# Rolling Upgrade with Oracle 12c: A piece of cake!

**Hervé Schweitzer**
**dbi services**
**BaselArea**

**Keywords**

**Oracle Database, Rolling Upgrade, near zero downtime migration**

## Introduction

Since Oracle 10.1 logical standby database exists, which allows using Rolling Upgrade functionality for Oracle database upgrades. The main advantage of Rolling Upgrade is, that it allows near zero downtime database upgrades. But until 11.2 lots of manual intervention was necessary for the setup and the usage of the Data Guard broker configuration was not possible. Since Oracle 12c Oracle has introduced a new PL/SQL package dbms_rolling, which simplifies the usage of Rolling Upgrade, however the drawback is that Active Guard option must be licensed.

## Logical Standby Database Concept

A logical standby database is a database where SQL statements are directly applied, and not archive or redo log files recovery like for the physical standby database.

On a logical standby database with the help of the archived redo log files, SQL statements are created, then these statements will be applied to the logical standby database.

To create SQL statements on the logical standby database the LogMiner dictionary is used. Below you will find the 3 important steps for Oracle logical database replication.

- On source database the LogMiner dictionary is built into the redo data during initial logical standby database setup.
- Then the dictionary is created on the logical standby database with help of the information available in the archived log files transmitted from the primary database.
- Finally on target database Oracle re-construct the SQL statement based on the archived log file contents and the created LogMiner dictionary.

To build an Oracle logical standby database some requirements are needed, each row in a table must be uniquely identified with a Primary key-Unique key, or the uniqueness is guaranteed with all columns.

An Oracle logical standby database is more complex to administer as a physical standby database. As soon as a conflict occurs the replication is stopped and must be manually resolved.

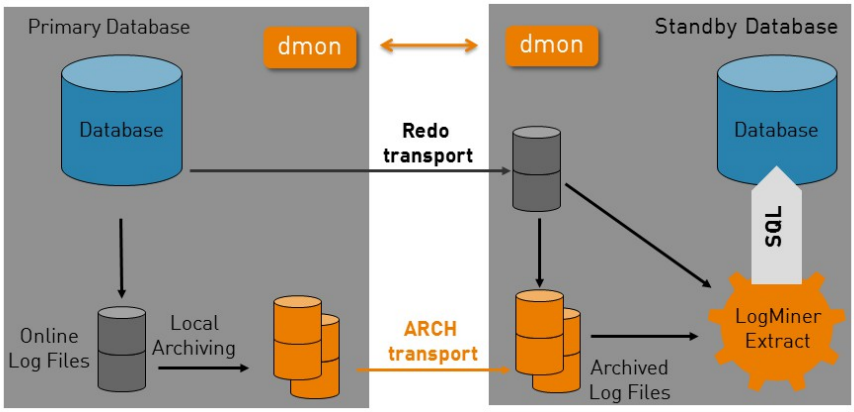
An Oracle logical standby database environment can be built with the Data Guard broker, thus the monitoring, operation and administration is easier to manage.

But the main problem of an Oracle logical standby database is that some object types are not supported, and lots of DDL commands are not replicated.

- BFILE

- ROWID, UROWID
- Collections (including VARRAYs and nested tables)
- Objects with nested tables and REFs
- The following Spatial types are not supported:
    - MDSYS.SDO_GEORASTER
    - MDSYS.SDO_TOPO_GEOMETRY
- Lots of DDL commands are not replicated
    - Documentation Data Guard Concepts and Administration
        - C.12 Skipped SQL Statements on a Logical Standby Database

Description of an Oracle logical standby database environment




**Rolling Upgrade concept**

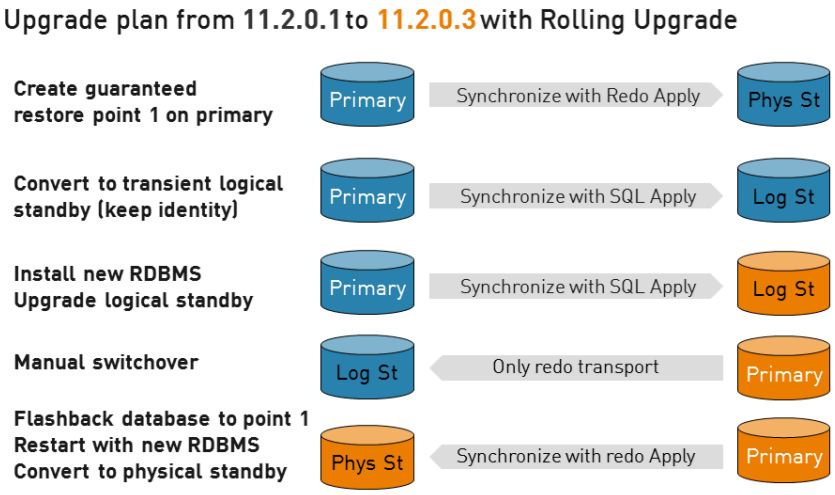
Rolling Upgrade with help of an Oracle logical standby database exists since Oracle 10.1. Rolling Upgrade is a solution which allows a near zero downtime database upgrade. But with Oracle 10.1 and until Oracle 11.2 lots of manual intervention for the setup, configuration and operation were necessary. One of the disadvantages until 11.2 was that a Data Guard Broker configuration was not supported.

Rolling Upgrade is based on an Oracle Physical standby database environment, but during the Rolling Upgrade the physical standby database is converted to a logical standby database, and thus all limitations of an Oracle logical standby database are also true for Rolling Upgrade.

Rolling Upgrade converts a physical standby database to a logical standby database, then upgrades the logical standby database to a higher Oracle version, and finally only a switchover is necessary to activate the new primary database with the higher Oracle version. Afterwards the former primary database is converted back to a physical standby database and upgraded automatically.

Rolling Upgrade can be implemented with unsupported object types, but it needs more attention and no changes are possible on unsupported objects during the upgrade.

Below as example the different steps of a Rolling Upgrade with Oracle 11.2




With Oracle 12c, Oracle has created a new PL/SQL package DMS_ROLLING, which allows some automatic steps for the Rolling Upgrade of a database. Furthermore an existing Data Guard broker configuration is now also partially supported.

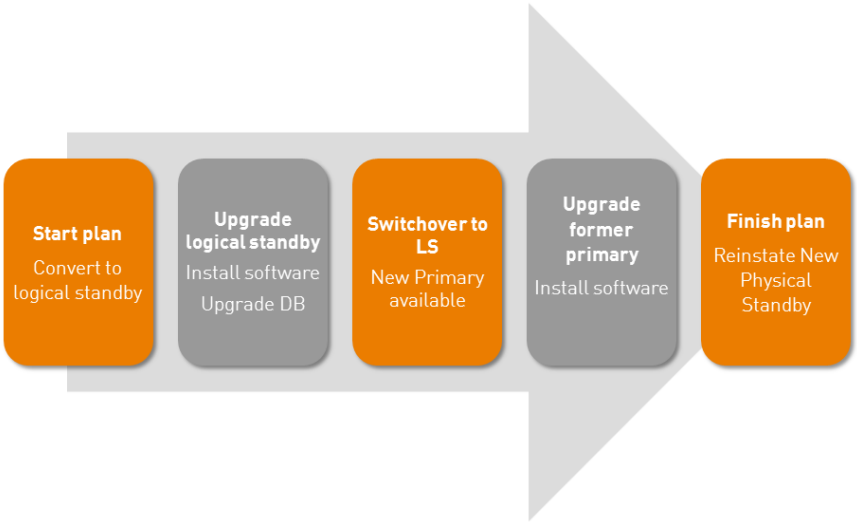
DBMS_ROLLING with Data Guard Broker usage overview

| Stages | Actions |
|---|---|
| Specification | dbms_rolling.init_plan |
| | dbms_rolling.set_parameter |
| DG BROKER | dgmgrl> disable configuration |
| Compilation | dbms_rolling.build_plan |
| Execution | dbms_rolling.start_plan |
| | Upgrade logical standby database manually(change OH, catupgrd) |
| | dbms_rolling.switchover |
| | Upgrade former primary database manually(change OH, catupgrd) |
| | dbms_rolling.finish_plan |
| DG BROKER | dgmgrl> enable configuration |
| | dbms_rolling_destroy_plan |

**Upgrade from Oracle 12cR1 to 12cR1 using Rolling Upgrade**

During the presentation all steps using the new dbms_rolling package will be presented in details with some tips and manual fixes.

The main steps of the Rolling Upgrade procedure are presented below, some are full automatic now (steps in orange on the below graph) and few manual interventions are still needed to upgrade the databases (in grey)




**Core messages**

As conclusion we will present you the advantage to implement Rolling Upgrade, but also the main drawbacks of a Rolling Upgrade implementation. Finally we will do a little comparison between another new feature of Oracle 12c (Multitenant database with Unplug/Plug) which also allows to upgrade a database with a reduced downtime.

**Contact Address:**

Hervé Schweitzer

dbi services

avenue de la gare 42

CH 2800 Delémont - BaselArea

Telefon: +41 (0) 79 963 43 67

E-Mail herve.schweitzer@dbi-services.com

Internet: www.dbi-services.com