ORACLE
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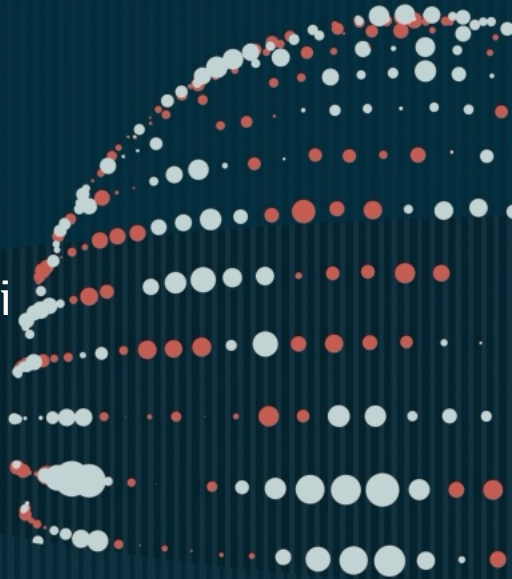
at CloudWorld

Upgrade to Oracle Database 23ai

Best Practices and Customer Experience



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DBAs

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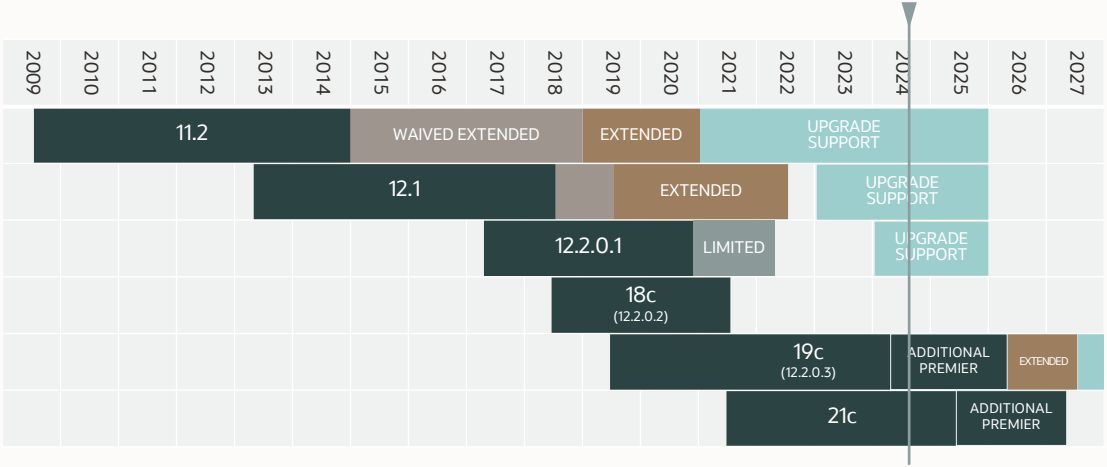
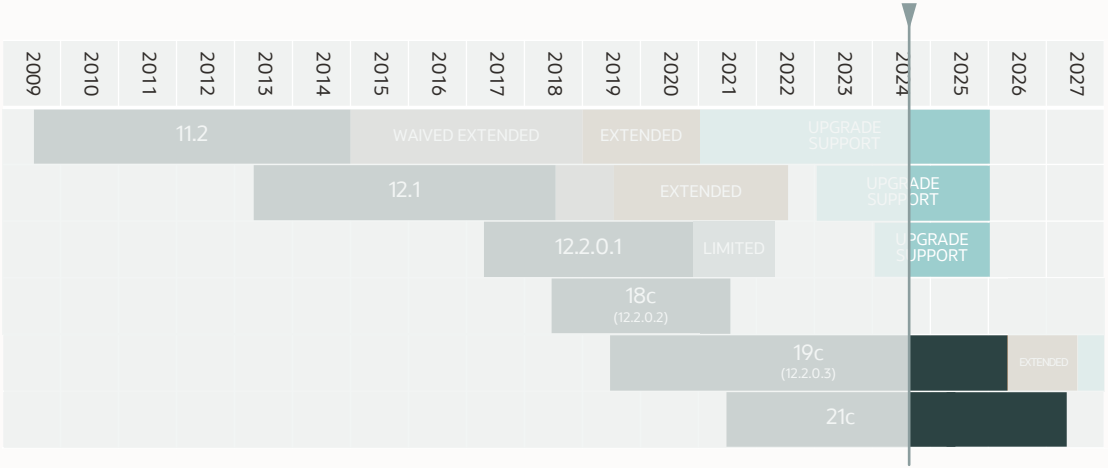
Before Upgrade and Migration

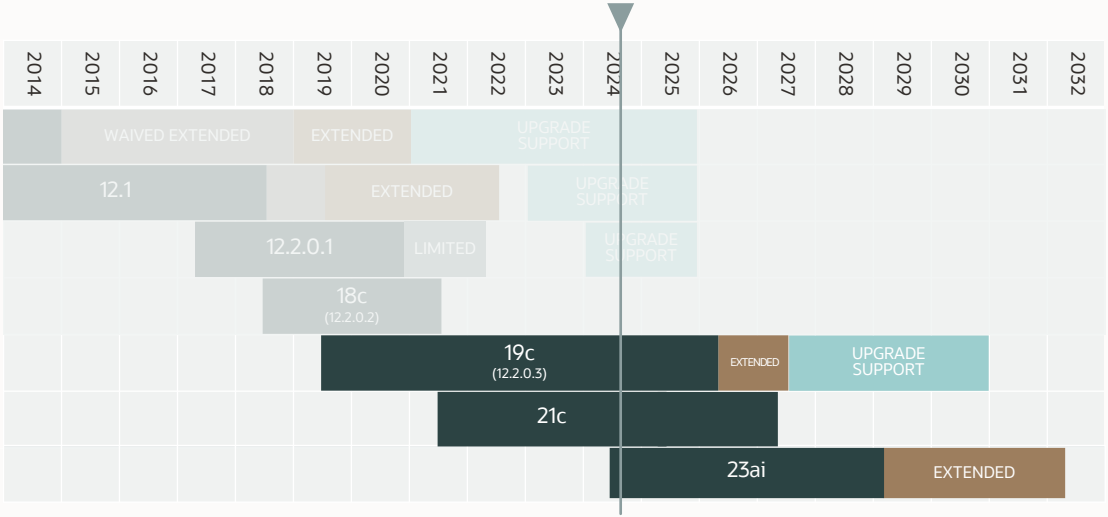
Lifetime Support Policy



Lifetime Support Policy



Lifetime Support Policy



Move production databases from one Long Term Support release to the next

- Release Schedule of Current Database Releases (Doc ID 742060.1)

Next Long Term Support release

Oracle Database 23ai

Upgrade possible only from:

- Oracle Database 19c
- Oracle Database 21c

Oracle Database 23ai supports the multitenant architecture only

- You must convert your database to a PDB

Single vs. Multitenant

Single Tenant

One PDB
No extra license

Multitenant

Multiple PDBs
Extra license if more than 3 PDBs

```
--Use up to 3 user-created PDBs
--without a license for Multitenant option.
--Applies to Oracle Database 19c and newer, including SE2

alter system set max_pdbs=3;
```


Generally, you don't need to change your application to use a pluggable database

```
alter session set container=PDB1;
```

```
alter database backup controlfile to trace;
```

```
ORA-65040: operation not allowed from within a pluggable
database
```


Non-CDB Compatible

- Some `ALTER DATABASE` and `ALTER SYSTEM` commands fail in a PDB

- Enable non-CDB compatibility by setting `NONCDB_COMPATIBLE=TRUE`
  - When you can't change the application
  - When you accept the reduced security

```
SQL> alter system set noncdb_compatible=true;
SQL> shutdown immediate
SQL> startup
```

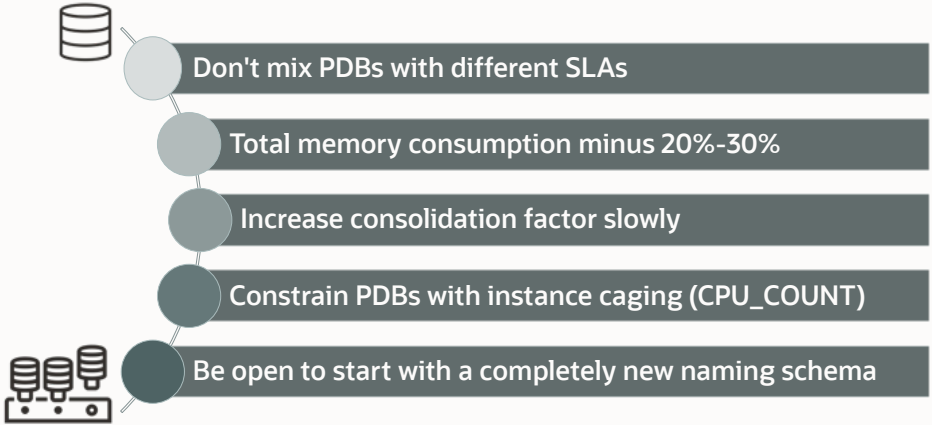
```
SQL> alter system set noncdb_compatible=true;
SQL> shutdown immediate
SQL> startup

SQL> alter session set container=PDB1;
SQL> alter database backup controlfile to trace;

Database altered.
```


Consolidation Strategies?

There is no "*best*" strategy



Ensure your clients can connect to Oracle Database 23ai

- Upgrade your clients well in advance of the upgrade

Client / Server Interoperability

Client Version	Server Version						
	23ai	21c	19c	18c	12.2.0	12.1.0	11.2.0
23ai[#11]	Yes	Yes	Yes	No	No	No	No
21c	Yes	Yes	Yes	Was	Was	Yes[#12]	No
19c	Yes	Yes	Yes	Was	Was	Yes[#12]	Yes[#9]
18c	No	Was	Was	Was	Was	Was	Was[#9]
12.2.0	No	Was	Was	Was	Was	Was	Was[#9]
12.1.0	No	Yes[#12]	Yes[#12]	Was	Was	Yes[#12]	Yes[#12]
11.2.0	No	No	Yes[#9]	Was[#9]	Was[#9]	Yes[#12]	Yes[#9]

MOS Note: 207303.1 - Client / Server Interoperability Support Matrix

```
--List current connections and their driver details
--Join to gv$session for more details.
--https://dohdatabase.com/2024/03/19/are-your-oracle-database-clients-ready-for-the-next-database-upgrade/

select * from gv$session_connect_info;
```


How to Plugin, Upgrade and Convert

Where Do You Start?

Installation

Download and install
Oracle Database 23ai

Container Database

AutoUpgrade

Installation of Oracle Home is simpler

- Gold images with recent Release Update
- Available for Oracle Database 23ai

23ai GI home disk space greatly reduced to 3 GB

- 12 GB in 19c

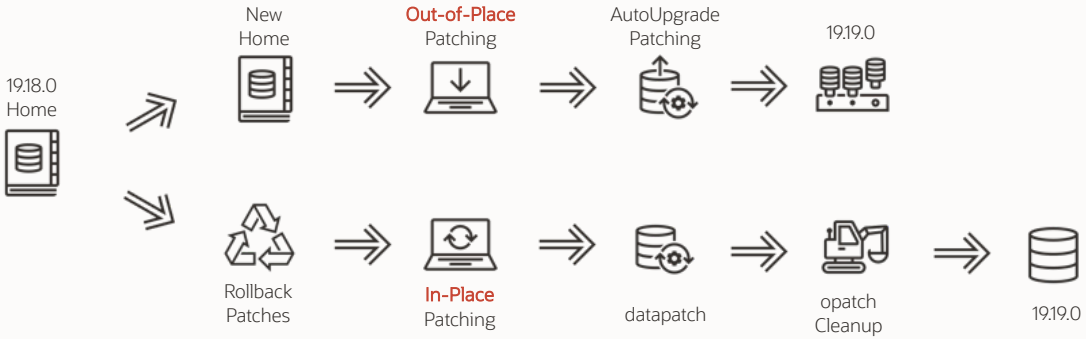
Use Out-Of-Place Patching

- Minimize downtime
- Minimize risk during outage
- Easier rollback

Exercise Patching?

Use our Patch Me If You Can LiveLabs

- https://apexapps.oracle.com/pls/apex/dbpm/r/livelabs/view-workshop?wid=3740



We made upgrading easy.
Now we make patching just as easy.

AutoUpgrade functionality extended to patching

```
$ cat DB23.cfg

patch1.source_home=/u01/app/oracle/product/23/dbhome_23_4_0
patch1.target_home=/u01/app/oracle/product/23/dbhome_23_5_0
patch1.sid=DB23


$ java -jar autoupgrade.jar -config DB23.cfg -mode deploy
```

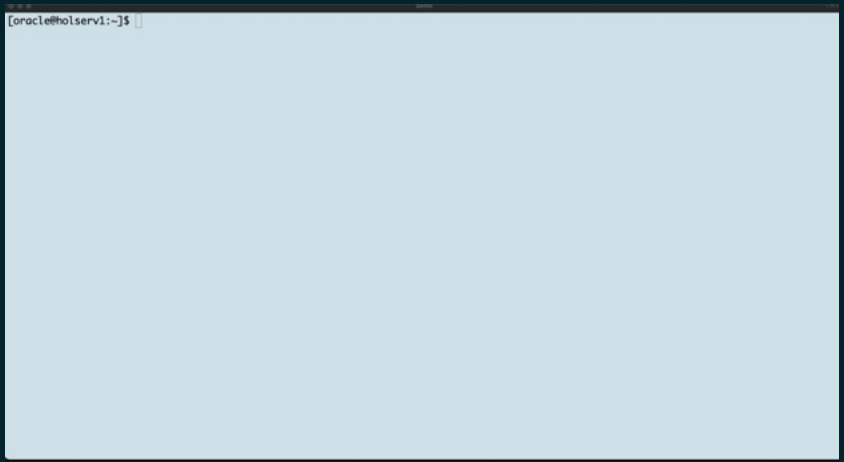

But we wanted more…

```
$ cat DB23.cfg

patch1.source_home=/u01/app/oracle/product/19/dbhome_19_14_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_24_0
patch1.sid=FTEX
patch1.folder=/home/oracle/autopatch/patch
patch1.patch=RU,OPATCH,OJVM,DPBP
patch1.download=YES
patch1.db_availability=OFFLINE
patch1.method=OUTOFPLACE


$ java -jar autoupgrade.jar –patch -config DB23.cfg -mode deploy
```


Demo



Where Do You Start?

Installation

Container Database

Create a new CDB in
Oracle Database 23ai

AutoUpgrade

Create Container Database

1 Character set

2 Components

3 `COMPATIBLE`

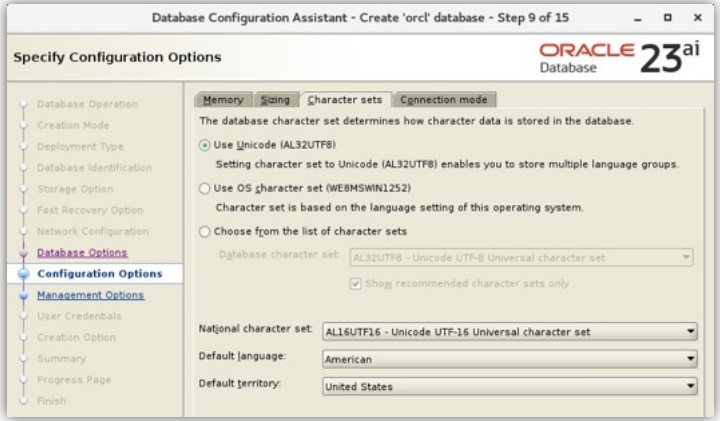
Create Container Database

1 Character set

- Always choose AL32UTF8
- Allows PDBs with any character set

2 Components

3 COMPATIBLE



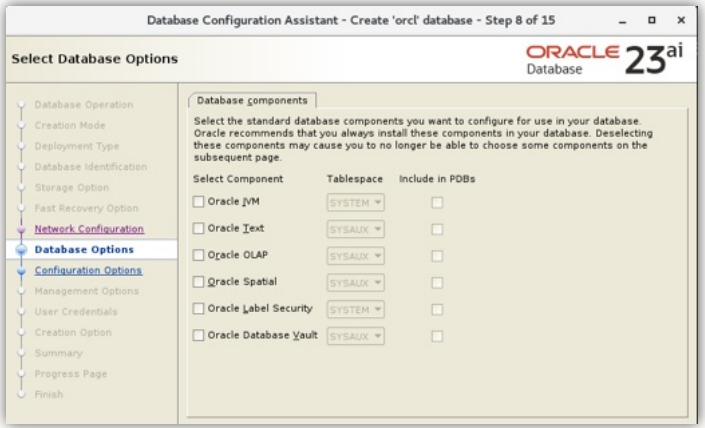
Create Container Database

1 Character set

2 Components

- Install as many as you need
- No more than that

3 COMPATIBLE



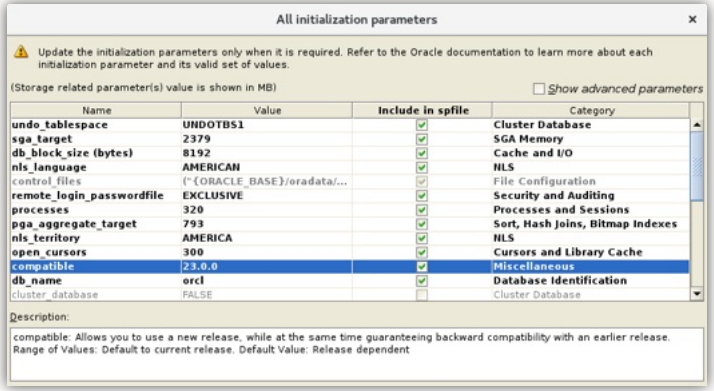
Create Container Database

1 Character set

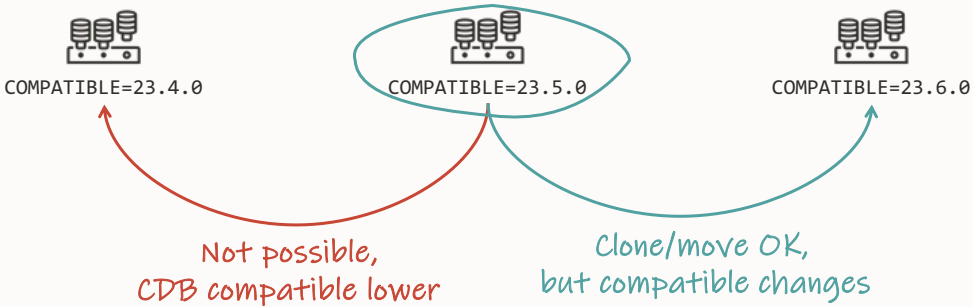
2 Components

3 COMPATIBLE

- Keep at the default setting, *23.0.0*
- Unless you want the option of downgrade



Compatible



```
SQL> select version_full from v$instance;

VERSION_FULL
------------
23.5.0.24.07
```


Where Do You Start?

Installation

Container Database

AutoUpgrade

Download latest version, create your config file and start the process

Always download the latest version of AutoUpgrade

- My Oracle Support Doc ID 2485457.1

```
$ java -jar autoupgrade.jar –version

build.version 24.5.240701
build.date 2024/07/01 12:36:10 -0400
build.hash d15e41338
build.hash_date 2024/06/27 13:56:59 -0400
build.supported_target_versions 12.2,18,19,21,23
build.type production
build.label (HEAD, origin/devel)
```


Flow

1 Plug in

2 Upgrade

3 Convert

23ai

You can also migrate with Data Pump or Transportable Tablespaces

- Suitable when direct upgrade is not possible
- Smaller databases
- Reorganizing data

Plugin - Standby Databases?

Data Guard

Plug-in on primary propagates to standby database via redo

1 Enabled recovery

2 Deferred recovery

Enabled Recovery

1

Enabled recovery

```
create pluggable database ... standbys=all
```

Standby records PDB creation

Standby locates data files

MRP applies redo to PDB

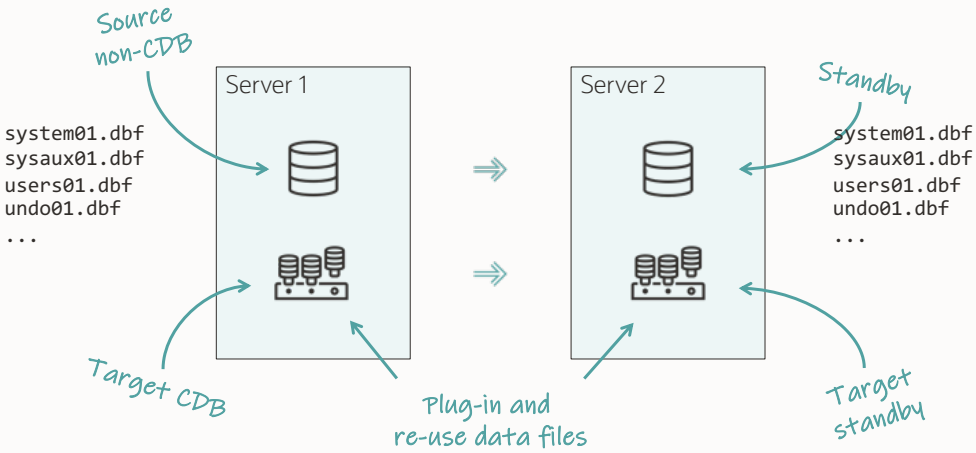
PDB is immediately protected

Default

2

Deferred recovery

Enabled Recovery



All data files on primary and standby must be at the same SCN

Enabled Recovery

- The plug-in happens on the primary database
- The plug-in uses the manifest file
- The manifest file contains information on data files from the primary database only

How does the standby database know which files to plug in?

Enabled Recovery

How does the standby database know which files to plug in?

1 Regular files

2 OMF in regular file system

3 ASM

Enabled Recovery

How does the standby database know which files to plug in?

1 Regular files

Simple and straight forward …

2 OMF in regular file system

Simple and straight forward …

3 ASM

Well …

Enabled Recovery | ASM

Primary

Standby

```
SQL> select name from v$datafile;

NAME
--------------------------------------------------------
+DATA/DB_BOSTON/DATAFILE/system.269.1103046537
+DATA/DB_BOSTON/DATAFILE/sysaux.270.1103046537
+DATA/DB_BOSTON/DATAFILE/users.273.1103046827
```

```
SQL> select name from v$datafile;

NAME
--------------------------------------------------------
+DATA/DB_CHICAGO/DATAFILE/system.265.1103050007
+DATA/DB_CHICAGO/DATAFILE/sysaux.266.1103050007
+DATA/DB_CHICAGO/DATAFILE/users.269.1103050009
```

Same file,
but different name

```
SQL> alter diskgroup data add alias
     '+DATA/DB_CHICAGO/DATAFILE/users.269.1103050009'
     for
     '+DATA/CDB1_CHICAGO/<PDB_GUID>/DATAFILE/users.269.1103050009':
```

Data Guard | Re-use Data Files

Primary

Standby

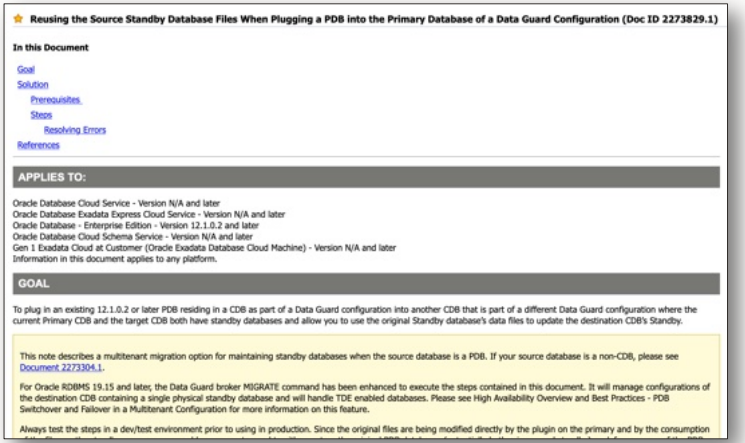
Looking for file like on primary

```
Recovery scanning directory +DATA/DB_BOSTON/... for any matching files
Deleted Oracle managed file +DATA/DB_BOSTON/...
Successfully added datafile 37 to media recovery
Datafile #37: +DATA/DB_CHICAGO/DATAFILE/users.269.1103050009
```

Follows alias and finds the real file

Data Guard | Enabled Recovery

Reusing the Source Standby Database Files When Plugging a PDB into the Primary Database of a Data Guard Configuration (Doc ID 2273829.1)



Reusing the Source Standby Database Files When Plugging a PDB into the Primary Database of a Data Guard Configuration (Doc ID 2273829.1)

In this Document

Goal
Solution
Prerequisites
Steps
Resolving Errors
References

APPLIES TO:

Oracle Database Cloud Service - Version N/A and later
Oracle Database Exadata Express Cloud Service - Version N/A and later
Oracle Database - Enterprise Edition - Version 12.1.0.2 and later
Oracle Database Cloud Schema Service - Version N/A and later
Gen 1 Exadata Cloud at Customer (Oracle Exadata Database Cloud Machine) - Version N/A and later
Information in this document applies to any platform.

GOAL

To plug in an existing 12.1.0.2 or later PDB residing in a CDB as part of a Data Guard configuration into another CDB that is part of a different Data Guard configuration where the current Primary CDB and the target CDB both have standby databases and allow you to use the original Standby database's data files to update the destination CDB's Standby.

This note describes a multitenant migration option for maintaining standby databases when the source database is a PDB. If your source database is a non-CDB, please see Document 2273304.1.

For Oracle RDBMS 19.15 and later, the Data Guard broker MIGRATE command has been enhanced to execute the steps contained in this document. It will manage configurations of the destination CDB containing a single physical standby database and will handle TDE enabled databases. Please see High Availability Overview and Best Practices - PDB Switchover and Failover in a Multitenant Configuration for more information on this feature.

Always test the steps in a dev/test environment prior to using in production. Since the original files are being modified directly by the plugin on the primary and by the consumption

Deferred Recovery

1

Enabled recovery

`create pluggable database ... standbys=all`

Standby records PDB creation

Standby locates data files

MRP applies redo to PDB

PDB is immediately protected

2

Deferred recovery

`create pluggable database ... standbys=none`

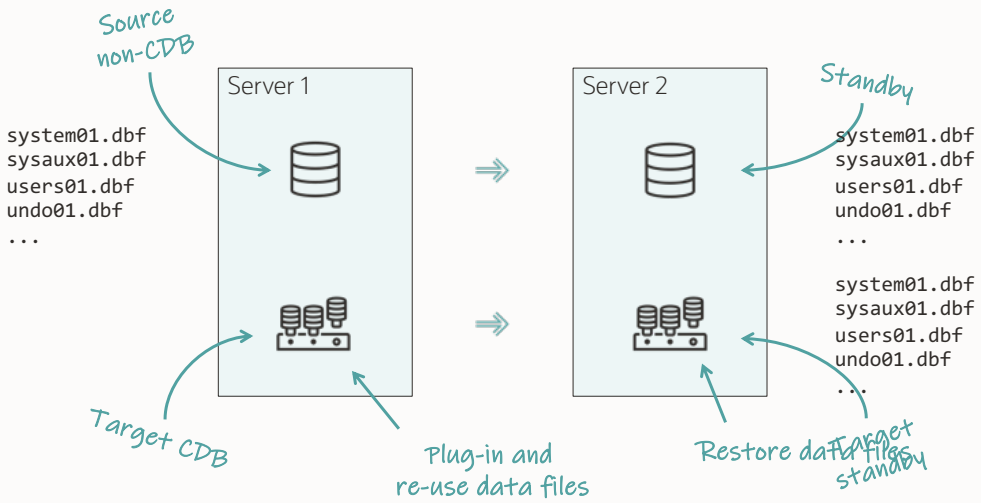
Standby records PDB creation

Standby ignores data files

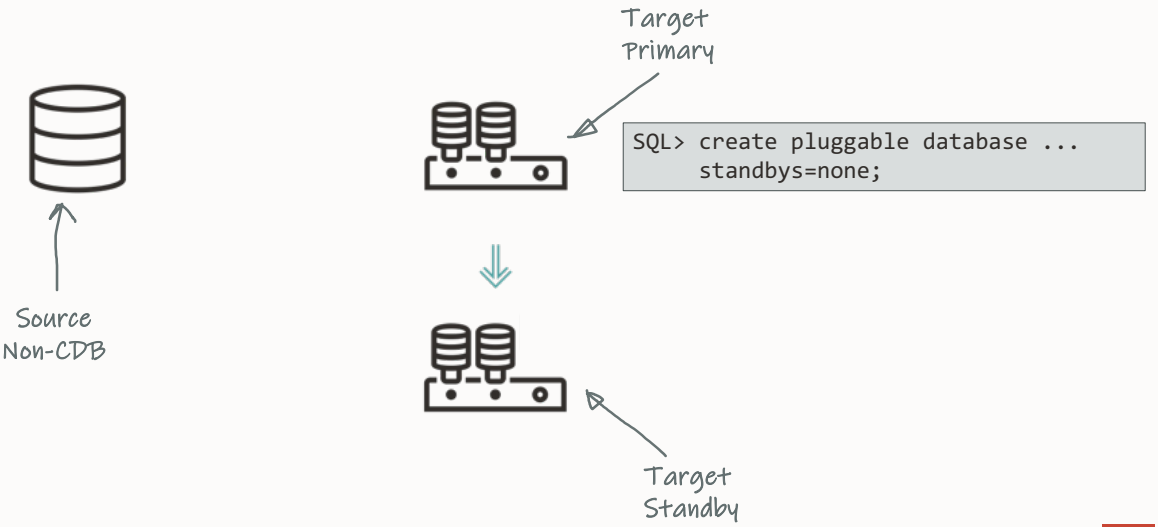
MRP skips redo

PDB protected after restore

Deferred Recovery

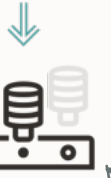


Deferred Recovery



Deferred Recovery

```
SQL> create pluggable database ...
     standbys=none;
```



PDB created
Data files missing

Deferred Recovery

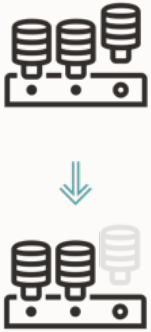
```
SQL> show pdbs

CON_NAME     OPEN MODE
PDB1         READ WRITE
```

```
SQL> show pdbs

CON_NAME     OPEN MODE
PDB1         MOUNTED
```

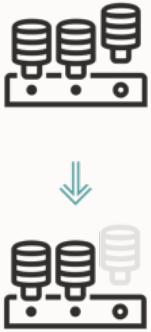
Deferred Recovery



```
SQL> select name, recovery_status
     from v$pdbs;

NAME    RECOVERY_STATUS
PDB1    DISABLED
```

Deferred Recovery



```
RMAN> restore pluggable database
      ... from service ... ;

SQL> alter pluggable database
     enable recovery;
SQL> alter database datafile
     ... online;
```

Deferred Recovery

```
RMAN> restore pluggable database
      ... from service ... ;

SQL> alter pluggable database
     enable recovery;
SQL> alter database datafile
     ... online;
```

- Automated process in Oracle Database 21c
- PDB Recovery Isolation
- Requires Active Data Guard

Don't jeopardize your Data Guard

- Test the procedure and verify your environment

Gotchas

```
--Allows CDB views to include information on PDB$SEED objects.
--By default, such information is hidden.
--https://mikedietrichde.com/2017/07/21/why-exclude_seed_cdb_view-is-now-an-underscore-in-oracle-12-2/

alter system set "_exclude_seed_cdb_view"=false;
```


```
--Default value is for CDBs with many PDBs
--Other places, it leads to concurrency issues
--Reset back to 12.1 default as described in MOS 2431353.1

alter system set "_cursor_obsolete_threshold"=1024
comment="Added 2024-09-11 – see OCW24 and MOS Note: 2431353.1";
```


```
--Database collects SQL Plan Directives even when adaptive
--statistics are off.
--If you do not use Adaptive Statistics (optimizer_adaptive_statistics)
--then turn it completely off as described in MOS 2209560.1

alter system set "_sql_plan_directive_mgmt_control"=0
comment="Added 2024-09-11 – see OCW24 and MOS Note: 2209560.1";
```


Should You Enable Optimizer Fixes?

Many optimizer fixes are `OFF` by default

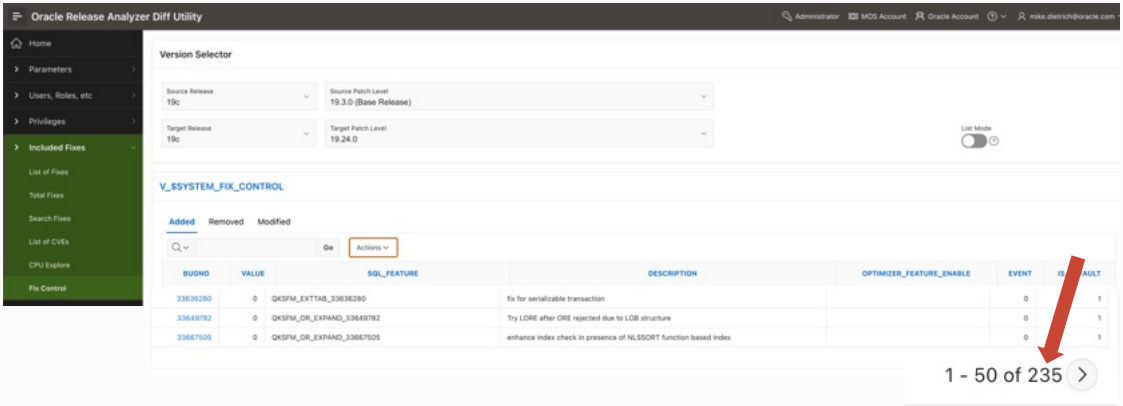
Enable optimizer fixes using `DBMS_OPTIM_BUNDLE`

```
begin
  dbms_optim_bundle.enable_optim_fixes(
   action                      => 'ON',
   scope                       => 'BOTH',
   current_setting_precedence => 'YES');
end;
/
```

Find available bug fixes in ORAdiff or `dbms_optim_bundle.GetBugsForBundle`

Should You Enable Optimizer Fixes?

`oradiff.oracle.com`



Should You Enable Optimizer Fixes?

Upgrade?

Enable optimizer fixes using `DBMS_OPTIM_BUNDLE`

New database?

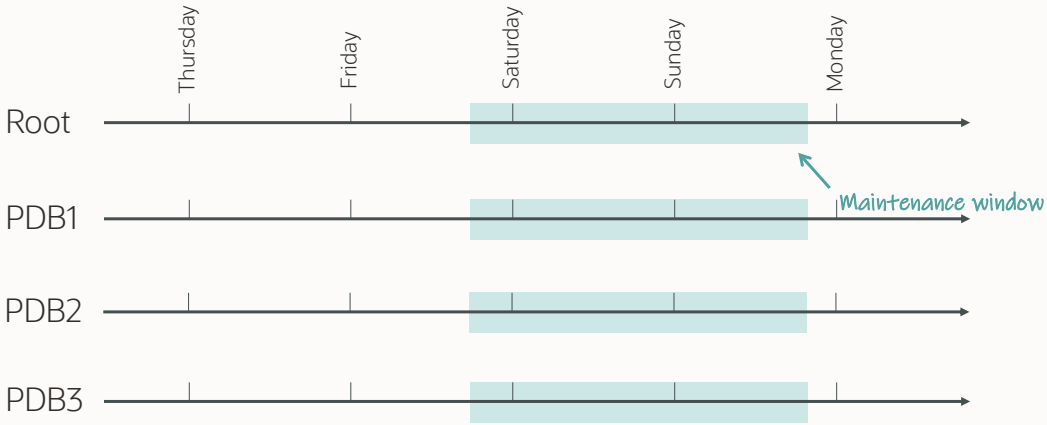
Enable optimizer fixes using `DBMS_OPTIM_BUNDLE`

Patching?

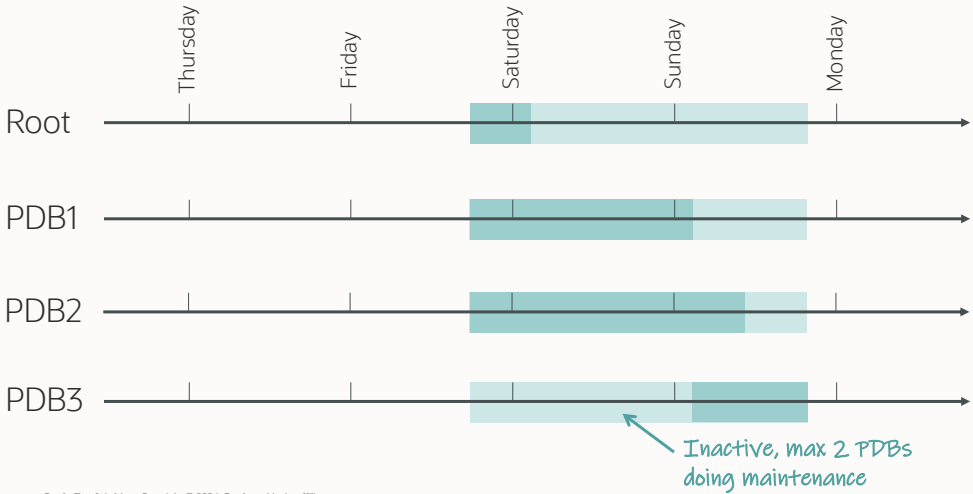
Do proper testing before enabling optimizer fixes using `DBMS_OPTIM_BUNDLE`

Automated Maintenance Tasks

Automated Maintenance Tasks



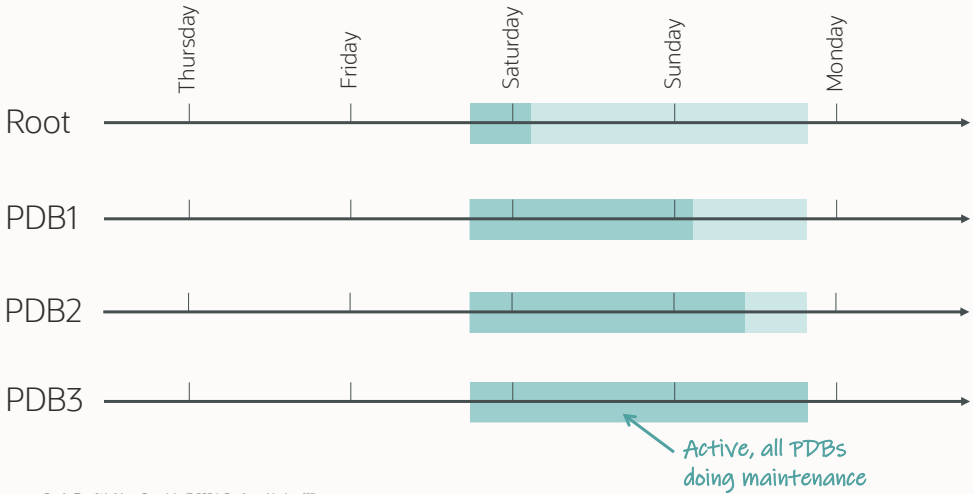
Automated Maintenance Tasks




```
--Change the amount of PDBs that can run maintenance tasks at the same time
--Default value 2

alter system set autotask_max_active_pdbs=3;
```

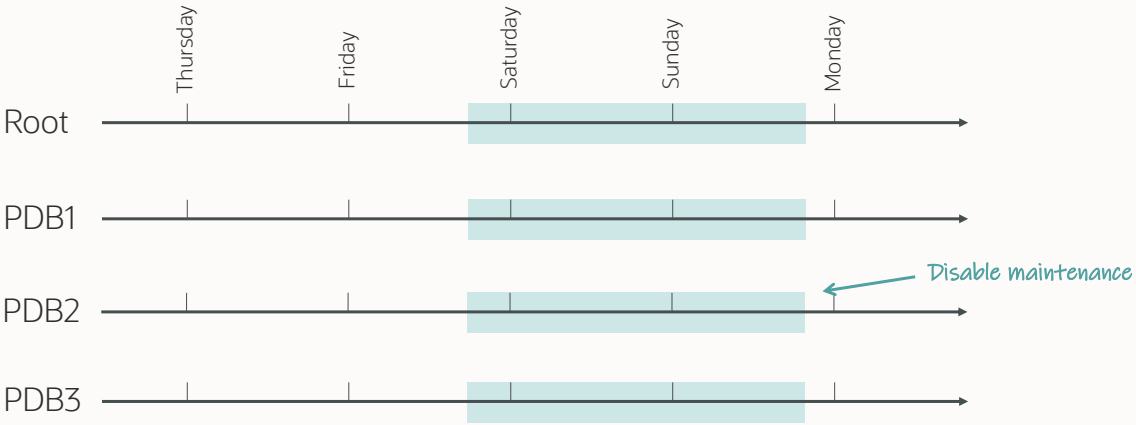

Automated Maintenance Tasks




```
--Selectively disable maintenance tasks in a PDB
--For instance, test databases or databases that are rebuilt frequently

alter session set container=PDB2;
alter system set enable_automatic_maintenance_pdb=false;
```

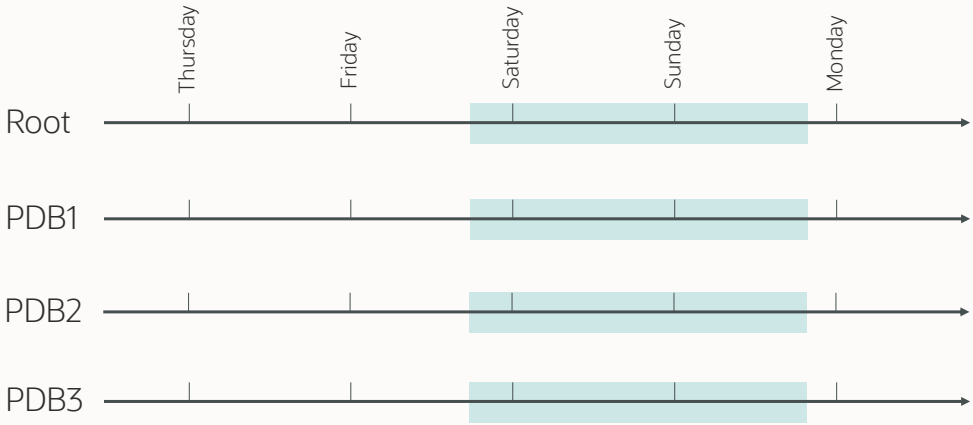

Automated Maintenance Tasks



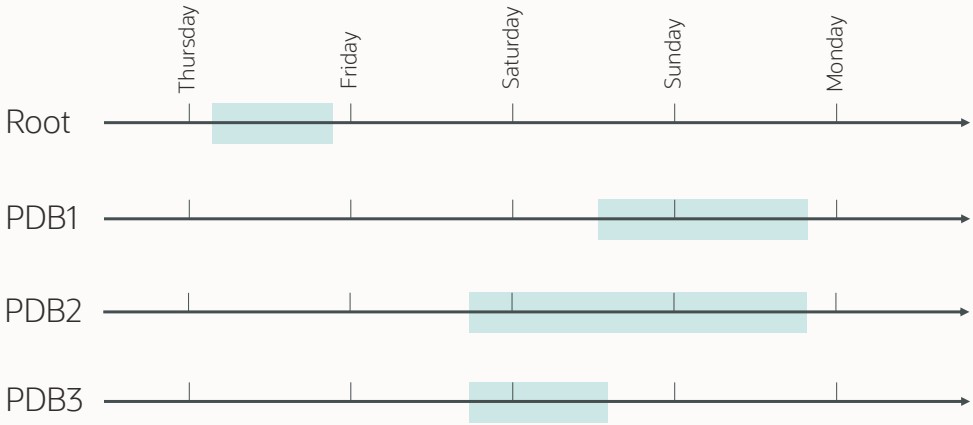
Shift maintenance windows

- Optionally, shorten maintenance windows

Automated Maintenance Tasks



Automated Maintenance Tasks



Selectively disable individual maintenance tasks using `DBMS_AUTO_TASK_ADMIN`

- Does a test database need Automatic Segment Advisor?
- Or Evolve Advisor?

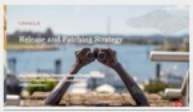
Resource Manager prevents maintenance tasks from *stealing* resources from users

- Consumer group **ORA$AUTOTASK**

Episode 1

Release and Patching Strategy

105 minutes – Feb 4, 2021



Episode 2

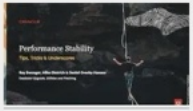
AutoUpgrade to Oracle Database 19c

115 minutes – Feb 20, 2021

Episode 3

Performance Stability, Tips and Tricks and Underscores

120 minutes – Mar 4, 2021



Episode 4

Migration to Oracle Multitenant

120 minutes – Mar 16. 2021

Episode 5

Migration Strategies – Insights, Tips and Secrets

120 minutes – Mar 25, 2021

Episode 6

Move to the Cloud – Not only for techies

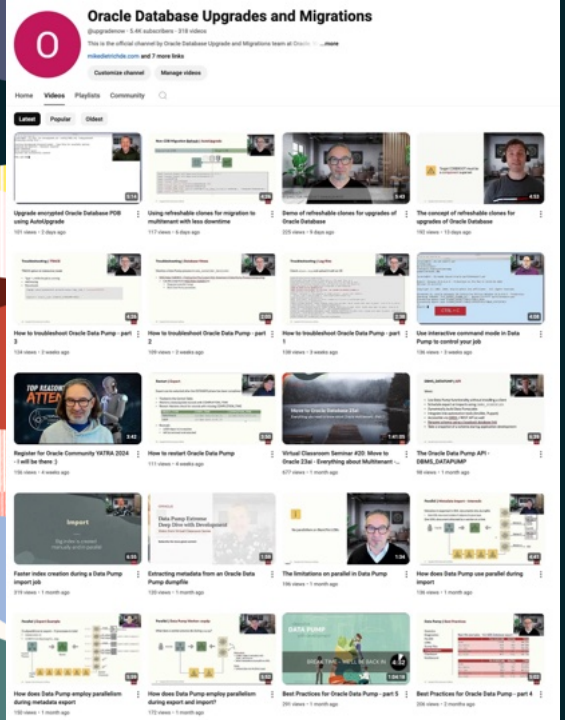
115 minutes – Apr 8, 2021

Recorded Web Seminars

`https://MikeDietrichDE.com/videos`

More than 35 hours of technical content:

- All tech, no marketing
- On-demand
- Anytime
- Anywhere

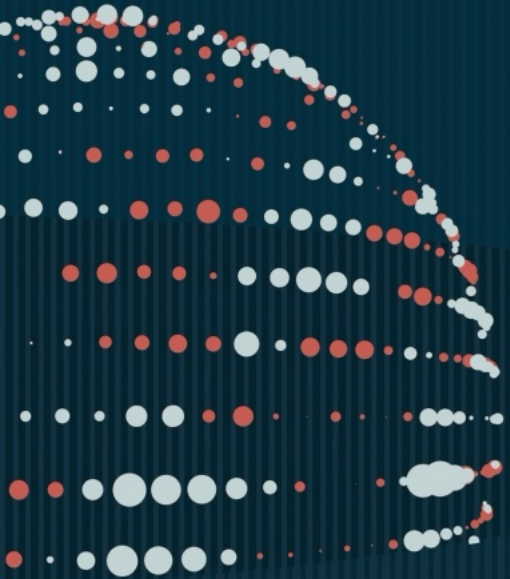


YouTube Channel

@UpgradeNow

- 300+ videos
- New videos every week
- No marketing
- No buzzword
- All tech

SCAN ME



ORACLE
DatabaseWorld
at CloudWorld

Thank You

Subtitle goes here

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