database privileges, and for the common storage tier shared by all databases. No Oracle Database installation owner has Oracle Grid Infrastructure binary ownership and privileges. Each database installation owner account has only those privileges required to access storage.

See Also:

Oracle Automatic Storage Management Administrator's Guide for more information about role-allocated operating system groups and users

4.5.4 Changing the Operating System User for an Oracle RAC Database

You may need to change the Oracle user for Oracle Real Application Clusters to take advantage of role-allocated system privileges.

There may be scenarios where you must change the operating system installation owner for an Oracle RAC database. For example, if your earlier release database is installed in Oracle home 4 (OH4) and `oracle` is the installation user account owner for that database, then you should consider changing the Oracle Grid Infrastructure operating system installation user account owner to `grid`. Changing the operating system user of Oracle Grid Infrastructure (Oracle Clusterware and Oracle ASM) enables separate databases to run as separate operating system users, so that no Oracle Database installation owner user account can make changes to the storage tier that other databases use.

See Also:

Oracle Grid Infrastructure Installation Guide for the procedures to change the operating system user for an Oracle RAC database with Grid Infrastructure and Oracle ASM

4.6 Recommended and Best Practices to Complete After Upgrading Oracle Database

Oracle recommends that you complete these good practices guidelines for updating Oracle Database. These practices are recommended for both manual and DBUA upgrades.

[Back Up the Database](#) (page 4-19)

Perform a full backup of the production database.

[Running the `postupgrade_fixups.sql` Script](#) (page 4-20)

Review this procedure to understand how to use the `postupgrade_fixups.sql` scripts for CDB and Non-CDB databases.

[Gathering Dictionary Statistics After Upgrading](#) (page 4-21)

To help to assure good performance, use this procedure to gather dictionary statistics after completing your upgrade.

[Regathering Fixed Objects Statistics with `DBMS_STATS`](#) (page 4-22)

After an upgrade, or after other database configuration changes, Oracle strongly recommends that you regather fixed object statistics after you have run representative workloads on Oracle Database.

[Reset Passwords to Enforce Case-Sensitivity](#) (page 4-22)

For upgraded databases, improve security by using case-sensitive passwords for default user accounts and user accounts.

[Understand Oracle Grid Infrastructure, Oracle ASM, and Oracle Clusterware](#) (page 4-25)

Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM) are both part of an Oracle Grid Infrastructure installation.

[Oracle Grid Infrastructure Installation and Upgrade and Oracle ASM](#) (page 4-26)

Oracle ASM is installed with Oracle Grid Infrastructure.

[Add New Features as Appropriate](#) (page 4-26)

Review new features as part of your database upgrade plan.

[Develop New Administrative Procedures as Needed](#) (page 4-26)

Plan a review of your scripts and procedures, and change as needed.

[Set Threshold Values for Tablespace Alerts](#) (page 4-27)

After an upgrade, thresholds for Oracle Database 12c database Tablespace Alerts are set to null, disabling the alerts.

[Migrating From Rollback Segments To Automatic Undo Mode](#) (page 4-27)

If your database release is earlier than Oracle Database 11g, then you must migrate the database that is being upgraded from using rollback segments (manual undo management) to automatic undo management.

[Configure Oracle Data Guard Broker](#) (page 4-28)

`InitialConnectIdentifier` is replaced by `DGConnectIdentifier`, which affects upgrades from Oracle Database 10g.

[Migrating Tables from the LONG Data Type to the LOB Data Type](#) (page 4-28)

You can use the `ALTER TABLE` statement to change the data type of a `LONG` column to `CLOB` and that of a `LONG RAW` column to `BLOB`.

[Migrate Your Upgraded Oracle Databases to Use Unified Auditing](#) (page 4-28)

To use the full facilities of unified auditing, you must manually migrate to unified auditing.

[Transfer Unified Audit Records After the Upgrade](#) (page 4-33)

Review these topics to understand how you can obtain better performance after you upgrade and migrate to unified auditing

[About Testing the Upgraded Production Oracle Database](#) (page 4-35)

Repeat tests on your production database that you carried out on your test database to ensure applications operate as expected.

4.6.1 Back Up the Database

Perform a full backup of the production database.

Although this step is not required, Oracle strongly recommends that you back up your production database.

See Also:

Oracle Database Backup and Recovery User's Guide for details about backing up a database with RMAN

4.6.2 Running the `postupgrade_fixups.sql` Script

Review this procedure to understand how to use the `postupgrade_fixups.sql` scripts for CDB and Non-CDB databases.

The `postupgrade_fixups.sql` script is generated when you run the Pre-Upgrade Information Tool (`preupgrade.jar`). Run this script any time after completing an upgrade. DBUA runs the `postupgrade_fixups.sql` script as part of completing the upgrade process. You can also run it manually.

For both Container Databases (CDBs) with pluggable databases (PDBs), and for Non-CDB databases, the `postupgrade_fixups.sql` script generates three categories of information for your upgraded database: general warnings, errors, and informational recommendations.

The name of the script is different for CDBs and for Non-CDBs:

- Non-CDB `postupgrade_fixups.sql`
- CDB: two different script sets of scripts:

- `postupgrade_fixups.sql`

This script is a consolidated script for all PDBs on the CDB. You can run the consolidated script across all of the containers by running it using `catcon.pl`.

- `postupgrade_fixups_pdbname.sql`

These scripts are generated for individual PDBs, where `pdbname` is the name of the PDB for which the script is created.

Run the `postupgrade_fixups` script to fix issues after the database upgrade is completed. You can run the script either by using the `catcon.pl` utility, or by using SQL*Plus.

The location of the `postupgrade_fixups.sql` and log files depends on how you set output folders, or define the `ORACLE-BASE` environment variable.

If you specify an output directory using the `DIR` option, then the output logs and files are placed under that directory in the path `/cfgtoollogs/dbunique_name/preupgrade`. If you do not specify an output directory with the `DIR` option, then the output is directed to one of the following default locations:

- If you do not specify an output directory with `DIR`, but you define an `ORACLE_BASE` environment variable, then the generated scripts and log files are created in the file path `ORACLE_BASE/cfgtoollogs/dbunique_name/preupgrade`.
- If you do not specify an output directory, and `ORACLE_BASE` is not defined, then the generated scripts and log files are created in `ORACLE_HOME/cfgtoollogs/dbunique_name/preupgrade`.

Set the system to spool results to a log file so you can read the output. However, do not spool to the `admin` directory:

```
SQL> SPOOL postupgrade.log
SQL> @postupgrade_fixups.sql
SQL> SPOOL OFF
```

Turn off the spooling of script results to the log file:

```
SQL> SPOOL OFF
```

If you define the user environment variable `ORACLE_BASE`, then the generated scripts and log files are created in the path `Oracle_Base/cfgtoollogs/` of the original database where you ran the upgrade. If `ORACLE_BASE` is not defined, then the generated scripts and log files are created in `Oracle_home/cfgtoollogs/` of the database where you ran the upgrade.

Related Topics:

[Output of the Pre-Upgrade Information Tool](#) (page 2-40)

4.6.3 Gathering Dictionary Statistics After Upgrading

To help to assure good performance, use this procedure to gather dictionary statistics after completing your upgrade.

Oracle recommends that you gather dictionary statistics both before and after upgrading the database, because Data Dictionary tables are modified and created during the upgrade. Starting with Oracle Database 12c release 2 (12.2), you gather statistics as a manual procedure after the upgrade, when you bring the database up in normal mode.

- **Non-CDB Oracle Database:** Oracle recommends that you use the `DBMS_STATS.GATHER_DICTIONARY_STATS` procedure to gather these statistics. For example, enter the following SQL statement:

```
SQL> EXEC DBMS_STATS.GATHER_DICTIONARY_STATS;
```

- **CDB (multitenant architecture) Oracle Database:** Oracle recommends that you use `catcon` to gather Data Dictionary statistics across the entire multitenant architecture

To gather dictionary statistics for all PDBs in a container database, use the following syntax

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/
catcon.pl -l /tmp -b gatherstats -- --x"exec
dbms_stats.gather_dictionary_stats"
```

To gather dictionary statistics on a particular PDB, use syntax similar to the following:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -l /tmp -c
'SALES1' -b gatherstats -- --x"exec dbms_stats.gather_dictionary_stats"
```

In the preceding example the `-c SALES1` option specifies a PDB inclusion list for the command that you run, specifying the database named `SALES1`. The option `-b gatherstats` specifies the base name for the logs. The option `--x` specifies the SQL command that you want to execute. The SQL command itself is inside the quotation marks.

Related Topics:

Oracle Database PL/SQL Packages and Types Reference

4.6.4 Regathering Fixed Objects Statistics with DBMS_STATS

After an upgrade, or after other database configuration changes, Oracle strongly recommends that you regather fixed object statistics after you have run representative workloads on Oracle Database.

Fixed objects are the X\$ tables and their indexes. V\$ performance views are defined through X\$ tables. Gathering fixed object statistics is valuable for database performance because these statistics help the optimizer generate good execution plans, which can improve database performance. Failing to obtain representative statistics may lead to suboptimal execution plans, which may cause significant performance problems.

Gather fixed objects statistics by using the `DBMS_STATS.GATHER_FIXED_OBJECTS_STATS` PL/SQL procedure. `DBMS_STATS.GATHER_FIXED_OBJECTS_STATS` also displays recommendations for removing all hidden or underscore parameters and events from `init.ora/spfile`.

Because of the transient nature of X\$ tables, you must gather fixed objects statistics when there is a representative workload on the system. If you cannot gather fixed objects statistics during peak load, then Oracle recommends that you do it after the system is in a runtime state, and the most important types of fixed object tables are populated.

To gather statistics for fixed objects, run the following PL/SQL procedure:

```
SQL> execute dbms_stats.gather_fixed_objects_stats;
```

4.6.5 Reset Passwords to Enforce Case-Sensitivity

For upgraded databases, improve security by using case-sensitive passwords for default user accounts and user accounts.

For greater security, Oracle recommends that you enable case sensitivity in passwords. Case sensitivity increases the security of passwords by requiring that users enter both the correct password string, and the correct case for each character in that string. For example, the password `hPP5620qr` fails if it is entered as `hpp5620QR` or `hPp5620Qr`.

To secure your database, create passwords in a secure fashion. If you have default passwords in your database, then change these passwords. By default, case sensitivity is enforced when you change passwords. Every password should satisfy the Oracle recommended password requirements, including passwords for predefined user accounts.

For new databases created after the upgrade, there are no additional tasks or management requirements.

Existing Database Requirements and Guidelines for Password Changes

- If the default security settings for Oracle Database 12c release 1 (12.1) and later are in place, then passwords must be at least eight characters, and passwords such as `welcome` and `oracle` are not allowed.
- The `IGNORECASE` parameter is deprecated. Do not use this parameter.

- For existing databases, to take advantage of password case-sensitivity, you must reset the passwords of existing users during the database upgrade procedure. Reset the password for each existing database user with an `ALTER USER` statement.
- Query the `PASSWORD_VERSIONS` column of `DBA_USERS` to find the `USERNAME` of accounts that only have the 10G password version, and do not have either the 11G or the 12C password version. Reset the password for any account that has only the 10G password version.

[Finding and Resetting User Passwords That Use the 10G Password Version](#) (page 4-23)

For better security, find and reset passwords for user accounts that use the 10G password version so that they use later, more secure password versions.

See Also:

- *Oracle Database Security Guide* for more information about password case sensitivity
 - *Oracle Database Security Guide* for more information about password strength
-

4.6.5.1 Finding and Resetting User Passwords That Use the 10G Password Version

For better security, find and reset passwords for user accounts that use the 10G password version so that they use later, more secure password versions.

Finding All Password Versions of Current Users

You can query the `DBA_USERS` data dictionary view to find a list of all the password versions that user accounts have.

For example:

```
SELECT USERNAME, PASSWORD_VERSIONS FROM DBA_USERS;
```

| USERNAME | PASSWORD_VERSIONS |
|----------|-------------------|
| JONES | 10G 11G 12C |
| ADAMS | 10G 11G |
| CLARK | 10G 11G |
| PRESTON | 11G |
| BLAKE | 10G |

The `PASSWORD_VERSIONS` column shows the list of password versions that exist for the account. 10G refers to the earlier case-insensitive Oracle password version, 11G refers to the SHA-1-based password version, and 12C refers to the SHA-2-based SHA-512 password version.

- User `jones`: The password for this user was reset in Oracle Database 12c release 12.1 when the `SQLNET.ALLOWED_LOGON_VERSION_SERVER` parameter setting was 8. This enabled all three password versions to be created.

- Users `adams` and `clark`: The passwords for these accounts were originally created in Oracle Database 10g and then reset in Oracle Database 11g. The Oracle Database 11g software was using the default `SQLNET.ALLOWED_LOGON_VERSION` setting of 8 at that time. Because case insensitivity is enabled by default, their passwords are now case sensitive, as is the password for `preston`.
- User `preston`: This account was imported from an Oracle Database 11g database that was running in Exclusive Mode (`SQLNET.ALLOWED_LOGON_VERSION = 12`).
- User `blake`: This account still uses the Oracle Database 10g password version. At this stage, user `blake` will be prevented from logging in.

Resetting User Passwords That Use the 10G Password Version

For better security, you should remove the 10G password version from the accounts of all users. In the following procedure, to reset the passwords of users who have the 10G password version, you must temporarily relax the `SQLNET.ALLOWED_LOGON_VERSION_SERVER` setting, which controls the ability level required of clients before login can be allowed. This will enable these users to log in and change their passwords, and hence generate the newer password versions in addition to the 10G password version. Afterward, you will set the database to use Exclusive Mode and ensure that the clients have the `O5L_NP` capability. Then the users can reset their passwords again, so that their password versions no longer include 10G but only have the more secure 11G and 12C password versions.

1. Query the `DBA_USERS` view to find users who only use the 10G password version.

```
SELECT USERNAME FROM DBA_USERS
WHERE ( PASSWORD_VERSIONS = '10G '
OR PASSWORD_VERSIONS = '10G HTTP ' )
AND USERNAME <> 'ANONYMOUS';
```

2. Configure the database so that it does not run in Exclusive Mode, as follows:
 - a. Edit the `SQLNET.ALLOWED_LOGON_VERSION_SERVER` setting in the `sqlnet.ora` file so that it is more permissive than the default. For example:

```
SQLNET.ALLOWED_LOGON_VERSION_SERVER=11
```

- b. Restart the database.
3. Expire the users that you found when you queried the `DBA_USERS` view to find users who only use the 10G password version.

You must expire the users who have only the 10G password version, and do not have one or both of the 11G or 12C password versions.

For example:

```
ALTER USER username PASSWORD EXPIRE;
```

4. Ask the users whose passwords you expired to log in.

When the users log in, they will be prompted to change their passwords. The database generates the missing 11G and 12C password versions for their account, in addition to the 10G password version. The 10G password version continues to be present, because the database is running in the permissive mode.

5. Ensure that the client software with which the users are connecting has the O5L_NP ability.

All Oracle Database release 11.2.0.3 and later clients have the O5L_NP ability. If you have an earlier Oracle Database client, then you must install the CPUOct2012 patch.

6. After all clients have the O5L_NP capability, set the security for the server back to Exclusive Mode, as follows:

- a. Remove the SEC_CASE_SENSITIVE_LOGON parameter setting from the instance initialization file, or set SEC_CASE_SENSITIVE_LOGON to TRUE.

```
SEC_CASE_SENSITIVE_LOGON = TRUE
```

- b. Remove the SQLNET.ALLOWED_LOGON_VERSION_SERVER parameter from the server sqlnet.ora file, or set the value of SQLNET.ALLOWED_LOGON_VERSION_SERVER in the server sqlnet.ora file back to 12, to set it to an Exclusive Mode.

```
SQLNET.ALLOWED_LOGON_VERSION_SERVER = 12
```

- c. Restart the database.

7. Find the accounts that still have the 10G password version.

```
SELECT USERNAME FROM DBA_USERS
WHERE PASSWORD_VERSIONS LIKE '%10G%'
AND USERNAME <> 'ANONYMOUS';
```

8. Expire the accounts that still have the 10G password version.

```
ALTER USER username PASSWORD EXPIRE;
```

9. Ask these users to log in to their accounts.

When the users log in, they are prompted to reset their passwords. The database then generates only the 11G and 12C password versions for their accounts. Because the database is running in Exclusive Mode, the 10G password version is no longer generated.

10. Rerun the following query:

```
SELECT USERNAME FROM DBA_USERS
WHERE PASSWORD_VERSIONS LIKE '%10G%'
AND USERNAME <> 'ANONYMOUS';
```

If this query does not return any results, then it means that no user accounts have the 10G password version. Hence, the database is running in a more secure mode than in previous releases.

4.6.6 Understand Oracle Grid Infrastructure, Oracle ASM, and Oracle Clusterware

Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM) are both part of an Oracle Grid Infrastructure installation.

If Oracle Grid Infrastructure is installed for a single server, then it is deployed as an Oracle Restart installation with Oracle ASM. If Oracle Grid Infrastructure is installed for a cluster, then it is deployed as an Oracle Clusterware installation with Oracle ASM.

Oracle Restart enhances the availability of Oracle Database in a single-instance environment. If you install Oracle Restart, and there is a temporary failure of any part of the Oracle Database software stack, including the database, listener, and Oracle ASM instance, Oracle Restart automatically restarts the failed component. In addition, Oracle Restart starts all these components when the database host computer is restarted. The components are started in the proper order, taking into consideration the dependencies among components.

Oracle Clusterware is portable cluster software that enables clustering of single servers so that they cooperate as a single system. Oracle Clusterware also provides the required infrastructure for Oracle RAC. In addition, Oracle Clusterware enables the protection of any Oracle application or any other application within a cluster. In any case Oracle Clusterware is the intelligence in those systems that ensures required cooperation between the cluster nodes.

4.6.7 Oracle Grid Infrastructure Installation and Upgrade and Oracle ASM

Oracle ASM is installed with Oracle Grid Infrastructure.

In earlier releases, Oracle ASM was installed as part of the Oracle Database installation. Starting with Oracle Database release 11.2, Oracle ASM is installed when you install the Grid Infrastructure components. Oracle ASM shares an Oracle home with Oracle Clusterware.

See Also:

Oracle Grid Infrastructure Installation Guide for your platform for information about Oracle homes, role-allocated system privileges groups, different installation software owner users, and other changes.

4.6.8 Add New Features as Appropriate

Review new features as part of your database upgrade plan.

Oracle Database New Features Guide describes many of the new features available in the new Oracle Database 12c release. Determine which of these new features can benefit the database and applications. You can then develop a plan for using these features.

It is not necessary to make any immediate changes to begin using your new Oracle Database software. You may prefer to introduce new feature enhancements into your database and corresponding applications gradually.

See Also:

Oracle Database New Features Guide

4.6.9 Develop New Administrative Procedures as Needed

Plan a review of your scripts and procedures, and change as needed.

After familiarizing yourself with the features of the new Oracle Database 12c release, review your database administration scripts and procedures to determine whether any changes are necessary.

Coordinate your changes to the database with the changes that are necessary for each application. For example, by enabling integrity constraints in the database, you may be able to remove some data checking from your applications.

4.6.10 Set Threshold Values for Tablespace Alerts

After an upgrade, thresholds for Oracle Database 12c database Tablespace Alerts are set to null, disabling the alerts.

You must identify tablespaces in the database that are candidates for monitoring, and you must set the appropriate threshold values for these tablespaces.

In newly-created Oracle Database 12c installations, the following values are used as defaults:

- 85% full warning
- 97% full critical

4.6.11 Migrating From Rollback Segments To Automatic Undo Mode

If your database release is earlier than Oracle Database 11g, then you must migrate the database that is being upgraded from using rollback segments (manual undo management) to automatic undo management.

Automatic undo management is the default undo space management mode. The `UNDO_MANAGEMENT` initialization parameter specifies which undo space management mode the system should use:

- If `UNDO_MANAGEMENT` is set to `AUTO` (or if `UNDO_MANAGEMENT` is not set), then the database instance starts in automatic undo management mode.

A null `UNDO_MANAGEMENT` initialization parameter defaults to automatic undo management mode in Oracle Database 11g Release 1 (11.1) and later. In earlier releases it defaults to manual undo management mode. Use caution when upgrading earlier releases.

- If `UNDO_MANAGEMENT` is set to `MANUAL`, then undo space is allocated externally as rollback segments.

1. Set the `UNDO_MANAGEMENT` parameter to `UNDO_MANAGEMENT=MANUAL`.
2. Start the instance again and run through a standard business cycle to obtain a representative workload. Assess the workload, and compute the size of the undo tablespace that you require for automatic undo management.
3. After the standard business cycle completes, run the following function to collect the undo tablespace size, and to help with the sizing of the undo tablespace. You require `SYSDBA` privileges to run this function.

```
DECLARE
    utbsiz_in_MB NUMBER;
BEGIN
    utbsiz_in_MB := DBMS_UNDO_ADV.RBU_MIGRATION;
end;
/
```

This function runs a PL/SQL procedure that provides information on how to size your new undo tablespace based on the configuration and usage of the rollback segments in your system. The function returns the sizing information directly.

4. Create an undo tablespace of the required size and turn on the automatic undo management by setting `UNDO_MANAGEMENT=AUTO` or by removing the parameter.
5. For Oracle RAC configurations, repeat these steps on all instances.

4.6.12 Configure Oracle Data Guard Broker

`InitialConnectIdentifier` is replaced by `DGConnectIdentifier`, which affects upgrades from Oracle Database 10g.

The value of `DGConnectIdentifier` is used for all Data Guard network traffic, all of the time. If you are upgrading an Oracle Database release 10g configuration, which requires you to first upgrade to Oracle Database 11g, then the value that exists for `InitialConnectIdentifier` is retained as the new value for `DGConnectIdentifier` for the database. When upgrading an Oracle Real Application Clusters (Oracle RAC) database, database administrators must ensure that the value for the `InitialConnectIdentifier` property reaches all instances.

4.6.13 Migrating Tables from the LONG Data Type to the LOB Data Type

You can use the `ALTER TABLE` statement to change the data type of a `LONG` column to `CLOB` and that of a `LONG RAW` column to `BLOB`.

The LOB data types (`BFILE`, `BLOB`, `CLOB`, and `NCLOB`) can provide many advantages over `LONG` data types.

In the following example, the `LONG` column named `long_col` in table `long_tab` is changed to data type `CLOB`:

```
SQL> ALTER TABLE Long_tab MODIFY ( long_col CLOB );
```

After using this method to change `LONG` columns to LOBs, all the existing constraints and triggers on the table are still usable. However, all the indexes, including Domain indexes and Functional indexes, on all columns of the table become unusable and must be rebuilt using an `ALTER INDEX . . . REBUILD` statement. Also, the Domain indexes on the `LONG` column must be dropped before changing the `LONG` column to a LOB.

See Also:

Oracle Database SecureFiles and Large Objects Developer's Guide for information about modifying applications to use LOB data

4.6.14 Migrate Your Upgraded Oracle Databases to Use Unified Auditing

To use the full facilities of unified auditing, you must manually migrate to unified auditing.

In unified auditing, all Oracle Database audit trails (`SYS.AUD$` for the database audit trail, `SYS.FGA_LOG$` for fine-grained auditing, `DVYS.AUDIT_TRAIL$` for Database Vault, and so on) are combined into one single audit trail, which you can view by querying the `UNIFIED_AUDIT_TRAIL` data dictionary view for single-instance installations and `GV$UNIFIED_AUDIT_TRAIL` for Oracle Real Application Clusters environments.

[Understanding Unified Auditing Migration Process for Oracle Database](#)
(page 4-29)

Decide which audit policies you want to use in the upgraded database.

[Migrating to Unified Auditing for Oracle Database](#) (page 4-30)

Use this procedure for multitenant container (CDB) databases to migrate to unified auditing.

[About Managing Earlier Audit Records After You Migrate to Unified Auditing](#)
(page 4-31)

Review, archive, and purge earlier audit trails in preparation for using the unified audit trail.

[Removing the Unified Auditing Functionality](#) (page 4-32)

Use this procedure to remove unified auditing, and to use mixed-mode audit.

[Obtaining Documentation References if You Choose Not to Use Unified Auditing](#) (page 4-32)

You can access documentation listed here to obtain information about non-unified auditing.

See Also:

Oracle Database Security Guide for information about how the audit features have changed for this release

4.6.14.1 Understanding Unified Auditing Migration Process for Oracle Database

Decide which audit policies you want to use in the upgraded database.

By default, unified auditing is not enabled for upgraded databases. If you have upgraded from an earlier release to Oracle Database 12c, then your database uses the same auditing functionality that was used in the earlier release. For newly created databases, the mixed-mode method of unified auditing is enabled by default. After you complete the migration to unified auditing, traditional auditing is disabled, and the new audit records write to the unified audit trail.

To enable and configure the audit policies and how they are used, choose one method as follows:

- Use the pure unified audit facility.

Migrate to unified auditing to use the full unified auditing facility features. After you complete the procedure to migrate to unified auditing, you can create and enable new audit policies and also use the predefined audit policies. The audit records for these policies write to the unified audit trail. The earlier audit trails and their audit records remain, but no new audit records write to the earlier audit trails.

Note:

The audit configuration from the earlier release has no effect in the unified audit system. Only unified audit policies generate audit records inside the unified audit trail.

- Use a mixed-mode audit facility.

The mixed-mode audit facility enables both traditional and unified auditing facilities to run simultaneously and applies to both new and upgraded databases. The mixed-mode unified auditing facility becomes available if you enable at least one of the unified auditing predefined audit policies. Audit records for these policies write to the unified audit trail. The audit configuration in the earlier release of Oracle Database is also available, and the audit records for this configuration write to the earlier audit trails. If you decide that you prefer using the pure unified audit facility, then you can migrate to it.

Note:

If the database is not writable, then audit records write to new format operating system files in the \$ORACLE_BASE/audit/\$ORACLE_SID directory.

See Also:

- *Oracle Database Security Guide* for information about the predefined audit policies
 - *Oracle Database Security Guide* for information about the ora_SecureConfig audit policy
-
-

4.6.14.2 Migrating to Unified Auditing for Oracle Database

Use this procedure for multitenant container (CDB) databases to migrate to unified auditing.

In CDB environments, perform the following procedure in the `root`. The procedure migrates both the `rootCDB`, and any associated PDBs, to unified auditing.

1. Log in to SQL*Plus as user `SYS` with the `SYSDBA` privilege.

```
sqlplus sys as sysdba
Enter password: password
```

In a Pluggable Databases environment, this login connects you to `root`.

2. Check if your Oracle Database is migrated to unified auditing using this query:

```
SQL> SELECT VALUE FROM V$OPTION WHERE PARAMETER = 'Unified Auditing';
```

If the output for the `VALUE` column is `TRUE`, then unified auditing is already enabled in your database. You can proceed to *Managing Earlier Audit Records*. If the output is `FALSE`, then complete the remaining steps in this procedure.

3. Stop the database. For single-instance environments, enter the following commands from SQL*Plus:

```
SQL> SHUTDOWN IMMEDIATE
SQL> EXIT
```

For Windows systems, stop the Oracle service:

```
net stop OracleService%ORACLE_SID%
```

For Oracle RAC installations, shut down each database instance as follows:

```
srvctl stop database -db db_name
```

4. Stop the listener. (Stopping the listener is not necessary for Oracle RAC and Oracle Grid Infrastructure listeners.)

```
lsnrctl stop listener_name
```

You can find the name of the listener by running the `lsnrctl status` command. The `Alias` setting indicates the name.

5. Go to the directory `$ORACLE_HOME/rdbms/lib`.
6. Enable unified auditing.

- Linux and UNIX

```
make -f ins_rdbms.mk uniaud_on ioracle ORACLE_HOME=$ORACLE_HOME
```

- Windows

```
Rename the file %ORACLE_HOME%/bin/orauniaud12.dll.dbl to
%ORACLE_HOME%/bin/orauniaud12.dll.
```

7. Restart the listener.

```
lsnrctl start listener_name
```

8. Restart the database.

Log in to SQL*Plus and then enter the `STARTUP` command:

```
sqlplus sys as sysoper
Enter password: password
```

```
SQL> STARTUP
```

For Windows systems, start the Oracle service:

```
net start OracleService%ORACLE_SID%
```

For Oracle RAC installations, start each database instance:

```
srvctl start database -db db_name
```

4.6.14.3 About Managing Earlier Audit Records After You Migrate to Unified Auditing

Review, archive, and purge earlier audit trails in preparation for using the unified audit trail.

After you complete the procedure to migrate Oracle Database to use unified auditing, any audit records that your database had before remain in their earlier audit trails. You can archive these audit records and then purge their audit trails. With unified auditing in place, any new audit records write to the unified audit trail.

See Also:

- "Archiving the Audit Trail" in *Oracle Database Security Guide*
 - "Purging Audit Trail Records" in *Oracle Database Security Guide*
-
-

4.6.14.4 Removing the Unified Auditing Functionality

Use this procedure to remove unified auditing, and to use mixed-mode audit.

After you have enabled your databases to use unified auditing, if you decide that you do not want unified auditing, then you can use this procedure to remove the unified auditing functionality. In this case, your database uses the mixed-mode audit facility.

1. Stop the database.

```
sqlplus sys as sysoper
Enter password: password
```

```
SQL> SHUTDOWN IMMEDIATE
SQL> EXIT
```

For Windows systems, stop the Oracle service:

```
net stop OracleService%ORACLE_SID%
```

For Oracle RAC installations, shut down each database instance as follows:

```
srvctl stop database -db db_name
```

2. Go to the `$ORACLE_HOME/rdbms/lib` directory.

3. Disable the unified auditing executable.

- **UNIX:** Run the following command:

```
make -f ins_rdbms.mk uniaud_off ioracle ORACLE_HOME=$ORACLE_HOME
```

- **Windows:** Rename the `%ORACLE_HOME%/bin/orauniaud12.dll` file to `%ORACLE_HOME%/bin/orauniaud12.dll.dbl`.

4. Restart the database.

```
sqlplus sys as sysoper
Enter password: password
```

```
SQL> STARTUP
SQL> EXIT
```

For Windows systems, start the Oracle service again.

```
net start OracleService%ORACLE_SID%
```

For Oracle RAC installations, start each database instance using the following syntax:

```
srvctl start database -db db_name
```

4.6.14.5 Obtaining Documentation References if You Choose Not to Use Unified Auditing

You can access documentation listed here to obtain information about non-unified auditing.

After upgrading to Oracle Database 12c, if you choose not to change to unified auditing, then Oracle documentation and Oracle Technology Network provide information about traditional non-unified auditing.

- *Oracle Database Security Guide*: This guide is the main source of information for configuring auditing. You must use the Oracle Database Release 11g version of this manual. To access this guide:
 1. Visit Oracle Technology Network at the following URL:
<http://www.oracle.com/technetwork/index.html>
 2. From the Downloads menu, under Databases, select Database 11g.
 3. In the Downloads page, select the **Documentation** tab.
 4. From the most recent Oracle Database 11g Release 2 (11.2) Documentation page, select the **View Library** link to display the home page of the Release 11g documentation set.
 5. Under the **Search** field, select the **Master Book List** link.
 6. Search for *Security Guide*.
 7. Select either the **HTML** or the **PDF** link for this guide.
- *Oracle Database SQL Language Reference*: This guide explains how to use the `AUDIT` and `NOAUDIT` statements for both unified auditing and non-unified auditing environments.
- *Oracle Database Reference*: This guide explains how to use the initialization parameters and data dictionary views that are associated with a non-unified auditing environment. For a list of these, see *Oracle Database Security Guide*.
- *Oracle Database Vault Administrator's Guide*: This guide explains how to configure auditing in a non-unified auditing environment for Database Vault.
- *Oracle Label Security Administrator's Guide*: This guide explains how to configure auditing in a non-unified auditing environment for Oracle Label Security.

4.6.15 Transfer Unified Audit Records After the Upgrade

Review these topics to understand how you can obtain better performance after you upgrade and migrate to unified auditing

[About Transferring Unified Audit Records After an Upgrade](#) (page 4-33)

Transferring the unified audit records from Oracle Database 12c release 12.1 to the new relational table under `AUDSYS` schema for this release improves the read performance of the unified audit trail.

[Transferring Unified Audit Records After an Upgrade](#) (page 4-34)

You can transfer unified audit records to the new relational table in `AUDSYS` by using the `DBMS_AUDIT_MGMT.TRANSFER_UNIFIED_AUDIT_RECORDS` PL/SQL procedure.

4.6.15.1 About Transferring Unified Audit Records After an Upgrade

Transferring the unified audit records from Oracle Database 12c release 12.1 to the new relational table under `AUDSYS` schema for this release improves the read performance of the unified audit trail.

Starting with this release, unified audit records are written directly to a new internal relational table that is located in the `AUDSYS` schema. In Oracle Database 12c release

12.1, the unified audit records were written to the common logging infrastructure (CLI) SGA queues. If you migrated to unified auditing in that release, then you can transfer the unified audit records that are from that release to this new internal table for better read performance. It is not mandatory that you perform this transfer, but Oracle recommends that you do so because the new internal table improves the unified audit trail read performance. This is a one-time operation. All new unified audit records that are generated after the upgrade will be written to the new table. The table is a read-only table and any attempt to modify the metadata or data of this table is mandatorily audited.

After you upgrade to Oracle Database 12c release 12.2, if you have any unified audit records present in the UNIFIED_AUDIT_TRAIL from the earlier release, then consider transferring them to this new internal relational table by using the transfer procedure for better read performance of the unified audit trail.

As with the SYS schema, you cannot query the AUDSYS schema if you have the SELECT ANY TABLE system privilege. In addition, this table is not listed as a schema object in the ALL_TABLES data dictionary view unless you have either the SELECT ANY DICTIONARY system privilege or an explicit SELECT privilege on this internal table. Until the database is open read write, the audit records are written to OS spillover files (.bin format). However, you can transfer the audit records in these OS files to the internal relational table after the database opens in the read write mode by using the DBMS_AUDIT_MGMT.LOAD_UNIFIED_AUDIT_FILES procedure.

4.6.15.2 Transferring Unified Audit Records After an Upgrade

You can transfer unified audit records to the new relational table in AUDSYS by using the DBMS_AUDIT_MGMT.TRANSFER_UNIFIED_AUDIT_RECORDS PL/SQL procedure.

1. Log in to the database instance as a user who has been granted the AUDIT_ADMIN role.

For example, in a non-multitenant environment:

```
sqlplus sec_admin
Enter password: password
```

For a multitenant environment, connect to the root:

```
sqlplus c##sec_admin@root
Enter password: password
```

You can perform this procedure execution in the root as well as in a PDB, because the UNIFIED_AUDIT_TRAIL view is container specific. In addition, the transfer procedure is container specific. That is, performing the transfer from the root does not affect the unified audit records that are present in the unified audit trail for the PDB.

2. For a multitenant environment, query the DBA_PDB_HISTORY view to find the correct GUID that is associated with the CLI table that is specific to the container from which audit records must be transferred.

For example:

```
SQL> SELECT PDB_NAME, PDB_GUID FROM DBA_PDB_HISTORY;
```

```
PDB_NAME  PDB_GUID
-----  -
HR_PDB    33D96CA7862D53DFE0534DC0E40A7C9B
...
```

3. In a multitenant environment, connect to the container for which you want to transfer the audit records.

You cannot perform the transfer operation on a container that is different from the one in which you are currently connected.

4. Run the `DBMS_AUDIT_MGMT.TRANSFER_UNIFIED_AUDIT_RECORDS` procedure.

For example:

```
SQL> EXEC DBMS_AUDIT_MGMT.TRANSFER_UNIFIED_AUDIT_RECORDS;
```

PL/SQL procedure successfully completed.

Or, to specify the PDB GUID:

```
SQL> EXEC DBMS_AUDIT_MGMT.TRANSFER_UNIFIED_AUDIT_RECORDS
('33D96CA7862D53DFE0534DC0E40A7C9B');
```

PL/SQL procedure successfully completed.

5. If the database is in open read write mode, then execute the `DBMS_AUDIT_MGMT.LOAD_UNIFIED_AUDIT_FILES` procedure.

Until the database is in open read write mode, audit records are written to operating system (OS) files. The

`DBMS_AUDIT_MGMT.LOAD_UNIFIED_AUDIT_FILES` procedure moves the unified audit records that are present in the files to database tables. You can find the unified audit records that are present in the OS spillover files by querying the `V$UNIFIED_AUDIT_TRAIL` dynamic view.

For example, if you want to execute this procedure for audit records in the `HR_PDB` container, then you must connect to that PDB first:

```
SQL> CONNECT sec_admin@HR_PDB
Enter password: password
```

```
SQL> EXEC DBMS_AUDIT_MGMT.LOAD_UNIFIED_AUDIT_FILES;
```

PL/SQL procedure successfully completed.

6. Query the `UNIFIED_AUDIT_TRAIL` data dictionary view to check if the records transferred correctly.

Oracle highly recommends that you query `UNIFIED_AUDIT_TRAIL`. After a successful audit record transfer, you should query the `UNIFIED_AUDIT_TRAIL` because querying the `V$UNIFIED_AUDIT_TRAIL` dynamic view will show the audit records that are present only in the OS spillover files.

4.6.16 About Testing the Upgraded Production Oracle Database

Repeat tests on your production database that you carried out on your test database to ensure applications operate as expected.

If you upgraded a test database to the new Oracle Database release and then tested it, then you can now repeat those tests on the production database that you upgraded to the new Oracle Database 12c release. Compare the results, noting anomalies. Repeat the test upgrade as many times as necessary.

Test the newly upgraded production database with existing applications to verify that they operate properly with a new Oracle database. You also might test enhanced

functions by adding available Oracle Database features. However, first ensure that the applications operate in the same manner as they did before the upgrade.

4.7 Recommended Tasks After Upgrading an Oracle RAC Database

Decide if you want to configure clients to use SCAN or node listeners for connections.

Oracle Real Application Clusters 12c uses the Single Client Access Name (SCAN). The SCAN is a single name that resolves to three IP addresses in the public network. When you upgrade a release of an Oracle RAC database earlier than release 11.2, the Oracle RAC database is registered with SCAN listeners as remote listeners. The Oracle RAC database also continues to register with all node listeners. SCAN listeners offer a variety of benefits. These benefits include enabling you to configure clients one time, and adding or removing nodes from the cluster without needing to change client connection configurations.

You can configure clients to use SCANS, or you can continue to use listeners configured on cluster member nodes. If you migrate all of your client connections to use SCANS, then you can remove the node listeners from the `REMOTE_LISTENERS` parameter. However, you cannot remove the node listeners themselves, because only node listeners can create dedicated servers for the database.

See Also:

Oracle Clusterware Administration and Deployment Guide for more information about Single Client Access Names (SCAN)

4.8 Recommended Tasks After Upgrading Oracle ASM

After you have upgraded Oracle ASM, Oracle recommends that you perform tasks such as resetting the Oracle ASM passwords and configuring disk groups.

[Create A Shared Password File in the ASM Diskgroup](#) (page 4-37)

If you advance the `COMPATIBLE.ASM` disk group attribute, then create a shared password file.

[Reset Oracle ASM Passwords to Enforce Case-Sensitivity](#) (page 4-37)

To take advantage of enforced case-sensitive passwords, you must reset the passwords of existing users during the database upgrade procedure.

[Advancing the Oracle ASM and Oracle Database Disk Group Compatibility](#) (page 4-37)

You can advance the Oracle Database and the Oracle ASM disk group compatibility settings across software versions.

[Set Up Oracle ASM Preferred Read Failure Groups](#) (page 4-38)

Oracle ASM administrators can specify some disks as preferred read disks for read I/O operations.

Related Topics:

[Add New Features as Appropriate](#) (page 4-26)

Review new features as part of your database upgrade plan.

[Develop New Administrative Procedures as Needed](#) (page 4-26)

Plan a review of your scripts and procedures, and change as needed.

4.8.1 Create A Shared Password File in the ASM Diskgroup

If you advance the `COMPATIBLE.ASM` disk group attribute, then create a shared password file.

If you advanced the `COMPATIBLE.ASM` disk group attribute to 12.1 or later, then you are required to create a shared password file in the ASM diskgroup.

See Also:

Oracle Automatic Storage Management Administrator's Guide for complete information about managing a shared password file in a disk group

4.8.2 Reset Oracle ASM Passwords to Enforce Case-Sensitivity

To take advantage of enforced case-sensitive passwords, you must reset the passwords of existing users during the database upgrade procedure.

In releases earlier than Oracle Database 11g Release 1 (11.1), passwords are not case sensitive. You can enforce case sensitivity for passwords. For example, the password `hPP5620qr` fails if it is entered as `hpp5620QR` or `hPp5620Qr`.

For new Oracle ASM instances, there are no additional tasks or management requirements. For upgraded Oracle ASM instances, each user password must be reset with an `ALTER USER` statement.

Note:

If the default Oracle Database security settings are in place, then passwords must be at least eight characters, and passwords such as `welcome` and `oracle` are not allowed. See *Oracle Database Security Guide* for more information.

4.8.3 Advancing the Oracle ASM and Oracle Database Disk Group Compatibility

You can advance the Oracle Database and the Oracle ASM disk group compatibility settings across software versions.

Caution:

If you advance the `COMPATIBLE.RDBMS` attribute, then you cannot revert to the previous setting. Before advancing the `COMPATIBLE.RDBMS` attribute, ensure that the values for the `COMPATIBLE` initialization parameter for all of the databases that use the disk group are set to at least the new setting for `COMPATIBLE.RDBMS` before you advance the attribute value.

Advancing compatibility enables new features only available in the new release. However, doing so makes the disk group incompatible with older releases of the software. Advancing the on disk compatibility is an irreversible operation.

Use the `compatible.rdbms` and `compatible.asm` attributes to specify the minimum software release required by the database instance and the Oracle ASM instance, respectively, to access the disk group. For example, the following `ALTER`

DISKGROUP statement advances the Oracle ASM compatibility of the disk group asmdg2:

```
ALTER DISKGROUP asmdg2 SET ATTRIBUTE 'compatible.asm' = '12.2'
```

In this case, the disk group can be managed only by Oracle ASM software of release 12.2 or later, while any database client of release 11.2 or later can use the disk group.

See Also:

Oracle Automatic Storage Management Administrator's Guide for complete information about disk group compatibility

Oracle Database SQL Language Reference for more information about the disk group compatibility attributes on the ALTER DISKGROUP and CREATE DISKGROUP statements

4.8.4 Set Up Oracle ASM Preferred Read Failure Groups

Oracle ASM administrators can specify some disks as preferred read disks for read I/O operations.

When an ASM administrator defines Oracle ASM preferred read failure groups, Oracle ASM can then read from the extent that is in the nearest preferred read disk, rather than always reading the primary copy.

See Also:

- *Oracle Clusterware Administration and Deployment Guide* for information about specifying failure groups settings in an extended cluster
 - *Oracle Automatic Storage Management Administrator's Guide* for complete information about Oracle ASM preferred read failure groups, and specifying the new ASM_PREFERRED_READ_FAILURE_GROUPS initialization parameter to list failure group names that contain the preferred read disks for each node in a cluster
 - *Oracle Database Reference* for the ASM_PREFERRED_READ_FAILURE_GROUPS initialization parameter
-
-

4.9 Recommended Tasks After Upgrading Oracle Database Express Edition

Use DBCA or run manual scripts to install additional components into Oracle Database.

An Oracle Database Express database contains only a subset of the components available in an Oracle Database Standard Edition or Oracle Database Enterprise Edition database. After upgrading to the new Oracle Database release, you can use Database Configuration Assistant (DBCA) or manual scripts to install additional components into your database.

4.10 Oracle Application Express PDB Plugin Considerations

Review this information if you use multitenant architecture, and after the upgrade, you want to plug in a PDB that contains Oracle Application Express releases 5.0.0, 5.0.1, or 5.0.2.

Oracle Database 12c release 2 (12.2) includes Oracle Application Express release 5.0.3. The Oracle Application Express versions can be incompatible. Incompatible versions are an issue when you upgrade Oracle Database release 12.2, you plug in PDBs that contains earlier releases of Oracle Application Express, and then upgrade to Oracle Application Express releases 5.0.0, 5.0.1, or 5.0.2. If the Oracle Application Express versions are incompatible, then when the PDB is upgraded, the Oracle Application Express release on the PDBs is not patched to release 5.0.3. In that event, you can only use it with restrictions.

To complete the upgrade of Oracle Application Express to release 5.0.3, you must carry out a procedure to run an additional package. Refer to the section "Working with Incompatible Application Express Versions" in *Oracle Application Express Installation Guide*. Complete the required actions so that you can plug in PDBs with earlier release Oracle Application Express installations.

See Also:

Oracle Application Express Installation Guide

4.11 Tasks to Complete Only After Manually Upgrading Oracle Database

After you complete your upgrade, you must perform the tasks described here if you upgrade your database manually instead of using DBUA.

[Changing Passwords for Oracle Supplied Accounts](#) (page 4-40)

Oracle recommends that you carry out these tasks to protect new Oracle user accounts.

[Create or Migrate Your Password File with ORAPWD](#) (page 4-40)

Review if you have REMOTE_LOGIN_PASSWORDFILE set.

[Migrating Your Initialization Parameter File to a Server Parameter File](#) (page 4-41)

If you are currently using a traditional initialization parameter file, then use this procedure to migrate to a server parameter file.

[Identifying and Copying Oracle Text Files To a New Oracle Home](#) (page 4-41)

To upgrade Oracle Text, use this procedure to identify and copy required files from your existing Oracle home to the new release Oracle home. Complete this task after you upgrade Oracle Database.

[Upgrading the Oracle Clusterware Configuration](#) (page 4-42)

If you are using Oracle Clusterware, then you must upgrade the Oracle Clusterware keys for the database.

[Adjust the Initialization Parameter File for the New Release](#) (page 4-42)

Review these topics to help you to check your initialization parameters after upgrading.

[Set CLUSTER_DATABASE Initialization Parameter For Oracle RAC After Upgrade](#) (page 4-44)

For upgrades of Oracle RAC databases you set the `CLUSTER_DATABASE` initialization parameter to `false` before upgrading a cluster database.

4.11.1 Changing Passwords for Oracle Supplied Accounts

Oracle recommends that you carry out these tasks to protect new Oracle user accounts.

Depending on the release from which you upgraded, there may be new Oracle user accounts on your database. Oracle recommends that you lock all Oracle supplied accounts except for `SYS` and `SYSTEM`, and expire their passwords, so that new passwords are required when the accounts are unlocked.

Note:

If the default Oracle Database 12c security settings are in place, then passwords must be at least eight characters, and passwords such as `welcome` and `oracle` are not allowed.

See Also:

Oracle Database Security Guide about password requirements

You can view the status of all accounts by issuing the following SQL statement:

```
SQL> SELECT username, account_status
       FROM dba_users
       ORDER BY username;
```

To lock and expire passwords, issue the following SQL statement:

```
SQL> ALTER USER username PASSWORD EXPIRE ACCOUNT LOCK;
```

4.11.2 Create or Migrate Your Password File with ORAPWD

Review if you have `REMOTE_LOGIN_PASSWORDFILE` set.

If the `REMOTE_LOGIN_PASSWORDFILE` initialization parameter is set to `EXCLUSIVE`, then create or migrate the password file with `ORAPWD`. Oracle Database 12c provides a new option to `ORAPWD` for migrating the password file from your existing database.

As of Oracle Database 12c release 2 (12.2), if `REMOTE_LOGIN_PASSWORDFILE` is set to `SHARED`, then you receive a pre-upgrade check validation warning. You can choose one of the following options to correct this issue:

- Disable the password file-based authentication entirely by setting `REMOTE_LOGIN_PASSWORDFILE = NONE`
- Limit the password file-based authentication by setting `REMOTE_LOGIN_PASSWORD = EXCLUSIVE`

See Also:

Oracle Database Administrator's Guide for more information about creating or migrating password files

4.11.3 Migrating Your Initialization Parameter File to a Server Parameter File

If you are currently using a traditional initialization parameter file, then use this procedure to migrate to a server parameter file.

1. If the initialization parameter file is located on a client computer, then transfer the file from the client computer to the server computer.
2. Create a server parameter file using the `CREATE SPFILE` statement. This statement reads the initialization parameter file to create a server parameter file. You are not required to start the database to issue a `CREATE SPFILE` statement.
3. Start up the instance using the newly-created server parameter file.

Note:

If you are using Oracle RAC, then you must combine all of your instance-specific initialization parameter files into a single initialization parameter file. Complete the procedures necessary for using a server parameter file with cluster databases.

See Also:

- *Oracle Real Application Clusters Administration and Deployment Guide*
 - *Oracle Real Application Clusters Installation Guide* for your operating system
 - *Oracle Database Administrator's Guide* for more information about creating server parameter files
 - *Oracle Database SQL Language Reference* for information about the `CREATE SPFILE` statement
-
-

4.11.4 Identifying and Copying Oracle Text Files To a New Oracle Home

To upgrade Oracle Text, use this procedure to identify and copy required files from your existing Oracle home to the new release Oracle home. Complete this task after you upgrade Oracle Database.

Certain Oracle Text features rely on files under the Oracle home that you have configured. After a manual upgrade to a new release, or after any other process that changes the Oracle home, you must identify and move these files manually. These files include any user filters, any mail filter configuration files, and all the knowledge base extension files. After you identify the files, copy the files from your existing Oracle home to the new Oracle home.

To identify the list of files that you must copy from the existing Oracle home, Oracle recommends that you run the SQL script `/ctx/admin/ctx_oh_files.sql`.

1. Log in with the SYS, SYSTEM, or CTXSYS system privileges for the earlier release database.
2. Run `$ORACLE_HOME/ctx/admin/ctx_oh.sql` under the Oracle home of the earlier release database.

For example:

```
sqlplus / as sysdba
connected
SQL> @?/ctx/admin/ctx_oh_files
```

3. Review the output from the `ctx_oh_files.sql` command, and copy those files to the new Oracle home.

Related Topics:

Oracle Text Application Developer's Guide

4.11.5 Upgrading the Oracle Clusterware Configuration

If you are using Oracle Clusterware, then you must upgrade the Oracle Clusterware keys for the database.

Run `srvctl` for Oracle Database 12c to upgrade the database. For example:

```
ORACLE_HOME/bin/srvctl upgrade database -db name -o ORACLE_HOME
```

Related Topics:

Oracle Real Application Clusters Administration and Deployment Guide

4.11.6 Adjust the Initialization Parameter File for the New Release

Review these topics to help you to check your initialization parameters after upgrading.

Each release of Oracle Database introduces new initialization parameters, deprecates some initialization parameters, and desupports some initialization parameters. You must adjust the parameter file to account for these changes and to take advantage of new initialization parameters that might be beneficial to your system. Additionally, when you perform a manual upgrade without using DBUA, the `tnsnames.ora` file is not automatically populated with new configuration information and settings. Therefore, you must manually update `tnsnames.ora` and adjust `local_listener` and `remote_listener` parameter references if these must be resolved.

[Setting the COMPATIBLE Initialization Parameter After Upgrade](#) (page 4-43)

After testing, you can set the `COMPATIBLE` initialization parameter to the compatibility level you want for your new database.

[Adjust TNSNAMES.ORA and LISTENER Parameters After Upgrade](#) (page 4-44)

After performing a manual upgrade, if you must resolve `local_listener` and `remote_listener` in `tnsnames.ora`, then you must manually adjust those parameters.

See Also:

- *Oracle Database Reference* “Changes In this Release” section for a list of the new initialization parameters in Oracle Database 12c, and for information about each parameter
 - for desupported and deprecated initialization parameters in Oracle Database 12c
 -
-

4.11.6.1 Setting the COMPATIBLE Initialization Parameter After Upgrade

After testing, you can set the `COMPATIBLE` initialization parameter to the compatibility level you want for your new database.

The `COMPATIBLE` initialization parameter controls the compatibility level of your database. Set the `COMPATIBLE` initialization parameter to a higher value only when you are certain that you no longer need the ability to downgrade your database.

1. Perform a backup of your database before you raise the `COMPATIBLE` initialization parameter (optional).

Raising the `COMPATIBLE` initialization parameter can cause your database to become incompatible with earlier releases of Oracle Database. A backup ensures that you can return to the earlier release if necessary.

2. If you are using a server parameter file, then complete the following steps:

- a. To set or change the value of the `COMPATIBLE` initialization parameter, update the server parameter file.

For example, to set the `COMPATIBLE` initialization parameter to 12.2.0, enter the following statement:

```
SQL> ALTER SYSTEM SET COMPATIBLE = '12.2.0' SCOPE=SPFILE;
```

- b. Shut down and restart the instance.

3. If you are using an initialization parameter file, then complete the following steps:

- a. If an instance is running, then shut it down.

For example:

```
SQL> SHUTDOWN IMMEDIATE
```

- b. To set or change the value of the `COMPATIBLE` initialization parameter, you edit the initialization parameter file.

For example, to set the `COMPATIBLE` initialization parameter to for Oracle Database release 12.2, enter the following in the initialization parameter file:

```
COMPATIBLE = 12.2.0
```

- c. Start the instance using `STARTUP`.

Note:

If you are using an ASM disk group, then the disk group compatibility attribute must be equal to or less than the value for the database compatibility parameter in `init.ora`.

See Also:

Oracle Database Backup and Recovery User's Guide for more information about performing a backup

4.11.6.2 Adjust TNSNAMES.ORA and LISTENER Parameters After Upgrade

After performing a manual upgrade, if you must resolve `local_listener` and `remote_listener` in `tnsnames.ora`, then you must manually adjust those parameters.

DBUA handles changes to network naming and listeners during automatic upgrades. However, during a manual upgrade, neither `tnsnames.ora` nor the listeners are changed.

Related Topics:

Oracle Database Net Services Administrator's Guide

Oracle Database Net Services Reference

4.11.7 Set CLUSTER_DATABASE Initialization Parameter For Oracle RAC After Upgrade

For upgrades of Oracle RAC databases you set the `CLUSTER_DATABASE` initialization parameter to `false` before upgrading a cluster database.

After you complete the upgrade, you must set this parameter to `true`.

Upgrading Applications After Upgrading Oracle Database

To take full advantage of new features, you must upgrade applications running in the new release.

Many new features and enhancements are available after upgrading to a new release of Oracle Database. Review these topics for guidance in planning these application upgrades.

Topics:

[Overview of Upgrading Applications on a New Oracle Database Release](#)
(page 5-2)

You are not required to modify existing applications that do not use features available in the new Oracle Database release.

[Compatibility Issues for Applications on Different Releases of Oracle Database](#)
(page 5-2)

You can encounter compatibility issues between different releases of Oracle Database that may affect your applications.

[Software Upgrades and Client and Server Configurations for Oracle Database](#)
(page 5-3)

Use these topics to understand your options for upgrading precompiler and Oracle Call Interface (OCI) applications, depending on the type of software upgrade that you are performing and your client and server configurations.

[Compatibility Rules for Applications When Upgrading Oracle Database Client or Server Software](#) (page 5-4)

Compatibility rules apply when you upgrade Oracle Database client or server software.

[About Upgrading Precompiler and OCI Applications in Oracle Database](#)
(page 5-7)

Review this information if you want to upgrade precompiler and Oracle Call Interface (OCI) applications.

[About Upgrading Options for Oracle Precompiler and OCI Applications](#)
(page 5-7)

Oracle provides several options for upgrading your precompiler and Oracle Call Interface (OCI) applications running on a new release of Oracle Database.

[Upgrading SQL*Plus Scripts and PL/SQL after Upgrading Oracle Database](#)
(page 5-9)

To use features and functions of the new Oracle Database release, you must change existing SQL scripts to use the syntax of the new Oracle Database release.

[About Upgrading Oracle Forms or Oracle Developer Applications](#) (page 5-10)

Oracle Forms includes a number of new features.

5.1 Overview of Upgrading Applications on a New Oracle Database Release

You are not required to modify existing applications that do not use features available in the new Oracle Database release.

Existing applications running in a new release of Oracle Database function the same as they did in earlier releases and achieve the same, or enhanced, performance.

Many new features and enhancements are available after upgrading to the new Oracle Database release. Some of these features provide added features and functions, while others provide improved performance. Before you upgrade your applications, you should review these new features to decide which ones you want to use.

See Also:

- *Oracle Database New Features Guide* for information about the new features available in Oracle Database 12c
 - <http://www.oracle.com/technetwork/indexes/documentation/> Oracle Technical network (OTN) for information about using individual Oracle Database 12c database products or options
-
-

5.2 Compatibility Issues for Applications on Different Releases of Oracle Database

You can encounter compatibility issues between different releases of Oracle Database that may affect your applications.

Compatibility issues can occur due to differences between Oracle Database releases. Also, in each new release of Oracle Database, new Oracle reserved words can be added, or initialization parameters can be changed, or the data dictionary can be changed. Review the relevant topics in this documentation for more information.

When you upgrade your Oracle Database software to a new release, ensure that your applications do not use any Oracle reserved words, that your applications are compatible with the initialization parameters of the database, and that your applications are compatible with the data dictionary of the database.

Also be aware that new releases of Oracle Database may be supported only on particular operating system releases or patch sets. An operating system release and patch set that is supported for use with a previous release of Oracle Database may not be supported for current releases. Check operating system requirements before you begin an upgrade. In addition, some features may require additional patch sets or kernel additions to be able to use.

See Also:

- *Oracle Installation Guides* for Oracle Database and Oracle Grid Infrastructure for your operating system for information about operating system and configuration requirements
 -
 - *Oracle Database SQL Language Reference* for a complete list of Oracle reserved words
-
-

5.3 Software Upgrades and Client and Server Configurations for Oracle Database

Use these topics to understand your options for upgrading precompiler and Oracle Call Interface (OCI) applications, depending on the type of software upgrade that you are performing and your client and server configurations.

[Possible Client and Server Configurations for Oracle Database](#) (page 5-3)
Select a client/server configuration to run your precompiler and OCI applications.

[Types of Software Upgrades for Oracle Database Client and Server Software](#) (page 5-4)

Review to identify if a release is a major release or a maintenance release.

5.3.1 Possible Client and Server Configurations for Oracle Database

Select a client/server configuration to run your precompiler and OCI applications.

Your precompiler and OCI applications run on the client in a client/server environment, where the Oracle Database server is the server. You can use one or more of the following client/server configurations in your environment

Oracle Database Client and Server on Different Computers

The client software and the server software are on different computers, and they are connected through a network. The client and server environments are separate.

Oracle Database Client and Server in Different Oracle Locations on the Same Computer

The client software and the server software are on the same computer, but they are installed in different Oracle home directories. Again, the client and server environments are separate.

Oracle Database Client and Server in the Same Oracle Location

The client software and server software are installed in the same Oracle home on the same computer. In this case, any upgrade of the server software is also an upgrade of the client software.

See Also:

Oracle Database Concepts for more information about client/server environments

5.3.2 Types of Software Upgrades for Oracle Database Client and Server Software

Review to identify if a release is a major release or a maintenance release.

Two types of upgrades are possible for Oracle Database client and server software: a major release of Oracle Database, and a maintenance release for Oracle Database.

Oracle Database Major Release Upgrade

In a major release, the upgrade changes the first digit of the release number. For example, upgrading from Oracle Database 11g to Oracle Database 12c is a major database release upgrade.

Oracle Database Maintenance Release Upgrade

In a maintenance release, the upgrade changes the second digit of the release number. For example, upgrading from Oracle Database 12c Release 1 (12.1) to Oracle Database 12g release 2 (12.2) is a database maintenance release upgrade. However, Oracle can introduce new features in maintenance releases.

5.4 Compatibility Rules for Applications When Upgrading Oracle Database Client or Server Software

Compatibility rules apply when you upgrade Oracle Database client or server software.

Compatibility rules are based on the type of software upgrade you are performing, and the type of client/server configuration.

Note:

This section uses the terms introduced in “Software Upgrades and Client and Server Configurations.” .

[Rules for Upgrading Oracle Database Server Software](#) (page 5-4)

Different rules apply when you upgrade Oracle Database server software depending on your database environment.

[Upgrading the Oracle Database Client Software](#) (page 5-5)

Keeping the server and client software at the same release number ensures the maximum stability for your applications.

5.4.1 Rules for Upgrading Oracle Database Server Software

Different rules apply when you upgrade Oracle Database server software depending on your database environment.

[If You Do Not Change the Client Environment, Then You Are Not Required to Relink](#) (page 5-5)

Review these scenarios to determine if you must relink your applications after upgrading.

[Applications Can Run Against Newer or Older Oracle Database Server Releases](#) (page 5-5)

If you run a precompiler or OCI application against a database server, then Oracle recommends that the release of the database server software you use is be equal to or later than the client software release.

5.4.1.1 If You Do Not Change the Client Environment, Then You Are Not Required to Relink

Review these scenarios to determine if you must relink your applications after upgrading.

If your client and server are on different computers, or are in different Oracle home directories on the same computer, and you upgrade the Oracle Database server software without changing the client software, then you are not required to precompile, compile, or relink your applications.

In this set of scenarios, client software using Oracle Databases are in separate locations from the server software, and the client software continues to function without direct effects from the upgrade.

However, if your applications are using the same Oracle home as the Oracle Database server, then your server upgrade also upgrades your client software, and you must follow the rules for upgrading Oracle Database client software.

Note:

You can upgrade the Oracle Database server software, but not install the new precompiler or OCI client software, when you are using the same Oracle home for both binaries. In this case, the client software is not upgraded. However, Oracle does not recommend this configuration.

5.4.1.2 Applications Can Run Against Newer or Older Oracle Database Server Releases

If you run a precompiler or OCI application against a database server, then Oracle recommends that the release of the database server software you use is be equal to or later than the client software release.

This recommendation configuration is not strictly required.

For example, if your client software is Oracle10g Release 2 (10.2.0.4), then Oracle recommends that your server software is Oracle10g Release 2 (10.2.0.4) or later if you run precompiler applications on the client against the server.

5.4.2 Upgrading the Oracle Database Client Software

Keeping the server and client software at the same release number ensures the maximum stability for your applications.

Use this information to plan your Oracle Database Client installations. Depending on how your applications are linked, different rules apply when you upgrade the Oracle Database client software.

Oracle recommends that you upgrade your client software to match the current server software. For example, if you upgrade your server to Oracle Database 12c, then Oracle recommends upgrading the client software to Oracle Database 12c as well. The latest Oracle Database client software may provide added features and performance enhancements that are only available with current Oracle Database client releases.

[About Linking Applications with Newer Libraries](#) (page 5-6)

You can link the code generated by precompiler applications and OCI with a release of the client library that equals or is later than the server release.

[Statically Linked Applications Must Always Be Relinked](#) (page 5-6)

Statically-linked code can be incompatible with error messages in the upgraded ORACLE_HOME.

[About Relinking Dynamically Linked Applications](#) (page 5-6)

Dynamically linked OCI applications from Oracle Database 10g Release 1 (10.1) and later releases are upward-compatible with the current release.

5.4.2.1 About Linking Applications with Newer Libraries

You can link the code generated by precompiler applications and OCI with a release of the client library that equals or is later than the server release.

You can link OCI applications with a release of the OCI runtime library that equals or is later than the release of the OCI library with which the application was developed.

5.4.2.2 Statically Linked Applications Must Always Be Relinked

Statically-linked code can be incompatible with error messages in the upgraded ORACLE_HOME.

You must relink statically-linked OCI applications for both major and minor releases. The statically-linked Oracle client-side library code may be incompatible with the error messages in the upgraded ORACLE_HOME. For example, if an error message is updated with additional parameters, then it becomes incompatible with the statically-linked code.

5.4.2.3 About Relinking Dynamically Linked Applications

Dynamically linked OCI applications from Oracle Database 10g Release 1 (10.1) and later releases are upward-compatible with the current release.

The Oracle client-side dynamic library is upward-compatible with the previous version of the library. Oracle Universal Installer creates a symbolic link for the previous version of the library that resolves to the current version. Therefore, an application that is dynamically linked with the previous version of the Oracle client-side dynamic library does not require relinking to operate with the current version of the Oracle client-side library.

Note:

If the application is linked with a run-time library search path (such as `-rpath` on Linux), then the application may still run with the version of the Oracle client-side library with which it is linked. You must relink the application to run with the current version of the Oracle client-side library.

If the application is linked with the deferred option (for example, statically-linked application), then it must be relinked.

If the application is from a release earlier than Oracle Database 10g Release 1 (10.1), then it must be relinked.

5.5 About Upgrading Precompiler and OCI Applications in Oracle Database

Review this information if you want to upgrade precompiler and Oracle Call Interface (OCI) applications.

Testing precompiler and Oracle Call Interface upgrades consists of the following steps:

1. Create a test environment before you upgrade your production environment.
2. Include your upgraded application and the new Oracle Database software in your test environment.
3. Ensure that your test environment provides a realistic test of your application.

Related Topics:

[Testing the Upgrade Process for Oracle Database](#) (page 2-48)

See Also:

- *Pro*C/C++ Programmer's Guide*
 - *Pro*COBOL Programmer's Guide*
 - *Oracle Call Interface Programmer's Guide*
-
-

5.6 About Upgrading Options for Oracle Precompiler and OCI Applications

Oracle provides several options for upgrading your precompiler and Oracle Call Interface (OCI) applications running on a new release of Oracle Database.

The upgrade options are listed in order of increasing difficulty and increasing potential benefits. That is, Option 1 is the least difficult option, but it offers the least potential benefits, while Option 3 is the most difficult option, but it offers the most potential benefits.

[Option 1: Leave the Application Unchanged](#) (page 5-8)

Leave the application and its environment unchanged.

[Option 2: Precompile or Compile the Application Using the New Software](#) (page 5-8)

Application code must be changed if any APIs are deprecated or changed.

[Option 3: Change the Application Code to Use New Oracle Database Features](#) (page 5-8)

Make code changes to your applications to take advantage of new Oracle Database features.

[Changing Oracle Precompiler and OCI Application Development Environments](#) (page 5-9)

When you have decided on the new features to use, change the code of your application to use these features.

5.6.1 Option 1: Leave the Application Unchanged

Leave the application and its environment unchanged.

Do not relink, precompile, or compile the application, and do not change the application code. The application continues to work against the new Oracle Database 12c. This option requires that the Oracle home environment of the application is not upgraded. You can leave the application unchanged, and it continues to work with the Oracle Database 12c server. The major advantage to this option is that it is simple and easy. In addition, this option requires the least amount of administration, because you are not required to upgrade any of your client computers. If you have a large number of client computers, then avoiding the administrative costs of upgrading all of them can become very important.

The major disadvantage to this option is that your application cannot use the features that are available in the new release of Oracle Database. In addition, your application cannot leverage all the possible performance benefits of Oracle Database 12c.

5.6.2 Option 2: Precompile or Compile the Application Using the New Software

Application code must be changed if any APIs are deprecated or changed.

Precompile or compile and then relink the application using the new release of Oracle Database. When upgrading to the new release of Oracle Database software, you must precompile or compile the application with the new software after making necessary code changes to account for APIs that are deprecated or changed.

This option requires that you install the new Oracle Database client software on each client computer. You are required to precompile or compile, and relink your application only one time, regardless of the number of clients you have.

By recompiling, you perform a syntax check of your application code. Some problems in the application code that were not detected by previous releases of the Oracle software might emerge when you precompile or compile with the new Oracle software. Therefore, precompiling and compiling with the new software often helps you detect and correct problems in the application code that might have gone unnoticed before.

Also, recompiling affords maximum stability for your application, because you are sure that it works with the new Oracle software. Further, your environment is ready for new development using the latest tools and features available. In addition, you might benefit from performance improvements that are available with the new Oracle software only after you recompile and relink.

5.6.3 Option 3: Change the Application Code to Use New Oracle Database Features

Make code changes to your applications to take advantage of new Oracle Database features.

Change the application code to use new features in Oracle Database 12c. Then, precompile or compile and then relink the code. This option is the most difficult, but it can provide the most potential benefits. You gain all of the advantages described in Option 2: Precompile or Compile the Application Using the New Software. . In addition, you also benefit from changes to your application that may leverage performance and scalability benefits available with the new release of Oracle Database. Further, you can add new features to your application that are available only with the new release. Consult the Oracle documentation for your development environment so that you understand how to implement the features you want to use.

See Also:

Oracle Database New Features Guide to become familiar with the features of Oracle Database 12c

5.6.4 Changing Oracle Precompiler and OCI Application Development Environments

When you have decided on the new features to use, change the code of your application to use these features.

Follow the appropriate instructions in the following sections based on your development environment.

[Changing Precompiler Applications](#) (page 5-9)

Complete these steps to change precompiler applications to use Oracle Database 12c features.

[Changing OCI Applications](#) (page 5-9)

Complete the steps listed here to change your OCI application to use features of Oracle Database 12c.

5.6.4.1 Changing Precompiler Applications

Complete these steps to change precompiler applications to use Oracle Database 12c features.

1. To use new features in Oracle Database 12c, incorporate the code for these new features into existing applications.
2. Precompile each application using the Oracle precompiler.
3. Compile each application.
4. Relink each application with the run-time library of the new Oracle Database 12c, `SQLLIB`, which is included with the precompiler.

5.6.4.2 Changing OCI Applications

Complete the steps listed here to change your OCI application to use features of Oracle Database 12c.

1. Incorporate OCI calls of the new Oracle Database 12c into the existing application.
2. Compile the application.
3. Relink the application with the run-time library of the new Oracle Database 12c.

5.7 Upgrading SQL*Plus Scripts and PL/SQL after Upgrading Oracle Database

To use features and functions of the new Oracle Database release, you must change existing SQL scripts to use the syntax of the new Oracle Database release.

If existing SQL scripts do not use features and functions of the new Oracle Database release, then they run unchanged on the new Oracle Database release, and require no modification.

Be aware that because of improved error checking in the new Oracle Database release, it may identify errors at compile time rather than at run time.

[Evaluation of Numeric Literals](#) (page 5-10)

At least one constant in a numeric computation with literals must be a decimal specified to the 10th place.

5.7.1 Evaluation of Numeric Literals

At least one constant in a numeric computation with literals must be a decimal specified to the 10th place.

This requirement is needed because all Oracle Database releases later than Oracle Database 10g release 1 (10.1) use `INTEGER` arithmetic (approximately nine significant digits) for some expressions. Oracle9i release 2 (9.2) used `NUMBER` arithmetic (approximately 38 significant digits). If your results contain literals greater than nine (9) significant digits, then one literal should be in decimal format to prevent numeric overflow errors. For example, in Oracle Database 10g and later releases, the computation of `v1` in the following example causes a numeric overflow error:

```
DECLARE
  v1 NUMBER(38);
BEGIN
  v1 := 256*256*256*256;
  DBMS_OUTPUT.PUT_LINE(v1);
END;
/
```

The solution to the error is to specify one numeric literal as a decimal (256.0), as follows:

```
DECLARE
  v1 NUMBER(38);
BEGIN
  v1 := 256*256*256*256.0;
  DBMS_OUTPUT.PUT_LINE(v1);
END;
/
```

See Also:

*SQL*Plus User's Guide and Reference* to learn about SQL*Plus and numeric literal requirements

5.8 About Upgrading Oracle Forms or Oracle Developer Applications

Oracle Forms includes a number of new features.

Forms applications run the same on Oracle9i, Oracle Database 10g, and Oracle Database 11g. In Oracle Database 12c, *Oracle Database Development Guide* is renamed to *Oracle Database Advanced Application Developer's Guide*. Review the new features and changes described for developing applications, and for the new Oracle Database release.

See Also :

Oracle Database New Features Guide to determine if any of the features of Oracle Database 12c can benefit your applications, or otherwise affect them

Downgrading Oracle Database to an Earlier Release

For supported releases of Oracle Database, you can downgrade a database to the release from which you last upgraded.

For example, if you recently upgraded from release 11.2.0.4 to Oracle Database 12c release 2 (12.2), and you did not change the compatible initialization parameter to 12.1 or higher, then you can downgrade to release 11.2.0.4. If you upgraded your Oracle Database 12c release from 12.1.0.2 to release 12.2.0.1, and you did not change the compatible initialization parameter to 12.2.0.1, then you can downgrade to release 12.1.0.2.

See Also:

Oracle Database Installation Guide for your operating system for downgrading information specific to your operating platform

Topics:**[Supported Releases for Downgrading Oracle Database](#)** (page 6-2)

You can downgrade both major releases and patchset releases, based on the original Oracle Database release from which the database was upgraded.

[Check for Incompatibilities When Downgrading Oracle Database](#) (page 6-5)

To see if the database has incompatibilities that can prevent you from downgrading, check the compatibility level of your database.

[Perform a Full Backup Before Downgrading Oracle Database](#) (page 6-5)

Oracle strongly recommends that you perform a full backup of your Oracle Database 12c database before you downgrade to a supported earlier release.

[Performing Required Predowngrade Steps for Oracle Database](#) (page 6-5)

Complete the required preparation steps described here before you downgrade Oracle Database to the earlier release from which you upgraded.

[Downgrading a CDB or Non-CDB Oracle Database](#) (page 6-9)

Run `catdwgrd.sql` to downgrade your Oracle Database 12c database to a supported major release, or a relevant patchset upgrade.

[Downgrading a Single Pluggable Oracle Database \(PDB\)](#) (page 6-16)

If you are downgrading the latest release of Oracle Database 12c, then you can downgrade one PDB without downgrading the whole CDB.

[Downgrading PDBs That Contain Oracle Application Express](#) (page 6-17)

Use this procedure to avoid INVALID OBJECTS OWNED BY APEX_050000 errors when you downgrade PDBs that contain Oracle Application Express.

[Post-Downgrade Tasks for Oracle Database Downgrades](#) (page 6-17)

Additional tasks may be required after downgrading an Oracle database due to changes that affect compatibility, components, and supported protocols.

[Troubleshooting the Downgrade of Oracle Database](#) (page 6-26)

Use this troubleshooting information to address issues that may occur when downgrading Oracle Database.

6.1 Supported Releases for Downgrading Oracle Database

You can downgrade both major releases and patchset releases, based on the original Oracle Database release from which the database was upgraded.

You can downgrade a non-PDB Oracle Database from Oracle Database 12c release 2 (12.2) to Oracle Database 12c releases 12.1.0.2, 12.1.0.1; and you can downgrade to Oracle Database 11g releases 11.2.0.4 and 11.2.0.3.

You can downgrade a PDB from Oracle Database 12c release 2 (12.2) to Oracle Database 12c release 12.1.0.2, but not to 12.1.0.1.

You can downgrade a CDB from Oracle Database 12c release 2 (12.2) to 12.1.0.2, but not to 12.1.0.1.

Note:

Starting with Oracle Database 12c, release 1 (12.1), non-CDB architecture is deprecated. It can be desupported in a future release.

The following table provides additional information about releases supported for downgrading. When using this table, also read about compatibility in "Checking for Incompatibilities When Downgrading Oracle Database."

Table 6-1 Supported Releases and Editions for Downgrading

| Oracle Database Release or Edition | Downgradable (Yes/No) | Notes |
|------------------------------------|--|---|
| 12.1.0.2 | Yes | <p>You cannot downgrade a database after you set the compatible initialization parameter to 12.1.0.2.</p> <p>You can downgrade a non-CDB from 12.2 to 12.1.0.2, 12.1.0.1, 11.2.0.4, 11.2.0.3 (all supported upgrade releases).</p> <p>You can downgrade a PDB from 12.2 to 12.1.0.2, but not to 12.1.0.1.</p> <p>You can downgrade a CDB from 12.2 to 12.1.0.2, but not to 12.1.0.1.</p> <p>Install the latest bundle patch or patch set update (BP or PSU) before you downgrade a CDB, or before you unplug and downgrade a PDB. Patches (PSU, BP) are available for download on My Oracle Support. Refer to My Oracle Support note 756671.1 to obtain the latest patch set.</p> <p>You cannot downgrade to releases earlier than the minimum compatibility setting for the new Oracle Database release.</p> |
| 12.1.0.1 | Yes for non-CDBs No for CDBs and PDBs | <p>If you unplug an Oracle Database 12c Release 1 (12.1.0.1) PDB from a 12.1.0.1 database, and then plug this PDB into a 12.1.0.2 database for upgrade, then you cannot downgrade this PDB if the compatible initialization parameter in the 12.1.0.2 database is higher than '12.1.0.1.0'.</p> <p>You cannot downgrade a PDB from 12.2 to 12.1.0.1.</p> <p>You cannot downgrade a CDB from 12.2 to 12.1.0.1.</p> |
| Oracle Enterprise Manager | No | <p>If you downgrade to an earlier supported release, then you must reconfigure Oracle Enterprise Manager controls.</p> <p>Before you start your upgrade, you must use the <code>emdwrtd</code> utility to save DB Control files and data, so that you can restore Oracle Enterprise Manager Database Control (DB Control) after a downgrade.</p> |
| Oracle Database Express Edition | No | You cannot downgrade a database that is upgraded from Oracle Database Express Edition. |

The following recommendations for earlier supported releases affect downgrading for Oracle Database:

- This release includes multitenant architecture, which provides architecture features for a multitenant container database (CDB), and pluggable databases (PDBs). Because of these architecture changes, you cannot downgrade if you set the compatible initialization parameter to the highest level after upgrading to this release.
- This release contains a new object privilege, `READ`, in addition to `SELECT`. After you downgrade, note the following implications of this object privilege:

- If you have the `SELECT` and `READ` object privileges, then the `READ` privilege is removed.
- If you previously only had the `READ` object privilege, then the `READ` object privilege is transformed into the `SELECT` object privilege.

Refer to Oracle Database Security Guide for more information about the `READ` and `SELECT` object privileges.

- If Oracle XML DB is not installed in the database that you upgrade, then during a downgrade, Oracle XML DB is uninstalled. For example, if you did not install Oracle XML DB with Oracle Database 11g Release 2 (11.2), then Oracle XML DB is installed with Oracle Database 12c. If you downgrade the database, then Oracle XML DB is uninstalled as part of the downgrade. Oracle XML DB is included by default with Oracle Database 12c release 1 (12.1), and later releases.
- During upgrade to Oracle Database 12c, the Database (DB) Control repository is removed. If you downgrade to an earlier release, then you must reconfigure the Database (DB) Control to use it after the downgrade.
- Downgrade is not supported for Oracle Enterprise Manager. If you downgrade to an earlier supported release, then you must reconfigure Oracle Enterprise Manager controls.

Caution:

Before you start an upgrade, you must understand the following information regarding compatibility to be able to downgrade:

- You cannot downgrade a database after you set the compatible initialization parameter to 12.1.0.2.
 - You can only downgrade a pluggable database (PDB) if you set the compatibility to 12.1.0.1.
 - If you unplug a release 12.1.0.1 PDB from a 12.1.0.1 database, and then plug this PDB into a release 12.1.0.2 database, then you cannot downgrade this PDB.
 - Install the latest bundle patch or patch set update (BP or PSU) before you try to downgrade a CDB or unplug and downgrade a PDB. See My Oracle Support Note 756671.1 to obtain the latest patch set.
-
-

Related Topics:

<https://support.oracle.com/rs?type=doc&id=756671.1>

Oracle Database Security Guide

[Saving Oracle Enterprise Manager Database Control Configuration and Data \(page 2-22\)](#)

[Running EMCA to Restore Oracle Enterprise Manager After Downgrading \(page 6-20\)](#)

6.2 Check for Incompatibilities When Downgrading Oracle Database

To see if the database has incompatibilities that can prevent you from downgrading, check the compatibility level of your database.

If the compatibility level of your Oracle Database 12c database is 12.1.0, then you are not able to downgrade.

If you are downgrading to Oracle Database 11g release 2, then set the `COMPATIBLE` initialization parameter to 11.2.0 or lower.

Note:

For Oracle ASM disk groups, if you change disk group compatibility to 12.1.0.0 when you upgrade your database, then when you downgrade to the earlier release, you cannot mount your Oracle ASM disk groups.

You must manually restore compatibility of Oracle ASM disk groups before downgrade. Otherwise, the instance cannot mount the disk groups after downgrade.

See Also:

Oracle Automatic Storage Management Administrator's Guide for information about Oracle ASM disk group compatibility

6.3 Perform a Full Backup Before Downgrading Oracle Database

Oracle strongly recommends that you perform a full backup of your Oracle Database 12c database before you downgrade to a supported earlier release.

See Also:

Oracle Database Backup and Recovery User's Guide for information about performing RMAN backups

6.4 Performing Required Predowngrade Steps for Oracle Database

Complete the required preparation steps described here before you downgrade Oracle Database to the earlier release from which you upgraded.

Before you start a downgrade, you must resolve incompatibilities between database releases. For example, determine if you must disable components in the database before you start the downgrade.

1. If you are downgrading a CDB or unplugging and downgrading a PDB in Oracle Database, then you must first apply the latest bundle patch or patch set update (BP or PSU) available, and apply any required set of additional fixes on My Oracle Support Note 756671.1:

<https://support.oracle.com/rs?type=doc&id=756671.1>

2. If you have enabled Oracle Database Vault on your database, then disable Oracle Database Vault before downgrading the database.

Use `DBA_DV_STATUS` to find out if Oracle Database Vault is enabled:

```
SQL> SELECT * FROM DBA_DV_STATUS;
```

If the output is `TRUE`, then Oracle Database Vault is enabled, so you must disable it.

On multitenant architecture Oracle Database systems, use `CDB_DV_STATUS` on `CDB$ROOT` to find out the Oracle Database Vault status on all PDBs plugged in to the CDB:

```
SQL> SELECT * FROM CDB_DV_STATUS;
```

3. If your database uses Oracle Label Security, and you are downgrading to release 11.2, then run the Oracle Label Security (OLS) preprocess downgrade `olspreupgrade.sql` script in the new Oracle Database 12c Oracle home.

Caution:

Run `olspreupgrade.sql` before you downgrade from Oracle Database 12c to database release 11.2 for databases that use Oracle Label Security and Oracle Database Vault.

- a. Query the `V$OPTION` dynamic view. Determine if Oracle Label Security is enabled. For example:

```
SQL> SELECT VALUE FROM V$OPTION WHERE PARAMETER = 'Oracle Label Security';
```

- b. Run the `olspreupgrade.sql` script:

```
SQL> @ORACLE_HOME/rdbms/admin/olspreupgrade.sql
```

4. If you have enabled Unified Auditing, then you can choose to back up and purge the unified audit trail:

- a. Find if unified audit records exist.

```
SQL> SELECT COUNT(*) FROM UNIFIED_AUDIT_TRAIL;
```

- b. Back up the existing audit data to a table. For example:

```
SQL> CREATE TABLE UA_DATA AS (SELECT * FROM UNIFIED_AUDIT_TRAIL);
```

- c. Clean up the audit trail.

```
EXEC DBMS_AUDIT_MGMT.CLEAN_AUDIT_TRAIL(audit_trail_type =>
DBMS_AUDIT_MGMT.AUDIT_TRAIL_UNIFIED, use_last_arch_timestamp => FALSE);
```

5. Before downgrade, ensure that the target Oracle Home for the downgraded database contains the version of the time zone file that your database is using.

To find which time zone file version your database is currently using, query `V$TIMEZONE_FILE` using the following command:

```
SQL> select * from V$TIMEZONE_FILE;
```

For example:

If the query returns `timezlg_18.dat` in the column `V$TIMEZONE_FILE.FILENAME`, then check if the file is present in the target Oracle Home:

Linux and UNIX

```
$ORACLE_HOME/oracore/zoneinfo/timz1rg_18.dat
```

Windows

```
%ORACLE_HOME%\oracore\zoneinfo\timz1rg_18.dat
```

If the required time zone file is missing from the target Oracle Home, then do one of the following:

- If you installed the current version of the time zone file as a patch, and you still know the patch number, then use the same patch number to download the corresponding time zone file for the target release from the My Oracle Support website.
- Locate the correct patch by using the My Oracle Support website patch search function. Enter the following search criteria: "Product is 'Oracle Database'", "Release is '*target release*'", and "Description contains 'DST'".
- If you cannot locate the patch on the My Oracle Support website, then log a service request with Oracle Support.

After you find and download the required patch, install it in the target Oracle Home.

6. If you created objects based on fixed objects, then drop these objects to avoid possible ORA-00600 errors. You can re-create these objects after the downgrade.
7. If you have Oracle Enterprise Manager configured in your database, then drop the Enterprise Manager user:

```
DROP USER sysman CASCADE;
```

Note:

After you drop the Enterprise Manager user, you can find that MGMT* synonyms are invalid. You must reconfigure Oracle Enterprise Manager to use any Oracle Enterprise Manager controls in the downgraded database.

8. If you are downgrading to Oracle Database 12c release 1 (12.1.0.2) that has the JSON bundled patch applied, and that uses Simple Oracle Document Access (SODA), then ensure that you apply the JSON bundle patch (JSON Patch Bundle 1 or JSON Patch Bundle 2) to the Oracle Database 12.1.0.2 binary. For more information, review the following My Oracle Support note:
<https://support.oracle.com/rs?type=doc&id=1992767.1>
9. Obtain the appropriate ARUs for your server operating system from the PSE listed for your release. Download and install all the patches listed for your earlier release before you start the downgrade:
 - a. Log in to My Oracle Support:
<https://support.oracle.com>
 - b. Select **Patches & Updates**. In the Patch Search frame, provide the bug number listed for your release, and provide the platform for your server.

- c. Download and install the patch
- d. Repeat until you have installed all required patches for your server.

Obtain the patches for your release:

Downgrade from 12.2.0.1.0 to 12.1.0.2.0 with CDB and PDB

- 20594149: DATABASE BUNDLE PATCH 12.1.0.2.7, or the latest 12.1.0.2 bundle patch set update
- 20898997: XMLTYPESUP: QCTOXSNLB SHOULD NOT CHECK AGAINST SNAPSHOT SIZE
- 20348910: ALTER TYPE REPLACE IN PRVTAQJL.SQL TO BE REPLACE WITH CREATE OR REPLACE TYPE
- 20958816: INVALID OBJECTS AFTER DOWNGRADE FROM 12.2.0.1 TO 12.1.0.2

Downgrade from 12.2.0.1.0 to 12.1.0.2.0 non-CDB

- 20594149: DATABASE BUNDLE PATCH 12.1.0.2.7, or the latest 12.1.0.2 bundle patch set update
- 21856522: UPGRADE OF 12.1 TO 12.2 CAUSE XOQ COMPONENT TO BE INVALID
- 20898997: XMLTYPESUP: QCTOXSNLB SHOULD NOT CHECK AGAINST SNAPSHOT SIZE
- 20348910: ALTER TYPE REPLACE IN PRVTAQJL.SQL TO BE REPLACE WITH CREATE OR REPLACE TYPE
- 20958816: INVALID OBJECTS AFTER DOWNGRADE FROM 12.2.0.1 TO 12.1.0.2

Downgrade from 12.2.0.1.0 to 12.1.0.1.0 non-CDB

- 23054354: DATABASE PATCH SET UPDATE 12.1.0.1
- 20898997: XMLTYPESUP: QCTOXSNLB SHOULD NOT CHECK AGAINST SNAPSHOT SIZE
- 20348910: ALTER TYPE REPLACE IN PRVTAQJL.SQL TO BE REPLACE WITH CREATE OR REPLACE TYPE

Downgrade from 12.2.0.1.0 to 11.2.0.4.0

- 23054359: DATABASE PATCH SET UPDATE 11.2.0.4
- 20898997: XMLTYPESUP: QCTOXSNLB SHOULD NOT CHECK AGAINST SNAPSHOT SIZE
- 20348910: ALTER TYPE REPLACE IN PRVTAQJL.SQL TO BE REPLACE WITH CREATE OR REPLACE TYPE

Downgrade from 12.2.0.1.0 to 11.2.0.3.0

- 20299017: DATABASE PATCH SET UPDATE 11.2.0.3.14 (INCLUDES CPUAPR2015)

- 20898997: XMLTYPESUP: QCTOXSNLB SHOULD NOT CHECK AGAINST SNAPSHOT SIZE
- 20348910: ALTER TYPE REPLACE IN PRVTAQJL.SQL TO BE REPLACE WITH CREATE OR REPLACE TYPE

Related Topics:

Oracle Label Security Administrator's Guide

Oracle Database Globalization Support Guide

6.5 Downgrading a CDB or Non-CDB Oracle Database

Run `catdwgrd.sql` to downgrade your Oracle Database 12c database to a supported major release, or a relevant patchset upgrade.

Note:

Starting with Oracle Database 12c release 1 (12.1), non-CDB architecture is deprecated. It can be desupported in a future release.

If you are downgrading from release 12.2 to release 12.1, then you can downgrade all databases in a multitenant container database (CDB) or one pluggable database (PDB) within a CDB. Oracle Database releases earlier than Oracle Database 12c did not use multitenant architecture.

1. Log in to the system as the owner of the Oracle Database Oracle home directory.
2. At a system prompt, change to the directory `ORACLE_HOME/rdbms/admin`, where `ORACLE_HOME` is the Oracle home on your system.

Note:

If you are downgrading a cluster database, then shut down the database completely, and change the value for the initialization parameter `CLUSTER_DATABASE` to `FALSE`. After the downgrade, set this parameter back to `TRUE`.

3. Using SQL*Plus, connect to the database instance as a user with `SYSDBA` privileges:


```
sqlplus sys as sysdba
Enter password: password
```
4. Log in to the system as the owner of the Oracle home under the new Oracle Database 12c.
5. Change directory to `ORACLE_HOME/rdbms/admin`, and start SQL*Plus.
6. Connect to the database that you want to upgrade using an account with `DBA` privileges:

```
CONNECT / AS SYSDBA
```

7. Start the instance in downgrade mode by issuing the following SQL*Plus command for your Oracle Database instance type. You can be required to use the `PFIL` option to specify the location of your initialization parameter file.

Non-CDB instances:

```
SQL> startup downgrade pfile=pfile_name
```

CDB instances:

```
SQL> startup downgrade pfile=pfile_name
```

```
SQL> alter pluggable database all open downgrade;
```

Specify the location of your initialization parameter file `PFIL`.

See Also:

Oracle Database Administrator's Guide for information about specifying initialization parameters at startup and the initialization parameter file

8. (Optional) If you are downgrading a non-CDB, then you can set the system to spool results to a log file so you can track the changes and issues.

If you are downgrading a CDB, then you do not need to perform this step. CDBs automatically spool output to the `catcon_logs`.

On a non-CDB, enter the following command to spool results to a log file, where `downgrade.log` is the name of the log file:

```
SQL> SPOOL downgrade.log
```

9. Use the following command to start the downgrade, depending on your configuration:

Non-CDB:

```
SQL> @catdwgrd.sql
```

CDB:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -d $ORACLE_HOME/rdbms/admin -e -b catdwgrd -l output_directory -r catdwgrd.sql
```

In the CDB example, `catdwgrd.sql` is run on containers using `catcon.pl`. To run commands with the `catcon.pl` utility, you first start Perl. The `-d` parameter tells `catcon.pl` where to find `catdwgrd`. The `-l` parameter specifies the output directory for log files (instead of writing to the `rdbms/admin` directory). Specifying the `-r` parameter causes `catdwgrd` to run first on the PDBs, and second on `CDB_ROOT`.

Run `catdwgrd` using the `-r` parameter when you downgrade a CDB. The `-r` parameter changes the default order that scripts are run, so that scripts run in all PDBs, and then in `CDB_ROOT`.

Note:

- Use the version of the `catdwgrd.sql` script included with Oracle Database 12c.
 - You must run `catdwgrd` using the `-r` parameter when downgrading a CDB.
 - Run `catdwgrd.sql` in the Oracle Database 12c environment.
 - The `catdwgrd.sql` script downgrades all Oracle Database components in the database to the release from which you upgraded. The downgrade is either to the supported major release from which you upgraded, or to the patch release from which you upgraded.
-
-

If you are downgrading a multitenant environment database, and the `catdwgrd.sql` command encounters a failure, then review the error message. Check to see what issues are present in the CDB\$ROOT or PDBs before proceeding. Check the section "Troubleshooting the Downgrade of Oracle Database." Fix the issues as stated in the errors. After you resolve the errors, rerun `catdwgrd.sql` with the `catcon.pl` utility, using the syntax `catcon.pl -c 'cdb,pdb' -r`.

Caution:

If the downgrade for a component fails, then an `ORA-39709` error is displayed. The SQL*Plus session terminates without downgrading the Oracle Database data dictionary. All components must be successfully downgraded before the Oracle Database data dictionary is downgraded. Identify and fix the problem before rerunning the `catdwgrd.sql` script.

10. For Non-CDB only, if you turned the spool on, then turn off the spooling of script results to the log file:

```
SQL> SPOOL OFF
```

Next, check the spool file, and verify that no errors occurred during the downgrade. You named the spool file in Step 8, and the suggested name was `downgrade.log`. Correct any problems that you find in this file. If necessary, rerun the downgrade script.

Note:

You can save the results from the first time you ran the downgrade script. Before you rerun the downgrade script, rename the file `downgrade.log` to a different name, so that it is not overwritten when you rerun the script.

11. Shut down the instance:

```
SQL> SHUTDOWN IMMEDIATE
```

12. Exit SQL*Plus.

13. If your operating system is Linux or UNIX, then change the following environment variables to point to the directories of the release to which you are downgrading:

- ORACLE_HOME
- PATH

Also check that your `oratab` file, and any client scripts that set the value of `ORACLE_HOME`, point to the downgraded Oracle home.

See Also:

Oracle Database Installation Guide for your operating system for information about setting other important environment variables on your operating system

14. If your operating system is Windows, then complete the following steps:
- a. Stop all Oracle services, including the `OracleServiceSID` Oracle service of the Oracle Database 12c database, where *SID* is the instance name.

For example, if your *SID* is `ORCL`, then enter the following at a command prompt:

```
C:\> NET STOP OracleServiceORCL
```

See Also:

Oracle Database Platform Guide for Microsoft Windows for more information about stopping Oracle services on Windows

- b. Delete the Oracle service at a command prompt by issuing the command `ORADIM`.

For example, if your *SID* is `ORCL`, then enter the following command:

```
C:\> ORADIM -DELETE -SID ORCL
```

- c. Create the Oracle service of the database that you are downgrading at a command prompt using the command `ORADIM`:

```
C:\> ORADIM -NEW -SID SID -INTPWD PASSWORD -MAXUSERS USERS  
-STARTMODE MANUAL -PFILE ORACLE_HOME\DATABASE\INITSID.ORA
```

The syntax for `ORADIM` includes the following variables:

| Variable | Description |
|-----------------|---|
| <i>SID</i> | Same system identifier (SID) name as the SID of the database being downgraded. |
| <i>PASSWORD</i> | Password for the database instance. This password is the password for the user connected with <code>SYSDBA</code> privileges. The <code>-INTPWD</code> option is not required. If you are prompted for a password, then use the password for the standard user account for this Windows platform. |

| Variable | Description |
|--------------------|---|
| <i>USERS</i> | Maximum number of users that can be granted SYSDBA and SYSOPER privileges. |
| <i>ORACLE_HOME</i> | Oracle home directory of the database to which you are downgrading. Ensure that you specify the full path name with the option <code>-PFILE</code> , including the drive letter where the Oracle home directory is mounted. See <i>Oracle Database Administrator's Guide</i> for information about specifying initialization parameters at startup, and for information about the initialization parameter file. |

For example, if your *SID* is ORCL, your *PASSWORD* is TWxy5791, the maximum number of *USERS* is 10, and the *ORACLE_HOME* directory is C:\ORANT, then enter the following command:

```
C:\> ORADIM -NEW -SID ORCL -INTPWD TWxy5791 -MAXUSERS 10
      -STARTMODE AUTO -PFILE C:\ORANT\DATABASE\INITORCL.ORA
```

Note:

The ORADIM command prompts you for the password for the Oracle home user account. You can specify other options using ORADIM.

You are not required to change any Windows Registry settings when downgrading a database. The ORADIM utility makes all necessary changes automatically.

See Also:

Oracle Database Platform Guide for Microsoft Windows for information about administering an Oracle Database instance using ORADIM

15. Restore the configuration files (for example, parameter files, password files, and so on) of the release to which you are downgrading.

If the database is an Oracle RAC database, then run the following command to return the database to single instance mode:

```
SET CLUSTER_DATABASE=FALSE
```

Note:

If you are downgrading a cluster database, then perform this step on all nodes on which this cluster database has instances configured. Set the value for the initialization parameter `CLUSTER_DATABASE` to `FALSE`. After the downgrade, set this initialization parameter back to `TRUE`.

See Also:

Oracle Real Application Clusters Administration and Deployment Guide for information about initialization parameter use in Oracle RAC

16. At a system prompt, change to the admin directory in the Oracle home directory of the earlier release to which you are downgrading. (*ORACLE_HOME*/rdbms/admin, where *ORACLE_HOME* is the path to the earlier release Oracle home.)

17. Start SQL*Plus, and connect to the database instance as a user with SYSDBA privileges.

For a non-CDB:

```
SQL> CONNECT / AS SYSDBA
SQL> STARTUP UPGRADE
```

For a CDB:

```
connect / as sysdba
startup upgrade;
alter pluggable database all open upgrade;
```

18. (Optional) For a non-CDB, set the system to spool results to a log file to track changes and issues. This step is not needed for a CDB.

```
SQL> SPOOL reload.log
```

19. Run *catrelod.sql* on non-CDB databases, or use *catcon.pl* to run *utlrp.sql* on CDB databases.

For a non-CDB:

```
SQL> $ORACLE_HOME/rdbms/admin/catrelod.sql
```

For a CDB:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -n 1 -e -b
catrelod -d $ORACLE_HOME/rdbms/admin catrelod.sql
```

reloads the appropriate version for each of the database components in the downgraded database.

20. If you turned on spooling for a non-CDB, then turn off the spooling of script results to the log file:

```
SQL> SPOOL OFF
```

Check the spool file, and verify that the packages and procedures compiled successfully. Correct any problems that you find in this log file, and rerun the appropriate script, if necessary.

21. Shut down and restart the instance for normal operation:

```
SQL> SHUTDOWN IMMEDIATE
SQL> STARTUP
```

You can be required to use the option *PFFILE* to specify the location of your initialization parameter file.

See Also:

Oracle Database Administrator's Guide for information about specifying initialization parameters at startup, and in the initialization parameter file

22. If you configured your database to use Oracle Label Security, then complete this step. If you did not configure your database to use Oracle Label Security, then proceed to the next step.

- a. Copy the script `olstrig.sql` from the Oracle home under Oracle Database 12c to the Oracle home of the release number to which you are downgrading the database.
- b. From the Oracle home of the downgrade release, run `olstrig.sql` to recreate DML triggers on tables with Oracle Label Security policies:

```
SQL> @olstrig.sql
```

23. (Optional) For a non-CDB, set the system to spool results to a log file to track changes and issues. This step is not needed for a CDB. Example:

```
SQL> SPOOL utlrp.log
```

24. Run the `utlrp.sql` script to recompile any remaining stored PL/SQL and Java code. Use the procedure for your configuration:

non-CDB:

```
SQL> $ORACLE_HOME/rdbms/admin/utlrp.sql
```

CDB:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -n 1 -e -b utlrp -d $ORACLE_HOME/rdbms/admin utlrp.sql
```

The `utlrp.sql` script recompiles all existing PL/SQL modules previously in `INVALID` state, such as packages, procedures, types, and so on. The log file `utlrp0.log` is generated. That log file lists the recompilation results.

25. If you turn on spooling for a non-CDB when you run `utlrp.sql`, then turn off the spooling of script results to the log file:

```
SQL> SPOOL OFF
```

Check the spool file, and verify that the packages and procedures compiled successfully. Correct any problems that you find in this log file. If necessary, rerun the appropriate script.

26. Exit SQL*Plus.

27. If you are downgrading a cluster database, then you must run the following command to downgrade the Oracle Clusterware database configuration. :

```
$ srvctl downgrade database -d db-unique-name -o oraclehome -t to_version
```

Replace the variables in this syntax example with the values for your system:

- `db-unique-name` is the database name (not the instance name).
- `oraclehome` is the location of the old Oracle home for the downgraded database.
- `to_version` is the database release to which the database is downgraded. (For example: 12.1.0.2.0.)

Note:

Run this command from the current Oracle Database 12c Oracle home, not from the Oracle home to which the database is being downgraded.

At the completion of this procedure, your database is downgraded.

Related Topics:

[Troubleshooting the Downgrade of Oracle Database](#) (page 6-26)

Oracle Database Administrator's Guide

6.6 Downgrading a Single Pluggable Oracle Database (PDB)

If you are downgrading the latest release of Oracle Database 12c, then you can downgrade one PDB without downgrading the whole CDB.

For example, you can unplug a PDB from a release 12.2.0.1 CDB, downgrade it, and then plug it in to a release 12.1.0.2 CDB, or you can convert the database to a standalone database.

Downgrade the PDB

In this procedure, you downgrade the PDB to release 12.1.0.2:

1. Start up the release 12.2.0.1 PDB in DOWNGRADE mode. The CDB can be in normal mode when you do this.

```
SQL> alter pluggable database CDB1_PDB1 open downgrade;
```

2. Downgrade the PDB by running `catdwgrd`, which in this example is PDB1.

Run `catdwgrd` as follows:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -d  
$ORACLE_HOME/rdbms/admin -n 1 -l <output directory> -e -b catdwgrd -c 'PDB1'  
catdwgrd.sql
```

In the example, `catdwgrd` is run with `catcon.pl`. The `-d` parameter tells `catcon.pl` where to find `catdwgrd`. The `-l` parameter specifies the output directory for log files, instead of writing to the `rdbms/admin` directory). You must use the `-r` parameter to run the two scripts together at the same time.

3. Close the PDB.

Unplug the PDB from the CDB

In this step you unplug the downgraded PDB from the release 12.2.0.1 CDB:

1. Connect to the 12.2.0.1 CDB.
2. Close the PDB that you want to unplug.

```
SQL> alter pluggable database PDB1 close;
```

3. Unplug the downgraded 12.1.0.2 PDB, replacing the variable `path` with the path on your system:

```
SQL> alter pluggable database PDB1 unplug into 'path/pdb1.xml';
```

You receive the following response when the unplug is completed:

```
Pluggable database altered
```

Plug in the Downgraded 12.1.0.2 PDB

In this step you plug the downgraded 12.1.0.2 PDB into the 12.1.0.2 CDB. To do this, you must create the PDB in this CDB. The following example shows how to create a pluggable database called PDB1:

1. Connect to the 12.1.0.2 CDB.

2. Plug in the 12.1.0.2 PDB.

```
SQL> create pluggable database PDB1 using 'path/pdb1.xml';
```

You will see Pluggable database created.

3. Open the PDB in upgrade mode:

```
SQL> alter pluggable database PDB1 open upgrade;
```

4. Connect to the PDB:

```
SQL> alter session set container=PDB1;
```

5. Run `catrelod` in the PDB:

```
SQL> @$ORACLE_HOME/rdbms/admin/catrelod.sql
```

The `catrelod.sql` script reloads the appropriate version for each of the database components in the downgraded database.

6. Run `utlrlp` in the PDB:

```
SQL> @$ORACLE_HOME/rdbms/admin/utlrlp.sql
```

The `utlrlp.sql` script recompiles all existing PL/SQL modules that were previously in an `INVALID` state, such as packages, procedures, types, and so on.

6.7 Downgrading PDBs That Contain Oracle Application Express

Use this procedure to avoid `INVALID OBJECTS OWNED BY APEX_050000` errors when you downgrade PDBs that contain Oracle Application Express.

After you downgrade the PDB to an earlier release, enter a SQL statement similar to the following to drop the Oracle Application Express user:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -b drop_apex5
-c 'PDB1' -- --x'drop user apex_050000 cascade'
```

In this example, the PDB name is 'PDB1'.

6.8 Post-Downgrade Tasks for Oracle Database Downgrades

Additional tasks may be required after downgrading an Oracle database due to changes that affect compatibility, components, and supported protocols.

[Oracle XML DB Authentication Recommendations for an Oracle Database Downgrade](#) (page 6-18)

Upgrades from releases earlier than 12.1 result in digest authentication being disabled.

[Re-enabling Oracle Database Vault after Downgrading Oracle Database](#)

(page 6-18)

You must do this if you are instructed during the downgrade to disable Oracle Database Vault.

[Restoring the Configuration for Oracle Clusterware](#) (page 6-19)

To restore the configuration, you must restore the release from which you were upgrading.

[Restoring Oracle Enterprise Manager after Downgrading Oracle Database](#)

(page 6-19)

The restore task described in this section is required only if you are performing a downgrade, and Oracle Enterprise Manager is configured on the host.

[Restoring Oracle Application Express to the Earlier Release](#) (page 6-23)

After a downgrade, if you upgraded Oracle Application Express at the same time as you upgraded Oracle Database, then you must complete steps to revert to the earlier Oracle Application Express release.

[Gathering Dictionary Statistics After Downgrading](#) (page 6-24)

To help to assure good performance after you downgrade, use this procedure to gather dictionary statistics.

[Regathering Fixed Object Statistics After Downgrading](#) (page 6-24)

After the downgrade, run representative workloads on Oracle Database, and regather fixed object statistics.

[Regathering Stale CBO Statistics After Downgrade](#) (page 6-25)

Oracle recommends that you regather Oracle Cost-Based Optimizer (CBO) statistics after completing a downgrade of Oracle Database from 12c release 2 (12.2).

6.8.1 Oracle XML DB Authentication Recommendations for an Oracle Database Downgrade

Upgrades from releases earlier than 12.1 result in digest authentication being disabled.

If you downgrade to a release that is earlier than Oracle Database 12c, in which digest authentication is not supported, digest authentication is disabled and made unavailable as an authentication choice. This affects HTTP authentication for Oracle XML DB Repository. If you did not take advantage of digest authentication and instead used the default configuration, then no further actions are necessary.

See Also:

Oracle XML DB Developer's Guide for information about authentication with Oracle XML DB for database installation, upgrade, and downgrade

6.8.2 Re-enabling Oracle Database Vault after Downgrading Oracle Database

You must do this if you are instructed during the downgrade to disable Oracle Database Vault.

If you use Oracle Database Vault, then you may have been instructed to disable it before downgrading your database. To use Oracle Database Vault after downgrading, you must re-enable it.

See Also:

Oracle Database Vault Administrator's Guide for the procedure to re-enable Oracle Database Vault

6.8.3 Restoring the Configuration for Oracle Clusterware

To restore the configuration, you must restore the release from which you were upgrading.

You can restore the Oracle Clusterware configuration to the state it was in before the Oracle Clusterware 12c Release 2 (12.2) upgrade. Any configuration changes that you have performed during or after the Oracle Database 12c upgrade process are removed and cannot be recovered.

See Also:

Oracle Grid Infrastructure Installation and Upgrade Guide for your platform

6.8.4 Restoring Oracle Enterprise Manager after Downgrading Oracle Database

The restore task described in this section is required only if you are performing a downgrade, and Oracle Enterprise Manager is configured on the host.

To restore Oracle Enterprise Manager, you first run Oracle Enterprise Manager configuration assistant (EMCA), and then you run the emdwgrd utility.

[Requirements for Restoring Oracle Enterprise Manager After Downgrading](#)
(page 6-19)

You must complete these requirements before you upgrade to be able to restore Oracle Enterprise Manager after a downgrade.

[Running EMCA to Restore Oracle Enterprise Manager After Downgrading](#)
(page 6-20)

Review these topics and select your restoration scenario to restore Oracle Enterprise Manager after a downgrade.

[Running the emdwgrd utility to restore Enterprise Manager Database Control](#)
(page 6-22)

You can restore the Oracle Enterprise Manager Database Control and data by using the emdwgrd utility after you run `emca -restore`.

6.8.4.1 Requirements for Restoring Oracle Enterprise Manager After Downgrading

You must complete these requirements before you upgrade to be able to restore Oracle Enterprise Manager after a downgrade.

The following must be true to use `emca -restore` to restore Oracle Enterprise Manager to its previous state:

- Before the upgrade, you saved a backup of your Oracle Enterprise Manager configuration files and data
- You run the `emca` binary located in the Oracle Database 12c Oracle home for this procedure

On Oracle Clusterware systems, to restore Oracle Enterprise Manager on an Oracle RAC database, you must have the database registered using `srvctl` before you run `emca -restore`. You must run `emca -restore` from the `ORACLE_HOME/bin` directory of the earlier Oracle Database release to which the database is being downgraded.

Run the `emca -restore` command with the appropriate options to restore Oracle Enterprise Manager Database Control or Grid Control to the old Oracle home.

Specify different `emca` options, depending on whether the database you want to downgrade is a single-instance database, an Oracle RAC database, or an Oracle ASM database.

See Also:

Oracle Clusterware Administration and Deployment Guide for information about `srvctl`

6.8.4.2 Running EMCA to Restore Oracle Enterprise Manager After Downgrading

Review these topics and select your restoration scenario to restore Oracle Enterprise Manager after a downgrade.

[Running emca on a Single-Instance Oracle Database Without Oracle ASM](#)
(page 6-20)

Use Enterprise Manager Configuration Assistant (`emca`) to manage your database.

[Running EMCA on an Oracle RAC Database Without Oracle ASM](#) (page 6-21)

Use Enterprise Manager Configuration Assistant (`emca`) to manage your database:

[Running EMCA on a Single-Instance Oracle ASM Instance](#) (page 6-21)

Use Enterprise Manager Configuration Assistant (`emca`) to manage your database and storage.

[Running emca on an Oracle ASM on Oracle RAC Instance](#) (page 6-21)

Use Enterprise Manager Configuration Assistant (`emca`) to manage your database and storage.

[Running emca on a Single-Instance Oracle Database With Oracle ASM](#)
(page 6-21)

Use Enterprise Manager Configuration Assistant (`emca`) to manage your database and storage.

[Running emca on an Oracle RAC Database and Oracle ASM Instance](#)
(page 6-22)

Use Enterprise Manager Configuration Assistant (`emca`) to manage your database and storage.

6.8.4.2.1 Running emca on a Single-Instance Oracle Database Without Oracle ASM

Use Enterprise Manager Configuration Assistant (`emca`) to manage your database.

Use this command to run Enterprise Manager Configuration Assistant.

```
ORACLE_HOME/bin/emca -restore db
```

You are prompted to enter the following information:

- Oracle home for the database that you want to restore
- Database SID
- Listener port number

6.8.4.2.2 Running EMCA on an Oracle RAC Database Without Oracle ASM

Use Enterprise Manager Configuration Assistant (emca) to manage your database:

Use this procedure to run Enterprise Manager Configuration Assistant:

```
ORACLE_HOME/bin/emca -restore db -cluster
```

You are prompted to enter the following information:

- Oracle home for the database that you want to restore
- Database unique name
- Listener port number

6.8.4.2.3 Running EMCA on a Single-Instance Oracle ASM Instance

Use Enterprise Manager Configuration Assistant (emca) to manage your database and storage.

Use this command to run Enterprise Manager Configuration Assistant.

```
ORACLE_HOME/bin/emca -restore asm
```

You are prompted to enter the following information:

- Oracle home for the database that you want to restore
- Oracle ASM port
- Oracle ASM SID

6.8.4.2.4 Running emca on an Oracle ASM on Oracle RAC Instance

Use Enterprise Manager Configuration Assistant (emca) to manage your database and storage.

Use this command to run Enterprise Manager Configuration Assistant.

```
ORACLE_HOME/bin/emca -restore asm -cluster
```

You are prompted to enter the following information:

- Oracle home for the database that you want to restore
- Oracle ASM port

6.8.4.2.5 Running emca on a Single-Instance Oracle Database With Oracle ASM

Use Enterprise Manager Configuration Assistant (emca) to manage your database and storage.

Use this command to run Enterprise Manager Configuration Assistant.

```
ORACLE_HOME/bin/emca -restore db_asm
```

You are prompted to enter the following information:

- Oracle home for the Oracle Database that you want to restore
- Database SID
- Listener port number
- Oracle ASM port
- Oracle ASM home
- Oracle ASM SID [+ASM]

6.8.4.2.6 Running emca on an Oracle RAC Database and Oracle ASM Instance

Use Enterprise Manager Configuration Assistant (emca) to manage your database and storage.

Use this command to run Enterprise Manager Configuration Assistant:

```
ORACLE_HOME/bin/emca -restore db_asm -cluster
```

You are prompted to enter the following information:

- Oracle home for the database that you want to restore
- Database unique name
- Listener port number
- Oracle ASM port
- Oracle ASM Oracle home
- Oracle ASM SID [+ASM]

The output of emca varies according to the options that you specify and the values that you enter at the prompts. In Oracle RAC environments, you must repeat this step on all Oracle RAC cluster member nodes.

You must now run the emdwgrd utility to restore Oracle Enterprise Manager Database Control and data.

6.8.4.3 Running the emdwgrd utility to restore Enterprise Manager Database Control

You can restore the Oracle Enterprise Manager Database Control and data by using the emdwgrd utility after you run emca -restore.

To use emdwgrd, you must do the following:

- Set *ORACLE_HOME* and other environment variables to point to the Oracle home from which the upgrade originally took place.
- Run the emdwgrd utility from the Oracle Database 12c home

The following procedure is for Linux and UNIX. To run it on Windows, substitute emdwgrd.bat for emdwgrd.

1. Set *ORACLE_HOME* to the Oracle home from which the database upgrade originally took place.
2. Set *ORACLE_SID* to the SID of the database that was upgraded and then downgraded.

3. Set *PATH*, *LD_LIBRARY_PATH* and *SHLIB_PATH* to point to the Oracle home from which the database upgrade originally took place.

4. Go to the Oracle Database 12c Oracle home:

```
cd $ORACLE_HOME/bin
```

5. Run `emdwgrd` using one of the following procedures:

- a. For a single-instance database, run the following command, where *SID* is the SID of the database that was upgraded and then downgraded and *save_directory* is the path to the storage location you chose when saving your database control files and data:

```
emdwgrd -restore -sid SID -path save_directory -tempTablespace TEMP
```

- b. For an Oracle RAC database, remote copy is required across the cluster nodes. Define an environment variable to indicate which remote copy is configured. For example:

```
setenv EM_REMCP /usr/bin/scp
```

Then, run `emdwgrd -restore` with the following options:

```
emdwgrd -restore -tempTablespace TEMP -cluster -sid SID_OldHome -path save_directory
```

If the Oracle home is on a shared device, then add `-shared` to the `emdwgrd` command options.

6. Enter the SYS and SYSMAN passwords when prompted by `emdwgrd`.
7. When `emdwgrd` completes, Oracle Enterprise Manager Database Control is downgraded to the old Oracle home.

6.8.5 Restoring Oracle Application Express to the Earlier Release

After a downgrade, if you upgraded Oracle Application Express at the same time as you upgraded Oracle Database, then you must complete steps to revert to the earlier Oracle Application Express release.

To complete the downgrade of Oracle Application Express after a database downgrade, complete all the steps listed in *Oracle Application Express Installation Guide* to revert your Oracle Application Express release to the earlier release. The steps to revert are different, depending on whether your architecture is a Non-CDB or a multitenant architecture (CDB) Oracle Database.

Note:

You only need to complete these steps if you upgraded Oracle Application Express at the same time that you upgraded the database.

Related Topics:

Oracle Application Express Installation Guide

6.8.6 Gathering Dictionary Statistics After Downgrading

To help to assure good performance after you downgrade, use this procedure to gather dictionary statistics.

Oracle recommends that you gather dictionary statistics after downgrading the database, so that the statistics are collected for the downgraded release Data Dictionary tables.

- Non-CDB Oracle Database: Oracle recommends that you use the `DBMS_STATS.GATHER_DICTIONARY_STATS` procedure to gather these statistics. For example, enter the following SQL statement:

```
SQL> EXEC DBMS_STATS.GATHER_DICTIONARY_STATS;
```

- CDB (multitenant architecture) Oracle Database: Oracle recommends that you use `catcon` to gather Data Dictionary statistics across the entire multitenant architecture.

To gather dictionary statistics for all PDBs in a container database, use the following syntax:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/  
catcon.pl -l /tmp -b gatherstats -- --x"exec  
dbms_stats.gather_dictionary_stats"
```

To gather dictionary statistics on a particular PDB, use syntax similar to the following:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -l /tmp -c  
'SALES1' -b gatherstats -- --x"exec dbms_stats.gather_dictionary_stats"
```

In the preceding example the `-c SALES1` option specifies a PDB inclusion list for the command that you run, specifying the database named `SALES1`. The option `-b gatherstats` specifies the base name for the logs. The option `--x` specifies the SQL command that you want to execute. The SQL command itself is inside the quotation marks.

Related Topics:

Oracle Database PL/SQL Packages and Types Reference

6.8.7 Regathering Fixed Object Statistics After Downgrading

After the downgrade, run representative workloads on Oracle Database, and regather fixed object statistics.

Fixed objects are the X\$ tables and their indexes. V\$ performance views are defined through X\$ tables. After you downgrade, regather fixed object statistics to ensure that the optimizer for the restored database can generate good execution plans. These execution plans can improve database performance. Failing to obtain representative statistics can lead to suboptimal execution plans, which can cause performance problems

Gather fixed objects statistics by using the `DBMS_STATS.GATHER_FIXED_OBJECTS_STATS` PL/SQL procedure. `DBMS_STATS.GATHER_FIXED_OBJECTS_STATS` also displays recommendations for removing all hidden or underscore parameters and events from `init.ora` and `SPFILE`.

To gather statistics for fixed objects, run the following PL/SQL procedure:

```
SQL> execute dbms_stats.gather_fixed_objects_stats;
```

See Also:

Oracle Database PL/SQL Packages and Types Reference for more information about using the `GATHER_FIXED_OBJECTS_STATS` procedure

6.8.8 Regathering Stale CBO Statistics After Downgrade

Oracle recommends that you regather Oracle Cost-Based Optimizer (CBO) statistics after completing a downgrade of Oracle Database from 12c release 2 (12.2).

When you upgrade Oracle Database and gather new CBO statistics, the upgraded database has new database statistics. The upgraded database also can include new histogram types. For this reason, when you downgrade the database, the statistics that you collected for the new release can be different from the previous release. This issue is applicable both to data dictionary tables, and to regular user tables.

Regather stale statistics either by using `GATHER_DATABASE_STATS`, or by using gather commands that you typically use to update stale statistics in the dictionary and application schemas.

For example:

- Non-CDB Oracle Database: To regather statistics, Oracle recommends that you use the `GATHER_DATABASE_STATS` procedure, with the option `'GATHER STALE'`. For example:

```
SQL> execute dbms_stats.gather_database_stats(options=>'GATHER STALE');
```

- CDB (multitenant architecture) Oracle Database: to regather Data Dictionary statistics across the entire multitenant architecture, Oracle recommends that you use `catcon`.

To regather stale dictionary statistics for all PDBs in a container database, use the following syntax:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -l /tmp -b gatherstats -- --x"exec dbms_stats.gather_database_stats(options=>'GATHER STALE')"
```

To gather dictionary statistics on a particular PDB, use syntax similar to the following:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -l /tmp -c 'SALES1' -b gatherstats -- --x"exec dbms_stats.gather_database_stats(options=>'GATHER STALE')"
```

In the preceding example, the `-c SALES1` option specifies a PDB inclusion list for the command that you run, specifying the database named `SALES1`. The option `-b gatherstats` specifies the base name for the logs. The option `--x` specifies the SQL command that you want to execute. The SQL command itself is inside the quotation marks.

Related Topics:

Oracle Database PL/SQL Packages and Types Reference

6.9 Troubleshooting the Downgrade of Oracle Database

Use this troubleshooting information to address issues that may occur when downgrading Oracle Database.

This section contains known errors that may occur during downgrades, and workarounds to address those errors.

[Errors Downgrading Oracle Database Components with catdwgrd.sql Script](#) (page 6-26)

Use this section to troubleshoot errors when you run the `catdwgrd.sql` script during a downgrade, such as `ORA-20001: Downgrade cannot proceed`.

[Oracle Multimedia Downgrade and imrelod.sql Script Error](#) (page 6-27)

Review if you encounter `ORA-20000: Oracle ORDIM component in registry is status: DOWNGRADED`.

[Oracle Database Vault and dvrelod.sql Script Error](#) (page 6-27)

Review if you encounter `ORA-31011: XML parsing failed`.

[Downgrading Oracle Grid Infrastructure \(Oracle Restart\) After Successful or Failed Upgrade](#) (page 6-28)

To downgrade Oracle Restart, you must deconfigure and then reinstall Oracle Grid Infrastructure. You can then add back the databases and services.

[Oracle ACFS and Oracle Grid Infrastructure Downgrades to 11g Release 2 \(11.2\)](#) (page 6-28)

You must run `acfsroot install` before you attempt to start the software stack.

[Database Links Passwords After Downgrading Oracle Database 11g Release 1 \(11.1\)](#) (page 6-28)

Reset the passwords for any database links that were created in releases 11.2 or 12.1.

6.9.1 Errors Downgrading Oracle Database Components with catdwgrd.sql Script

Use this section to troubleshoot errors when you run the `catdwgrd.sql` script during a downgrade, such as `ORA-20001: Downgrade cannot proceed`.

The `catdwgrd.sql` script downgrades all Oracle Database components in the database to the major release from which you originally upgraded. This script must run before the Data Dictionary can be downgraded. If you encounter any problems when you run the script, then correct the causes of the problems, and rerun the script.

Errors you can see include `ORA-39709: incomplete component downgrade; string downgrade aborted`, and `ORA-06512`. When these errors occur, downgrades cannot proceed.

- **Cause:** One or more components that must be downgraded before proceeding with the Data Dictionary downgrade did not downgrade.

- **Action:** Review the log files to determine what errors occurred before the `catdwgrd.sql` script halted, and the downgrade was stopped.

Review these examples to understand how to correct this issue.

Example 6-1 ORA-20001 Error Due To ORA-06512

Your downgrade stops. When you review the log files, you find that `catdwgrd.sql` terminates on this error:

```
DECLARE * ERROR at line 1: ORA-20001: Downgrade cannot proceed -
Unified Audit Trail data exists. Please clean up the data first
using DBMS_AUDIT_MGMT.CLEAN_AUDIT_TRAIL. ORA-06512: at line 65
ORA-06512: at line 42
```

Errors typically describe what you must do to fix the issue that is preventing the downgrade to complete. Follow the instructions in the error message. After you have fixed the cause of the error, rerun the `catdwgrd.sql` script.

If the CDB downgrade fails during the downgrade of CDB\$ROOT due to a check, then follow the instructions in the error message to fix the condition error. After you fix the error, rerun `catdwgrd.sql` with `catcon.pl`. Use the `-c` option to run the command with the inclusion list 'CDB\$ROOT PDB1'. Use the `-r` option to run the command first on the PDB, and then on CDB\$ROOT. For example:

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl -d $ORACLE_HOME/rdbms/
admin -e -b catdwgrd -l /scratch/rac/downgradeLogs -c 'CDB$ROOT' -r catdwgrd.sql
```

6.9.2 Oracle Multimedia Downgrade and `imrelod.sql` Script Error

Review if you encounter ORA-20000: Oracle ORDIM component in registry is status: DOWNGRADED.

When downgrading Oracle Database from release 12.1 to release 11.2.0.2, an error may be raised from the `imrelod.sql` script, which is included with release 11.2.0.2.

```
ORA-20000: Oracle ORDIM component in registry is status:
DOWNGRADED. Oracle ORDIM must be installed and valid prior to
Oracle Multimedia upgrade, downgrade, or patch.
```

- **Cause** The `imrelod.sql` script raises this error because it does not know the status of ORDIM.
- **Action** No action. You can ignore this error.

6.9.3 Oracle Database Vault and `dvrelod.sql` Script Error

Review if you encounter ORA-31011: XML parsing failed.

When downgrading Oracle Database from release 12.1 to release 11.2.0.3, databases that use Oracle Database Vault may encounter the following error, which is a result of the `dvrelod.sql` script that is included with release 11.2.0.3:

```
ORA-31011: XML parsing failed; Oracle Database Vault downgrade to release 11.2.0.3
```

- **Cause** The `dvrelod.sql` script does not know the status of XML parsing.
- **Action** No action. You can ignore this message.

6.9.4 Downgrading Oracle Grid Infrastructure (Oracle Restart) After Successful or Failed Upgrade

To downgrade Oracle Restart, you must deconfigure and then reinstall Oracle Grid Infrastructure. You can then add back the databases and services.

Related Topics:

<https://support.oracle.com/rs?type=doc&id=1364412.1>

Oracle Grid Infrastructure Installation and Upgrade Guide

6.9.5 Oracle ACFS and Oracle Grid Infrastructure Downgrades to 11g Release 2 (11.2)

You must run `acfsroot install` before you attempt to start the software stack.

If you use Oracle ASM Cluster File System (Oracle ACFS), and you upgrade to Oracle Grid Infrastructure 12c, either for a cluster or for an Oracle Restart standalone server, and you choose to downgrade to Oracle Grid Infrastructure 11g Release 2 (11.2), then before you attempt to start the release 11.2 software stack, you must run the command `acfsroot install` from the release 11.2 Oracle Grid Infrastructure Oracle home (Grid home).

See Also:

Oracle Database Readme, and the release notes for your operating system platform for the latest information about issues and solutions

6.9.6 Database Links Passwords After Downgrading Oracle Database 11g Release 1 (11.1)

Reset the passwords for any database links that were created in releases 11.2 or 12.1.

After downgrading to Oracle Database release 11.1, you are required to reset the passwords for any database links that were created in releases 11.2 or 12.1.

[ORA-00600 Errors with Database Links Passwords After Downgrading to Oracle Database 11.1 Release 1](#) (page 6-28)

This error can occur if you do not reset the database link password.

[Using Oracle Data Pump Export to Create a Dump File Containing All Existing Database Links](#) (page 6-29)

Before performing the downgrade, use this Oracle Data Pump export procedure to create a dump file that contains all the existing database links.

6.9.6.1 ORA-00600 Errors with Database Links Passwords After Downgrading to Oracle Database 11.1 Release 1

This error can occur if you do not reset the database link password.

If you do not reset the database link password, then an internal error is displayed when anyone attempts to make use of the database link. For reference, this is the internal error that is reported in the Oracle trace file when the Oracle server fails to retrieve the password of the database link:

ORA-00600: [kzdlk_zt2 err], [18446744073709551601]

To reset the password for the database link after downgrading to release 11.1, use the `ALTER DATABASE LINK` command to change the password back to the original password by specifying the original password in the `IDENTIFIED BY` clause.

To create new database links while running Oracle Database release 11.2 or 12.1 that do not have this password issue, contact Oracle support for information about how to use the `IDENTIFIED BY VALUES` clause of the `CREATE DATABASE LINK` command.

See Also:

Oracle Database SQL Language Reference for information about `ALTER DATABASE LINK`

Oracle Database Administrator's Guide for information about controlling connections established by database links

6.9.6.2 Using Oracle Data Pump Export to Create a Dump File Containing All Existing Database Links

Before performing the downgrade, use this Oracle Data Pump export procedure to create a dump file that contains all the existing database links.

The dump file you create includes any newly-created database links. The procedure uses the `FULL=Y` and `INCLUDE=DB_LINK` parameters with the `expdp` command.

1. Log in to SQL*Plus.

For example:

```
sqlplus system/manager
```

2. Drop the dump directory in case one exists.

For example:

```
SQL> DROP DIRECTORY dpump_dir;
SQL> CREATE DIRECTORY dpump_dir AS '/location_to_write_datapump_dump_file';
```

3. Export the database links.

For example:

```
$ expdp system/manager FULL=Y directory=dpump_dir
  dumpfile=saved_dblinks.dmp INCLUDE=DB_LINK;
```

4. After the downgrade, if any of the downgraded database links are not working properly, then drop these links, and import them from the dump file:

```
$ impdp system/manager directory=dpump_dir dumpfile=saved_dblinks.dmp;
```

For example, if you find that links are showing the internal error ORA-00600, then dropping and importing the links from the dump file should cause those links to work as intended.

Migrating Data Using Oracle Data Pump

Use the Export and Import utilities in Oracle Data Pump to migrate data from one database to another.

Oracle Data Pump provides high performance Export (`expdp`) and Import (`impdp`) utilities. These utilities facilitate upgrading to Oracle Database.

See Also:

Oracle Database Utilities for detailed information about Data Pump and the Export and Import utilities

Topics:

[Overview of Data Pump and Export/Import For Migrating Data](#) (page 7-1)

Oracle provides Data Pump Export and Import to migrate (move) data from one Oracle database to another.

[Migrating Data With Oracle Data Pump Before Upgrades](#) (page 7-2)

Use this Oracle Data Pump procedure to export data from the source database before you install the new Oracle Database software. Then import the data into the target upgraded database.

[Importing a Full Oracle Database Using a Network Link](#) (page 7-4)

This database export/import method is an alternative to Oracle Data Pump migrations that is helpful when you are migrating to a different storage system.

[Data Pump Requirements When Downgrading Oracle Database](#) (page 7-5)

You can obtain a downward-compatible dump file using Data Pump.

7.1 Overview of Data Pump and Export/Import For Migrating Data

Oracle provides Data Pump Export and Import to migrate (move) data from one Oracle database to another.

Migrating data by using Oracle Data Pump offers the following benefits:

- Supports filtering the metadata that is exported and imported based upon objects and object types, using `INCLUDE` and `EXCLUDE` parameters.
- Supports different modes for unloading/loading portions of the database including: full database mode, schema mode, table mode, tablespace mode, and transportable tablespace mode.
- Enables you to specify how partitioned tables should be handled during import operations, using the `PARTITION_OPTIONS` parameter.

- Provides support for the full range of data types.

Related Topics:

[The Export/Import Method for Migrating Data When Upgrading Oracle Database](#) (page 2-4)

See Also:

Oracle Database Utilities for an overview of Data Pump Export and Import

7.2 Migrating Data With Oracle Data Pump Before Upgrades

Use this Oracle Data Pump procedure to export data from the source database before you install the new Oracle Database software. Then import the data into the target upgraded database.

1. Install the new Oracle Database software, and ensure that it is patched to the latest Oracle bundle patch or patch set update (BP or PSU). Installation steps for Oracle Database are covered in your operating system-specific Oracle documentation.
2. Export data from the current database using the Export utility shipped with the current database.

The current database must not be available for updates during and after the export. If the current database is available to users for updates after the export, then before making the current database available, you must put procedures in place to copy the changes made in the current database to the new database after the import is complete.

To obtain a consistent point from which you can update the exported database, use one of the following options:

- Set `FLASHBACK_TIME=SYSTIMESTAMP` in your parameter file, so that the image you obtain of the data in the tables that you export represents the committed state of the table data at the same single point-in-time for all the tables that you are exporting.
- Use `FLASHBACK_SCN` to select a specific system change number (SCN) that the Export can use to enable the Flashback Query utility.

Using a flashback option increases UNDO usage and retention.

3. Create the new database. If the new database is on the same server, and it has the same name as the current database, then shut down the current database before creating the new database.

(Option) You can change the storage parameters from the source database. You can pre-create tablespaces, users, and tables in the new database to improve space usage by changing storage parameters. When you pre-create tables using SQL*Plus, either run the database in the original database compatibility mode or make allowances for the specific data definition conversions that occur during import.

4. Start SQL*Plus in the new Oracle Database environment, and start an Oracle Database instance.

For example:

```
$ SQLPLUS / AS SYSDBA
SQL> STARTUP
```

5. If you have pre-created items, then specify the `TABLE_EXISTS_ACTION=APPEND` option for Data Pump Import.

Note:

If the new database is created on the same server as the source database, and you do not want to overwrite the source database data files, then you must pre-create the tablespaces and set the following parameter values for the Data pump import:

- `REUSE_DATAFILES=N` for Data Pump Import
(Option) You can use the `REMAP_DATAFILE`, `REMAP_TABLESPACE` and `REMAP_TABLE` options to remap references to export database names in the dump file set to new, non-colliding names in the importing database.
 - `DESTROY=N` for original Import.
-
-

6. Import the objects exported from the current database by using the new database Import utility. To save the informational messages and error messages from the import session to a file, use the following parameters:
 - The `LOGFILE` parameter for Data Pump Import
 - The `LOG` parameter for original Import
7. After the import, check the import log file for information about the imports of specific objects that completed successfully. If there were failures, check for information about any objects that failed.
8. Use further Import scenarios, or use SQL scripts that create the database objects to clean up incomplete imports (or possibly to start an entirely new import).

Note:

If a Data Pump Export or Import job encounters an unrecoverable error, then the job can be restarted after the condition inducing the failure is corrected. The job continues automatically from the point of failure.

9. If changes are made to the current database after the export, then make sure that those changes are propagated to the new database before making it available to users. Refer to step 1 in this procedure.
10. Complete required post-upgrade tasks for your upgrade as described in Chapter 4, "Post-Upgrade Tasks for Oracle Database."

See Also:

- *Oracle Database Administrator's Guide* for information about creating a database
 - *Oracle Database Utilities Import* chapter for more information about the import utility
 - *Oracle Database Utilities Export* chapter for information about using the Export utility on the current database
 - *Oracle Database Readme* for information about your specific release
-
-

7.3 Importing a Full Oracle Database Using a Network Link

This database export/import method is an alternative to Oracle Data Pump migrations that is helpful when you are migrating to a different storage system.

Set up a database link and use the Data Pump Import utility (`impdp`) to perform a full database import from a source database to a destination database. Using this method to migrate data means that dump files are not written, so you do not have to copy over dump files. This method is of particular benefit when you use different storage systems. However, you must work within the limits imposed by the earlier release Oracle Data Pump software during the Oracle Database export.

Note:

To avoid interoperability errors, ensure that you have applied appropriate patchsets to the database you want to upgrade before you start the upgrade.

1. Ensure that the exporting user at the source database has the `DATAPUMP_EXP_FULL_DATABASE` role.
You must specify this exporting user when you create the database link.
2. Ensure that the importing user at the destination database has the `DATAPUMP_IMP_FULL_DATABASE` role.
3. Create and test a database link between the source and destination databases.
4. Use the following command syntax to start a Data Pump export, where *import_user* is the username for the importing user, and *db_link* is the name of the database link owned by the exporting user:

```
impdp import_user NETWORK_LINK=db_link FULL=Y NOLOGFILE=Y;
```

Note:

Running this command on the importing database implicitly triggers a Data Pump export operation (`expdp`) on the exporting Oracle Database.

5. A log file for the import operation writes to the `DATA_PUMP_DIR` directory. You can discover the location of this directory by running the following command:

```
SQL> select * from dba_directories where DIRECTORY_NAME like 'DATA_PUMP_DIR';
```


In carrying out this command, be aware that the XDB repository is not moved in a full database export and import operation. LONG columns and NESTED columns are also not moved. However, user-created XML schemas are moved.

Note:

The import operation recreates users on the new destination server. The creation date for users in the `dba_users` table shows the actual import date. The expiration date is updated to the value of the `creation_date` plus the `password_life_time` columns. The creation dates in the `dba_users` table in the destination database are different from the values for the `dba_users` table in the source database.

Related Topics:

[Migrating Data With Oracle Data Pump Before Upgrades](#) (page 7-2)

Use this Oracle Data Pump procedure to export data from the source database before you install the new Oracle Database software. Then import the data into the target upgraded database.

See Also:

<http://support.oracle.com> to obtain the latest patchsets

7.4 Data Pump Requirements When Downgrading Oracle Database

You can obtain a downward-compatible dump file using Data Pump.

When you use Oracle Data Pump with the downgrade process, the Oracle Database release to which you downgrade must be no more than one release earlier than the release from which you are downgrading.

Use one of the following Data Pump Export methods to obtain a downward-compatible dump file:

- Use the Data Pump Export utility included in the current release Oracle Database home, and set the `VERSION` parameter to the release of the earlier target to which you are downgrading.

Data Pump Import cannot read dump file sets created by the version of Oracle Data Pump that is later than the current Oracle Database release, unless you created these dump file sets with the `VERSION` parameter set to the release number of the target database. For this reason, the best way to perform a downgrade is to use Data Pump Export with the `VERSION` parameter set to the release number of the target database to which you are downgrading.

- Use the Data Pump Export utility with `DOWNGRADE` using the `NETWORK_LINK` parameter with the `VERSION` parameter.

If the compatibility level of the database to which you want to downgrade is earlier than the version of the export dump file sets you created, then you can still transfer data over a database link if the compatibility level of the Oracle Database from which you want to export is within two major release numbers. For example, if one database is Oracle Database 12c release 2 (12.2), then the other database must be 12c release 1, or 11g release 2 (12.2). You can use Data Pump Export this

way to recover from having the `VERSION` set to an incompatible value during a previous dump file export.

Note:

If you raise the compatibility level after you install the new release of Oracle Database, so that it uses features from the new release, then objects that use those new features cannot be downgraded. For example, if you use the long identifiers available with Oracle Database 12c release 2 (12.2), then objects with those long identifiers cannot be downgraded. After the downgrade, when you try to import those objects, and the Data Pump Import utility attempts to recreate objects that use long identifiers, you receive an error.

See Also:

Oracle Database Utilities for more information about using the `VERSION` parameter

Behavior Changes, Deprecated and Desupported Features for Oracle Database 12c Release 2 (12.2)

Oracle Database 12c introduces upgrade behavior changes for your database in addition to new features. Changes in behavior include deprecated and desupported initialization parameters, options, syntax, and the deprecation and desupport of features and components.

These topics do not describe new features introduced in Oracle Database 12c, nor do they describe changes in earlier releases of Oracle Database.

Be aware of the implications of deprecated and desupported:

- *Deprecated* features are features that are no longer being enhanced but are still supported for the full life of the 12.2.0.1.
- *Desupported* features are features that are no longer supported by fixing bugs related to that feature, and features for which Oracle may remove the code required to use the feature. Where indicated, a deprecated feature can be desupported in a future major release.

See Also:

- *Oracle Database New Features Guide* for a complete list of all new features introduced in this release
 - *Oracle Database Reference* for a list of new initialization parameters, new static data dictionary views, and new dynamic performance views
 - *Oracle Database Installation Guide* for your operating system
-

Topics:

[Initialization Parameter Changes in Oracle Database 12c Release 2 \(12.2\)](#)
(page 8-3)

Review to see the list of new, deprecated, and desupported initialization parameters in this release.

[Deprecated Features in Oracle Database 12c Release 2 \(12.2\)](#) (page 8-6)

Review the deprecated features listed in this section to prepare to use alternatives after you upgrade.

[Desupported Features in Oracle Database 12c Release 2 \(12.2\)](#) (page 8-13)

Review this list of desupported features as part of your upgrade planning.

-
- [Database Upgrade Assistant \(DBUA\) Enhancements and Changes](#) (page 8-16)
Oracle Database 12c release 2 (12.2) includes several enhancements to DBUA, and some features have been removed or modified.
- [Enhancements to Oracle Data Guard Broker and Rolling Upgrades](#) (page 8-17)
Starting with Oracle Database 12c release 2 (12.2), Oracle Data Guard Broker has more features to assist rolling upgrades.
- [About Changes in Default SGA Permissions for Oracle Database](#) (page 8-18)
Starting with Oracle Database 12c Release 2 (12.2.0.1), by default, permissions to read and write to the System Global Area (SGA) are limited to the Oracle software installation owner.
- [Network Access Control Lists and Upgrade to Oracle Database 12c](#) (page 8-18)
Network access control lists (ACLs) are implemented as Real Application Security ACLs in 12c, and existing ACLs are migrated from XML DB ACLs and renamed during upgrade.
- [Parallel Upgrade Utility Batch Scripts](#) (page 8-19)
In Oracle Database 12c release 2, you can run the Parallel Upgrade Utility using command-line batch scripts. `catupgrd.sql` is no longer distributed.
- [Unified Auditing AUDIT_ADMIN and AUDIT_VIEWER Roles Changes](#) (page 8-19)
You may need to rename or drop AUDIT_ADMIN and AUDIT_VIEWER roles before upgrading.
- [Oracle Update Batching Batch Size Settings Disabled](#) (page 8-20)
Oracle update batching settings are disabled in Oracle Database 12c release 2 (12.2). Use JDBC batching instead.
- [About Upgrading Tables Dependent on Oracle-Maintained Types](#) (page 8-20)
Starting with Oracle Database 12c release 2 (12.2), you can run the Parallel Upgrade Utility with the `-T` option to set tables to READ ONLY.
- [Case-Insensitive Passwords and ORA-1017 Invalid Username or Password](#) (page 8-21)
The Oracle Database 12c release 2 (12.2) default authentication protocol is 12 (Exclusive Mode). This protocol requires case-sensitive passwords for authentication. Review your options if you have earlier release password versions.
- [About Deploying Oracle Grid Infrastructure Using Rapid Home Provisioning](#) (page 8-22)
Rapid Home Provisioning is a software lifecycle management method for provisioning and patching Oracle homes. Rapid Home Provisioning enables mass deployment of standard operating environments for databases and clusters.
- [Restrictions Using Zero Data Loss Recovery Appliance Release 12.1 Backups](#) (page 8-23)
Zero Data Loss Recovery Appliance release 12.1 does not support backups from protected database clients using Oracle Database 12c release 2 (12.2).

8.1 Initialization Parameter Changes in Oracle Database 12c Release 2 (12.2)

Review to see the list of new, deprecated, and desupported initialization parameters in this release.

[Deprecated Initialization Parameters in Oracle Database 12c Release 2 \(12.2\)](#)
(page 8-3)

Review the deprecated initialization parameters in this release to understand changes and replacements in parameter settings.

[Desupported Initialization Parameters in Oracle Database 12c Release 2 \(12.2\)](#)
(page 8-4)

Review this list of desupported initialization parameters for changes and replacements in parameter settings in this release.

[Initialization Parameter Default Changes in Oracle Database 12c Release 2 \(12.2\)](#)
(page 8-5)

Review this list of initialization parameter default setting changes for Oracle Database 12c release 2 (12.2).

8.1.1 Deprecated Initialization Parameters in Oracle Database 12c Release 2 (12.2)

Review the deprecated initialization parameters in this release to understand changes and replacements in parameter settings.

O7_DICTIONARY_ACCESSIBILITY Initialization parameter

The initialization parameter `O7_DICTIONARY_ACCESSIBILITY` controls restrictions on `SYSTEM` privileges. If the parameter is set to `TRUE`, then access to objects in the `SYS` schema is allowed. The default setting is `FALSE`. This default setting prevents system privileges that allow access to objects in any schema from allowing access to objects in the `SYS` schema. The `O7_DICTIONARY_ACCESSIBILITY` parameter is deprecated.

ASM_PREFERRED_READ_FAILURE_GROUPS Initialization Parameter

The `ASM_PREFERRED_READ_FAILURE_GROUPS` initialization parameter is deprecated in Oracle Automatic Storage Management 12c release 2 (12.2.0.1). Starting with Oracle Automatic Storage Management (Oracle ASM) 12c release 2 (12.2.0.1), specifying the preferred read failure groups is done automatically, so the use of the `ASM_PREFERRED_READ_FAILURE_GROUPS` initialization parameter is no longer required. Use the `PREFERRED_READ.ENABLED` disk group attribute to control the preferred read functionality.

PARALLEL_ADAPTIVE_MULTI_USER Initialization Parameter

The initialization parameter `PARALLEL_ADAPTIVE_MULTI_USER` specifies if you want to use an adaptive algorithm to improve performance in multi-user environments that use parallel execution. This parameter is deprecated, and the default value is now `FALSE`. There is no replacement for this parameter. Oracle recommends that you use the Oracle Database feature Parallel Statement Queuing to obtain parallel execution performance gains.

UTL_FILE_DIR Initialization Parameter

The initialization parameter `UTL_FILE_DIR` specifies accessible directories for PL/SQL file I/O. This parameter is deprecated, and Oracle recommends that you do not provide `UTL_FILE_DIR` access. Oracle recommends that you instead use the

directory object feature, which replaces UTL_FILE_DIR. Directory objects provide the following benefits:

- They offer more flexibility and granular control to the UTL_FILE application administrator
- They can be maintained dynamically, without shutting down the database
- They are consistent with other Oracle tools.

Related Topics:

Oracle Database Reference

8.1.2 Desupported Initialization Parameters in Oracle Database 12c Release 2 (12.2)

Review this list of desupported initialization parameters for changes and replacements in parameter settings in this release.

GLOBAL_CONTEXT_POOL_SIZE Initialization Parameter

The GLOBAL_CONTEXT_POOL_SIZE initialization parameter is removed and desupported in this release.

GLOBAL_CONTEXT_POOL_SIZE specified the amount of memory to allocate in the SGA for storing and managing global application context. The default value of this parameter was null. The parameter was deprecated in Oracle Database 10g release 2 (10.2).

MAX_ENABLED_ROLES Initialization Parameter

The MAX_ENABLED_ROLES initialization parameter is removed and desupported in this release.

There is no replacement for this parameter. Oracle Database has not used this parameter since Oracle Database 10g release 2 (10.2).

OPTIMIZER_ADAPTIVE_FEATURES Initialization Parameter

The OPTIMIZER_ADAPTIVE_FEATURES initialization parameter is removed and desupported in this release.

The functions of this parameter are replaced by two new parameters. The default value for OPTIMIZER_ADAPTIVE_PLANS is TRUE. When set to TRUE, this parameter determines alternate execution plans that are based on statistics collected as a query executes. OPTIMIZER_ADAPTIVE_STATISTICS is set by default to FALSE. When set to TRUE, the optimizer augments the statistics gathered in the database with adaptive statistics gathered at SQL statement parse time to improve the quality of SQL execution plans.

PARALLEL_AUTOMATIC_TUNING Initialization Parameter

The PARALLEL_AUTOMATIC_TUNING initialization parameter is removed and desupported in this release.

The PARALLEL_AUTOMATIC_TUNING initialization parameter determined the default values for parameters that controlled parallel processing. It was deprecated in Oracle Database 10g release 2 (10.2).

PARALLEL_IO_CAP_ENABLED Initialization Parameter

The PARALLEL_IO_CAP_ENABLED initialization parameter determined if Oracle Database set a limit to the default degree of parallelism to a level no greater than the

I/O system supported. This parameter was deprecated in Oracle Database release 11.2. The function of this parameter was replaced by the `PARALLEL_DEGREE_LIMIT` parameter, when that parameter is set to `IO`.

PARALLEL_SERVER Initialization Parameter

The `PARALLEL_SERVER` initialization parameter is removed and desupported in this release.

The `PARALLEL_SERVER` initialization parameter was used to start a database in Oracle Parallel Server mode. This parameter was deprecated in Oracle Database release 9.0.1. Oracle Parallel Server was replaced with Oracle Real Application Clusters, which uses the `CLUSTER_DATABASE` initialization parameter.

PARALLEL_SERVER_INSTANCES Initialization Parameter

The `PARALLEL_SERVER_INSTANCES` initialization parameter is removed and desupported in this release.

The `PARALLEL_SERVER_INSTANCES` initialization parameter specified the number of configured instances in Oracle Parallel Server mode. This parameter was deprecated in Oracle Database release 9.0.1. Oracle Parallel Server was replaced with Oracle Real Application Clusters, which uses the `CLUSTER_DATABASE_INSTANCES` initialization parameter.

USE_INDIRECT_DATA_BUFFERS Initialization Parameter

The initialization parameter `USE_INDIRECT_DATA_BUFFERS` is removed and desupported in this release.

The parameter was used to enable the Very Large Memory feature for 32-bit platforms. These platforms are no longer supported.

Related Topics:

Oracle Database Reference

8.1.3 Initialization Parameter Default Changes in Oracle Database 12c Release 2 (12.2)

Review this list of initialization parameter default setting changes for Oracle Database 12c release 2 (12.2).

OPTIMIZER_ADAPTIVE_PLANS and OPTIMIZER_ADAPTIVE_STATISTICS

`OPTIMIZER_ADAPTIVE_FEATURE` functions are replaced by two new parameters: `OPTIMIZER_ADAPTIVE_PLANS`, and `OPTIMIZER_ADAPTIVE_STATISTICS`.

`OPTIMIZER_ADAPTIVE_PLANS` controls adaptive plans. It is set by default to `TRUE`. When set to `TRUE`, this parameter determines alternate execution plans built with alternative choices that are based on statistics collected as a query executes.

`OPTIMIZER_ADAPTIVE_STATISTICS` controls adaptive statistics. It is set by default to `FALSE`. When set to `TRUE`, the optimizer augments the statistics gathered in the database with adaptive statistics gathered at SQL statement parse time to improve the quality of SQL execution plans. Some query shapes are too complex to rely upon base table statistics alone. The optimizer augments them with adaptive statistics to determine more accurately the best SQL execution plan.

SQL92_SECURITY Initialization Parameter Default is TRUE

The SQL standard specifies that security administrators should be able to require that users have `SELECT` privilege on a table when running an `UPDATE` or `DELETE` statement that references table column values in a `WHERE` or `SET` clause.

SQL92_SECURITY specifies whether users must have been granted the SELECT object privilege in order to execute such UPDATE or DELETE statements.

Starting in Oracle Database 12c release 2 (12.2), the default setting for this parameter changes from FALSE to TRUE.

When this parameter is set to TRUE, users must have SELECT privilege on the object being deleted or updated.

Related Topics:

Oracle Database Reference

8.2 Deprecated Features in Oracle Database 12c Release 2 (12.2)

Review the deprecated features listed in this section to prepare to use alternatives after you upgrade.

[Deprecation of ALTER TYPE REPLACE](#) (page 8-7)

Starting with Oracle Database 12c release 2 (12.2.0.1), the REPLACE clause of ALTER TYPE is deprecated.

[Deprecation of configToolAllCommands Script](#) (page 8-7)

The postinstallation check script configToolAllCommands is deprecated in Oracle Database 12c release 1 (12.1).

[Deprecation of DBMS_DEBUG Package](#) (page 8-8)

The DBMS_DEBUG package is deprecated in Oracle Database 12c release 2 (12.2). Oracle recommends that you use DBMS_DEBUG_JDWP.

[Deprecation of DBMS_JOB Package](#) (page 8-8)

The DBMS_JOB package is deprecated, and may be desupported in a future release.

[Deprecation of Intelligent Data Placement \(IDC\)](#) (page 8-8)

Intelligent Data Placement is deprecated in Oracle Database 12c release 2 (12.2).

[Deprecation of CONTINUOUS_MINE Option](#) (page 8-8)

Starting with Oracle Database 12c Release 2 (12.2.0.1), the LogMiner CONTINUOUS_MINE option is deprecated.

[Deprecation of Non-CDB Architecture](#) (page 8-9)

The non-CDB architecture was deprecated in Oracle Database 12c. It can be desupported and unavailable in a release after Oracle Database 12c Release 2.

[Deprecation of Oracle Administration Assistant for Windows](#) (page 8-9)

Oracle Administration Assistant for Windows is deprecated in Oracle Database 12c release 2 (12.2).

[Deprecation of Oracle Data Provider for .NET PromotableTransaction Setting](#) (page 8-9)

The Oracle Data Provider for .NET PromotableTransaction setting is deprecated, because it is no longer necessary.

[Deprecation of oracle.jdbc.OracleConnection.unwrap\(\)](#) (page 8-9)

Starting in Oracle Database 12c release 2 (12.2), the Java package `oracle.jdbc.OracleConnection.unwrap()` is deprecated.

[Deprecation of oracle.jdbc.rowset Package](#) (page 8-10)

Starting in Oracle Database 12c release 2 (12.2), the Java `oracle.jdbc.rowset` package is deprecated

[Deprecation of oracle.sql.DatumWithConnection Classes](#) (page 8-10)

`oracle.sql` classes that extend `oracle.sql.DatumWithConnection` are deprecated in Oracle Database 12c release 2 (12.2), in favor of `oracle.jdbc` extension types.

[Deprecation of Oracle Multimedia Java APIs](#) (page 8-10)

The Oracle Multimedia Java APIs are deprecated in Oracle Database 12c release 2.

[Deprecation of Oracle Multimedia Support for DICOM](#) (page 8-11)

Starting in Oracle Database 12c release 2 (12.2), the Oracle Multimedia DICOM feature is deprecated.

[Deprecation of Multimedia SQL/MM Still Image Standard Support](#) (page 8-11)

Starting in Oracle Database 12c release 2 (12.2), Oracle Multimedia SQL/MM Still Image standard support is deprecated.

[Deprecation of Unicode Collation Algorithm \(UCA\) 6.1 Collations](#) (page 8-11)

Starting in Oracle Database 12c release 2, the Unicode Collation Algorithm (UCA) 6.1 collations are deprecated.

[Deprecation of UNIFIED_AUDIT_SGA_QUEUE_SIZE](#) (page 8-11)

Starting in Oracle Database 12c release 2, the initialization parameter `UNIFIED_AUDIT_SGA_QUEUE_SIZE` is deprecated.

[Deprecation of VERIFY_FUNCTION and VERIFY_FUNCTION_11G](#) (page 8-12)

The `VERIFY_FUNCTION` and `VERIFY_FUNCTION_11G` password verify functions are deprecated in this release, because they enforce the weaker password restrictions from earlier releases.

[Deprecation of V\\$MANAGED_STANDBY](#) (page 8-12)

The `V$MANAGED_STANDBY` view is deprecated in Oracle Database 12c release 2 (12.2.0.1). Oracle recommends that you use the new view `V$DATAGUARD_PROCESS`.

[Deprecation of Some XML DB Functions](#) (page 8-12)

Starting with Oracle Database 12c release 2 (12.2) the options listed in this topic are deprecated.

8.2.1 Deprecation of ALTER TYPE REPLACE

Starting with Oracle Database 12c release 2 (12.2.0.1), the `REPLACE` clause of `ALTER TYPE` is deprecated.

As an alternative, Oracle recommends that you use the `ALTER TYPE` methods `ADD` and `DROP`, or use `ALTER TYPE method ADD`.

Related Topics:

Oracle Database PL/SQL Language Reference

8.2.2 Deprecation of configToolAllCommands Script

The postinstallation check script `configToolAllCommands` is deprecated in Oracle Database 12c release 1 (12.1).

The script `configToolAllCommands` runs in the response file mode to configure Oracle products after installation. It uses a separate password response file. Starting with Oracle Database 12c release 2 (12.2), `configToolAllCommands` is deprecated. It may be desupported in a future release.

You can now obtain postinstallation checks as part of the installation process. Oracle recommends that you run the Oracle Database or Oracle Grid Infrastructure installer with the option `-executeConfigTools`. You can use the same response file created during installation to complete postinstallation configuration.

8.2.3 Deprecation of DBMS_DEBUG Package

The DBMS_DEBUG package is deprecated in Oracle Database 12c release 2 (12.2). Oracle recommends that you use DBMS_DEBUG_JDWP.

In earlier releases, PL/SQL included the DBMS_DEBUG package to enable internal and third-party tools to debug PL/SQL programs. The DBMS_DEBUG package provides APIs to set breakpoints, obtain values of variables, and so on. This functionality has been provided by the DBMS_DEBUG_JDWP package for several releases. DBMS_DEBUG_JDWP provides the equivalent PL/SQL debugging capabilities, and it enables seamless debugging of PL/SQL routines when it calls into or is called from server-side Java (OJVM) with Java stored procedures.

Related Topics:

Oracle Database PL/SQL Packages and Types Reference

8.2.4 Deprecation of DBMS_JOB Package

The DBMS_JOB package is deprecated, and may be desupported in a future release.

Oracle recommends that developers move to DBMS_SCHEDULER, which provides a richer set of features and capabilities.

Related Topics:

Oracle Database Administrator's Guide

8.2.5 Deprecation of Intelligent Data Placement (IDC)

Intelligent Data Placement is deprecated in Oracle Database 12c release 2 (12.2).

Intelligent Data Placement enables you to specify disk regions on Oracle ASM disks for best performance. Using the disk region settings, you can ensure that frequently accessed data is placed on the outermost (hot) tracks which have greater speed and higher bandwidth. In addition, files with similar access patterns are located physically close, reducing latency. Intelligent Data Placement also enables the placement of primary and mirror extents into different hot or cold regions

This feature is deprecated in Oracle Database 12c release 2 (12.2).

Related Topics:

Oracle Automatic Storage Management Administrator's Guide

8.2.6 Deprecation of CONTINUOUS_MINE Option

Starting with Oracle Database 12c Release 2 (12.2.0.1), the LogMiner CONTINUOUS_MINE option is deprecated.

The LogMiner CONTINUOUS_MINE option is still supported for backward compatibility reasons. However, Oracle recommends that you discontinue using it. There is no replacement functionality.

8.2.7 Deprecation of Non-CDB Architecture

The non-CDB architecture was deprecated in Oracle Database 12c. It can be desupported and unavailable in a release after Oracle Database 12c Release 2.

Oracle recommends use of the CDB architecture.

8.2.8 Deprecation of Oracle Administration Assistant for Windows

Oracle Administration Assistant for Windows is deprecated in Oracle Database 12c release 2 (12.2).

Oracle Administration Assistant for Windows is a tool for creating database administrators, operators, users, and roles in Windows. It also allows database service, startup and shutdown configuration, and Windows Registry parameter management.

Instead of using Oracle Administration Assistant for Windows, use native Windows administration tools.

8.2.9 Deprecation of Oracle Data Provider for .NET PromotableTransaction Setting

The Oracle Data Provider for .NET PromotableTransaction setting is deprecated, because it is no longer necessary.

Promotable transactions themselves are not being deprecated. Only this specific setting is deprecated.

The Oracle Data Provider for .NET registry setting PromotableTransaction indicates whether the application must keep transactions as local, or if it can begin all single connection transactions as local, and then promote the transaction to distributed when a second connection enlists. This is the concept of promotable transactions.

The Promotable Transaction setting is deprecated in Oracle Database 12c release 2 (12.2). There is no reason not to use promotable transactions. Oracle recommends you accept the default value promotable.

8.2.10 Deprecation of oracle.jdbc.OracleConnection.unwrap()

Starting in Oracle Database 12c release 2 (12.2), the Java package `oracle.jdbc.OracleConnection.unwrap()` is deprecated.

The Java package `oracle.jdbc.OracleConnection.unwrap()` is deprecated in Oracle Database 12c release 2, and later releases. There is no replacement for this package.

Oracle recommends that you replace this JDBC method in your applications with standard Java methods.

Related Topics:

<https://support.oracle.com/rs?type=doc&id=2024500.1>

8.2.11 Deprecation of `oracle.jdbc.rowset` Package

Starting in Oracle Database 12c release 2 (12.2), the Java `oracle.jdbc.rowset` package is deprecated.

Oracle recommends that you use the Standard JDBC RowSet package to replace this feature.

Related Topics:

Oracle Database JDBC Developer's Guide

<https://support.oracle.com/rs?type=doc&id=2024500.1>

8.2.12 Deprecation of `oracle.sql.DatumWithConnection` Classes

`oracle.sql` classes that extend `oracle.sql.DatumWithConnection` are deprecated in Oracle Database 12c release 2 (12.2), in favor of `oracle.jdbc` extension types.

In previous releases, Oracle Database included Oracle JDBC drivers that provided specific type extensions and performance extensions in both `oracle.sql` and `oracle.jdbc` Java packages. Starting with Oracle Database 12c release 2 (12.2), the `oracle.sql` classes that extend `oracle.sql.DatumWithConnection` are deprecated. The `oracle.jdbc` extensions continue to be supported.

For example, here is a partial list of deprecated `oracle.sql` classes:

- ARRAY
- BFILE
- BLOB
- CLOB
- OPAQUE
- REF
- STRUCT

Oracle recommends that you replace `oracle.sql` classes that extend `oracle.sql.DatumWithConnection` in your applications with standard Java types, or with `oracle.jdbc` extensions.

8.2.13 Deprecation of Oracle Multimedia Java APIs

The Oracle Multimedia Java APIs are deprecated in Oracle Database 12c release 2.

The following Java APIs are deprecated in Oracle Database 12c Release 2 (12.2), and may be desupported in a future release:

- Oracle Multimedia Java API
- Oracle Multimedia Servlets and JSP Java API
- Oracle Multimedia DICOM Java API
- Oracle Multimedia Mid-Tier Java API

Related Topics:

Oracle Multimedia Reference

Oracle Multimedia DICOM Developer's Guide

8.2.14 Deprecation of Oracle Multimedia Support for DICOM

Starting in Oracle Database 12c release 2 (12.2), the Oracle Multimedia DICOM feature is deprecated.

There is no replacement for DICOM support in Oracle Database.

Related Topics:

Oracle Multimedia DICOM Developer's Guide

8.2.15 Deprecation of Multimedia SQL/MM Still Image Standard Support

Starting in Oracle Database 12c release 2 (12.2), Oracle Multimedia SQL/MM Still Image standard support is deprecated.

For image processing operations, Oracle Multimedia developers can call the new ORD_IMAGE PL/SQL package, or call the ORDImage methods.

For image matching, Oracle Database developers can use open source packages, such as OpenCV.

Related Topics:

Oracle Multimedia Reference

Oracle Multimedia User's Guide

8.2.16 Deprecation of Unicode Collation Algorithm (UCA) 6.1 Collations

Starting in Oracle Database 12c release 2, the Unicode Collation Algorithm (UCA) 6.1 collations are deprecated.

The Unicode Collation Algorithm (UCA) 6.1 collations (UCA0610_*) are deprecated. They can be desupported and unavailable in a future release. Oracle recommends that you use the latest supported version of UCA collations for sorting multilingual data.

Related Topics:

Oracle Database Globalization Support Guide

8.2.17 Deprecation of UNIFIED_AUDIT_SGA_QUEUE_SIZE

Starting in Oracle Database 12c release 2, the initialization parameter UNIFIED_AUDIT_SGA_QUEUE_SIZE is deprecated.

The UNIFIED_AUDIT_SGA_QUEUE_SIZE parameter is deprecated, and the value for this parameter is no longer honored. However, the parameter is currently retained for backward compatibility.

See *Oracle Database Security Guide* for additional information about Unified Audit records.

Related Topics:

Oracle Database Security Guide

8.2.18 Deprecation of VERIFY_FUNCTION and VERIFY_FUNCTION_11G

The VERIFY_FUNCTION and VERIFY_FUNCTION_11G password verify functions are deprecated in this release, because they enforce the weaker password restrictions from earlier releases.

Oracle recommends that you use the functions ORA12C_VERIFY_FUNCTION and ORA12C_STRONG_VERIFY_FUNCTION. These functions enforce stronger, more up-to-date password verification restrictions.

See Also:

Oracle Database Security Guide

8.2.19 Deprecation of V\$MANAGED_STANDBY

The V\$MANAGED_STANDBY view is deprecated in Oracle Database 12c release 2 (12.2.0.1). Oracle recommends that you use the new view V\$DATAGUARD_PROCESS.

The V\$DATAGUARD_PROCESS view includes much more information about processes used by Oracle Data Guard.

Related Topics:

Oracle Database Reference

8.2.20 Deprecation of Some XML DB Functions

Starting with Oracle Database 12c release 2 (12.2) the options listed in this topic are deprecated.

The following options are deprecated:

- Oracle XQuery function ora:contains. Use XQuery Full Text instead.
- Oracle SQL function XMLRoot. Use SQL/XML function XMLSerialize() with a version number instead.
- Nested tables stored as index-ordered tables (IOTs). This includes both the use of option DBMS_XMLSCHEMA.REGISTER_NT_AS_IOT, and the use of clause NESTED TABLE N STORE AS ... (ORGANIZATION INDEX) when creating a table with nested-table column N. Instead, store nested-table columns using heap storage (the default behavior for PL/SQL procedure DBMS_XMLSCHEMA.registerSchema).
- PL/SQL procedure DBMS_XSLPROCESSOR.CLOB2FILE. Use DBMS_LOB.CLOB2FILE instead.
- PL/SQL function DBMS_XSLPROCESSOR.READ2CLOB. Use DBMS_LOB.LOADCLOBFROMFILE instead.
- Use of XLink with Oracle XML DB.

- Oracle XML DB Content Connector.

For more information, refer to *Oracle XML DB Developer's Guide*.

Related Topics:

Oracle XML DB Developer's Guide

8.3 Desupported Features in Oracle Database 12c Release 2 (12.2)

Review this list of desupported features as part of your upgrade planning.

[Desupport of Advanced Replication](#) (page 8-13)

Starting in Oracle Database 12c release 2 (12.2), the Advanced Replication feature of Oracle Database is desupported.

[Desupport of Direct File System Placement for OCR and Voting Files](#) (page 8-14)

Placing OCR and Voting Disk files on shared file systems is desupported in favor of placing the files on Oracle ASM.

[Desupport of JPublisher](#) (page 8-14)

All Oracle JPublisher features are desupported and unavailable in Oracle Database 12c Release 2 (12.2.0.1).

[Desupport of preupgrd.sql and utluppkg.sql](#) (page 8-14)

The `preupgrd.sql` and `utluppkg.sql` scripts are replaced by the Preupgrade Information Tool (`preupgrade.jar`).

[Desupported Oracle Data Provider for .NET APIs for Transaction Guard](#) (page 8-15)

Application programming interfaces (APIs) for Transaction Guard listed here are desupported in Oracle Database 12c release 2 (12.2).

[Desupported Views in Oracle Database 12c Release 2 \(12.2\)](#) (page 8-15)

The views listed in this topic are desupported in Oracle Database 12c release 2 (12.2).

[SQLJ Support Inside Oracle Database](#) (page 8-15)

Starting with Oracle Database 12c release 2 (12.2), Oracle does not support running server-side SQLJ code.

[Desupport of Some XML DB Features](#) (page 8-15)

Starting in Oracle Database 12c release 2 (12.2), the XML DB features listed here are desupported.

8.3.1 Desupport of Advanced Replication

Starting in Oracle Database 12c release 2 (12.2), the Advanced Replication feature of Oracle Database is desupported.

The Oracle Database Advanced Replication feature is desupported in its entirety. The desupport of this feature includes all functionality associated with this feature: multimaster replication, updateable materialized views, hierarchical materialized views, and deployment templates. Read-only materialized views are still supported with basic replication.

Oracle recommends that you replace your use of Advanced Replication with Oracle GoldenGate.

8.3.2 Desupport of Direct File System Placement for OCR and Voting Files

Placing OCR and Voting Disk files on shared file systems is desupported in favor of placing the files on Oracle ASM.

Starting with Oracle Grid Infrastructure 12c Release 2 (12.2), the placement of Oracle Clusterware files: the Oracle Cluster Registry (OCR), and the Voting Files, directly on a shared file system is desupported in favor of having Oracle Clusterware files managed by Oracle Automatic Storage Management (Oracle ASM). You cannot place Oracle Clusterware files directly on a shared file system. If you need to use a supported shared file system, either a Network File System, or a shared cluster file system instead of native disks devices, then you must create Oracle ASM disks on supported network file systems that you plan to use for hosting Oracle Clusterware files before installing Oracle Grid Infrastructure. You can then use the Oracle ASM disks in an Oracle ASM disk group to manage Oracle Clusterware files.

If your Oracle Database files are stored on a shared file system, then you can continue to use the same for database files, instead of moving them to Oracle ASM storage.

8.3.3 Desupport of JPublisher

All Oracle JPublisher features are desupported and unavailable in Oracle Database 12c Release 2 (12.2.0.1).

Oracle recommends that you use the following alternatives:

- To continue to use Web service callouts, Oracle recommends that you use the Oracle JVM Web Services Callout utility, which is a replacement for the Web Services Callout utility.
- To replace other JPublisher automation capabilities, including mapping user-defined SQL types or SQL types, wrapping PL/SQL packages and similar capabilities, Oracle recommends that developers use explicit steps, such as precompiling code with SQLJ precompiler, building Java STRUCT classes, or using other prestructured options.

Related Topics:

<https://support.oracle.com/rs?type=doc&id=1937939.1>

See Also:

My Oracle Support Note 1937939.1 for more information about JDeveloper deprecation and desupport

8.3.4 Desupport of `preupgrd.sql` and `utluppkg.sql`

The `preupgrd.sql` and `utluppkg.sql` scripts are replaced by the Preupgrade Information Tool (`preupgrade.jar`).

Beginning with Oracle Database 12c release 2 (12.2), the Pre-Upgrade Information Tool scripts `preupgrd.sql` and `utluppkg.sql` are no longer supplied as part of the Oracle Database release. The Pre-Upgrade Information Tool `preupgrade.jar` replaces both of these files.

The `preupgrade.jar` Pre-Upgrade Information Tool is supplied with Oracle Database 12c release 2 (12.2). This script has the same capabilities as the scripts it replaces. It can run using the Java Development Kits (JDKs) installed with Oracle Database releases supported for direct upgrade to Oracle Database 12c release 2 (12.2).

8.3.5 Desupported Oracle Data Provider for .NET APIs for Transaction Guard

Application programming interfaces (APIs) for Transaction Guard listed here are desupported in Oracle Database 12c release 2 (12.2).

The following Oracle Data Provider for .NET application programming interfaces for Transaction Guard are desupported in Oracle Database 12c Release 2 (12.2):

- `OracleLogicalTransactionStatus` class
- `OracleConnection.GetLogicalTransactionStatus` method
- `OracleConnection.LogicalTransactionId` property
- `OracleConnection.OracleLogicalTransaction` property
- `OracleLogicalTransaction.DataSource` property
- `OracleLogicalTransaction.GetOutcome()` method
- `OracleLogicalTransaction.GetOutcome(string, string, string)` method
- `OracleLogicalTransaction.UserId` property

8.3.6 Desupported Views in Oracle Database 12c Release 2 (12.2)

The views listed in this topic are desupported in Oracle Database 12c release 2 (12.2).

Revise any of your SQL statements that use these views.

DBA_REGISTERED_MVIEW_GROUPS View

V\$REPLPROP View

V\$REPLQUEUE View

8.3.7 SQLJ Support Inside Oracle Database

Starting with Oracle Database 12c release 2 (12.2), Oracle does not support running server-side SQLJ code.

Oracle supports using client-side SQLJ. However, Oracle does not support the use of server-side SQLJ, including running stored procedures, functions, and triggers in the database environment.

8.3.8 Desupport of Some XML DB Features

Starting in Oracle Database 12c release 2 (12.2), the XML DB features listed here are desupported.

The following features are desupported:

- Java classes in package `oracle.xdb.dom`
- Oracle XPath function `ora:instanceof`. Use XQuery operator `instance of` instead.

- Oracle XPath function `ora:instanceof-only`. Use XML Schema attribute `xsi:type` instead.
- Function-based indexes on XMLType. Use XMLIndex with a structured component instead.
- Oracle XQuery function `ora:view`. Use XQuery functions `fn:collection` instead.
- PL/SQL procedure `DBMS_XDB_ADMIN.CreateRepositoryXMLIndex`
- PL/SQL procedure `DBMS_XDB_ADMIN.XMLIndexAddPath`
- PL/SQL procedure `DBMS_XDB_ADMIN.XMLIndexRemovePath`
- PL/SQL procedure `DBMS_XDB_ADMIN.DropRepositoryXMLIndex`
- XML schema annotation (attribute) `csx:encodingType`
- XMLIndex index on CLOB portions of hybrid XMLType storage (index on CLOB data that is embedded within object-relational storage)

8.4 Database Upgrade Assistant (DBUA) Enhancements and Changes

Oracle Database 12c release 2 (12.2) includes several enhancements to DBUA, and some features have been removed or modified.

In response to customer requests, and to improve functionality, Database Upgrade Assistant (DBUA) includes new features and code enhancements. Also, some features in previous releases have been removed.

DBUA New Features

DBUA includes the following new features for Oracle Database 12c release 2 (12.2):

- **Selective PDB Plug-In Upgrades:** You can plug in a PDB created in a previous release into a release 12.2 multitenant architecture CDB environment, and upgrade the PDB using DBUA started from the release 12.2 CDB home
You can unplug PDBs from a CDB, upgrade the CDB and any PDBs plugged in to the CDB, and then plug in earlier release PDBs and upgrade them using DBCA.
- **Priority-Based PDB Upgrades:** You can set priority for PDB upgrades, so that higher priority PDBs are upgraded first.
- **Retry and Ignore Functionality:** You can fix errors and retry upgrades, or select to ignore certain errors and continue upgrades.
- **Pause and Continue Functionality:** You can stop the upgrade, and continue the upgrade at a later time.
- **Standalone Prerequisite Checks:** You can run DBUA with the new `-executePrereqs` option to check prerequisites for upgrades at any time.
- **Listener Configuration During Database Moves:** You can configure the database with a new listener during a database move operation.
- **Improved Logging Mechanism:** DBUA now has time-stamped logs.
- **Performance Enhancements:** DBUA includes code enhancements that reduce the number of instance restarts during the upgrade process.

- **Enhanced Error Reporting:** All DBUA errors are reported using the error code prefix DBT, and all errors are reported as a list on a progress page, instead of being presented in message windows.

DBUA Removed Features

The following DBUA features available in previous releases are removed in Oracle Database 12c release 2 (12.2):

- **Data Files Move:** Data files can no longer be moved during upgrades.
- **Database Renames During Upgrades:** It is no longer supported to rename Oracle Database names during the upgrade.
- **Degree of Parallelism Selection Removed from DBUA:** The default parallelism is calculated depending on the use case.
 - **Upgrade:** The default parallelism using DBUA is the same value used by the Parallel Upgrade Utility for manual upgrades. However, in an upgrade operation, you can override the default by specifying the number of cores that you want to use.
 - **Recompile:** The default parallelism for object recompilation is determined by the `utlrp` script used in manual upgrade.
- **Recompile parallelism is the same value as the upgrade parallelism by default.**
- **Changing Diagnostic and Audit Dest No Longer Available:** You can only change the Diagnostic and Audit destination by using the DBUA command-line option `-initParam`.
- **Remote DBUA Desupported:** In previous releases, DBUA had an option on Windows platforms for supporting Oracle Database remote upgrades. This feature is desupported.

8.5 Enhancements to Oracle Data Guard Broker and Rolling Upgrades

Starting with Oracle Database 12c release 2 (12.2), Oracle Data Guard Broker has more features to assist rolling upgrades.

Oracle Data Guard Broker now supports Oracle Active Data Guard rolling upgrade. Oracle Active Data Guard rolling upgrade was introduced in Oracle Database 12c release 1 (12.1). It simplifies the execution of the transient logical database rolling upgrade process by automating many manual steps in a simple PL/SQL package (DBMS_ROLLING). In addition to making database rolling upgrades simpler, the automated process is much more reliable. Oracle Data Guard broker can now direct Oracle Active Data Guard rolling upgrades from the DGMGRL command-line interface. Broker support also adds substantial simplification to the rolling upgrade process by transparently handling redo transport destination settings and other tasks.

In Oracle Database 12c release 2 (12.2) and later releases, when you perform a rolling upgrade using the DBMS_ROLLING PL/SQL package, you no longer have to disable the broker. In addition, the broker now reports when a rolling upgrade is in place, and tracks its status. The status information is displayed in the output of the DGMGRL commands `SHOW CONFIGURATION` and `SHOW DATABASE`.

Using Oracle Data Guard Broker to manage database rolling upgrades can simplify the upgrade process by minimizing your downtime and risk when introducing change to production environments.

Related Topics:

Oracle Data Guard Broker

8.6 About Changes in Default SGA Permissions for Oracle Database

Starting with Oracle Database 12c Release 2 (12.2.0.1), by default, permissions to read and write to the System Global Area (SGA) are limited to the Oracle software installation owner.

In previous releases, both the Oracle installation owner account and members of the OSDBA group had access to shared memory. The change in Oracle Database 12c Release 2 (12.2) to restrict access by default to the Oracle installation owner account provides greater security than previous configurations. However, this change may prevent DBAs who do not have access to the Oracle installation owner account from administering the database.

The Oracle Database initialization parameter `ALLOW_GROUP_ACCESS_TO_SGA` determines if the Oracle Database installation owner account (`oracle` in Oracle documentation examples) is the only user that can read and write to the database System Global Area (SGA), or if members of the OSDBA group can read the SGA. In Oracle Database 12c Release 2 (12.2), the default value for this parameter is `FALSE`, so that only the Oracle Database installation owner has read and write permissions to the SGA. Group access to the SGA is removed by default. This change affects all Linux and UNIX platforms.

If members of the OSDBA group require read access to the SGA, then you can change the initialization parameter `ALLOW_GROUP_ACCESS_TO_SGA` setting from `FALSE` to `TRUE`. Oracle strongly recommends that you accept the default permissions that limit access to the SGA to the oracle user account.

Related Topics:

Oracle Database Reference

8.7 Network Access Control Lists and Upgrade to Oracle Database 12c

Network access control lists (ACLs) are implemented as Real Application Security ACLs in 12c, and existing ACLs are migrated from XML DB ACLs and renamed during upgrade.

During Oracle Database upgrades to 12c release 1 (12.1) and later releases, network access control in Oracle Database is implemented using Real Application Security access control lists (ACLs). Existing ACLs in XDB are migrated during upgrade. Existing APIs in the `DBMS_NETWORK_ACL_ADMIN` PL/SQL package and catalog views are deprecated. These deprecated views are replaced with new equivalents in Oracle Database 12c.

Starting with Oracle Database 12c release 1 (12.1), you can grant network privileges by appending an access control entry (ACE) to a host ACL using `DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE`. If you append an ACE to a host that has no existing host ACL, then a new host ACL is created implicitly. If the host ACL exists, then the ACEs are appended to the existing ACL.

How Changing to Real Application Security ACLS Affects You

During upgrades, the following changes are made:

- Existing network ACLs are migrated from Oracle Database 11g XML DB to Oracle Database 12c Real Application Security. All privileges of the existing ACLs are preserved during this migration.
- Existing ACLs are renamed.

What You Need To Do Before Upgrades

- Check for existing Network ACLs before the upgrade.
- Preserve existing network ACLs and privileges (DBA_NETWORK_ACLS and DBA_NETWORK_ACL_PRIVILEGES) in an intermediate staging table. Preserving the existing privileges in a table enables you to restore them if the automatic migration fails, or if you want to roll back an upgrade.

Related Topics:

Oracle Database Security Guide

Oracle Database Reference

8.8 Parallel Upgrade Utility Batch Scripts

In Oracle Database 12c release 2, you can run the Parallel Upgrade Utility using command-line batch scripts. `catupgrd.sql` is no longer distributed.

Starting in Oracle Database 12c release 2 (12.2), you can run the Parallel Upgrade Utility (`catctl.pl`) from the command line by entering the shell commands `dbupgrade` for Linux and UNIX, and `dbupgrade.com` for Windows. These shell scripts call the `catctl.pl` script from the upgrade binary home. You can either run these scripts with default values, or you can run them with the same input parameters that you use to run `catctl.pl` from the Perl prompt.

Related Topics:

[About the Parallel Upgrade Utility for Oracle Database \(CATCTL.PL and DBUPGRADE\)](#) (page 3-3)

8.9 Unified Auditing AUDIT_ADMIN and AUDIT_VIEWER Roles Changes

You may need to rename or drop `AUDIT_ADMIN` and `AUDIT_VIEWER` roles before upgrading.

In Oracle Database 12c, if you use Unified Auditing, then two `AUDSYS` roles may exist in your Oracle Database 11g release 2 (11.2.0.4) and earlier releases that affect upgrading: `AUDIT_ADMIN` and `AUDIT_VIEWER`. Because of changes in these roles, you must drop these earlier release users or user roles before you can upgrade to Oracle Database 12c release 1 (12.1) or later.

If you have created `AUDIT_ADMIN` and `AUDIT_VIEWER` users or roles with Oracle Database 12c release 1 (12.1), then you do not need to drop these roles.

If you are affected by this requirement, and you cannot drop these `AUDSYS` roles, then select the `UNIFIED_AUDIT_TRAIL` view, create your own table, using similar definitions, and use this table to take a backup of the Unified Audit data. Oracle recommends that you carry out this procedure also if you may want to downgrade to your earlier release database.

The Pre-Upgrade Information Tool and `DBUA` perform a pre-upgrade check to make sure these users or roles do not exist in the database. Oracle recommends that you do

not use these names in your databases. If these users or roles exist, then you should rename or drop them as appropriate before upgrading to Oracle Database 12c.

See Also:

Oracle Database Security Guide for information on configuring privilege and role authorization for database security

8.10 Oracle Update Batching Batch Size Settings Disabled

Oracle update batching settings are disabled in Oracle Database 12c release 2 (12.2). Use JDBC batching instead.

Oracle update batching was deprecated in Oracle Database 12c Release 1 (12.1). Starting in Oracle Database 12c Release 2 (12.2), Oracle update batching is a no operation code (no-op). This means that if you implement Oracle update batching in your application using the Oracle Database 12c Release 2 (12.2) JDBC driver, then the specified batch size is not set, and results in a batch size of 1. With this batch setting, your application processes one row at a time. Oracle strongly recommends that you use the standard JDBC batching if you are using the Oracle Database 12c Release 2 (12.2) JDBC driver.

8.11 About Upgrading Tables Dependent on Oracle-Maintained Types

Starting with Oracle Database 12c release 2 (12.2), you can run the Parallel Upgrade Utility with the `-T` option to set tables to READ ONLY.

When you run the Parallel Upgrade Utility with the `-T` option, any tablespaces that do not contain Oracle Maintained objects are set to READ ONLY. Setting these tables to READ ONLY can reduce the amount of data that you need to back up before upgrading the database.

If your database has user tables that depend on Oracle Maintained types (for example, AQ queue tables), then you must upgrade these tables manually after upgrade.

After the upgrade is complete, to upgrade tables dependent on Oracle-Maintained types, run the script `utluptabdata.sql` to carry out ALTER TABLE UPGRADE commands on tables in tablespaces set to READ ONLY during the upgrade.

Starting with Oracle Database 12c release 2, the ALTER TYPE statement behavior is also changed. If a dependent table is in an accessible tablespace, then it is automatically upgraded to the new version of the type. If the dependent table is in a READ ONLY tablespace, then it is not automatically upgraded. Run the `utluptabdata.sql` script to upgrade those tables set to READ ONLY tablespace states during the upgrade. You only need to run the `utluptabdata.sql` script when you run the Parallel Upgrade Utility with the `-T` option to run the upgrade.

Note:

When tablespaces are set to READ ONLY, this setting prevents updates on all tables in the tablespace, regardless of a user's update privilege level. For example, users connecting as SYSDBA are prevented from changing their application data.

Related Topics:

[Upgrading Tables Dependent on Oracle-Maintained Types](#) (page 4-8)

[Running Upgrades with Read-Only and Offline Tablespaces](#) (page 2-31)

8.12 Case-Insensitive Passwords and ORA-1017 Invalid Username or Password

The Oracle Database 12c release 2 (12.2) default authentication protocol is 12 (Exclusive Mode). This protocol requires case-sensitive passwords for authentication. Review your options if you have earlier release password versions.

Starting with Oracle Database 12c release 2 (12.2), the default value for the SQLNET.ORA parameter `ALLOWED_LOGON_VERSION_SERVER` is changed to 12. This parameter refers to the logon authentication protocol used for the server, not the Oracle Database release.

By default, Oracle no longer supports case-insensitive password-based authentication; only the new password versions (11G and 12C) are allowed. The case-insensitive 10G password version is no longer generated.

If the following conditions are true, then you may have accounts that are prevented from logging into the database after upgrading to 12.2:

- You are upgrading a server that has user accounts created in an earlier Oracle Database release.
- User accounts created in the earlier release use a case-insensitive password version from an earlier release authentication protocol, such as the 10G password version.
- Earlier release user accounts have not reset passwords.
- The server has been configured with `SEC_CASE_SENSITIVE_LOGON` set to `FALSE`, so that it can only authenticate users who have a 10G case-insensitive password version.

If you have accounts that require 10G password versions, then to prevent accounts using that password version from being locked out of the database, you can change from an Exclusive Mode to a more permissive authentication protocol.

Note:

Oracle does not support case-insensitive password-based authentication while running in an Exclusive Mode. The default authentication protocol in Oracle Database 12c release 2 (12.2) is an Exclusive Mode. Oracle only supports case-insensitive authentication with the following conditions:

- The server is running in a mode other than an Exclusive Mode
 - The 10G password version is present
-

Option for Servers with Accounts Using Only 10G Password Version

After you upgrade to Oracle Database 12c release 2 (12.2), complete the following procedure to enable accounts using the 10G password version:

1. Log in as an administrator.
2. Edit the SQLNET.ORA file to change the SQLNET.ALLOWED_LOGON_VERSION_SERVER setting from the default, 12, to 11 or lower. For example:

```
SQLNET.ALLOWED_LOGON_VERSION_SERVER=11
```

After you change to a more permissive SQLNET.ALLOWED_LOGON_VERSION_SERVER setting, expire users' passwords to require them to change their passwords. For detailed information, refer to *Oracle Database Security Guide*.

Related Topics:

Oracle Database Security Guide

Oracle Database Net Services Reference

8.13 About Deploying Oracle Grid Infrastructure Using Rapid Home Provisioning

Rapid Home Provisioning is a software lifecycle management method for provisioning and patching Oracle homes. Rapid Home Provisioning enables mass deployment of standard operating environments for databases and clusters.

Rapid Home Provisioning (RHP) enables you to install clusters, and provision, patch, and upgrade Oracle Grid Infrastructure and Oracle Database homes. The supported versions are 11.2, 12.1, and 12.2. You can also provision applications and middleware using Rapid Home Provisioning. A single cluster, known as the Rapid Home Provisioning Server, stores and manages standardized images, called gold images, which can be provisioned to any number of nodes. You can install Oracle Grid Infrastructure cluster configurations such as Oracle Standalone Clusters, Oracle Member Clusters, and Oracle Application Clusters. After deployment, you can expand and contract clusters and Oracle RAC Databases.

You can provision Oracle Grid Infrastructure on a remote set of nodes in a cloud computing environment from a single cluster where you store templates of Oracle homes as images (called gold images) of Oracle software, such as databases, middleware, and applications.

Rapid Home Provisioning leverages a new file system capability which allows for separation of gold image software from the site-specific configuration changes, so the home path remains unchanged throughout updates. This capability of persistent home path is available for Oracle Grid Infrastructure 12c Release 2 (12.2) and combines the benefits of in-place and out-of-place patching.

Note: Rapid Home Provisioning supports provisioning, patching, and upgrade of single-instance databases on Oracle Grid Infrastructure for a standalone server, or Oracle Restart.

Rapid Home Provisioning

Deploying Oracle software using Rapid Home Provisioning has the following advantages:

- Ensures standardization and enables high degrees of automation with gold images and managed lineage of deployed software.

- Supports change management. With standardized Oracle homes, an administrator has better control of the hosted Oracle software and can easily manage the mass deployment and maintenance of the software through a single location for change management.
- Minimizes downtime during patching and upgrades, eases rollbacks, and makes provisioning for large systems easier and more efficient.
- Reduces the cumulative time to patch software images, since a single Oracle home may be used for many database instances.

See Also: *Oracle Clusterware Administration and Deployment Guide* for information about setting up the Rapid Home Provisioning Server and Client, creating and using gold images for provisioning and patching Oracle Grid Infrastructure and Oracle Database homes.

8.14 Restrictions Using Zero Data Loss Recovery Appliance Release 12.1 Backups

Zero Data Loss Recovery Appliance release 12.1 does not support backups from protected database clients using Oracle Database 12c release 2 (12.2).

Zero Data Loss Recovery Appliance release 12.2 (Recovery Appliance) does support backups from protected release 12.2 database clients.

If you back up your database to Recovery Appliance, then Oracle recommends that you do not not upgrade your database to release 12.2 until your Recovery Appliance is upgraded to release 12.2.

Changes for Earlier Releases of Oracle Database

Review changes in behavior between Oracle Database 11g release 2 (11.2) or Oracle Database 12c release 1 (12.1).

Behavior changes typically require you to make informed decisions to minimize risks that Oracle Database changes can create for in an upgraded Oracle Database. This appendix does not describe all changed behavior and new features in each release of Oracle Database.

See Also:

- *Oracle Database New Features Guide* for a complete list of all new features introduced in this release
 - *Oracle Database Reference* “Changes in this Release” section for a list of new initialization parameters, new static data dictionary views, and new dynamic performance views
 - *Oracle Database Installation Guide* for your operating system for more information about operating system parameter changes
 - Your operating system-specific Oracle documentation for more information about these initialization parameters.
-

Topics:

[Behavior Changes in Oracle Database 12c Release 1 \(12.1\)](#) (page A-1)

Review for descriptions of Oracle Database 12c release 1 (12.1) changes.

[Behavior Changes in Oracle Database 11g Release 2 \(11.2\)](#) (page A-34)

Review for descriptions of Oracle Database 11g Release 2 (11.2) changes.

A.1 Behavior Changes in Oracle Database 12c Release 1 (12.1)

Review for descriptions of Oracle Database 12c release 1 (12.1) changes.

Review these sections to find out about behavior changes in Oracle Database 12c release 1 (12.1), and to obtain information about actions that you can take to prevent problems resulting from these changes.

[Oracle Database Changes](#) (page A-2)

Review these topics to understand changes introduced in Oracle Database 12c release 1 (12.1) that affect Oracle Database operations.

[Oracle Database Security Changes](#) (page A-16)

Oracle Database 12c includes changes to security features in Oracle Database Vault and Oracle Data Guard and other areas.

[Oracle Globalization Support Deprecated or Desupported Features](#) (page A-27)

Oracle Database 12c provides changes to how Oracle supports globalization.

[Oracle Multimedia Deprecated or Desupported Features](#) (page A-27)

In Oracle Database 12c, ORDImage support for Oracle Multimedia DICOM is deprecated.

[Oracle Net Services Deprecated or Desupported Features](#) (page A-27)

Oracle Net Services has deprecated or no longer supports the features, parameters, and commands listed here.

[Oracle Text Deprecated and Desupported Features](#) (page A-29)

Three text indexes are desupported for Oracle Text starting with Oracle Database 12c.

[Oracle XML Database Changes](#) (page A-30)

Oracle XML Database is now installed with Oracle Database. It also has changed features in Oracle Database 12c.

A.1.1 Oracle Database Changes

Review these topics to understand changes introduced in Oracle Database 12c release 1 (12.1) that affect Oracle Database operations.

[Deprecation of Non-CDB Architecture](#) (page A-4)

The non-CDB architecture is deprecated in Oracle Database 12c, and may be desupported and unavailable in a release after Oracle Database 12c Release 2.

[Deprecation of catupgrd.sql Script and Introduction of Parallel Upgrade Utility](#) (page A-4)

In Oracle Database 12c release 1 (12.1), Oracle recommends that you use the Parallel Upgrade Utility (`catctl.pl` instead of `catupgrd.sql` to enable parallel upgrades.

[Error Associated with catupgrd.sql Run Without PARALLEL=NO](#) (page A-4)

If you choose to run the `catupgrd.sql` script instead of running `catctl.pl`, then you now must provide information for an additional input parameter, PARALLEL.

[Desupport of Oracle Enterprise Manager Database Control](#) (page A-5)

Starting with Oracle Database 12c, Oracle Enterprise Manager Database Control is desupported and is no longer available.

[Changes for Deinstallation and Cleanup of Oracle Base](#) (page A-6)

Review these topics to understand deinstallation and Oracle Base cleanup script changes.

[Identifying Deprecated and Desupported Parameters](#) (page A-7)

Use the query described here to locate deprecated and desupported parameters.

[Deprecated Oracle Database Roles](#) (page A-8)

The following Oracle Database roles are deprecated in Oracle Database 12c:

[Deprecated Views](#) (page A-8)

Views listed here are deprecated in Oracle Database 12c.

[Deprecation of Oracle Streams](#) (page A-9)

Oracle Streams is deprecated in Oracle Database 12c and may be desupported and unavailable in a later Oracle Database release.

[Deprecation of Advanced Replication](#) (page A-9)

Oracle Database Advanced Replication is deprecated in Oracle Database 12c.

[Deprecation of Single-Character SRVCTL CLI Options](#) (page A-10)

Starting with Oracle Database 12c, single-character options are deprecated and may be desupported in a later release.

[Desupported Features on Microsoft Windows Platforms](#) (page A-10)

Review these topics to learn which features are deprecated or desupported with Oracle Database 12c for Microsoft Windows.

[Desupport of Oracle Cluster File System \(OCFS\) on Windows](#) (page A-11)

Starting with Oracle Database 12c, Oracle Cluster File System (OCFS) is desupported on Windows. Support and distribution of OCFS on Linux (OCFS and OCFS2) remains unaffected by this desupport notice.

[Desupport for Raw Storage Devices](#) (page A-12)

Starting with Oracle Database 12c release 1 (12.1), block file storage on raw devices is not supported.

[About Upgrading Oracle Database Release 10.2 or 11.1 and OCFS and RAW Devices](#) (page A-12)

If you are upgrading an Oracle Database release 10.2.0.5 or release 11.1.0.7 environment that stores Oracle Clusterware files on OCFS on Windows or RAW devices, then you cannot directly upgrade to Oracle Database 12c release 1 (12.1).

[Desupport of `cluvfy comp cfs` for OCFS](#) (page A-12)

The `cluvfy comp cfs` component verification command option is removed from Oracle Database 12c release 1 (12.1).

[Deprecation of Stored List of Administrative Users for Cluster Administration](#) (page A-12)

Cluster administration is managed differently starting with Oracle Database 12c.

[Deprecation of `-checkpasswd` for QOSCTL Quality of Service \(QoS\) Command](#) (page A-13)

The syntax `qosctl -checkpasswd username password` is deprecated.

[Change to VARCHAR2, NVARCHAR2, and RAW Datatypes](#) (page A-13)

You can increase the `MAX_STRING_SIZE` value for these datatypes to 32767 bytes in Oracle Database 12c release 1 (12.1) and later releases.

[Oracle JDBC and SQLJ Deprecated and Desupported Features](#) (page A-13)

This is a list of features for JDBC, UCP, SQLJ, JPublisher, and Java in the Database (Oracle JVM) that are deprecated or desupported with Oracle Database 12c. The JDBC Javadoc also contains a page for all the deprecated APIs.

[Deprecated Features for Oracle Call Interface](#) (page A-16)

Oracle Call Interface (OCI) features listed here are deprecated in Oracle Database 12c, and may be desupported in a future release

[Changed Default for RESOURCE_LIMIT Parameter](#) (page A-16)

RESOURCE_LIMIT is set to TRUE by default.

A.1.1.1 Deprecation of Non-CDB Architecture

The non-CDB architecture is deprecated in Oracle Database 12c, and may be desupported and unavailable in a release after Oracle Database 12c Release 2.

Oracle recommends use of the CDB architecture.

Note:

There remain a small number of features that do not work with the CDB architecture (see README, section 2.2.1 "Features Restricted or Not Available for a Multitenant Container Database"). If you need these features, then continue to use the non-CDB architecture until your required feature works with the CDB architecture.

A.1.1.2 Deprecation of `catupgrd.sql` Script and Introduction of Parallel Upgrade Utility

In Oracle Database 12c release 1 (12.1), Oracle recommends that you use the Parallel Upgrade Utility (`catctl.pl` instead of `catupgrd.sql` to enable parallel upgrades.

Oracle Database 12c release 1 (12.1) introduces the new Parallel Upgrade Utility, `catctl.pl`. This utility replaces the `catupgrd.sql` script that was used in earlier releases. Although you can still use the `catupgrd.sql` script, it is deprecated starting with Oracle Database 12c. It will be removed in future releases. Oracle recommends that you perform database upgrades by using the new Parallel Upgrade Utility.

Related Topics:

[About the Parallel Upgrade Utility for Oracle Database \(CATCTL.PL and DBUPGRADE\)](#) (page 3-3)

A.1.1.3 Error Associated with `catupgrd.sql` Run Without `PARALLEL=NO`

If you choose to run the `catupgrd.sql` script instead of running `catctl.pl`, then you now must provide information for an additional input parameter, `PARALLEL`.

For example:

```
SQL> catupgrd.sql PARALLEL=NO
```

If you run `catupgrd.sql` without the parameter, then Oracle displays the following error message:

NOTE

The `catupgrd.sql` script is being deprecated in the 12.1 release of

Oracle Database. Customers are encouraged to use `catctl.pl` as the replacement for `catupgrd.sql` when upgrading the database dictionary.

```
cd $ORACLE_HOME/rdbms/admin
$ORACLE_HOME/perl/bin/perl catctl.pl -n 4 catupgrd.sql
```

Refer to the Oracle Database Upgrade Guide for more information.

This database upgrade procedure must be called with the following argument when invoking from the SQL prompt:

```
@catupgrd.sql PARALLEL=NO
```

A.1.1.4 Desupport of Oracle Enterprise Manager Database Control

Starting with Oracle Database 12c, Oracle Enterprise Manager Database Control is desupported and is no longer available.

Oracle introduces Oracle Enterprise Manager Database Express (Oracle EM Express) as a replacement. Oracle EM Express is installed when you upgrade to Oracle Database 12c.

You can carry out a manual configuration of the HTTP port for Oracle EM Express:

1. Look in the `init.ora/spfile` (default setting) for the following string:

```
dispatchers=(PROTOCOL=TCP)(SERVICE=sample_XDB)
```

Check the Oracle EM Express port configuration:

```
SQL> select DBMS_XDB_CONFIG.getHTTPport() from dual;
SQL> select DBMS_XDB_CONFIG.getHTTPSport() from dual;
```

2. Set new ports. For example:

```
SQL> exec DBMS_XDB_CONFIG.setHTTPport(5500);
SQL> exec DBMS_XDB_CONFIG.setHTTPSport(8080);
```

3. Access the Oracle EM Express home page in the browser. For example, using the settings you have provided, check the following path, where *database* is your SID, *hostname* is your fully qualified domain name, and *port* is the port you assigned:

```
http://database-hostname:port/em
```

For example:

```
http://localhost:5500/em
```

4. Repeat this configuration step for the CDB, and for every PDB, using different port numbers.

See Also:

- *Oracle Database Concepts* for an overview of Oracle EM Express
 - *Oracle Database 2 Day DBA* for information about using Oracle EM Express
 - *Oracle Database Concepts* for an introduction to Oracle Enterprise Manager Cloud Control
-
-

A.1.1.5 Changes for Deinstallation and Cleanup of Oracle Base

Review these topics to understand deinstallation and Oracle Base cleanup script changes.

[Change for Standalone Deinstallation Tool](#) (page A-6)

Starting with Oracle Database 12c, the deinstallation standalone utility is replaced with a deinstall option using Oracle Universal Installer (OUI).

[Desupport of CLEANUP_ORACLE_BASE Property](#) (page A-6)

In Oracle Database 12c, the `CLEANUP_ORACLE_BASE` property is removed for response file (silent) deinstalls.

[Deprecation of -cleanupOBase](#) (page A-6)

The `-cleanupOBase` flag of the deinstallation tool is deprecated in Oracle Database 12c Release 1 (12.1).

A.1.1.5.1 Change for Standalone Deinstallation Tool

Starting with Oracle Database 12c, the deinstallation standalone utility is replaced with a deinstall option using Oracle Universal Installer (OUI).

You can also run the deinstallation tool from the base directory of the installation media for Oracle Database, Oracle Database Client, or Oracle Grid Infrastructure.

Run the deinstallation tool by using the `runInstaller` command on Linux and UNIX, or `setup.exe` on Windows, with the `-deinstall` and `-home` options.

See Also:

- *Oracle Database Installation Guide* for your operating system for information about using OUI and `runInstaller`
 - *Oracle Grid Infrastructure Installation Guide* for your operating system
-
-

A.1.1.5.2 Desupport of CLEANUP_ORACLE_BASE Property

In Oracle Database 12c, the `CLEANUP_ORACLE_BASE` property is removed for response file (silent) deinstalls.

It is no longer supported to use `CLEANUP_ORACLE_BASE` to remove an Oracle base during silent or response file mode deinstalls.

A.1.1.5.3 Deprecation of -cleanupOBase

The `-cleanupOBase` flag of the deinstallation tool is deprecated in Oracle Database 12c Release 1 (12.1).

See Also:

Oracle Database Installation Guide for your operating system

A.1.1.6 Identifying Deprecated and Desupported Parameters

Use the query described here to locate deprecated and desupported parameters.

In Oracle Database 12c, some database parameters are deprecated and desupported, or removed.

To obtain a current list of deprecated parameters, run the following query in SQL*Plus:

```
SQL> SELECT name from v$parameter
        WHERE isdeprecated = 'TRUE' ORDER BY name;
```

The query returns a list of the deprecated parameters as of the date and time that you run it. The following example shows the query results that appear:

```
active_instance_count
background_dump_dest
buffer_pool_keep
buffer_pool_recycle
commit_write
cursor_space_for_time
fast_start_io_target
global_context_pool_size
instance_groups
lock_name_space
log_archive_start
max_enabled_roles
parallel_automatic_tuning
parallel_io_cap_enabled
parallel_server
parallel_server_instances
plsql_v2_compatibility
remote_os_authent
resource_manager_cpu_allocation
sec_case_sensitive_logon
serial_reuse
sql_trace
standby_archive_dest
user_dump_dest
```

[SEC_CASE_SENSITIVE_LOGON Initialization Parameter Deprecated](#)
(page A-8)

The SEC_CASE_SENSITIVE_LOGON initialization parameter is deprecated in Oracle Database 12c release 1 (12.1).

[FILE_MAPPING Initialization Parameter Deprecated](#) (page A-8)

The FILE_MAPPING initialization parameter is deprecated. It is still supported for backward compatibility.

[RDBMS_SERVER_DN Initialization Parameter Deprecated](#) (page A-8)

The initialization parameter RDBMS_SERVER_DN is deprecated in Oracle Database release 12.1.0.2.

A.1.1.6.1 SEC_CASE_SENSITIVE_LOGON Initialization Parameter Deprecated

The SEC_CASE_SENSITIVE_LOGON initialization parameter is deprecated in Oracle Database 12c release 1 (12.1).

See Also:

Oracle Database Reference for information about the SEC_CASE_SENSITIVE_LOGON initialization parameter

A.1.1.6.2 FILE_MAPPING Initialization Parameter Deprecated

The FILE_MAPPING initialization parameter is deprecated. It is still supported for backward compatibility.

See Also:

Oracle Database Reference for information about the FILE_MAPPING initialization parameter

A.1.1.6.3 RDBMS_SERVER_DN Initialization Parameter Deprecated

The initialization parameter RDBMS_SERVER_DN is deprecated in Oracle Database release 12.1.0.2.

Use LDAP_DIRECTORY_ACCESS instead of RDBMS_SERVER_DN.

See Also:

Oracle Database Reference for information about this parameter

A.1.1.7 Deprecated Oracle Database Roles

The following Oracle Database roles are deprecated in Oracle Database 12c:

[DELETE_CATALOG_ROLE Deprecated](#) (page A-8)

The DELETE_CATALOG_ROLE database role is deprecated in Oracle Database 12c.

A.1.1.7.1 DELETE_CATALOG_ROLE Deprecated

The DELETE_CATALOG_ROLE database role is deprecated in Oracle Database 12c.

See Also:

Oracle Database Reference for information about this role and dictionary objects

A.1.1.8 Deprecated Views

Views listed here are deprecated in Oracle Database 12c.

The following views are deprecated:

- `ALL_SCHEDULER_CREDENTIALS` view. See *Oracle Database Reference* for more information.
- `DBA_NETWORK_ACL_PRIVILEGES` view. See *Oracle Database Reference* for more information.
- `DBA_NETWORK_ACLS` view. See *Oracle Database Reference* for more information.
- `DBA_SCHEDULER_CREDENTIALS` view. See *Oracle Database Reference* for more information.
- `USER_NETWORK_ACL_PRIVILEGES` view. See *Oracle Database Reference* for more information.
- `USER_SCHEDULER_CREDENTIALS` view. See *Oracle Database Reference* for more information.
- `V$OBJECT_USAGE` view. Use the `USER_OBJECT_USAGE` view instead. See *Oracle Database Reference* for more information.

See Also:

Oracle Database Administrator's Guide for information about specifying Scheduler job credentials

A.1.1.9 Deprecation of Oracle Streams

Oracle Streams is deprecated in Oracle Database 12c and may be desupported and unavailable in a later Oracle Database release.

Use Oracle GoldenGate to replace all replication features of Oracle Streams.

Note:

Oracle Database Advanced Queuing is independent of Oracle Streams, and continues to be enhanced.

See Also:

Oracle GoldenGate documentation for information

A.1.1.10 Deprecation of Advanced Replication

Oracle Database Advanced Replication is deprecated in Oracle Database 12c.

Read-only materialized views are still supported with basic replication.

Use Oracle GoldenGate to replace all features of Advanced Replication. This guidance includes multimaster replication, updateable materialized views, hierarchical materialized views, and deployment templates.

See Also:

Oracle GoldenGate documentation

A.1.1.11 Deprecation of Single-Character SRVCTL CLI Options

Starting with Oracle Database 12c, single-character options are deprecated and may be desupported in a later release.

The Server Control Utility (SRVCTL) command line interface (CLI) supports long GNU-style options in addition to short CLI options used in earlier releases.

See Also:

Oracle Real Application Clusters Administration and Deployment Guide for information about SRVCTL

A.1.1.12 Desupported Features on Microsoft Windows Platforms

Review these topics to learn which features are deprecated or desupported with Oracle Database 12c for Microsoft Windows.

[Desupport of Oracle COM Automation on Windows](#) (page A-10)

Oracle Database 12c does not contain Oracle COM Automation.

[Desupport of Oracle Objects for OLE](#) (page A-10)

Oracle Database 12c does not contain Oracle Objects for OLE.

[Desupport of Oracle Counters for Windows Performance Monitor](#) (page A-11)

Oracle Database 12c does not contain Oracle Counters for Windows Performance Monitor.

[Programming Interface Deprecations for Oracle Data Provider for .NET](#) (page A-11)

Oracle Data Provider for .NET application programming interfaces for Transaction Guard listed here are deprecated in Oracle Database 12c (12.1.0.2), and may be desupported in a future release.

A.1.1.12.1 Desupport of Oracle COM Automation on Windows

Oracle Database 12c does not contain Oracle COM Automation.

This feature was deprecated in Oracle Database 11g, which is the last database release that contains the database component Oracle COM Automation. Oracle recommends that you migrate your Oracle COM applications to current technology, such as the .NET Framework.

See Also:

<https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=1175293.1>

A.1.1.12.2 Desupport of Oracle Objects for OLE

Oracle Database 12c does not contain Oracle Objects for OLE.

Oracle Objects for OLE is deprecated in Oracle Database 11g. You can migrate your code to the OLE DB data access standard and ActiveX Data Objects (ADO), or you can migrate your applications to .NET (or Java or another application architecture) and use another driver.

See Also:

<https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=1175303.1>

A.1.1.12.3 Desupport of Oracle Counters for Windows Performance Monitor

Oracle Database 12c does not contain Oracle Counters for Windows Performance Monitor.

Oracle Counters for Windows Performance Monitor was deprecated in Oracle Database 11g. The counters are not installed by default in earlier releases, and the counters only work on Windows. For monitoring, Oracle recommends that you use Oracle Enterprise Manager Cloud Control.

See Also:

<https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=1175297.1>

A.1.1.12.4 Programming Interface Deprecations for Oracle Data Provider for .NET

Oracle Data Provider for .NET application programming interfaces for Transaction Guard listed here are deprecated in Oracle Database 12c (12.1.0.2), and may be desupported in a future release.

- `OracleLogicalTransactionStatus` class
- `OracleConnection.LogicalTransactionId` property
- `OracleConnection.GetLogicalTransactionStatus` method

A.1.1.13 Desupport of Oracle Cluster File System (OCFS) on Windows

Starting with Oracle Database 12c, Oracle Cluster File System (OCFS) is desupported on Windows. Support and distribution of OCFS on Linux (OCFS and OCFS2) remains unaffected by this desupport notice.

Databases currently using OCFS on Windows to host either the Oracle cluster files (Oracle Cluster Registry and voting files) or database files or both need to have these files migrated off OCFS *before* upgrading to Oracle Database 12c.

See Also:

- *Oracle Automatic Storage Management Administrator's Guide* for information about migrating a database to use Oracle Automatic Storage Management (Oracle ASM)
 - <https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=1392280.1>
-

A.1.1.14 Desupport for Raw Storage Devices

Starting with Oracle Database 12c release 1 (12.1), block file storage on raw devices is not supported.

You must migrate any data files stored on raw devices to Oracle ASM, to a cluster file system, or to a Network File System (NFS).

This desupport guideline also applies to OCR and voting disk files for Oracle Clusterware. You cannot store OCR or voting disk files on raw devices. Before you start the upgrade, you must move Oracle Clusterware files from raw devices to a supported storage option.

A.1.1.15 About Upgrading Oracle Database Release 10.2 or 11.1 and OCFS and RAW Devices

If you are upgrading an Oracle Database release 10.2.0.5 or release 11.1.0.7 environment that stores Oracle Clusterware files on OCFS on Windows or RAW devices, then you cannot directly upgrade to Oracle Database 12c release 1 (12.1).

You must first perform an interim upgrade to Oracle Database release 11.2, and then migrate Oracle Clusterware files to Oracle Automatic Storage Management (Oracle ASM). Then you can upgrade from release 11.2 to Oracle Database 12c release 1 (12.1).

See Also:

- <http://www.oracle.com/technetwork/documentation/index.html> to obtain *Oracle Database Upgrade Guide* for Oracle Database 11g Release 2 (11.2)
 - *Oracle Database Installation Guide* for your operating system for procedures on installing the Oracle Database software
 - *Oracle Automatic Storage Management Administrator's Guide* for information about migrating a database to use Oracle Automatic Storage Management (Oracle ASM)
-
-

A.1.1.16 Desupport of `cluvfy comp cfs` for OCFS

The `cluvfy comp cfs` component verification command option is removed from Oracle Database 12c release 1 (12.1).

The Cluster Verification Utility (`cluvfy`) option `comp cfs` is removed in Oracle Database 12.1, because Oracle Cluster File System (OCFS) is no longer supported.

See Also:

Oracle Clusterware Administration and Deployment Guide for more information about cluster administration

A.1.1.17 Deprecation of Stored List of Administrative Users for Cluster Administration

Cluster administration is managed differently starting with Oracle Database 12c.

Starting with Oracle Database 12c, the method of cluster administration using a stored list of administrative users is being replaced with more comprehensive management of administrative user roles by configuring the access control list of the policy set.

See Also:

Oracle Clusterware Administration and Deployment Guide for more information about cluster administration

A.1.1.18 Deprecation of -checkpasswd for QOSCTL Quality of Service (QoS) Command

The syntax `qosctl -checkpasswd username password` is deprecated.

See Also:

Oracle Database Quality of Service Management User's Guide for information about QOSCTL syntax and commands

A.1.1.19 Change to VARCHAR2, NVARCHAR2, and RAW Datatypes

You can increase the `MAX_STRING_SIZE` value for these datatypes to 32767 bytes in Oracle Database 12c release 1 (12.1) and later releases.

Starting with Oracle Database 12c release 1 (12.1), you can increase the maximum size of the `VARCHAR2`, `NVARCHAR2`, and `RAW` datatypes to 32767 bytes. This size increase is possible if you set the `COMPATIBLE` initialization parameter to 12.0 or higher, and you set the `MAX_STRING_SIZE` initialization parameter to `EXTENDED`. This size increase is available for non-CDB Oracle Database instances, and for PDBs in multitenant architecture.

If you want to make this change, then you must run the `utl32k.sql` script in `UPGRADE` mode. After you run the script, you can set `MAX_STRING_SIZE` to `EXTENDED`.

Caution:

When you increase the `COMPATIBLE` initialization to 12.0 or higher, you cannot reverse this change.

See Also:

Oracle Database SQL Language Reference for more information about `MAX_STRING_SIZE`

A.1.1.20 Oracle JDBC and SQLJ Deprecated and Desupported Features

This is a list of features for JDBC, UCP, SQLJ, JPublisher, and Java in the Database (Oracle JVM) that are deprecated or desupported with Oracle Database 12c. The JDBC Javadoc also contains a page for all the deprecated APIs.

[Deprecation of SQLJ Inside the Server](#) (page A-14)

SQLJ usage inside the database server is deprecated in this release.

[Deprecated Oracle Update Batching](#) (page A-14)

Oracle Update Batching APIs are deprecated in Oracle Database 12c.

[Deprecated EndToEndMetrics-related APIs](#) (page A-15)

EndToEndMetrics -related APIs are deprecated in Oracle Database 12c. Use Universal Connection Pool instead.

[Deprecated Stored Outlines](#) (page A-15)

Stored outlines are deprecated in Oracle Database 12c.

[Deprecated Concrete Classes in oracle.sql Package](#) (page A-15)

The concrete classes in the `oracle.sql` package are deprecated in Oracle Database 12c.

[Deprecated defineColumnType Method](#) (page A-15)

The JDBC method `defineColumnType` is deprecated in Oracle Database 12c Release 1.

[Deprecated CONNECTION_PROPERTY_STREAM_CHUNK_SIZE Property](#) (page A-15)

The JDBC property `CONNECTION_PROPERTY_STREAM_CHUNK_SIZE` is deprecated in this release.

[Desupported Implicit Connection Caching](#) (page A-16)

Implicit Connection Caching is desupported in Oracle Database 12c.

A.1.1.20.1 Deprecation of SQLJ Inside the Server

SQLJ usage inside the database server is deprecated in this release.

The capability of translating and running SQLJ applications inside the database will not be available in later releases. SQLJ can only be used as a client tool to translate the applications that can connect to Oracle Database and run as a client. SQLJ cannot be used inside stored procedures, functions, or triggers.

A.1.1.20.2 Deprecated Oracle Update Batching

Oracle Update Batching APIs are deprecated in Oracle Database 12c.

The following APIs are deprecated and marked deprecated in the JDBC Javadoc:

- `OraclePreparedStatement.setExecuteBatch()`
- `OraclePreparedStatement.getExecuteBatch()`
- `OracleCallableStatement.setExecuteBatch()`

Use Standard Update Batching instead.

See Also:

Oracle Database JDBC Developer's Guide for information on Oracle Update Batching

A.1.1.20.3 Deprecated EndToEndMetrics-related APIs

EndToEndMetrics -related APIs are deprecated in Oracle Database 12c. Use Universal Connection Pool instead.

The following APIs are deprecated and marked deprecated in the JDBC Javadoc:

- `getEndToEndMetrics`
- `getEndToEndECIDSequenceNumber`
- `setEndToEndMetrics`
- `setApplicationContext`
- `clearAllApplicationContext`

See Also:

Oracle Database JDBC Developer's Guide and the JDBC Javadoc for information about Universal Connection Pool

A.1.1.20.4 Deprecated Stored Outlines

Stored outlines are deprecated in Oracle Database 12c.

Use plan baselines instead.

See Also:

Oracle Database SQL Tuning Guide for information about migrating stored outlines to plan baselines

A.1.1.20.5 Deprecated Concrete Classes in oracle.sql Package

The concrete classes in the `oracle.sql` package are deprecated in Oracle Database 12c.

These classes are replaced with new interfaces in the `oracle.jdbc` package.

See Also:

Oracle Database JDBC Developer's Guide for information about the new interfaces for `oracle.jdbc`

A.1.1.20.6 Deprecated defineColumnType Method

The JDBC method `defineColumnType` is deprecated in Oracle Database 12c Release 1.

A.1.1.20.7 Deprecated CONNECTION_PROPERTY_STREAM_CHUNK_SIZE Property

The JDBC property `CONNECTION_PROPERTY_STREAM_CHUNK_SIZE` is deprecated in this release.

A.1.1.20.8 Desupported Implicit Connection Caching

Implicit Connection Caching is desupported in Oracle Database 12c.

Use Universal Connection Pool instead.

See Also:

Oracle Universal Connection Pool for JDBC Developer's Guide for information

A.1.1.21 Deprecated Features for Oracle Call Interface

Oracle Call Interface (OCI) features listed here are deprecated in Oracle Database 12c, and may be desupported in a future release

- OCI deployment parameters in `sqlnet.ora` are deprecated. These include the following parameters:
 - OCI client result cache parameters: `OCI_RESULT_CACHE_MAX_SIZE`, `OCI_RESULT_CACHE_MAX_RSET_SIZE`, and `OCI_RESULT_CACHE_MAX_RSET_ROWS`

A.1.1.22 Changed Default for RESOURCE_LIMIT Parameter

`RESOURCE_LIMIT` is set to `TRUE` by default.

The Oracle Database `RESOURCE_LIMIT` parameter determines if resource limits are enforced in database profiles. In this release, the `RESOURCE_LIMIT` parameter is set to `TRUE` by default. If Oracle resource limits are disabled, then any defined profile limits are ignored. This behavior does not apply to password resources.

Check the `resource_limit` parameter setting by entering the following SQL*Plus command:

```
SQL> select value from v$parameter where name = 'resource_limit';
```

A.1.2 Oracle Database Security Changes

Oracle Database 12c includes changes to security features in Oracle Database Vault and Oracle Data Guard and other areas.

[Oracle Business Intelligence and Data Warehousing Changes](#) (page A-17)

Review this list of changes to business intelligence and data warehousing applications and features for Oracle Database 12c.

[Changes to Security Auditing Features](#) (page A-20)

The full set of auditing features are available automatically in Oracle Database 12c release 1 (12.1) and later releases.

[Deprecated Functions and Parameters in Oracle Label Security](#) (page A-20)

Nine Oracle Label Security features are deprecated in Oracle Database 12c release 1.

[Deprecated DBMS_NETWORK_ACL_ADMIN PL/SQL package Procedures](#) (page A-21)

`DBMS_NETWORK_ACL_ADMIN` PL/SQL package procedures listed here are deprecated in Oracle Database 12c.

[Deprecation of IGNORECASE and SEC_CASE_SENSITIVE_LOGON](#)

(page A-21)

The IGNORECASE argument of ORAPWD and the SEC_CASE_SENSITIVE_LOGON system parameter are deprecated in Oracle Database 12c.

[Deprecation of SQLNET.ALLOWED_LOGON_VERSION Parameter](#)

(page A-22)

The SQLNET.ALLOWED_LOGON_VERSION parameter is deprecated in Oracle Database 12c.

[Upgrading a System that Did Not Have SQLNET.ALLOWED_LOGON_VERSION Parameter Setting](#) (page A-22)

Review the parameter setting for SQLNET.ALLOWED_LOGON_VERSION_SERVER to determine its implications for security and client connections to the upgraded database.

[Deprecation of Windows NTS Authentication Using the NTLM Protocol](#)

(page A-23)

Because of security vulnerabilities, NTLM is deprecated as of Oracle Database 12c.

[Deprecation of Public Key Infrastructure for Transparent Data Encryption](#)

(page A-23)

Public Key Infrastructure (PKI) is deprecated for Transparent Data Encryption (TDE) in Oracle Database 12c.

[Desupported Cipher Suites for Secure Sockets Layer \(SSL\)](#) (page A-24)

Review this list of desupported cipher suites if you use Oracle Advanced Security.

[Desupport of Database Rules Manager \(RUL\) and Expression Filter \(EXF\)](#)

(page A-24)

Starting with Oracle Database 12c release 1, the Expression Filter (EXF) and Database Rules Manager (RUL) features are desupported.

[Oracle Data Guard Broker Deprecated or Desupported Features](#) (page A-24)

Review these deprecations if you use Oracle Data Guard Broker.

[Oracle Data Pump Export Utility Deprecated or Desupported Features](#)

(page A-25)

The XML_CLOBS option of the Oracle Data Pump Export DATA_OPTIONS parameter is deprecated.

[Oracle Database Vault Deprecated or Desupported Features](#) (page A-25)

Starting with Oracle Database 12c, the Oracle Database Vault features and rule sets listed here are deprecated or desupported.

[Oracle Database Semantic Technologies Deprecated or Desupported Features](#)

(page A-26)

Features listed here are deprecated for Oracle Database Semantic Technologies in Oracle Database 12c (12.1):

A.1.2.1 Oracle Business Intelligence and Data Warehousing Changes

Review this list of changes to business intelligence and data warehousing applications and features for Oracle Database 12c.

[Oracle Warehouse Builder \(OWB\) Not Installed with Oracle Database](#)
(page A-18)

Oracle Warehouse Builder must be installed separately.

[Desupport of Change Data Capture](#) (page A-18)

Oracle Change Data Capture is not included in Oracle Database 12c and is replaced with Oracle GoldenGate.

[Desupported Features in Oracle Data Mining](#) (page A-18)

These Oracle Data Mining features are desupported in Oracle Database 12c.

[Desupport of ABN Models for Oracle Data Mining Upgrades](#) (page A-19)

Starting with Oracle Database 12c, Oracle is desupporting the Data Mining Java API and the Adaptive Bayes Network (ABN) algorithm.

[Desupport of OLAP Catalog \(AMD\)](#) (page A-19)

Starting with Oracle Database 12c, the Common Warehouse Metamodel (CWM) standard is desupported for the OLAP catalog (AMD).

A.1.2.1.1 Oracle Warehouse Builder (OWB) Not Installed with Oracle Database

Oracle Warehouse Builder must be installed separately.

Starting with Oracle Database 12c, Oracle Warehouse Builder (OWB) is not installed as part of the software for Oracle Database. An installer for Oracle Warehouse Builder is available on Oracle Technology Network. OWB components that may exist from earlier releases are not upgraded as part of the Oracle Database upgrade process.

A.1.2.1.2 Desupport of Change Data Capture

Oracle Change Data Capture is not included in Oracle Database 12c and is replaced with Oracle GoldenGate.

See Also:

Oracle GoldenGate documentation for information

A.1.2.1.3 Desupported Features in Oracle Data Mining

These Oracle Data Mining features are desupported in Oracle Database 12c.

- The Oracle Data Mining Java API is no longer available. The programmatic interfaces to Oracle Data Mining 12c consist of two PL/SQL packages, `DBMS_DATA_MINING` and `DBMS_DATA_MINING_TRANSFORM`, and a family of SQL language functions for scoring data.

See Also:

Oracle Data Mining User's Guide for information about the Data Mining PL/SQL packages

- The Adaptive Bayes Network (ABN) algorithm is no longer available. The Decision Tree algorithm replaces ABN in Oracle Data Mining 12c.

See Also:

Oracle Data Mining Concepts for information about the Decision Tree algorithm

A.1.2.1.4 Desupport of ABN Models for Oracle Data Mining Upgrades

Starting with Oracle Database 12c, Oracle is desupporting the Data Mining Java API and the Adaptive Bayes Network (ABN) algorithm.

Because Oracle is desupporting these features, you cannot upgrade models created by the Oracle Data Mining Java API from Oracle Database release 11g to Oracle Database 12c. All other models and metadata are upgraded automatically during the upgrade from Oracle Database 11g to Oracle Database 12c. ABN models can be upgraded, but you cannot use them in an Oracle Database 12c database. You must drop ABN models either before the upgrade or afterward. You can replace ABN models by building new classification models in the Oracle Database 12c database.

See Also:

Oracle Data Mining User's Guide for information about the Data Mining API and data mining models

A.1.2.1.5 Desupport of OLAP Catalog (AMD)

Starting with Oracle Database 12c, the Common Warehouse Metamodel (CWM) standard is desupported for the OLAP catalog (AMD).

CWM standard support was deprecated in Oracle Database 11g Release 2 (11.2). If your existing database has CWM metadata in the OLAP catalog, and you upgrade to Oracle Database 12c, then the upgraded database has the AMD component. If the database you upgrade does not have the AMD component, then the upgraded Oracle Database 12c database also does not have the AMD component, because new installations for Oracle Database 12c do not include AMD. If your database has the AMD component, and you want to remove it, then run the `catnoamd.sql` script that is located in the path `ORACLE_HOME/olap/admin/catnoamd.sql`. You may run this script either before or after you complete your upgrade.

Note:

If the OLAP catalog exists in the database you are upgrading, you may see `AMD OLAP Catalog OPTION OFF` and invalid CWM OLAP objects. You can safely ignore the invalid OLAP objects as they are not needed.

See Also:

- *Oracle OLAP Java API Developer's Guide* for information about OLAP Java API metadata
 - *Oracle OLAP User's Guide* for more information on the OLAP option of Oracle Database and online analytic processing
-

A.1.2.2 Changes to Security Auditing Features

The full set of auditing features are available automatically in Oracle Database 12c release 1 (12.1) and later releases.

The auditing functionality is redesigned in Oracle Database 12c. When you create a new database with Oracle Database 12c, the full set of auditing enhancement features are automatically available. If you upgrade from an earlier release, then you are given the option of using some of the new audit features and the audit functionality from the release from which you upgraded. Oracle strongly recommends that you migrate to the full set of the latest audit features.

See Also:

Oracle Database Security Guide for information about new auditing features and changes for security

A.1.2.3 Deprecated Functions and Parameters in Oracle Label Security

Nine Oracle Label Security features are deprecated in Oracle Database 12c release 1.

The Oracle Label Security features listed here are deprecated in Oracle Database 12c release 1. They can be desupported in a future release. Oracle recommends that you use the alternative features listed here.

- LEAST_UBOUND. Use OLS_GREATEST_LBOUND instead.
- LUBD. Use OLS_GLBD instead.
- DOMINATES. Use OLS_DOMINATES instead.
- DOM. Use OLS_STRICTLY_DOMINATES instead.
- STRICTLY_DOMINATES. Use OLS_STRICTLY_DOMINATES instead.
- S_DOM. Use OLS_STRICTLY_DOMINATES instead.
- DOMINATED_BY. Use OLS_DOMINATED_BY instead.
- DOM_BY. Use OLS_DOMINATED_BY instead.
- STRICTLY_DOMINATED_BY. Use OLS_STRICTLY_DOMINATED_BY instead.
- S_DOM_BY. Use OLS_STRICTLY_DOMINATED_BY instead.

See Also:

- *Oracle Label Security Administrator's Guide* for information about finding greatest lower bound with GREATEST_LBOUND
 - *Oracle Label Security Administrator's Guide* for information about OLS_GLBD
 - *Oracle Label Security Administrator's Guide* for information about the OLS_DOMINATES standalone function
 - *Oracle Label Security Administrator's Guide* for information about OLS_STRICTLY_DOMINATES standalone function
 - *Oracle Label Security Administrator's Guide* for information about OLS_DOMINATED_BY standalone function
 - *Oracle Label Security Administrator's Guide* for information about OLS_STRICTLY_DOMINATED_BY standalone function
-
-

A.1.2.4 Deprecated DBMS_NETWORK_ACL_ADMIN PL/SQL package Procedures

DBMS_NETWORK_ACL_ADMIN PL/SQL package procedures listed here are deprecated in Oracle Database 12c.

- CREATE_ACL
- ADD_PRIVILEGE
- DELETE_PRIVILEGE
- ASSIGN_ACL
- UNASSIGN_ACL
- DROP_ACL
- ASSIGN_WALLET_ACL
- UNASSIGN_WALLET_ACL
- CHECK_PRIVILEGE
- CHECK_PRIVILEGE_ACLID

See Also:

Oracle Database Security Guide for information about managing fine-grained access in PL/SQL Packages and Types

A.1.2.5 Deprecation of IGNORECASE and SEC_CASE_SENSITIVE_LOGON

The IGNORECASE argument of ORAPWD and the SEC_CASE_SENSITIVE_LOGON system parameter are deprecated in Oracle Database 12c.

By default, passwords in Oracle Database 12c are case-sensitive.

See Also:

Oracle Database Security Guide for more information about configuring authentication and password protection

A.1.2.6 Deprecation of SQLNET.ALLOWED_LOGON_VERSION Parameter

The `SQLNET.ALLOWED_LOGON_VERSION` parameter is deprecated in Oracle Database 12c.

`SQLNET.ALLOWED_LOGON_VERSION` is replaced with two new Oracle Net Services parameters:

- `SQLNET.ALLOWED_LOGON_VERSION_SERVER`
- `SQLNET.ALLOWED_LOGON_VERSION_CLIENT`

See Also:

Oracle Database Net Services Reference for information about `SQLNET.ALLOWED_LOGON_VERSION_SERVER`

Oracle Database Net Services Reference for information about `SQLNET.ALLOWED_LOGON_VERSION_CLIENT`

Oracle Database Security Guide for information about this deprecation

Related Topics:

[Upgrading a System that Did Not Have SQLNET.ALLOWED_LOGON_VERSION Parameter Setting](#) (page A-22)

Review the parameter setting for `SQLNET.ALLOWED_LOGON_VERSION_SERVER` to determine its implications for security and client connections to the upgraded database.

[Check for the SQLNET.ALLOWED_LOGON_VERSION Parameter Behavior](#) (page 4-14)

Connections to Oracle Database from clients earlier than release 10g fail with the error ORA-28040: No matching authentication protocol.

A.1.2.7 Upgrading a System that Did Not Have SQLNET.ALLOWED_LOGON_VERSION Parameter Setting

Review the parameter setting for `SQLNET.ALLOWED_LOGON_VERSION_SERVER` to determine its implications for security and client connections to the upgraded database.

If you are upgrading a system that did not have a `SQLNET.ALLOWED_LOGON_VERSION` parameter setting (that is, it was using the default SQLNet setting 8), then the new default value for the login verifier is set to 11, which sets the 11g password verifier (11G) in Oracle Database 12c. This value permits Oracle Database 10g and 11g clients to connect to the database, as well as Oracle Database 12c clients.

If you do not provide a parameter setting for `SQLNET.ALLOWED_LOGON_VERSION_SERVER` (or the deprecated

SQLNET.ALLOWED_LOGON_VERSION) in the upgraded Oracle Database 12c server, then the new Oracle Database 12c default is 11. This setting enables connections from clients using releases earlier than Oracle Database release 11.2.0.3 that have not applied critical patch update CPU Oct 2012, or later patches, and that must use the 10g verifier (10G) to connect.

The higher the setting, the more restrictive the use of verifiers. A setting of 8 permits the most verifiers (that is, the 10G, 11G, and 12C verifiers are all permitted with this setting); a setting of 12a only permits the 12C verifier. For greater security, consider setting SQLNET.ALLOWED_LOGON_VERSION_SERVER to 12a. A setting of 12 permits both the 11G and 12C verifier to be used for authentication.

See Also:

Oracle Database Readme for the topic "Protection Against Password-Guessing Attacks"

Oracle Database Net Services Reference for information about SQLNET.ALLOWED_LOGON_VERSION_SERVER

Oracle Database Security Guide for additional information about verifier settings and client access

A.1.2.8 Deprecation of Windows NTS Authentication Using the NTLM Protocol

Because of security vulnerabilities, NTLM is deprecated as of Oracle Database 12c.

Windows users can no longer authenticate using the NTS adaptor on Windows clients and servers that require the NT Lan Manager (NTLM) protocol. Windows users can still use Kerberos. NTLM is still used for local user authentication, and in cases in which the database service runs as a local user.

A new client side `sqlnet.ora` boolean parameter `NO_NTLM` (defaulting to false) allows you to control when NTLM is used in NTS authentication. When you set `NO_NTLM` to true, this parameter value prevents NTLM from being used in Windows NTS authentication.

See Also:

Oracle Database Platform Guide for Microsoft Windows for information on changes that affect the Windows platform in this release

A.1.2.9 Deprecation of Public Key Infrastructure for Transparent Data Encryption

Public Key Infrastructure (PKI) is deprecated for Transparent Data Encryption (TDE) in Oracle Database 12c.

To configure TDE, use the ADMINISTER KEY MANAGEMENT SQL statement. Other implementations of PKI are not affected.

See Also:

Oracle Database Advanced Security Administrator's Guide for information about configuring TDE

A.1.2.10 Desupported Cipher Suites for Secure Sockets Layer (SSL)

Review this list of desupported cipher suites if you use Oracle Advanced Security.

Oracle Advanced Security has desupported the following cipher suites in Oracle Database 12c:

- SSL_DH_anon_WITH_DES_CBC_SHA
- SSL_RSA_EXPORT_WITH_DES40_CBC_SHA
- SSL_RSA_EXPORT_WITH_RC4_40_MD5
- SSL_RSA_WITH_DES_CBC_SHA

See Also:

Oracle Database Security Guide for information about supported SSL cipher suites

A.1.2.11 Desupport of Database Rules Manager (RUL) and Expression Filter (EXF)

Starting with Oracle Database 12c release 1, the Expression Filter (EXF) and Database Rules Manager (RUL) features are desupported.

If you are using Rules Manager, then Oracle recommends that you migrate to Oracle Business Rules, which is a component of Oracle Fusion Middleware. The Continuous Query Notification feature of Oracle Database replaces Expression Filter.

This script is executed by the upgrade process. To remove these components before upgrading, run the `catnoexf.sql` script before the upgrade. The `catnoexf.sql` script is located under `ORACLE_HOME/rdbms/admin/`.

See Also:

<https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=1244535.1>

A.1.2.12 Oracle Data Guard Broker Deprecated or Desupported Features

Review these deprecations if you use Oracle Data Guard Broker.

As part of Oracle Data Guard Broker's support for Separation of Duty features, the following broker properties are deprecated in Oracle Database 12c :

- LsbyASkipCfgPr
- LsbyASkipErrorCfgPr
- LsbyASkipTxnCfgPr
- LsbyDSkipCfgPr
- LsbyDSkipErrorCfgPr
- LsbyDSkipTxnCfgPr
- LsbySkipTable

- `LsbySkipTxnTable`

There are no replacements.

A.1.2.13 Oracle Data Pump Export Utility Deprecated or Desupported Features

The `XML_CLOBS` option of the Oracle Data Pump Export `DATA_OPTIONS` parameter is deprecated.

See Also:

Oracle Database Utilities for information about the Export `DATA_OPTIONS` parameter

A.1.2.14 Oracle Database Vault Deprecated or Desupported Features

Starting with Oracle Database 12c, the Oracle Database Vault features and rule sets listed here are deprecated or desupported.

Starting with Oracle Database 12c, the Database Vault Configuration Assistant (DVCA) and Database Vault Administrator (DVA) are being deprecated. Use Oracle Enterprise Manager Cloud Control for Oracle Database Vault configuration and administration.

[Deprecated Default Rule Sets for Oracle Database Vault](#) (page A-25)

Rule sets listed here are deprecated with Oracle Database 12c Release 1.

[Deprecated Default Realms for Oracle Database Vault](#) (page A-25)

The Oracle Data Dictionary realm and Oracle Enterprise Manager realm are deprecated in this release.

[Deprecated API for Oracle Database Vault](#) (page A-26)

The `DVSYSD.BMS_MACADM.SYNC_RULES` procedure is deprecated, because its functionality is built into the rule creation functionality.

A.1.2.14.1 Deprecated Default Rule Sets for Oracle Database Vault

Rule sets listed here are deprecated with Oracle Database 12c Release 1.

The following rule sets are deprecated in this release:

- Allow Oracle Data Pump Operation rule set
- Allow Scheduler Job rule set

See Also:

Oracle Database Vault Administrator's Guide for information about default rule sets

A.1.2.14.2 Deprecated Default Realms for Oracle Database Vault

The Oracle Data Dictionary realm and Oracle Enterprise Manager realm are deprecated in this release.

The objects formerly protected by the Oracle Data Dictionary realm have been migrated to new realms.

See Also:

Oracle Database Vault Administrator's Guide for information about new realms and default realms

A.1.2.14.3 Deprecated API for Oracle Database Vault

The `DVSYS.DBMS_MACADM.SYNC_RULES` procedure is deprecated, because its functionality is built into the rule creation functionality.

See Also:

Oracle Database Vault Administrator's Guide for information on rule creation

A.1.2.15 Oracle Database Semantic Technologies Deprecated or Desupported Features

Features listed here are deprecated for Oracle Database Semantic Technologies in Oracle Database 12c (12.1):

[VPD Support in Oracle Database Semantic Technologies](#) (page A-26)

Transition existing Semantic Technologies applications that depend on Virtual Private Database (VPD) to use Oracle Label Security (OLS) instead.

[Version-Enabled Models Support In Oracle Database Semantic Technologies](#) (page A-26)

The specific alternative to using Workspace Manager with semantic data depends on the purpose of the application.

A.1.2.15.1 VPD Support in Oracle Database Semantic Technologies

Transition existing Semantic Technologies applications that depend on Virtual Private Database (VPD) to use Oracle Label Security (OLS) instead.

See Also:

Oracle Database Semantic Technologies Developer's Guide for information about fine-grained access control for RDF data

A.1.2.15.2 Version-Enabled Models Support In Oracle Database Semantic Technologies

The specific alternative to using Workspace Manager with semantic data depends on the purpose of the application.

See Also:

Oracle Database Semantic Technologies Developer's Guide for information about Workspace Manager support for RDF data

<https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=1468273.1> for more information about use cases and recommended alternatives

A.1.3 Oracle Globalization Support Deprecated or Desupported Features

Oracle Database 12c provides changes to how Oracle supports globalization.

[Desupport of CSSCAN and CSALTER for Oracle Globalization](#) (page A-27)

Oracle Database 12c includes Oracle Database Migration Assistant for Unicode (DMU), and Oracle is desupporting the legacy database tools CSSCAN and CSALTER.

A.1.3.1 Desupport of CSSCAN and CSALTER for Oracle Globalization

Oracle Database 12c includes Oracle Database Migration Assistant for Unicode (DMU), and Oracle is desupporting the legacy database tools CSSCAN and CSALTER.

DMU provides a complete end-to-end Unicode migration solution for database administrators. Starting with Oracle Database 12c, DMU is included with Oracle Database. The CSSCAN and CSALTER tools are no longer included or supported.

A.1.4 Oracle Multimedia Deprecated or Desupported Features

In Oracle Database 12c, ORDIImage support for Oracle Multimedia DICOM is deprecated.

See Also:

Oracle Multimedia Reference for information about ORDIImage

A.1.5 Oracle Net Services Deprecated or Desupported Features

Oracle Net Services has deprecated or no longer supports the features, parameters, and commands listed here.

[Desupport of Oracle Net Connection Pooling](#) (page A-28)

In Oracle Database 12c, Oracle Net connection pooling is no longer supported.

[Desupport of Oracle Names](#) (page A-28)

Oracle Names was desupported as a naming method in Oracle Database 11g. You must migrate to directory naming.

[Desupport of Oracle Net Listener Password](#) (page A-28)

In Oracle Database 12c, the Oracle Net Listener password feature is no longer supported.

[Desupport of SQLNET.KERBEROS5_CONF_MIT Parameter for Oracle Net Services](#) (page A-28)

The `SQLNET.KERBEROS5_CONF_MIT` networking parameter is no longer needed and is not supported in `sqlnet.ora`.

[Desupport of Oracle Names Control Utility for Oracle Net Services](#) (page A-29)

The Oracle Names Control Utility is desupported. Starting with Oracle Database 10g, it is not available.

[Deprecated NT LAN Manager \(NTLM\) Protocol for Oracle Net Services](#)
(page A-29)

The NT LAN Manager (NTLM) protocol for domain authentication is deprecated in the Oracle Windows adapter.

A.1.5.1 Desupport of Oracle Net Connection Pooling

In Oracle Database 12c, Oracle Net connection pooling is no longer supported.

Oracle Net connection pooling was deprecated in Oracle Database 11g. This deprecation included the DISPATCHERS attributes TICKS, SESSIONS, and CONNECTIONS.

See Also:

Oracle Database Net Services Administrator's Guide for information about configuring dispatchers

Oracle Database Net Services Administrator's Guide for information about Oracle Connection Manager Parameters (cman.ora)

A.1.5.2 Desupport of Oracle Names

Oracle Names was desupported as a naming method in Oracle Database 11g. You must migrate to directory naming.

See Also:

Oracle Database Net Services Administrator's Guide for additional information about migrating to directory naming

A.1.5.3 Desupport of Oracle Net Listener Password

In Oracle Database 12c, the Oracle Net Listener password feature is no longer supported.

This change does not cause a loss of security, because Oracle Database enforces authentication through local operating system authentication.

See Also:

Oracle Database Net Services Reference for more information about Oracle Net Listener security

A.1.5.4 Desupport of SQLNET.KERBEROS5_CONF_MIT Parameter for Oracle Net Services

The SQLNET.KERBEROS5_CONF_MIT networking parameter is no longer needed and is not supported in sqlnet.ora.

By default, the value of SQLNET.KERBEROS5_CONF_MIT is set to FALSE. This parameter setting has no affect on the Kerberos configuration. In previous releases, when SQLNET.KERBEROS5_CONF_MIT is set to TRUE, the parameter set parsing in a format as specified by MIT Kerberos 5. However, this parameter setting is no

longer required. Starting with Oracle Database 12c, only MIT Kerberos 5 configuration is supported.

See Also:

Oracle Database Net Services Reference for information about Kerberos parameters for the `sqlnet.ora` file

A.1.5.5 Desupport of Oracle Names Control Utility for Oracle Net Services

The Oracle Names Control Utility is desupported. Starting with Oracle Database 10g, it is not available.

Desupport of the Oracle Names Control Utility includes desupporting all the related control utility commands. Oracle Database clients cannot use a Names Server to resolve connect strings. Migrate your applications to Oracle Internet Directory with LDAP directory naming.

See Also:

Oracle Database Net Services Reference for information about configuring the directory naming method

A.1.5.6 Deprecated NT LAN Manager (NTLM) Protocol for Oracle Net Services

The NT LAN Manager (NTLM) protocol for domain authentication is deprecated in the Oracle Windows adapter.

Only Kerberos authentication is used for the NTS adapter.

See Also:

Oracle Database Net Services Reference for information on Kerberos parameters for the `sqlnet.ora` file

A.1.6 Oracle Text Deprecated and Desupported Features

Three text indexes are desupported for Oracle Text starting with Oracle Database 12c.

[Desupport of CTXXPATH in Oracle Text and Oracle XML DB](#) (page A-30)

The CTXSYS.CTXXPATH index is desupported, starting with Oracle Database 12c release 1 (12.1).

[Desupport of ALTER INDEX OPTIMIZE for Text Indexes](#) (page A-30)

The ALTER INDEX OPTIMIZE [token index_token | fast | full [maxtime (time | unlimited)]] operation is not supported for Oracle Database 12c.

[Desupport of SYNC \[MEMORY memsize\] for Text Indexes](#) (page A-30)

The SYNC [MEMORY memsize] operation is not supported for Oracle Database 12c

A.1.6.1 Desupport of CTXXPATH in Oracle Text and Oracle XML DB

The CTXSYS.CTXXPATH index is desupported, starting with Oracle Database 12c release 1 (12.1).

The desupport of CTXSYS.CTXXPATH does not affect CTXCAT. Use XMLIndex indexes instead.

See Also:

Oracle XML DB Developer's Guide for more information about XMLIndex

A.1.6.2 Desupport of ALTER INDEX OPTIMIZE for Text Indexes

The ALTER INDEX OPTIMIZE [token index_token | fast | full [maxtime (time | unlimited)]] operation is not supported for Oracle Database 12c.

To optimize your index, use CTX_DDL.OPTIMIZE_INDEX.

See Also:

Oracle Text Reference for information about OPTIMIZE_INDEX

A.1.6.3 Desupport of SYNC [MEMORY memsize] for Text Indexes

The SYNC [MEMORY memsize] operation is not supported for Oracle Database 12c

. To synchronize your index, use CTX_DDL.SYNC_INDEX.

See Also:

Oracle Text Reference for information about SYNC_INDEX

A.1.7 Oracle XML Database Changes

Oracle XML Database is now installed with Oracle Database. It also has changed features in Oracle Database 12c.

[Oracle XML DB is Mandatory and Cannot Be Uninstalled](#) (page A-30)

Starting with Oracle Database 12c, Oracle XML DB is a mandatory component of Oracle Database.

[Deprecated Features for Oracle XML Database](#) (page A-31)

These features are deprecated in Oracle Database 12c Release 1, and may be desupported in a future release.

A.1.7.1 Oracle XML DB is Mandatory and Cannot Be Uninstalled

Starting with Oracle Database 12c, Oracle XML DB is a mandatory component of Oracle Database.

You cannot uninstall Oracle XML DB, and there is no option to exclude it when you create an Oracle Database. Oracle XML DB is automatically installed or upgraded when you upgrade an existing Oracle Database to Oracle Database 12c.

See Also:*Oracle XML DB Developer's Guide*

A.1.7.2 Deprecated Features for Oracle XML Database

These features are deprecated in Oracle Database 12c Release 1, and may be desupported in a future release.

- CLOB storage of `XMLType`, also known as unstructured storage, is deprecated. Use binary XML storage of `XMLType` instead.

To preserve whitespace in an XML file, store two copies of your original XML document. Use one file as an `XMLType` instance for database use and XML processing, and use the other file as a CLOB instance to provide document fidelity.

- Creating an `XMLIndex` index over an XML fragment stored as a CLOB instance embedded in object-relational `XMLType` data is deprecated. If you must index the data in such a fragment, then store the document using binary XML storage, instead of object-relational storage.
- The following PL/SQL subprograms in package `DBMS_XMLSCHEMA` are deprecated:

- `generateSchema`
- `generateSchemas`

There are no replacements for these constructs, and there is no workaround for this change.

- PL/SQL package `DBMS_XDB_CONFIG` is new. All Oracle XML((nbsp))DB configuration functions, procedures, and constants are moved from package `DBMS_XDB` to `DBMS_XDB_CONFIG`. These functions, procedures and constants are now deprecated for package `DBMS_XDB`. Use them in package `DBMS_XDB_CONFIG` instead.

The following is a list of subprograms deprecated in package `DBMS_XDB`:

- `ADDHTTPEXPIREMAPPING`
- `ADDMIMEMAPPING`
- `ADDSCHEMALOCMAPPING`
- `ADDSERVLET`
- `ADDSERVLETMAPPING`
- `ADDSERVLETSECMAPPING`
- `ADDXMLEXTENSION`
- `CFG_GET`
- `CFG_REFRESH`
- `CFG_UPDATE`

- DELETEHTTPEXPIREMAPPING
- DELETEDMEMAPPING
- DELETESCHEMALOCMAPPING
- DELETESERVLET
- DELETESERVLETMAPPING
- DELETESERVLETSECROLE
- DELETXMLEXTENSION
- GETFTPSPORT
- GETHTTPSPORT
- GETLISTENERENDPOINT
- SETFTPSPORT
- SETHTTPSPORT
- SETLISTENERENDPOINT
- SETLISTENERLOCALACCESS

The following is a list of constants that are deprecated in package DBMS_XDB:

- XDB_ENDPOINT_HTTP
- XDB_ENDPOINT_HTTP2
- XDB_PROTOCOL_TCP
- XDB_PROTOCOL_TCPS

See Also:

Oracle Database PL/SQL Packages and Types Reference, Chapter "DBMS_XDB_CONFIG"

- All Oracle SQL functions for updating XML data are deprecated. Use XQuery Update instead for these functions . The following is a list of deprecated XML updating functions:
 - updateXML
 - insertChildXML
 - insertChildXMLbefore
 - insertChildXMLafter
 - insertXMLbefore
 - insertXMLafter
 - appendChildXML

- deleteXML

See Also:

Oracle XML DB Developer's Guide for the appendix that describes Oracle SQL functions for updating XML data that are deprecated and recommendations for replacements

- Oracle SQL function `sys_xmlgen` is deprecated. Use the SQL/XML generation functions instead.

See Also:

Oracle XML DB Developer's Guide for information about SQL functions that you can use to construct XML data

- The following Oracle XQuery functions are deprecated. Use the corresponding standard XQuery functions instead, that is, the functions with the same names but with namespace prefix `fn`.

- `ora:matches` – use `fn:matches` instead
- `ora:replace` – use `fn:replace` instead

- The following Oracle constructs that provide support for XML translations are deprecated.

- PL/SQL package `DBMS_XMLTRANSLATIONS`
- Oracle XPath function `ora:translate`
- XML Schema annotations `xdb:maxOccurs`, `xdb:srcLang`, and `xdb:translate`

There are no replacements for these constructs, and there is no workaround for this change.

See Also:

Oracle XML DB Developer's Guide for more information

- The following XML Schema annotations are deprecated:

- `xdb:defaultTableSchema`
- `xdb:maintainOrder`
- `xdb:mapUnboundedStringToLob`
- `xdb:maxOccurs`
- `xdb:SQLCollSchema`
- `xdb:SQLSchema`
- `xdb:srcLang`

- `xdb:storeVarrayAsTable`
- `xdb:translate`

There are no replacements for these constructs, and there is no workaround for this change.

- The value `xml_clobs` for export parameter `data_options` is deprecated starting with Oracle Database 12c.

See Also:

Oracle XML DB Developer's Guide for information about exporting and importing XMLType Tables

See Also:

Oracle XML DB Developer's Guide for a complete list of changes in this release, and more information about changes

A.2 Behavior Changes in Oracle Database 11g Release 2 (11.2)

Review for descriptions of Oracle Database 11g Release 2 (11.2) changes.

Oracle Database 11g Release 2 (11.2) introduces new features and changes that affect compatibility and interoperability, and may affect upgrades.

[Deprecation of Oracle Net Listener SNMP Support in Oracle Database 11g Release 2 \(11.2\)](#) (page A-35)

Oracle has deprecated SNMP support in Oracle Net Listener in Oracle Database release 11.2.0.3.

[Changes to PL/SQL Procedures in Oracle Database 11g Release 2 \(11.2\)](#) (page A-35)

In Oracle Database 11g Release 2 (11.2), PL/SQL procedures listed here are moved from package `DBMS_XDB` to package `DBMS_XDB_ADMIN`.

[JOB_QUEUE_PROCESSES Parameter and Scheduling Jobs in Oracle Database 11g Release 2 \(11.2\)](#) (page A-36)

`JOB_QUEUE_PROCESSOR` settings now affect `DBMS_SCHEDULER`.

[Deprecated XML DB Constructs in Oracle Database 11g Release 2 \(11.2\)](#) (page A-36)

XML DB constructs listed here are deprecated in release 11.2.0.3:

[CURSOR_SHARING=SIMILAR Deprecated in Oracle Database 11g Release 2 \(11.2\)](#) (page A-37)

The `CURSOR_SHARING=SIMILAR` parameter is deprecated in Oracle Database release 11.2.0.3. Use adaptive cursor sharing instead.

[Planned Desupport of Change Data Capture in Oracle Database 11g Release 2 \(11.2\)](#) (page A-37)

Oracle Change Data Capture is being replaced with Oracle GoldenGate.

[Deprecation of Data Mining Java API in Oracle Database 11g Release 2 \(11.2\)](#)
(page A-37)

Starting with release 11.2.0.3 of Oracle Database, the Data Mining Java API is deprecated.

[Identifying Initialization Parameters Deprecated in Oracle Database 11g Release 2 \(11.2\)](#) (page A-37)

Use the query described here to locate deprecated parameters.

[Initialization Parameters Deprecated in Oracle Database 11g Release 2 \(11.2\)](#)
(page A-37)

Review this topic to find parameters deprecated in Oracle Database 11g release 2 (11.2).

[Initialization Parameters Desupported in Oracle Database 11g Release 2 \(11.2\)](#)
(page A-38)

Review this topic to find parameters desupported in Oracle Database 11g release 2(11.2).

[Static Data Dictionary Views Deprecated in Oracle Database 11g Release 2 \(11.2\)](#)
(page A-38)

The static data dictionary views listed here are deprecated in Oracle Database 11g Release 2 (11.2).

[Dynamic Performance Views Deprecated in Oracle Database 11g Release 2 \(11.2\)](#)
(page A-38)

The V\$FLASH_RECOVERY_AREA_USAGE dynamic performance view is deprecated in Oracle Database 11g Release 2 (11.2).

[Deprecated Features in Oracle Database 11g Release 2 \(11.2\)](#) (page A-38)

Deprecated features listed here are supported in Oracle Database 11g Release 2 (11.2) for backward compatibility. Oracle recommends that you migrate from deprecated features to recommended alternatives.

[Changes to LOG_ARCHIVE_DEST_n Parameters in Oracle Database 11g Release 2 \(11.2\)](#) (page A-39)

Supported destinations are raised from 10 to 31.

A.2.1 Deprecation of Oracle Net Listener SNMP Support in Oracle Database 11g Release 2 (11.2)

Oracle has deprecated SNMP support in Oracle Net Listener in Oracle Database release 11.2.0.3.

Oracle recommends that you do not use SNMP in new implementations.

See Also:

<https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&id=1341834.1>, "Planned end of support for SNMP in Oracle Net Listener"

A.2.2 Changes to PL/SQL Procedures in Oracle Database 11g Release 2 (11.2)

In Oracle Database 11g Release 2 (11.2), PL/SQL procedures listed here are moved from package DBMS_XDB to package DBMS_XDB_ADMIN.

The procedures moved to DBMS_XDB_ADMIN include:

- `moveXDB_tablespace`
- `rebuildHierarchicalIndex`

See Also:

Oracle Database PL/SQL Packages and Types Reference

A.2.3 JOB_QUEUE_PROCESSES Parameter and Scheduling Jobs in Oracle Database 11g Release 2 (11.2)

JOB_QUEUE_PROCESSOR settings now affect DBMS_SCHEDULER.

Starting with Oracle Database 11g Release 2 (11.2), setting JOB_QUEUE_PROCESSES to 0 causes both DBMS_SCHEDULER and DBMS_JOB jobs to not run. Previously, setting JOB_QUEUE_PROCESSES to 0 caused DBMS_JOB jobs to not run, but DBMS_SCHEDULER jobs were unaffected and would still run. The default value is 1000.

Oracle Database overrides the job queue setting to disable scheduler jobs during upgrade mode. Therefore, you can ignore this setting when upgrading Oracle Database. When the database is opened under UPGRADE mode, Oracle internally enforces that no jobs can be run (under DBMS_JOB or DBMS_SCHEDULER). It does not matter what JOB_QUEUE_PROCESSES is set to in UPGRADE mode.

See Also:

Oracle Database Reference for more information on this parameter

A.2.4 Deprecated XML DB Constructs in Oracle Database 11g Release 2 (11.2)

XML DB constructs listed here are deprecated in release 11.2.0.3:

- PL/SQL procedure `DBMS_XDB_ADMIN.createRepositoryXMLIndex`
- PL/SQL procedure `DBMS_XDB_ADMIN.XMLIndexAddPath`
- PL/SQL procedure `DBMS_XDB_ADMIN.XMLIndexRemovePath`
- PL/SQL procedure `DBMS_XDB_ADMIN.dropRepositoryXMLIndex`
- XML schema annotation (attribute) `csx:encodingType`
- `XMLIndex` index on CLOB portions of hybrid XMLType storage (this is CLOB data that is embedded within object-relational storage)

See Also:

Oracle XML DB Developer's Guide

A.2.5 CURSOR_SHARING=SIMILAR Deprecated in Oracle Database 11g Release 2 (11.2)

The CURSOR_SHARING=SIMILAR parameter is deprecated in Oracle Database release 11.2.0.3. Use adaptive cursor sharing instead.

See Also:

Oracle Database SQL Tuning Guide for information about adaptive cursor sharing

A.2.6 Planned Desupport of Change Data Capture in Oracle Database 11g Release 2 (11.2)

Oracle Change Data Capture is being replaced with Oracle GoldenGate.

For new applications, Oracle strongly recommends that you use Oracle GoldenGate.

For Oracle Database 11g Release 2 (11.2), Change Data Capture continues to function as in earlier releases. If you are currently using Change Data Capture, then you can continue to do so for the foreseeable future. However, Change Data Capture is not being further enhanced.

A.2.7 Deprecation of Data Mining Java API in Oracle Database 11g Release 2 (11.2)

Starting with release 11.2.0.3 of Oracle Database, the Data Mining Java API is deprecated.

Oracle Data Mining now supports a new release of Oracle Data Miner. The earlier release, Oracle Data Miner Classic, is still available for download on Oracle Technology Network (OTN), but it is no longer under active development.

A.2.8 Identifying Initialization Parameters Deprecated in Oracle Database 11g Release 2 (11.2)

Use the query described here to locate deprecated parameters.

A deprecated parameter behaves the same way as a regular parameter, except that a warning message is displayed at instance startup if a deprecated parameter is specified in the parameter file. In addition, all deprecated parameters are logged to the alert log at instance startup.

To obtain a list of all initialization parameters that are specified as deprecated for the current database, issue the following SQL statement:

```
SQL> SELECT name FROM v$parameter
        WHERE isdeprecated = 'TRUE';
```

A.2.9 Initialization Parameters Deprecated in Oracle Database 11g Release 2 (11.2)

Review this topic to find parameters deprecated in Oracle Database 11g release 2 (11.2).

The following initialization parameters are deprecated:

- ACTIVE_INSTANCE_COUNT
- PARALLEL_IO_CAP_ENABLED

To obtain a list of all deprecated initialization parameters, issue the following SQL statement:

```
SQL> SELECT name FROM v$parameter
       WHERE isdeprecated = 'TRUE';
```

A deprecated parameter behaves the same way as a regular parameter, except that a warning message is displayed at instance startup if a deprecated parameter is specified in the parameter file. In addition, all deprecated parameters are logged to the alert log at instance startup:

A.2.10 Initialization Parameters Desupported in Oracle Database 11g Release 2 (11.2)

Review this topic to find parameters desupported in Oracle Database 11g release 2(11.2).

The following initialization parameters are desupported:

```
DRS_START
GC_FILES_TO_LOCKS
MAX_COMMIT_PROPAGATION_DELAY
PLSQL_NATIVE_LIBRARY_DIR
PLSQL_NATIVE_LIBRARY_SUBDIR_COUNT
SQL_VERSION
```

Note:

An attempt to start a database using one or more desupported initialization parameters succeeds, but a warning is returned and recorded in the alert log.

A.2.11 Static Data Dictionary Views Deprecated in Oracle Database 11g Release 2 (11.2)

The static data dictionary views listed here are deprecated in Oracle Database 11g Release 2 (11.2).

The following static dictionary views are deprecated:

- ALL_STREAMS_STMTS (replaced by DBA_STREAMS_STMTS)
- DBA_COMPARISON_SCAN_SUMMARY (replaced by DBA_COMPARISON_SCAN)
- USER_COMPARISON_SCAN_SUMMARY (replaced by USER_COMPARISON_SCAN)

A.2.12 Dynamic Performance Views Deprecated in Oracle Database 11g Release 2 (11.2)

The V\$FLASH_RECOVERY_AREA_USAGE dynamic performance view is deprecated in Oracle Database 11g Release 2 (11.2).

The dynamic performance view V\$FLASH_RECOVERY_AREA_USAGE is replaced by V\$RECOVERY_AREA_USAGE

A.2.13 Deprecated Features in Oracle Database 11g Release 2 (11.2)

Deprecated features listed here are supported in Oracle Database 11g Release 2 (11.2) for backward compatibility. Oracle recommends that you migrate from deprecated features to recommended alternatives.

Dictionary-managed Tablespaces

Oracle recommends that you create locally managed tablespaces. Locally managed tablespaces are much more efficiently managed than dictionary-managed tablespaces.

MAX_JOB_SLAVE_PROCESSES

MAX_JOB_SLAVE_PROCESSES is deprecated. Use JOB_QUEUE_PROCESSES instead.

A.2.14 Changes to LOG_ARCHIVE_DEST_ *n* Parameters in Oracle Database 11g Release 2 (11.2)

Supported destinations are raised from 10 to 31.

Starting with Oracle Database 11g Release 2 (11.2), the number of supported destinations in the LOG_ARCHIVE_DEST_ *n* and the LOG_ARCHIVE_DEST_STATE_ *n* parameters have been increased from 10 to 31. Destinations LOG_ARCHIVE_DEST_11 through LOG_ARCHIVE_DEST_31 do not support the SYNC, ARCH, LOCATION, MANDATORY, ALTERNATE, or DEPENDENCY attributes, and cannot be specified as the target of the ALTERNATE or DEPENDENCY attributes.

LOG_ARCHIVE_DEST_11 through LOG_ARCHIVE_DEST_31 can only be used when the COMPATIBLE initialization parameter is set to 11.2.0 or higher.

Oracle Database Upgrade Utilities

Oracle Upgrade utility scripts help to carry out Oracle Database upgrades.

[Scripts for Upgrading Oracle Database](#) (page B-1)

Oracle provides a set of tools and scripts for upgrades that you run before, during, and after upgrading.

B.1 Scripts for Upgrading Oracle Database

Oracle provides a set of tools and scripts for upgrades that you run before, during, and after upgrading.

Note:

Some of the scripts Oracle provides cannot be run in UPGRADE mode.

The following table lists the various scripts and tools with a description for each.

Table B-1 Upgrade, Post-Upgrade, and Downgrade Scripts

| Script | Description |
|--|--|
| <code>catcon.pl</code> | Must be run in UPGRADE mode. This script is used when upgrading a CDB. |
| <code>catctl.pl</code> | Parallel Upgrade Utility (<code>catctl.pl</code> , and the shell script <code>dbupgrade</code>). You must run these scripts in UPGRADE mode. In Oracle Database 12c, Parallel Upgrade Utility replaces the SQL Upgrade Utility <code>catupgrd.sql</code> . With Parallel Upgrade Utility, you can run upgrade scripts and processes in parallel. This capability takes full advantage of your server CPU capacity, and can shorten upgrade time. DBUA uses this tool. |
| <code>dbupgrade</code> , <code>dbupgrade.cmd</code> | Shell scripts that call the <code>catctl.pl</code> script. These shell scripts are available with Oracle Database 12c release 2 (12.2). The scripts enable you to enter the <code>dbupgrade</code> command at the shell command prompt. You can either run these scripts with default values, or you can run them with the same input parameters that you use to run <code>catctl.pl</code> from the Perl prompt. Use <code>dbupgrade</code> for Linux and UNIX systems, and <code>dbupgrade.cmd</code> for Windows systems. |
| <code>catdwgrd.sql</code> | This is the downgrade script, which is used in the procedure to downgrade to the earlier release from which you upgraded. |

Table B-1 (Cont.) Upgrade, Post-Upgrade, and Downgrade Scripts

| Script | Description |
|-------------------------------|--|
| <code>catnoamd.sql</code> | Do not run in UPGRADE mode. Run this script only after upgrading. The <code>catnoamd.sql</code> script drops the OLAP catalog component, also referred to as AMD. |
| <code>catnoexf.sql</code> | The upgrade process runs this script for you; however, you can run the <code>catnoexf.sql</code> script before the upgrade. Do not run this script in UPGRADE mode. The <code>catnoexf.sql</code> script removes the Expression Filter (EXF) and Database Rules Manager (RUL) components, which are desupported in this release. |
| <code>catuppst.sql</code> | <p>You must run this script, either through DBUA or manually, if you perform a manual upgrade.</p> <p>DBUA automatically runs <code>catuppst.sql</code>. You only must run this script separately for manual upgrades.</p> <p>Do not run this in UPGRADE mode. Run <code>catuppst.sql</code>, located in the <code>ORACLE_HOME/rdbms/admin</code> directory, to perform remaining upgrade actions that do not require the database to be in UPGRADE mode. If an Oracle bundle patch or patch set update (PSU or BP) is installed in the Oracle home, then this script automatically applies that patch set update to the database.</p> <p>Caution: If you perform a manual upgrade, and you do not run <code>catuppst.sql</code>, then your database suffers performance degradation over time.</p> |
| <code>catuptabdata.sql</code> | <p>The <code>catuptabdata.sql</code> script is run automatically by <code>catuppst.sql</code> to run ALTER TABLE UPGRADE on any Oracle-Maintained tables that are affected by changes to Oracle-Maintained types during the upgrade.</p> <p>You can run the <code>catuptabdata.sql</code> script manually to upgrade any Oracle-Maintained tables that require upgrading because of changes to any Oracle-Maintained types. You must run the command with a user account that is granted the SYSDBA system privileges, and that is connected AS SYSDBA.</p> |
| <code>emdwrdr</code> | <p>Do not run this script in UPGRADE mode. The <code>emdwrdr</code> utility saves Oracle Enterprise Manager Database Control (DB Control) configuration files and data for your release 11g database.</p> <p>If you may need to downgrade Oracle Database 12c, and you want to restore Oracle DB Control, then you must run <code>emdwrdr</code> before you upgrade.</p> <p>See Also: Oracle Support document ID 1484775.1.</p> |

Table B-1 (Cont.) Upgrade, Post-Upgrade, and Downgrade Scripts

| Script | Description |
|-------------------------------------|---|
| <code>emremove.sql</code> | The <code>emremove.sql</code> script drops the Oracle Enterprise Manager-related schemas and objects. Use this script to manually remove DB Control. Running <code>emremove.sql</code> before starting the upgrade process minimizes downtime. This is an optional pre-upgrade step because the Parallel Upgrade Utility and DBUA automatically run this script. Caution: If you want to preserve the DB Control configuration and data to have the option of downgrading and restoring DB Control, then you must first follow the procedure for using <code>emdwrdr</code> . |
| <code>olspreupgrade.sql</code> | Do not run this script in UPGRADE mode. The <code>olspreupgrade.sql</code> script is a preprocessing script required for upgrading a database earlier than Oracle Database release 12.1 that uses Oracle Label Security (OLS) and Oracle Database Vault. |
| <code>postupgrade_fixups.sql</code> | The <code>postupgrade_fixups.sql</code> script is supplied with Oracle Database. Run <code>postupgrade_fixups.sql</code> after upgrading. DBUA runs this script automatically; however, you can run it any time after upgrading. |
| <code>preupgrd.sql</code> | (Obsolete in 12.2) The <code>preupgrd.sql</code> Pre-Upgrade Information Tool is supplied with Oracle Database 12c release 1 (12.1). Run <code>preupgrd.sql</code> any time before upgrading to analyze your database. The Pre-Upgrade Information Tool provides a preview of the items that DBUA checks and generates scripts, called Fixup scripts, that you can run to resolve issues that are flagged in the source database. In release 12.1, <code>preupgrd.sql</code> script replaces the <code>utlu121i.sql</code> script.) In release 12.2, <code>preupgrade.jar</code> replaces <code>preupgrd.sql</code> . |
| <code>preupgrade.jar</code> | The <code>preupgrade.jar</code> Pre-Upgrade Information Tool is supplied with Oracle Database 12c release 2 (12.2). The <code>preupgrade.jar</code> has the same capabilities as <code>preupgrd.sql</code> , which <code>preupgrade.jar</code> replaces. |
| <code>utlrlp.sql</code> | Use <code>utlrlp.sql</code> to recompile stored PL/SQL and Java code. DBUA runs this script automatically. When you upgrade manually, you must run this script. |
| <code>utlu122s.sql</code> | The <code>utlu122s.sql</code> Post-Upgrade Status Tool is supplied with Oracle Database and displays the version and elapsed upgrade time for each component in <code>DBA_REGISTRY</code> . The Post-Upgrade Status Tool can be run any time after upgrading the database. |

Table B-1 (Cont.) Upgrade, Post-Upgrade, and Downgrade Scripts

| Script | Description |
|-------------------------------|---|
| <code>utluptabdata.sql</code> | <p>Run the <code>utluptabdata.sql</code> script after upgrades to perform an <code>ALTER TABLE UPGRADE</code> command on any user tables that depend on Oracle-Maintained types that changed during the upgrade.</p> <p>You must run the <code>utluptabdata.sql</code> script either with a user account that is assigned the <code>ALTER TABLE</code> system privilege for all of the tables that you want to upgrade, or by a user account with <code>SYSDBA</code> system privileges that is connected <code>AS SYSDBA</code>).</p> <p>User tables are not automatically upgraded to new versions of types during the database upgrade, so that you can run the upgrade with user tablespaces set to <code>READ ONLY</code>.</p> |

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