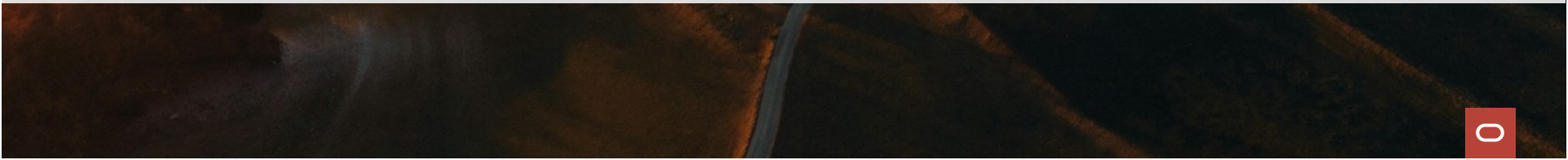
Photo by Nejc Soklič on Unsplash

Fast Track Your Upgrade to Oracle AI Database 26ai

Make IT, May 2026



Oracle

DBAs

run the world

Daniel Overby Hansen

Distinguished Product Manager

dohdatabase

@dohdatabase.com

https://dohdatabase.com

Copyright © 2026, Oracle and/or its affiliates

Rodrigo Jorge

Distinguished Product Manager

rodrigoaraujorge

@dbarj.com.br

https://www.dbarj.com.br

Copyright © 2026, Oracle and/or its affiliates

Get the Slides

https://dohdatabase.com/slides

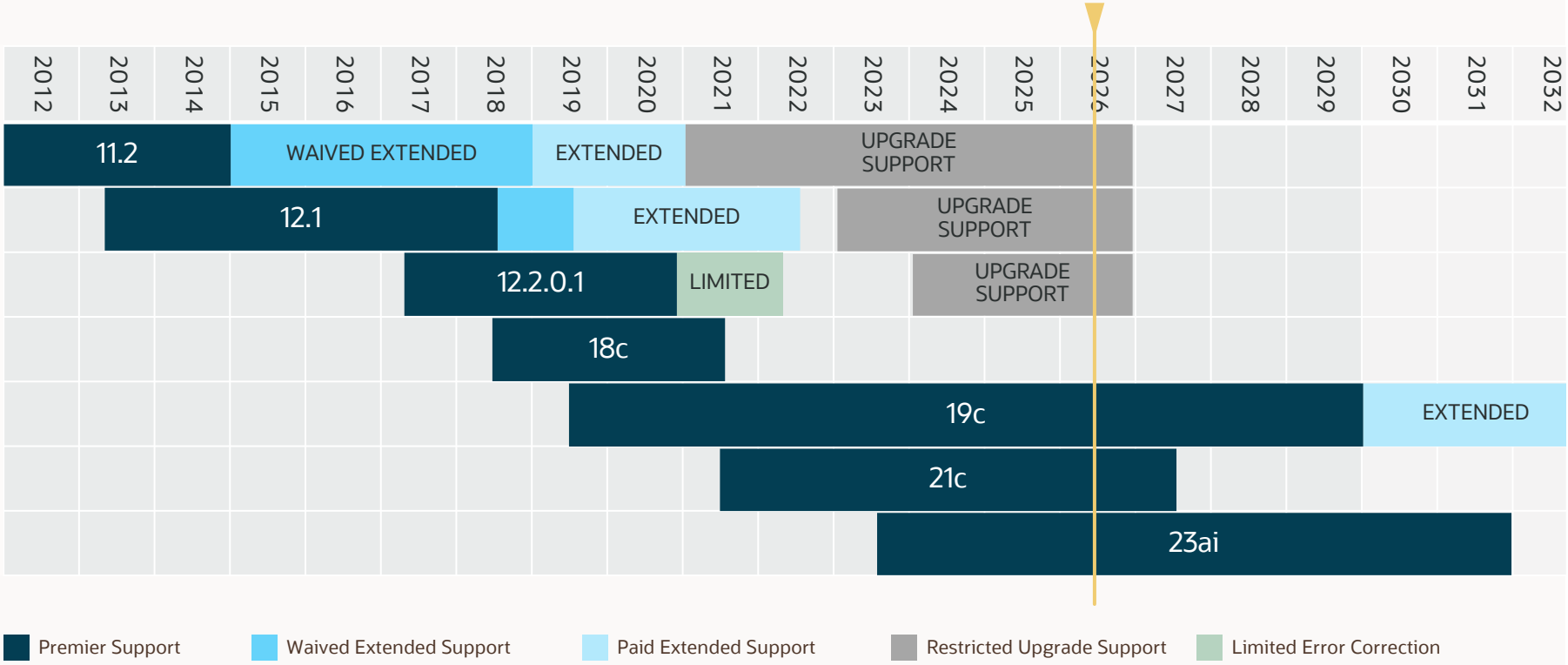
Copyright © 2026, Oracle and/or its affiliates

Copyright © 2026, Oracle and/or its affiliates

Upgrade to Oracle AI Database 26ai

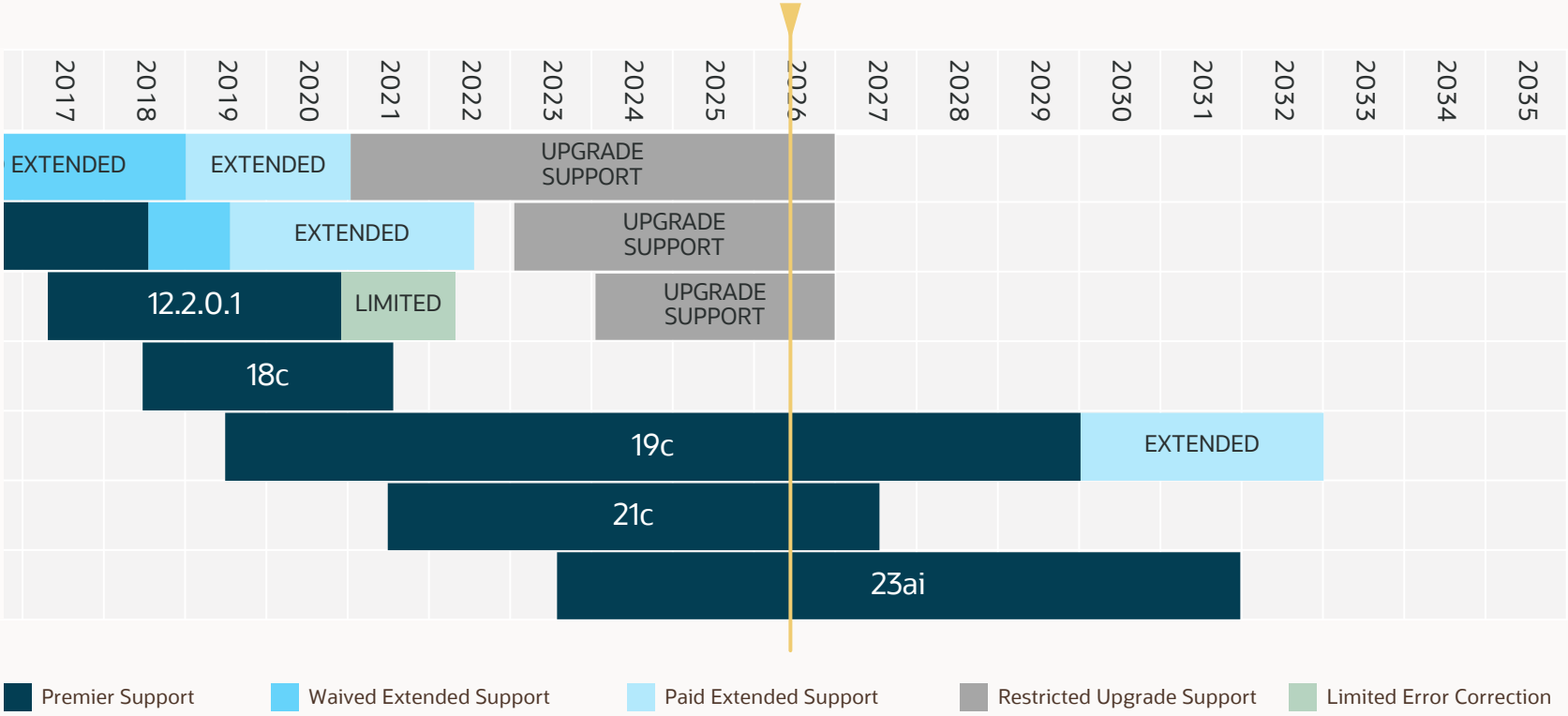
Copyright © 2026, Oracle and/or its affiliates

Lifetime Support Policy



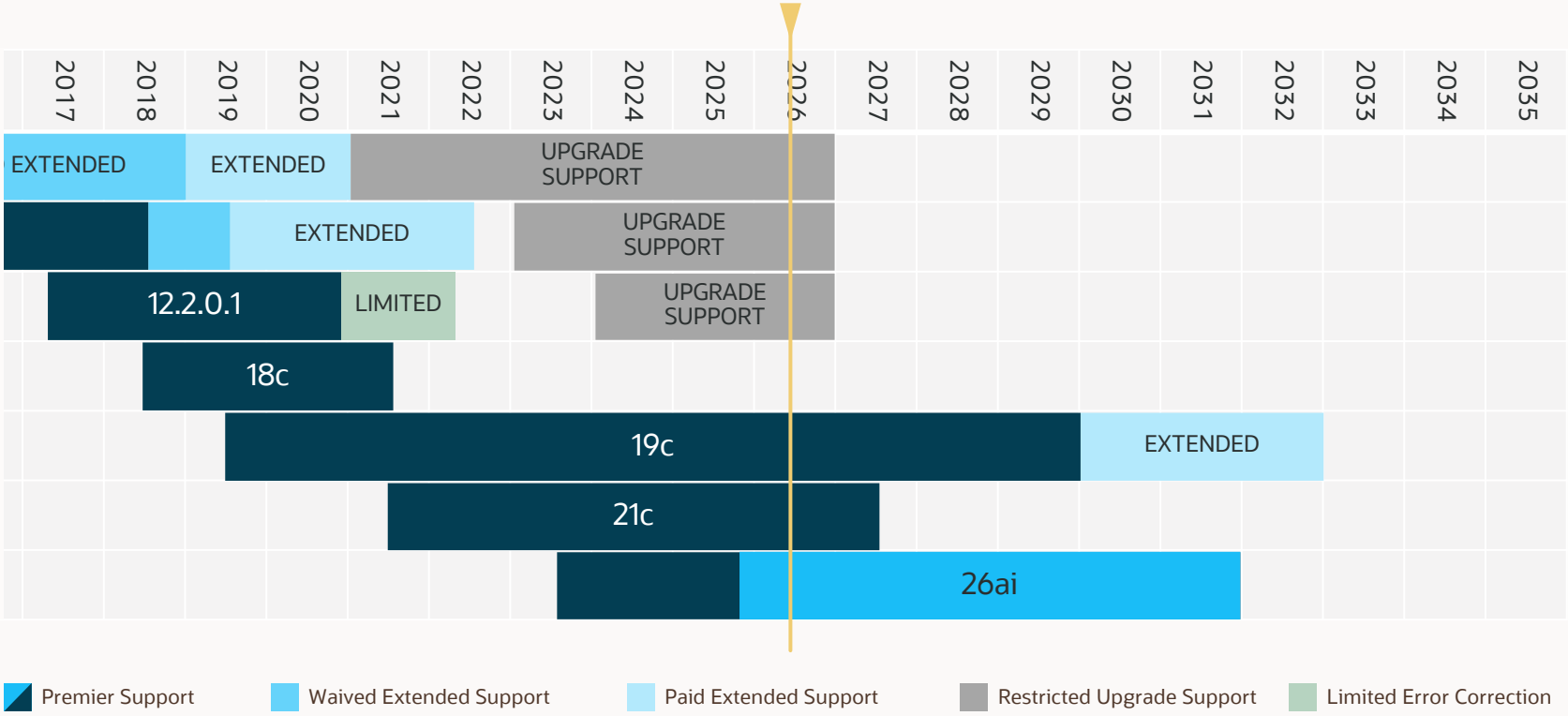
Copyright © 2026, Oracle and/or its affiliates

Lifetime Support Policy



Copyright © 2026, Oracle and/or its affiliates

Lifetime Support Policy



Copyright © 2026, Oracle and/or its affiliates

Oracle strongly recommends that you upgrade to a Long Term Support Release

- Oracle Database 19c or Oracle AI Database 26ai

Copyright © 2026, Oracle and/or its affiliates

26ai

When will it be available on-prem?

Copyright © 2026, Oracle and/or its affiliates

On-Premises Server Releases (includes client)

(Download here)

Linux x86	*Not Planned*	*Not Planned*	*Not planned*	*Not planned*	*Not planned*	*Not planned*	*Not planned*	28-Aug-2013		
Linux x86-64	January 2026 Release Update (23.26.1) (Instant Client and Full Client are available today)	13-Aug-2021	25-Apr-2019	23-Jul-2018	1-Mar-2017	22-Jul-2014	25-Jun-2013	27-Aug-2013		
Linux on Arm	*TBA*	*Not Planned*	28-June-2023 Client: May-2021 download	*Not Planned*	*Not Planned*	*Not Planned*	*Not Planned*	*Not Planned*		
Oracle Solaris SPARC (64-	*TBA*	*See KB126264*	26-Apr-2019	30-Jul-2018	1-Mar-2017	22-Jul-2014	25-Jun-2013	29-Aug-2013		

26ai

What about the other platforms?

Copyright © 2026, Oracle and/or its affiliates

Platforms

Microsoft Windows x64 (64-bit)
IBM AIX on POWER Systems

- CY2026

Oracle Solaris SPARC (64-bit)
IBM Linux on System z

- CY2027

Linux on Arm

- TBA

Release Schedule of Current Database Releases (PNEWS1360)

Copyright © 2026, Oracle and/or its affiliates

26ai

There is no need to re-certify your app

- Certification for Oracle Database 23ai applies to Oracle AI Database 26ai

Copyright © 2026, Oracle and/or its affiliates

Types of Upgrades

Copyright © 2026, Oracle and/or its affiliates

Types of Upgrades

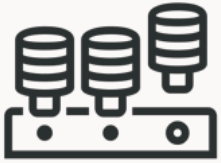
CDB
upgrade

PDB
unplug-plug

Non-CDB
upgrade and convert

Copyright © 2026, Oracle and/or its affiliates

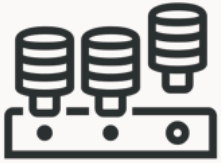
CDB Upgrade



- Upgrades entire CDB including all PDBs
- *Many-as-one* principle
- Less work, more automation
- In-place upgrade, no extra resources needed
- Supports Flashback Database
- Seamless Data Guard + RMAN integration
- At least 30-45 minutes, possibly hours

Copyright © 2026, Oracle and/or its affiliates

CDB Upgrade



- Less control
- Common SLAs needed

Copyright © 2026, Oracle and/or its affiliates

PDB Upgrade

- Upgrades single PDB
- More flexibility
- More control
- Typically, 10-30 minutes

Copyright © 2026, Oracle and/or its affiliates

PDB Upgrade

- Additional CDB needed
- Out-of-place upgrade, extra resources needed
- PDB is moved or cloned
- No support for Flashback Database
- Extra work for Data Guard
- Restore between containers requires pre-plugin backups

Copyright © 2026, Oracle and/or its affiliates

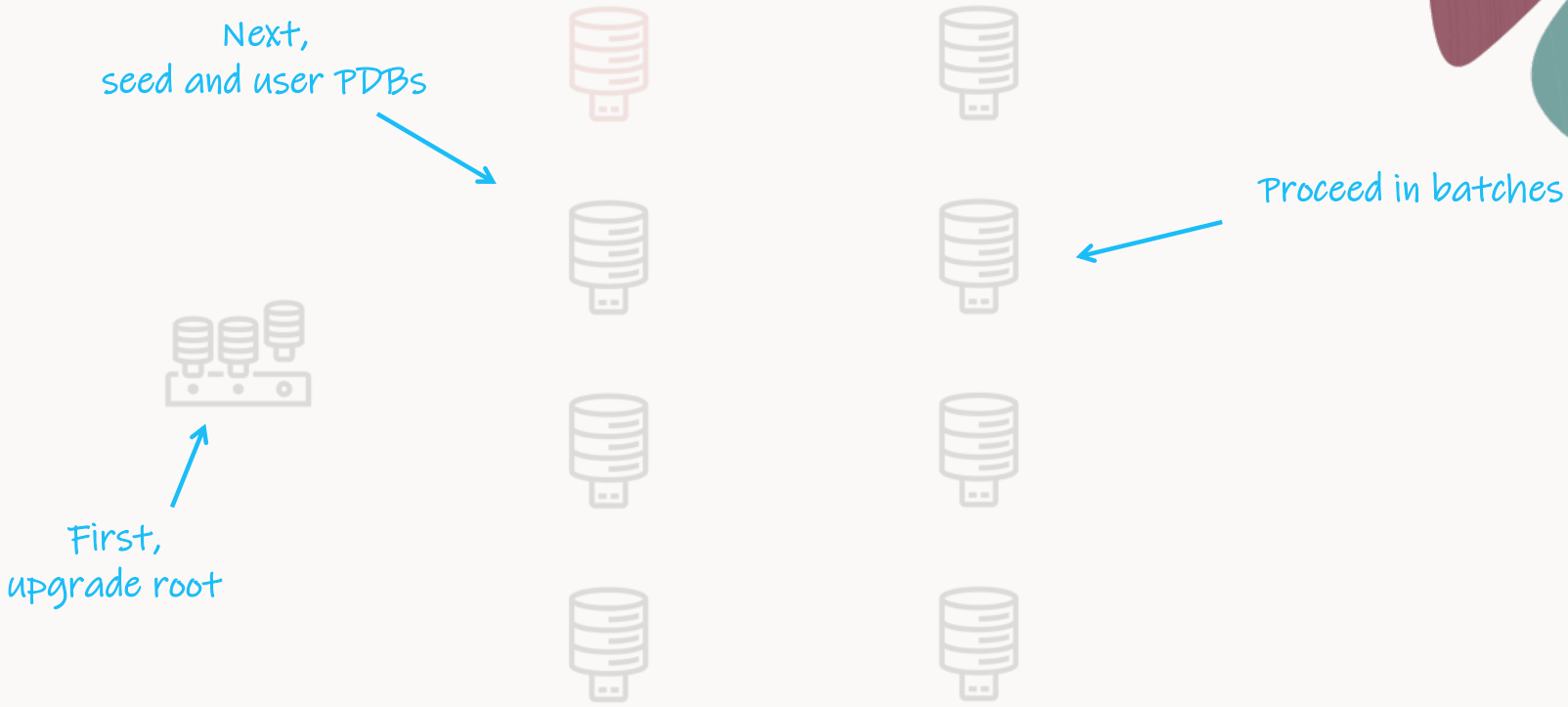
Non-CDB to PDB

- Similar to unplug-plug upgrade
- One-time conversion
- Irreversible
- No support for Flashback Database
- Extra work for Data Guard
- Typically, 5-10 minutes
- Restore requires pre-plugin backups

Copyright © 2026, Oracle and/or its affiliates

Comparing CDB and PDB upgrades

Copyright © 2026, Oracle and/or its affiliates

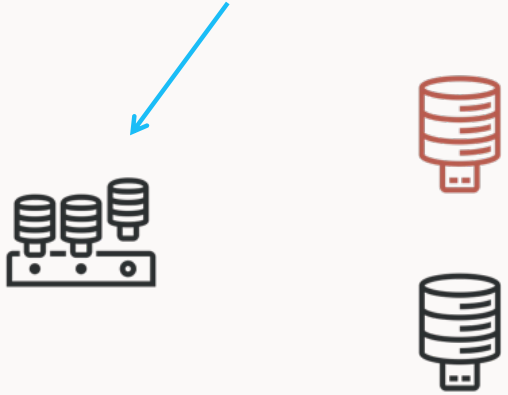


Copyright © 2026, Oracle and/or its affiliates

Single tenant,
always two batches

Copyright © 2026, Oracle and/or its affiliates

Oracle Database 19c



Oracle AI Database 26ai

Copyright © 2026, Oracle and/or its affiliates

Unplug-plug upgrades are faster than upgrading an entire CDB

Copyright © 2026, Oracle and/or its affiliates

Comparing **UPGRADE** types

	CDB upgrade	PDB upgrade	PDB conversion
Time	Longest	Shorter	Very short
Complexity	Easy	Moderate	Moderate
Outage	One big outage	Many smaller outages	Many smaller outages
Rollback	Flashback Database	Other rollback options	Other rollback options
Data Guard + RMAN	Seamless integration	Extra work	Extra work

Copyright © 2026, Oracle and/or its affiliates

Upgrading an entire CDB

Copyright © 2026, Oracle and/or its affiliates

```
global.global_log_dir=/home/oracle/autoupgrade/logs/CDB1
upg1.source_home=/u01/app/oracle/product/19
upg1.target_home=/u01/app/oracle/product/26
upg1.sid=CDB1
```


Copyright © 2026, Oracle and/or its affiliates

```
global.global_log_dir=/home/oracle/autoupgrade/logs/CDB19
upg1.source_home=/u01/app/oracle/product/19
upg1.target_home=/u01/app/oracle/product/26
upg1.sid=CDB1
upg1.timezone_upg=no
```


Copyright © 2026, Oracle and/or its affiliates

```
global.global_log_dir=/home/oracle/autoupgrade/logs/CDB1
upg1.source_home=/u01/app/oracle/product/19
upg1.target_home=/u01/app/oracle/product/26
upg1.sid=CDB1
upg1.timezone_upg=no
upg1.run_dictionary_health=full
```


Copyright © 2026, Oracle and/or its affiliates

```
global.global_log_dir=/home/oracle/autoupgrade/logs/CDB1
upg1.source_home=/u01/app/oracle/product/19
upg1.target_home=/u01/app/oracle/product/26
upg1.sid=CDB1
upg1.timezone_upg=no
upg1.run_dictionary_health=full
upg1.raise_compatible=yes
```


Copyright © 2026, Oracle and/or its affiliates

```
global.global_log_dir=/home/oracle/autoupgrade/logs/CDB1
upg1.source_home=/u01/app/oracle/product/19
upg1.target_home=/u01/app/oracle/product/26
upg1.sid=CDB1
upg1.timezone_upg=no
upg1.run_dictionary_health=full
upg1.raise_compatible=yes
upg1.emcli_path=/u01/app/oracle/oem
upg1.em_target_name=CDB1_myhost.domain.int
```


Copyright © 2026, Oracle and/or its affiliates

```
global.global_log_dir=/home/oracle/autoupgrade/logs/CDB1
upg1.source_home=/u01/app/oracle/product/19
upg1.target_home=/u01/app/oracle/product/26
upg1.sid=CDB1
upg1.timezone_upg=no
upg1.run_dictionary_health=full
upg1.raise_compatible=yes
upg1.emcli_path=/u01/app/oracle/oem
upg1.em_target_name=CDB1_myhost.domain.int
upg1.rman_catalog_connect_string=catalogdb
```


Copyright © 2026, Oracle and/or its affiliates

```
java -jar autoupgrade.jar -config CDB1.cfg -mode analyze
```


Copyright © 2026, Oracle and/or its affiliates

```
java -jar autoupgrade.jar -config CDB1.cfg -mode analyze
```

```
java -jar autoupgrade.jar -config CDB1.cfg -mode deploy
```


Copyright © 2026, Oracle and/or its affiliates

Use AutoUpgrade to download patches and install Oracle home

Copyright © 2026, Oracle and/or its affiliates

Upgrade

- Webinar: Best Practices for Upgrading to Oracle AI Database 26ai
- Blog post: Upgrade to Oracle AI Database 26ai

Copyright © 2026, Oracle and/or its affiliates

Performance and Migrations

Copyright © 2026, Oracle and/or its affiliates

What's the Worst That Can Happen?

Photo by Ugi K. on Unsplash

Copyright © 2026, Oracle and/or its affiliates

Photo by Dave Hoefler on Unsplash

What if we had a *one-button* tool that points out the bad statements…

Copyright © 2026, Oracle and/or its affiliates

SQL Performance Analyzer

Copyright © 2026, Oracle and/or its affiliates

Database Licensing Information User Manual

1 Licensing Information

1.1 Introduction

This Licensing Information document is a part of the product or program documentation under the terms of your Oracle license agreement and is intended to help you understand the program editions, entitlements, restrictions, prerequisites, special license rights, and/or separately licensed third party technology terms associated with the Oracle software program(s) covered by this document (the "Program(s)"). Entitled or restricted use products or components identified in this document that are not provided with the particular Program may be obtained from the Oracle Software Delivery Cloud website (https://edelivery.oracle.com) or from media Oracle may provide. If you have a question about your license rights and obligations, please contact your Oracle sales representative, review the information provided in Oracle's Software Investment Guide (http://www.oracle.com/us/

Oracle Real Application Testing	Extra cost option: **EE-ES** Included option: **BaseDB EE**, **BaseDB EE-HP**, **BaseDB EE-EP**, **ExaDB**	Oracle Real Application Testing includes the following features: • Database Replay • SQL Performance Analyzer (SPA) • Database Migration Planner • Database Migration Workbench **Database Replay** • The Oracle Real Application Testing license is required on both capture and replay systems for Database Replay and is charged by the total number of CPUs on those systems. Licensing is also charged by the total number of CPUs on both systems when the capture is done on any read-only standby database and the workload is replayed on a True Cache. • Use of Capture and Replay ASH Analytics Reports, Compare Period ADDM Reports, and Replay Compare Period Reports also requires an Oracle Diagnostics Pack license. • An Oracle Real Application Testing license permits you to access Database Replay functionality through Oracle Enterprise Manager, as well as through the following database server command-line APIs: `DBMS_WORKLOAD_CAPTURE` package and `DBMS_WORKLOAD_REPLAY` package. The use of the `DBMS_WORKLOAD_REPLAY.COMPARE_PERIOD_REPORT()` function also requires a license for Oracle Diagnostics Pack. **SQL Performance Analyzer (SPA)** An Oracle Real Application Testing license permits you to access SQL Performance Analyzer functionality through Oracle Enterprise Manager, as w as through the following database server command-line API: `DBMS_SQLPA`

PERFORMANCE STABILITY

Copyright © 2026, Oracle and/or its affiliates

1

CAPTURE

2

ANALYZE

3

FIX

4

REMEDY

1

CAPTURE

Capture
workload information
into SQL Tuning Set

2

ANALYZE

3

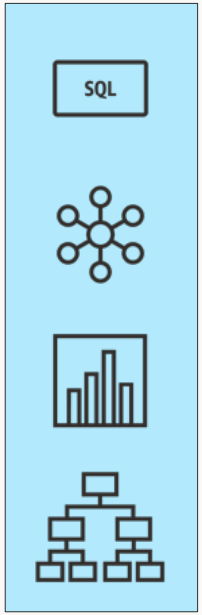
FIX

4

REMEDY

SQL Tuning Set | Definition

SQL Tuning Set



SQL statement

Context

Statistics

Plans

Copyright © 2026, Oracle and/or its affiliates

```
--Capture directly from cursor cache at regular intervals
exec DBMS_SQLSET.CAPTURE_CURSOR_CACHE ( ... );

--One time sample from cursor cache
exec DBMS_SQLSET.SELECT_CURSOR_CACHE ( ... );
```


Copyright © 2026, Oracle and/or its affiliates

```
--Capture directly from cursor cache at regular intervals
exec DBMS_SQLSET.CAPTURE_CURSOR_CACHE ( ... );

--One time sample from cursor cache
exec DBMS_SQLSET.SELECT_CURSOR_CACHE ( ... );

--Capture from AWR
SQL> exec DBMS_SQLSET.SELECT_WORKLOAD_REPOSITORY ( ... );
```


Copyright © 2026, Oracle and/or its affiliates

```
SQL> select name, statement_count from dba_sqlset;

NAME                             STATEMENT_COUNT
_______________________________ _________________
SALES_APP_WORKLOAD                          2543
```


Copyright © 2026, Oracle and/or its affiliates

```
SQL> select view_name from dba_views where view_name like 'DBA%SQLSET%';

VIEW_NAME
_______________________________
DBA_SQLSET
DBA_SQLSET_REFERENCES
DBA_SQLSET_STATEMENTS
DBA_SQLSET_BINDS
DBA_SQLSET_PLANS
```


Copyright © 2026, Oracle and/or its affiliates

Automatic SQL Tuning Set captures statements at regular intervals

- Off by default

Copyright © 2026, Oracle and/or its affiliates

```
SQL> select name, statement_count from dba_sqlset;

NAME                           STATEMENT_COUNT
------------------------------ ---------------
SALES_APP_WORKLOAD                        2543
SYS_AUTO_STS                              3320
```


Copyright © 2026, Oracle and/or its affiliates

Gather at least a full month of workload data

- Assist in testing your database
- Useful in solving post-migration performance problems

Copyright © 2026, Oracle and/or its affiliates

```
EXEC DBMS_SQLSET.PACK_STGTAB ( ... );

...

EXEC DBMS_SQLSET.UNPACK_STGTAB ( ... );
```


Copyright © 2026, Oracle and/or its affiliates

```
-- If you have many bind variables in your queries, increase the number of binds
-- to capture from 400 (default) to 3999 (max)

alter system set "_cursor_bind_capture_area_size"=3999;
```


Copyright © 2026, Oracle and/or its affiliates

Further Information

SQL Tuning Set

- Blog post: Oracle SQL Tuning Sets (STS) – The foundation for SQL Tuning
- Blog post: What is the automatic SQL tuning set?

Copyright © 2026, Oracle and/or its affiliates

1

CAPTURE

2

ANALYZE

Analyze performance after migration using SQL Performance Analyzer

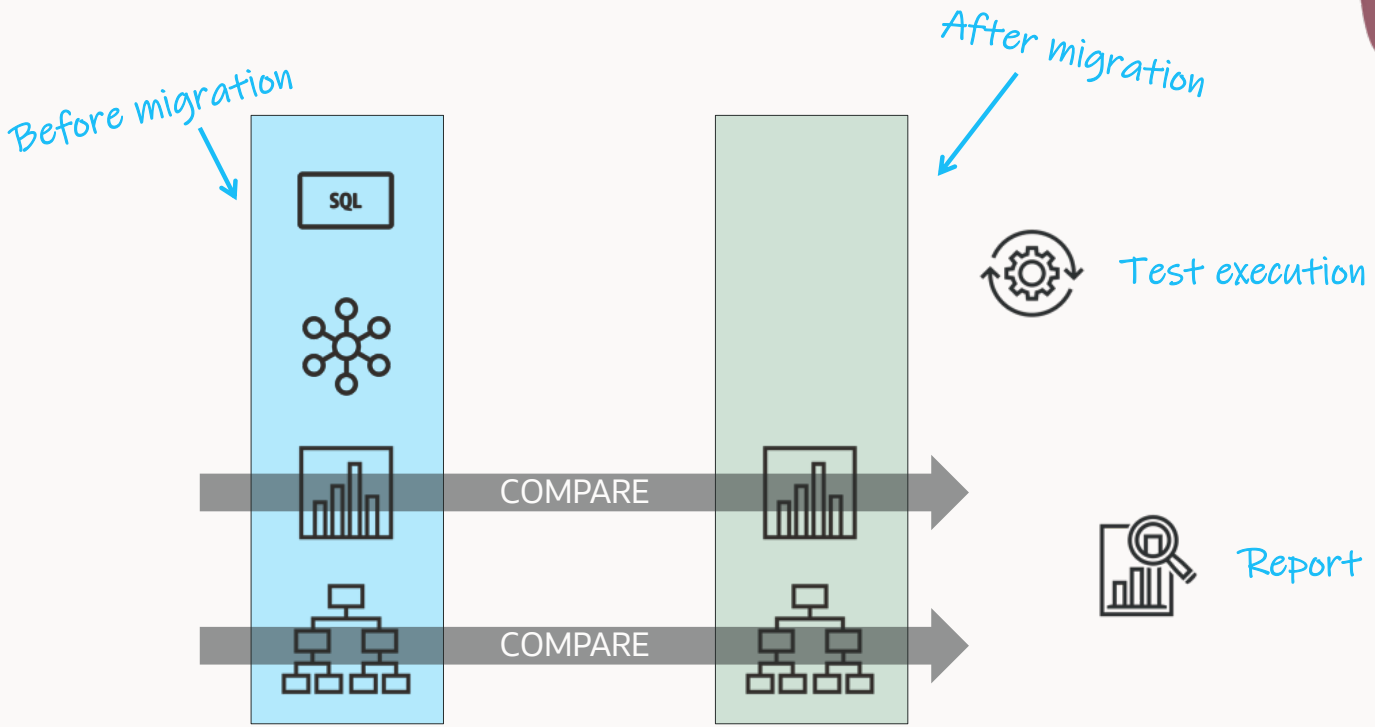
3

FIX

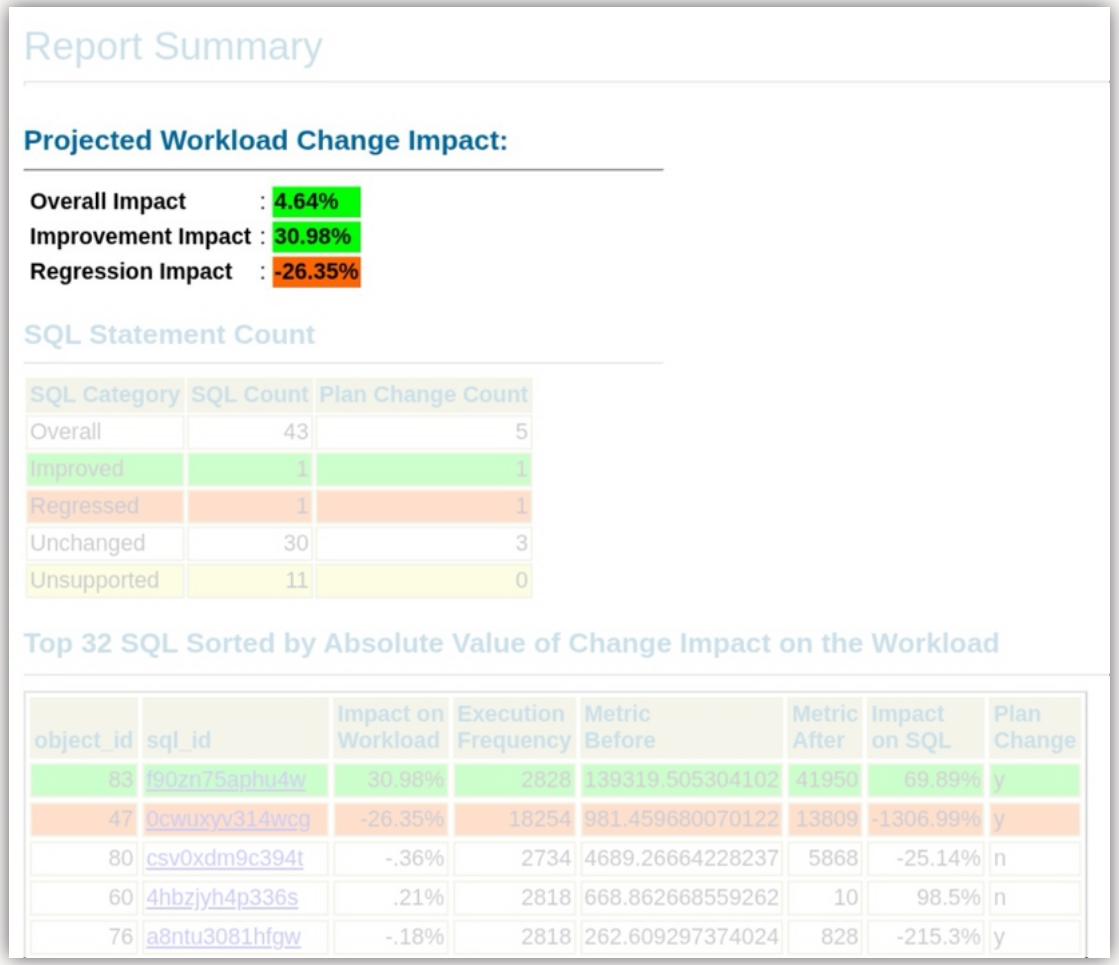
4

REMEDY

SQL Performance Analyzer



Copyright © 2026, Oracle and/or its affiliates



Report Summary

Projected Workload Change Impact:

Overall Impact	**4.64%**
Improvement Impact	**30.98%**
Regression Impact	**-26.35%**

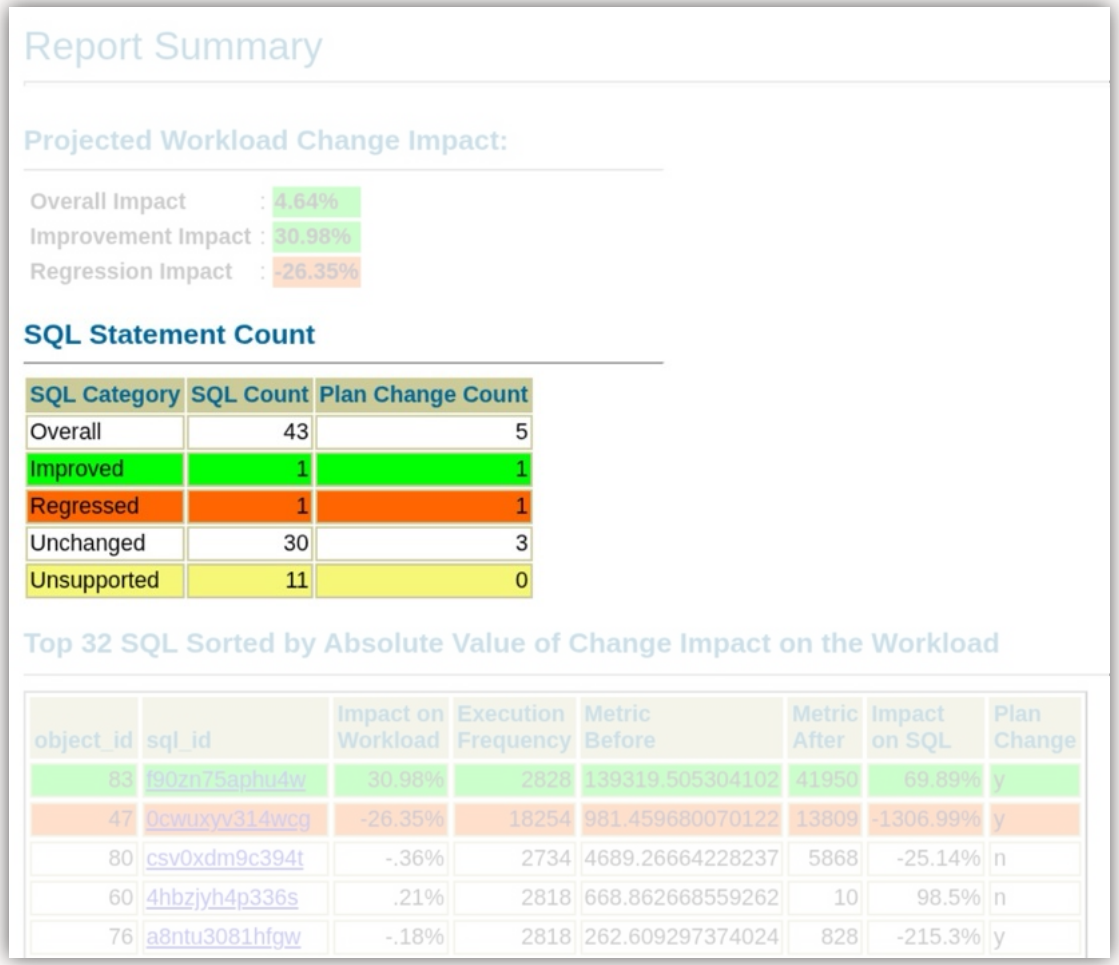
SQL Statement Count

SQL Category	SQL Count	Plan Change Count
Overall	43	5
Improved	1	1
Regressed	1	1
Unchanged	30	3
Unsupported	11	0

Top 32 SQL Sorted by Absolute Value of Change Impact on the Workload

object_id	sql_id	Impact on Workload	Execution Frequency	Metric Before	Metric After	Impact on SQL	Plan Change
83	f90zn75aphu4w	30.98%	2828	139319.505304102	41950	69.89%	y
47	0cwuxyv314wcg	-26.35%	18254	981.459680070122	13809	-1306.99%	y
80	csv0xdm9c394t	-.36%	2734	4689.26664228237	5868	-25.14%	n
60	4hbzjyh4p336s	.21%	2818	668.862668559262	10	98.5%	n
76	a8ntu3081hfgw	-.18%	2818	262.609297374024	828	-215.3%	y

Copyright © 2026, Oracle and/or its affiliates



Report Summary

Projected Workload Change Impact:

Overall Impact : 4.64%
Improvement Impact : 30.98%
Regression Impact : -26.35%

SQL Statement Count

SQL Category	SQL Count	Plan Change Count
Overall	43	5
Improved	1	1
Regressed	1	1
Unchanged	30	3
Unsupported	11	0

Top 32 SQL Sorted by Absolute Value of Change Impact on the Workload

object_id	sql_id	Impact on Workload	Execution Frequency	Metric Before	Metric After	Impact on SQL	Plan Change
83	f90zn75aphu4w	30.98%	2828	139319.505304102	41950	69.89%	y
47	0cwuxyv314wcg	-26.35%	18254	981.459680070122	13809	-1306.99%	y
80	csv0xdm9c394t	-.36%	2734	4689.26664228237	5868	-25.14%	n
60	4hbzjyh4p336s	.21%	2818	668.862668559262	10	98.5%	n
76	a8ntu3081hfgw	-.18%	2818	262.609297374024	828	-215.3%	y

Copyright © 2026, Oracle and/or its affiliates

Report Summary

Projected Workload Change Impact:

Overall Impact	: 4.64%
Improvement Impact	: 30.98%
Regression Impact	: -26.35%

SQL Statement Count

SQL Category	SQL Count	Plan Change Count
Overall	43	5
Improved	1	1
Regressed	1	1
Unchanged	30	3
Unsupported	11	0

Top 32 SQL Sorted by Absolute Value of Change Impact on the Workload

object_id	sql_id	Impact on Workload	Execution Frequency	Metric Before	Metric After	Impact on SQL	Plan Change
83	f90zn75aphu4w	30.98%	2828	139319.505304102	41950	69.89%	y
47	0cwuxyv314wcg	-26.35%	18254	981.459680070122	13809	-1306.99%	y
80	csv0xdm9c394t	-.36%	2734	4689.26664228237	5868	-25.14%	n
60	4hbzjyh4p336s	.21%	2818	668.862668559262	10	98.5%	n
76	a8ntu3081hfgw	-.18%	2818	262.609297374024	828	-215.3%	y

Copyright © 2026, Oracle and/or its affiliates

SQL Details:

Object ID : 47
Schema Name : TPCC
Container Name : Unknown (con_dbid: 344460545)
SQL ID : 0cwuxyv314wcg
Execution Frequency : 18254
SQL Text : SELECT ROWID FROM CUSTOMER WHERE C_W_ID = :B3 AND C_D_ID = :B2 AND C_LAST = :B1

Bind Variables:

1 - (NUMBER): 3
2 - (NUMBER): 7
3 - (VARCHAR2): ESEEINGOUGHT

Execution Statistics:

Stat Name	Impact on Workload	Value Before	Value After	Impact on SQL
elapsed_time	-26.35%	.000981	.013809	-1306.99%
parse_time			.000477	
cpu_time	-106.5%	.000494	.013743	-2681.43%
user_io_time			0	
buffer_gets	-130.82%	253	7252	-2759.03%
cost	-745969.19%	255	1982	-677.25%
reads	0%	0	0	0%
writes	0%	0	0	0%

Copyright © 2026, Oracle and/or its affiliates

SQL Details:

Object ID : 47
Schema Name : TPCC
Container Name : Unknown (con_dbid: 344460545)
SQL ID : 0cwuxyv314wcg
Execution Frequency : 18254
SQL Text : SELECT ROWID FROM CUSTOMER WHERE C_W_ID = :B3 AND C_D_ID = :B2 AND C_LAST = :B1

Bind Variables:

1 - (NUMBER): 3
2 - (NUMBER): 7
3 - (VARCHAR2): ESEEINGOUGHT

Execution Statistics:

Stat Name	Impact on Workload	Value Before	Value After	Impact on SQL
elapsed_time	-26.35%	.000981	.013809	-1306.99%
parse_time			.000477	
cpu_time	-106.5%	.000494	.013743	-2681.43%
user_io_time			0	
buffer_gets	-130.82%	253	7252	-2759.03%
cost	-745969.19%	255	1982	-677.25%
reads	0%	0	0	0%
writes	0%	0	0	0%

Copyright © 2026, Oracle and/or its affiliates

Execution Plan Before Change:

Plan Hash Value : 612465046

Id	Operation	Name	Rows	Bytes	Cost	Time
0	SELECT STATEMENT				255	
1	SORT ORDER BY		2	92	255	00:00:01
2	TABLE ACCESS BY INDEX ROWID BATCHED	CUSTOMER	2	92	254	00:00:01
3	INDEX RANGE SCAN	CUSTOMER_I1	3000		10	00:00:01

Execution Plan After Change:

Plan Id : 545
Plan Hash Value : 4040750106

Id	Operation	Name	Rows	Bytes	Cost	Time
0	SELECT STATEMENT		2	92	1982	00:00:01
1	SORT ORDER BY		2	92	1982	00:00:01
* 2	TABLE ACCESS FULL	CUSTOMER	2	92	1981	00:00:01

Predicate Information (identified by operation id):

- 2 - filter("C_LAST"=:B1 AND "C_D_ID"=:B2 AND "C_W_ID"=:B3)

Copyright © 2026, Oracle and/or its affiliates

Execution Plan Before Change:

Plan Hash Value : 612465046

Id	Operation	Name	Rows	Bytes	Cost	Time
0	SELECT STATEMENT				255	
1	SORT ORDER BY		2	92	255	00:00:01
2	TABLE ACCESS BY INDEX ROWID BATCHED	CUSTOMER	2	92	254	00:00:01
3	INDEX RANGE SCAN	CUSTOMER_I1	3000		10	00:00:01

Execution Plan After Change:

Plan Id : 545
Plan Hash Value : 4040750106

Id	Operation	Name	Rows	Bytes	Cost	Time
0	SELECT STATEMENT		2	92	1982	00:00:01
1	SORT ORDER BY		2	92	1982	00:00:01
* 2	TABLE ACCESS FULL	CUSTOMER	2	92	1981	00:00:01

Predicate Information (identified by operation id):

- 2 - filter("C_LAST"=:B1 AND "C_D_ID"=:B2 AND "C_W_ID"=:B3)

Copyright © 2026, Oracle and/or its affiliates

You don't need to connect your app to use SQL Performance Analyzer

Copyright © 2026, Oracle and/or its affiliates

You can use SQL Performance Analyzer to test any change to your database

Copyright © 2026, Oracle and/or its affiliates

Further Information

SQL Performance Analyzer

- Blog post: Smooth transition to Autonomous Database using SPA

Copyright © 2026, Oracle and/or its affiliates

1

CAPTURE

2

ANALYZE

3

FIX

Fix regressing statements

4

REMEDY

Fixing Statements

Most cloud offerings have access to a number of tools:

- SQL Tuning Advisor
- Real-time SQL Monitoring
- SQL Access Advisor

Copyright © 2026, Oracle and/or its affiliates

Perhaps you even have access to a DBA

Copyright © 2026, Oracle and/or its affiliates

You could also ask ChatGPT

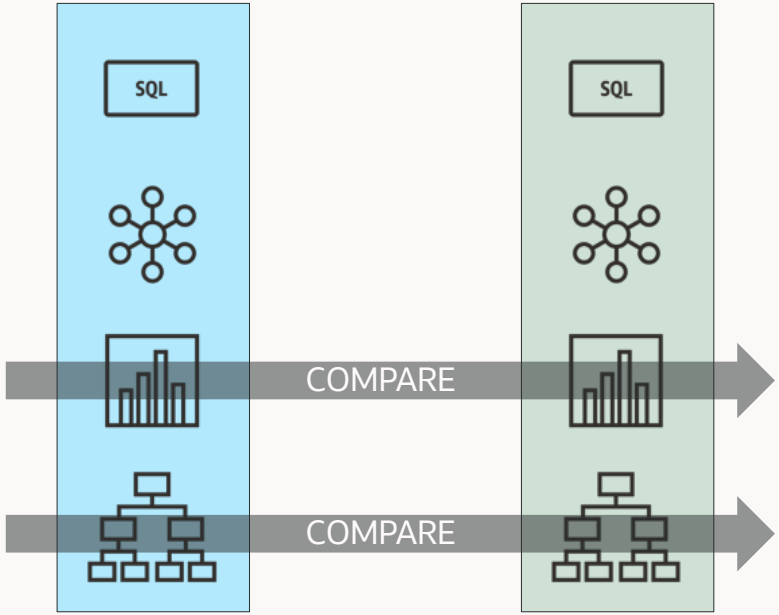
Copyright © 2026, Oracle and/or its affiliates

What is the best fix?

- Does it have any side effects?

Copyright © 2026, Oracle and/or its affiliates

Continuous Improvement



Copyright © 2026, Oracle and/or its affiliates

Continuous Improvement

Implement change

Test execute

Check outcome

Repeat

Copyright © 2026, Oracle and/or its affiliates

1

CAPTURE

2

ANALYZE

3

FIX

4

REMEDY

Stabilize performance
using
SQL Plan Management

SQL Plan Management is the best tool to ensure plan stability

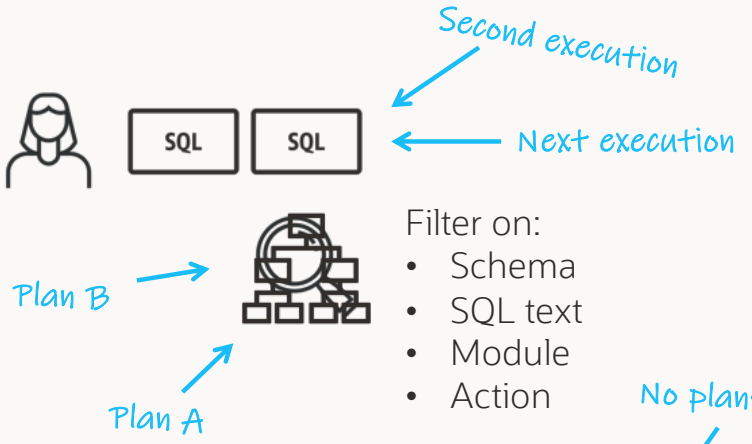
Copyright © 2026, Oracle and/or its affiliates

```
-- Toggles creation of SQL plan baselines for all repeatable statements
-- Usually, not recommended to capture and create baselines for all statements

alter system set optimizer_capture_sql_plan_baselines=true;
```

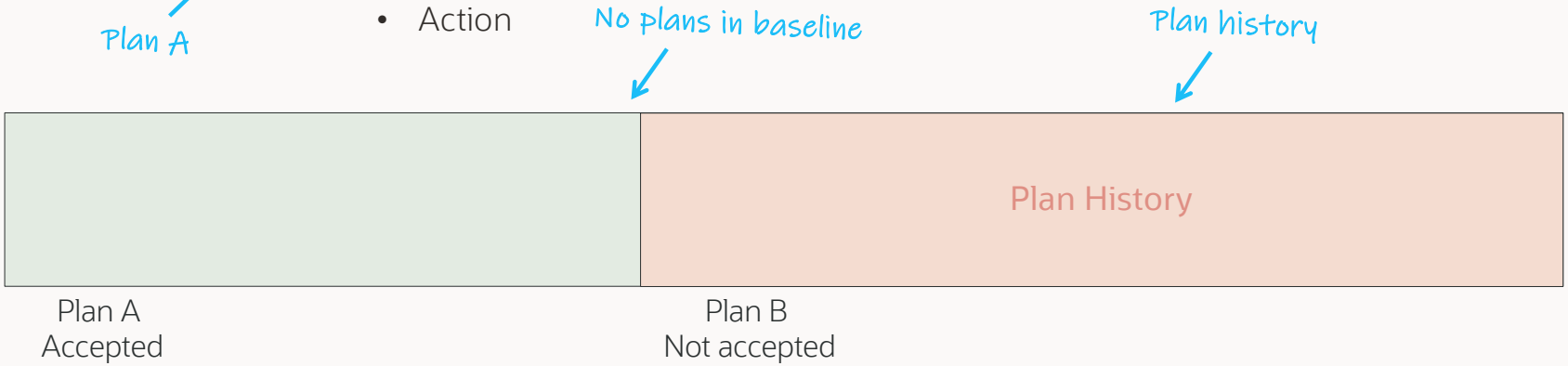

Copyright © 2026, Oracle and/or its affiliates

SQL Plan Management



Filter on:
- Schema
- SQL text
- Module
- Action

Something changed:
- New statistics
- New parameters
- Upgrade



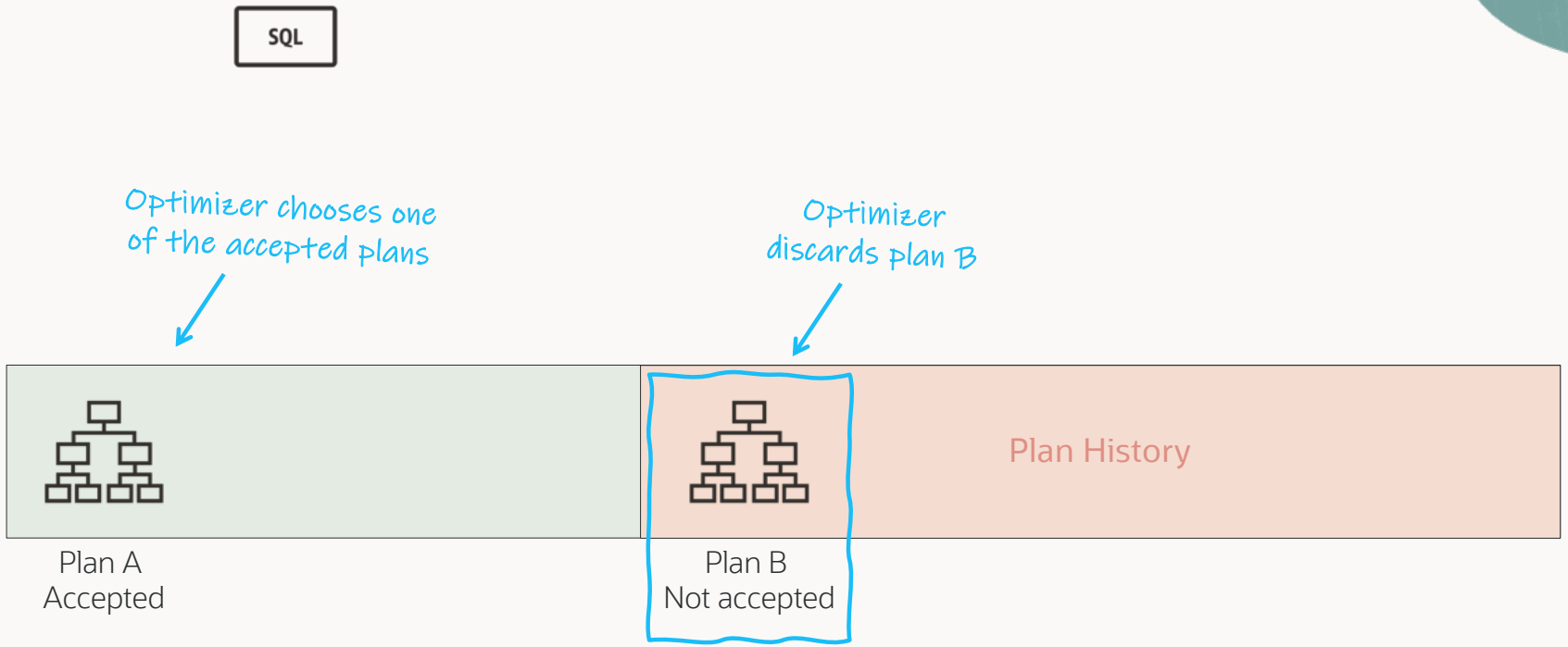
Copyright © 2026, Oracle and/or its affiliates

```
-- Restricts the optimizer to only use plans that are accepted
-- This is the default value

alter system set optimizer_use_sql_plan_baselines=true;
```

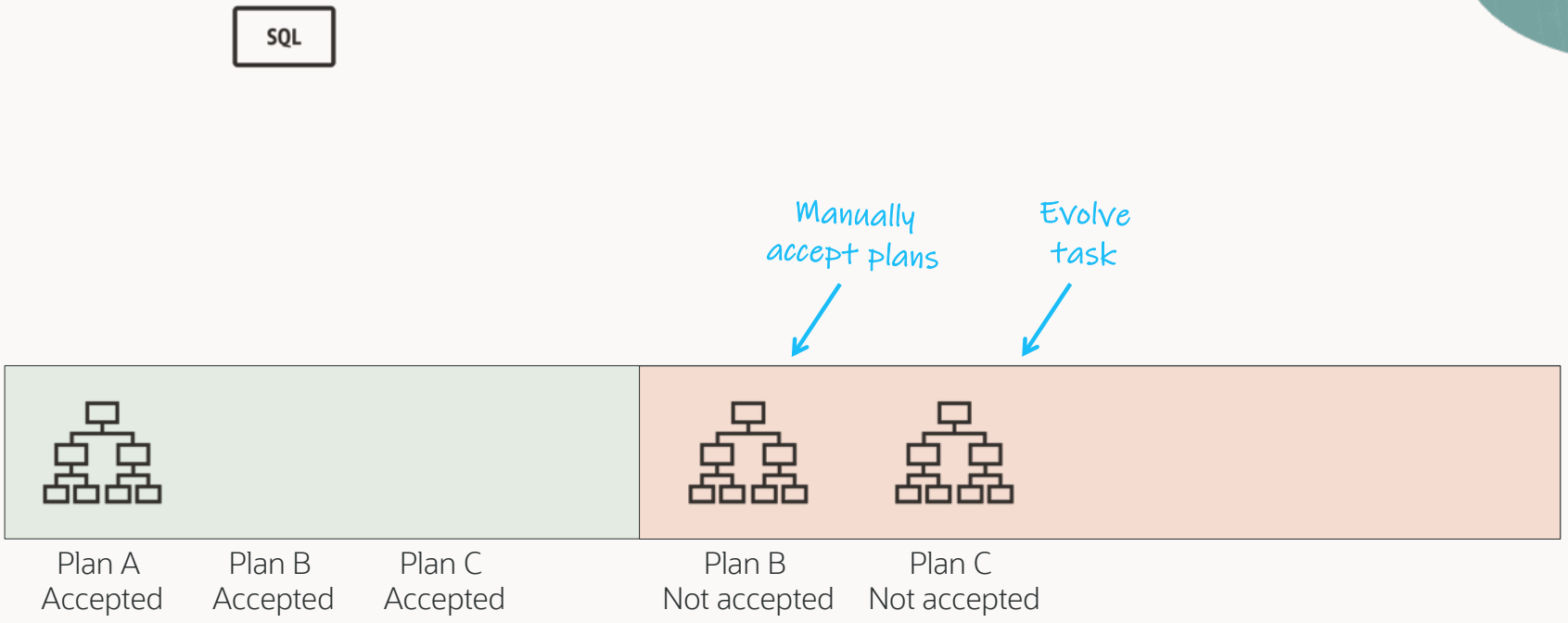

Copyright © 2026, Oracle and/or its affiliates

SQL Plan Management



Copyright © 2026, Oracle and/or its affiliates

SQL Plan Management



Copyright © 2026, Oracle and/or its affiliates

```
-- The database stores plans in the plan history for 53 weeks.
-- This might consume a lot of space. Consider lowering the limit.

exec dbms_spm.configure('plan_retention_weeks', 5);
```


Copyright © 2026, Oracle and/or its affiliates

You can manually create plan baselines for specific statements

- Don't capture all plans

Copyright © 2026, Oracle and/or its affiliates

```
-- Load all plans from a SQL tuning set into plan baselines
-- Plans are accepted automatically without test execution

var cnt number;
exec :cnt := DBMS_SPM.LOAD_PLANS_FROM_SQLSET(
                basic_filter => 'sql_id=''0cwuxyv314wcg''',
                ...
             );
```


Copyright © 2026, Oracle and/or its affiliates

Plan baselines are transportable; create in test, use in production

Copyright © 2026, Oracle and/or its affiliates

```
-- Pack baselines from "problematic" statements into staging table
exec DBMS_SPM.PACK_STGTAB_BASELINE(sql_handle => SQL_130f372d9ffe4df9, ...);
```


Copyright © 2026, Oracle and/or its affiliates

```
-- Pack baselines from "problematic" statements into staging table
exec DBMS_SPM.PACK_STGTAB_BASELINE(sql_handle => SQL_130f372d9ffe4df9, ...);
exec DBMS_SPM.PACK_STGTAB_BASELINE(sql_handle => SQL_51dc7232adc62849, ...);
exec DBMS_SPM.PACK_STGTAB_BASELINE(sql_handle => SQL_3f38bc33ae7086c9, ...);
```


Copyright © 2026, Oracle and/or its affiliates

```
-- Pack baselines from "problematic" statements into staging table
exec DBMS_SPM.PACK_STGTAB_BASELINE(sql_handle => SQL_130f372d9ffe4df9, ...);
exec DBMS_SPM.PACK_STGTAB_BASELINE(sql_handle => SQL_51dc7232adc62849, ...);
exec DBMS_SPM.PACK_STGTAB_BASELINE(sql_handle => SQL_3f38bc33ae7086c9, ...);

...

-- After production migration, import plan baselines to fix regressions
exec DBMS_SPM.UNPACK_STGTAB_BASELINE( ... );
```


Copyright © 2026, Oracle and/or its affiliates

Here's one for the Top Gun DBA

Copyright © 2026, Oracle and/or its affiliates

```
--Loads all known plans from cursor cache, AWR,
--and automatic SQL tuning sets into a SQL plan baseline.
--Use Evolve Advisor to find the best plan and mark that as accepted.

var report clob;
exec :report := dbms_spm.add_verified_sql_plan_baseline('<sql_id>');
select :report report from dual;
```


Copyright © 2026, Oracle and/or its affiliates

Who said literals?

- SQL Plan Management is not a good fit for an application that doesn't use bind variables

Copyright © 2026, Oracle and/or its affiliates

```
--Application using literals creates many distinct statements
--You'd get 4 plan baselines
select * from sales where order_id=42;
select * from sales where order_id=56;
select * from sales where order_id=101;
select * from sales where order_id=220;
```


Copyright © 2026, Oracle and/or its affiliates

```
--Application using literals creates many distinct statements
--You'd get 4 plan baselines
select * from sales where order_id=42;
select * from sales where order_id=56;
select * from sales where order_id=101;
select * from sales where order_id=220;


--Ideally change the application to use literals
--You'd get only 1 plan baseline
select * from sales where order_id=:b1;
```


Copyright © 2026, Oracle and/or its affiliates

Generally, avoid setting CURSOR_SHARING=FORCE

- Advice from Real-World Performance Group

Copyright © 2026, Oracle and/or its affiliates

Use SQL Profiles

- Part of Tuning Pack included in most cloud offerings

Copyright © 2026, Oracle and/or its affiliates

Further Information

SQL Plan Management

- Blog post: SQL Plan Management Cheat Sheet – Part 1
- Blog post: SQL Plan Management Cheat Sheet – Part 2
- Blog post: What is automatic SQL plan management and why should you care?
- Blog post: What is Real-time SQL plan Management?
- My Oracle Support: Things to Consider to Avoid SQL Plan Management (SPM) Related Problems on 19c (KB139467)

Copyright © 2026, Oracle and/or its affiliates

1

CAPTURE

2

ANALYZE

3

FIX

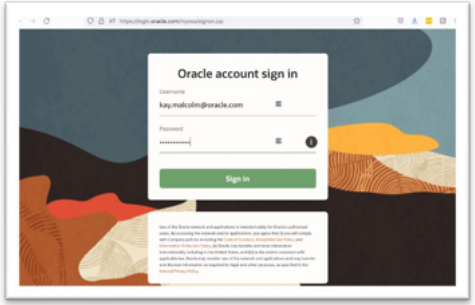
4

REMEDY

The Lab Environment

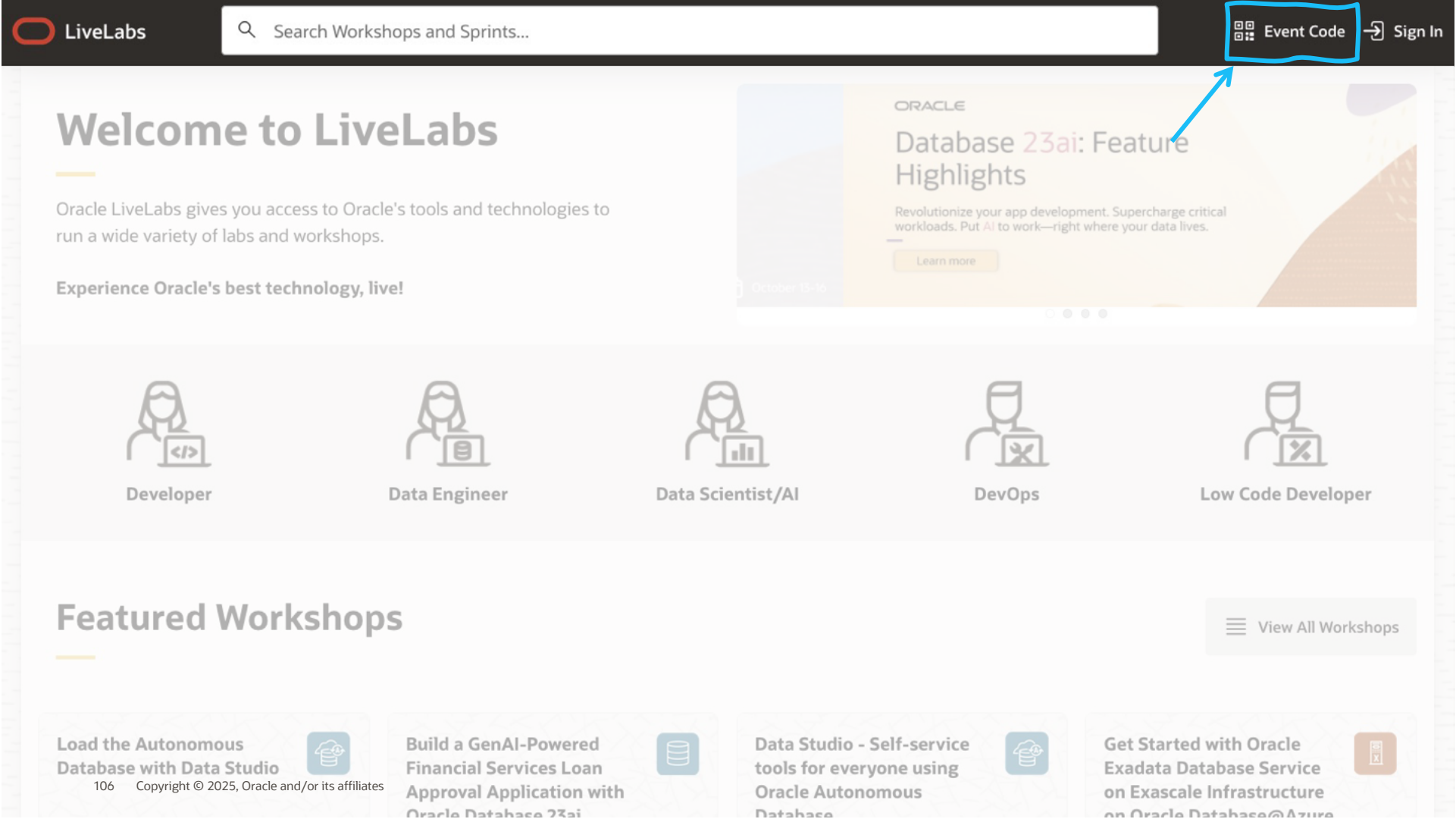
Requirements

Laptop



Oracle Account

Copyright © 2025, Oracle and/or its affiliates



Copyright © 2025, Oracle and/or its affiliates

LiveLabs

Search Workshops and Sprints...

Event Code

Sign In

Let's Get Started
Welcome to LiveLabs

Oracle LiveLabs gives you access to Oracle's tools and technologies to run a wide variety of labs and workshops.

Experience Oracle's best technolo

Developer

Low Code Developer

Enter Event Code

If you've been provided with an event code by Oracle, enter it below

Event Code
09281-HUKB-AIRK

Required

Cancel

Submit Event Code

Featured Worksh

View All Workshops

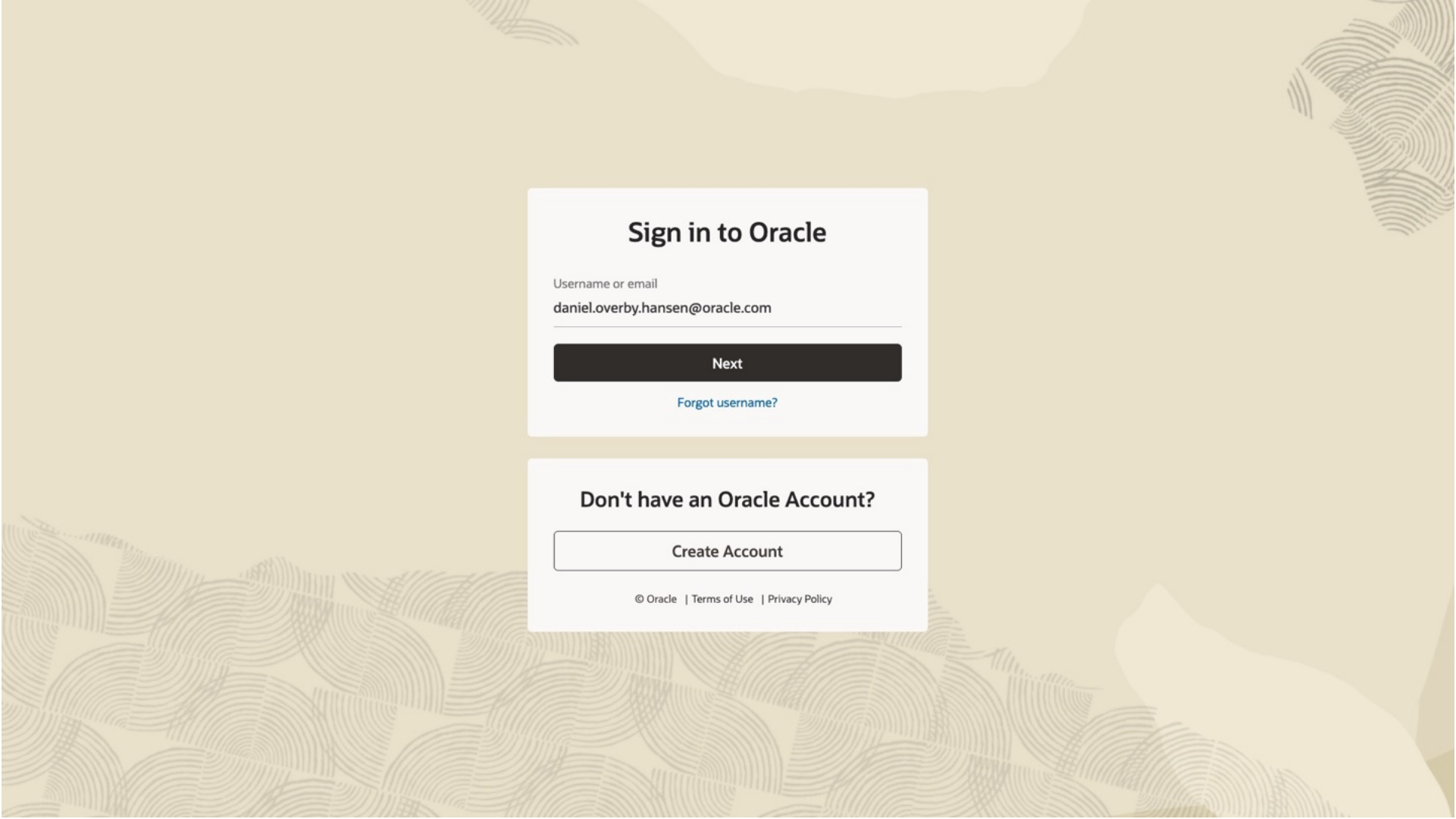
Load the Autonomous Database with Data Studio

Build a GenAI-Powered Financial Services Loan Approval Application with Oracle Database 23ai

Data Studio - Self-service tools for everyone using Oracle Autonomous Database

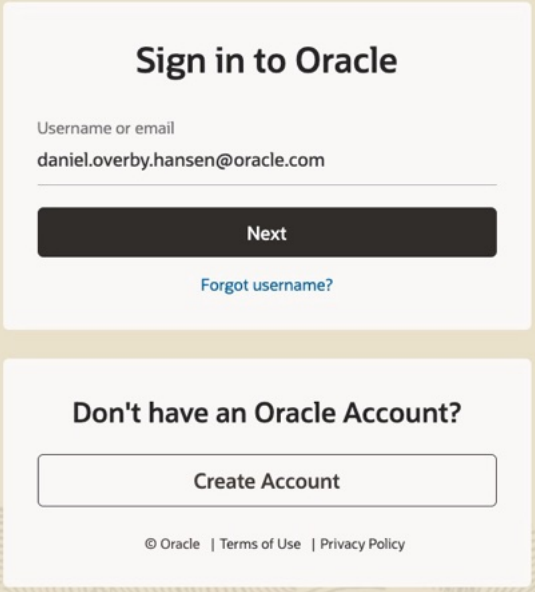
Get Started with Oracle Exadata Database Service on Exascale Infrastructure on Oracle Database@Azure

Copyright © 2025, Oracle and/or its affiliates


Sign in to Oracle
Username or email
daniel.overby.hansen@oracle.com
Next
Forgot username?
Don't have an Oracle Account?
Create Account
© Oracle | Terms of Use | Privacy Policy

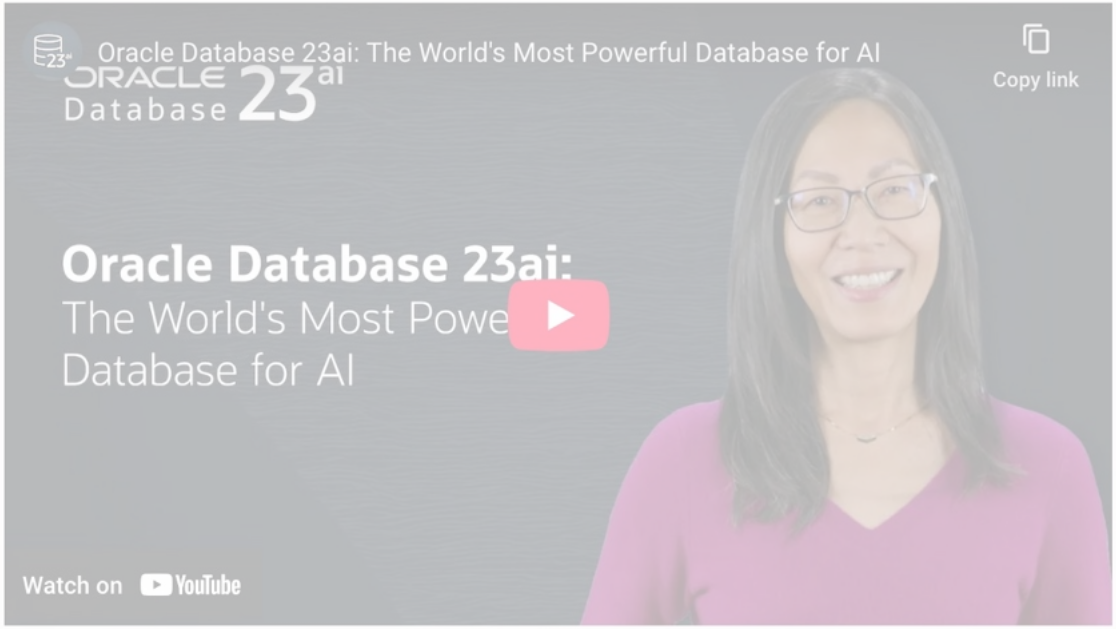
Use your Oracle Account to log in

- This is not your Oracle Cloud Tenancy account
- It is your Oracle SSO account



Oracle AI World 2025 - Fast Track: Upgrade to Oracle Database 23ai [PI1147]

Share
Start



2 hours

Organizer:
Oracle

Event Date:
Oct 13 - 16

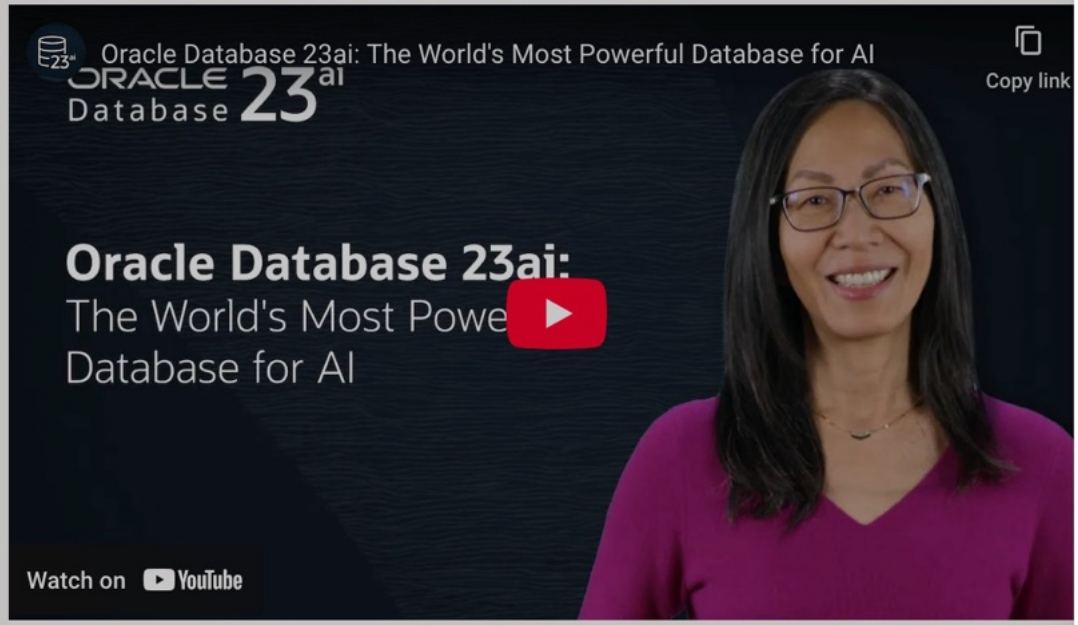
Outline

- Upgrade Oracle Database using AutoUpgrade
- Convert to multitenant architecture using AutoUpgrade
- Convert to multitenant architecture using Refreshable Clone PDBs
- Convert to multitenant architecture using Data Pump
- Ensure performance stability
- Capture workload information
- Detect regressing statements using SQL Performance Analyzer
- Fix bad plans using SQL Tuning Advisor
- Avoid plan regressions with SQL Plan Management
- Restore failed upgrade

Hitchhiker's Guide for Upgrading to Oracle Database 23ai

Oracle AI World 2025 - Fast Track: Upgrade to Oracle Database 23ai [PI1147]

Share
Start



The **Run on Your Environment** button provides step-by-step instructions so you can run this workshop using your own resources!

Run on Your Environment

The **Run on LiveLabs** button will dynamically create resources in an Oracle-owned tenancy for you to use for free!
Oracle account help | ***Oracle account signup***

Run on LiveLabs Sandbox

The **Preview Sandbox Instructions** button will open a link with the Sandbox instructions for you to preview before creating a reservation.

Preview Sandbox Instructions

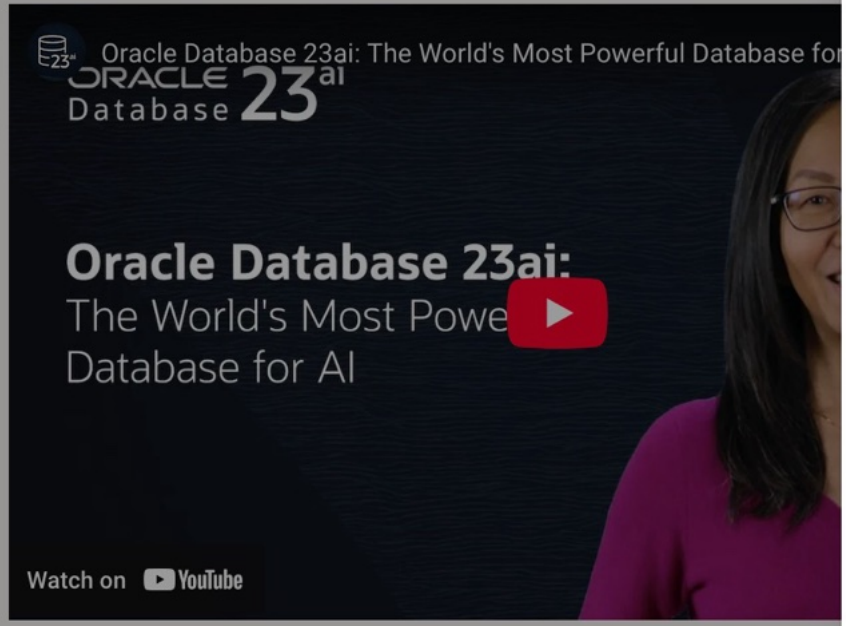
Hitchhiker's Guide for Upgrading to Oracle Database 23ai

- Restore failed upgrade

LiveLabs

Search for workshops and sprints...

Oracle AI World 2025 - Fast Track: Upgrad [PI1147]



Hitchhiker's Guide for Upgrading to Oracle Data

Reserve Workshop

Attendee Email Address
daniel.overby.hansen@oracle.com

Attendee Timezone
PST (-07:00)

Required

* Start Workshop Now?

I consent to receive emails from LiveLabs for my reservation and I agree that I will not upload sensitive personal or company information to Oracle Cloud Infrastructure *

Preview Sandbox Instructions

Submit Reservation

My Reservations

All your current workshop reservations are shown below. You can edit active or pending reservations, view workshop details, attend an available workshop, or delete a reservation.

To access this page again click the user dropdown in the top right corner and select **My Reservations**

Note: The status of your reservations will be emailed to you. Check your mail for any status updates.

Hitchhiker's Guide for Upgrading to Oracle Database 23ai

Wednesday October 8th, 12:59am (00:59) PST

Pending creation

Refresh the page a few times
until a lab environment is assigned

Copyright © 2025, Oracle and/or its affiliates

My Reservations

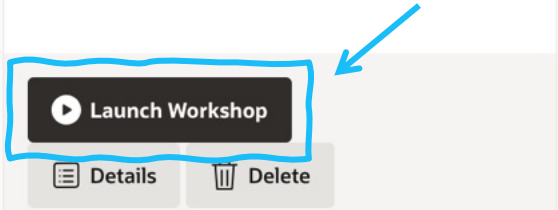
All your current workshop reservations are shown below. You can edit active or pending reservations, view workshop details, attend an available workshop, or delete a reservation.

To access this page again click the user dropdown in the top right corner and select **My Reservations**

Note: The status of your reservations will be emailed to you. Check your mail for any status updates.

Hitchhiker's Guide for Upgrading to Oracle Database 23ai

Wednesday October 8th, 12:59am (00:59) PST



Introduction

About this Workshop

Oracle Database 23ai is a *Long Term Support Release*. This lab combines several upgrade and migration methods, and equips you with performance features and tools to ensure stability when you move to any new Oracle Database release. By upgrading to Oracle Database 23ai, you will have Premier Support until the end of 2031 and Extended Support for a period thereafter. There is a direct upgrade path to Oracle Database 23ai from Oracle Database 19c and 21c, regardless of the Release Update applied.

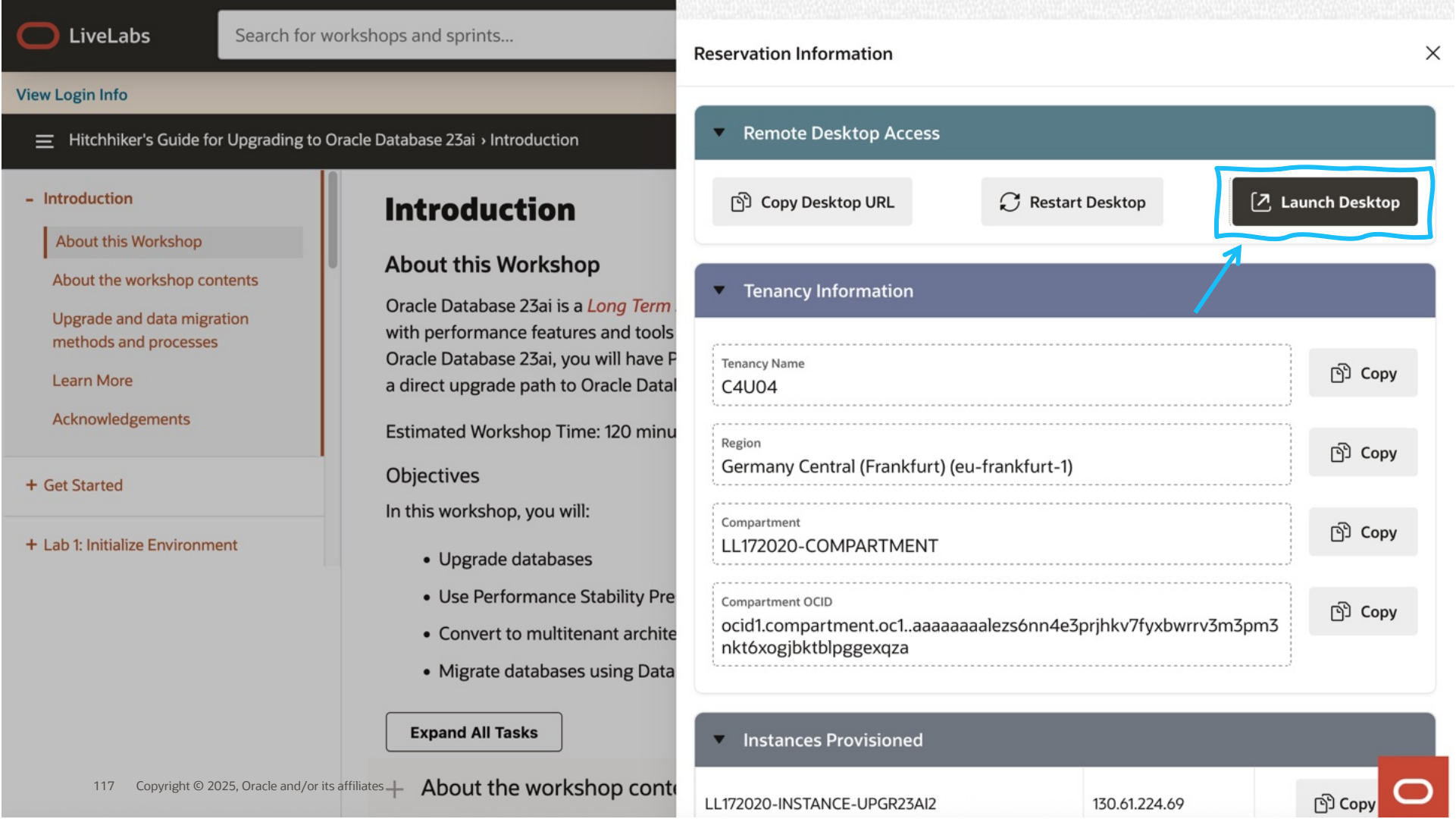
Estimated Workshop Time: 120 minutes

Objectives

In this workshop, you will:

- Upgrade databases
- Use Performance Stability Prescription to ensure performance stability
- Convert to multitenant architecture
- Migrate databases using Data Pump and transportable tablespaces

Expand All Tasks



Copyright © 2025, Oracle and/or its affiliates

HTTPS-Only Mode Alert

Secure Site Not Available

You've enabled HTTPS-Only Mode for enhanced security, and a HTTPS version of **168.138.107.232:6080** is not available.

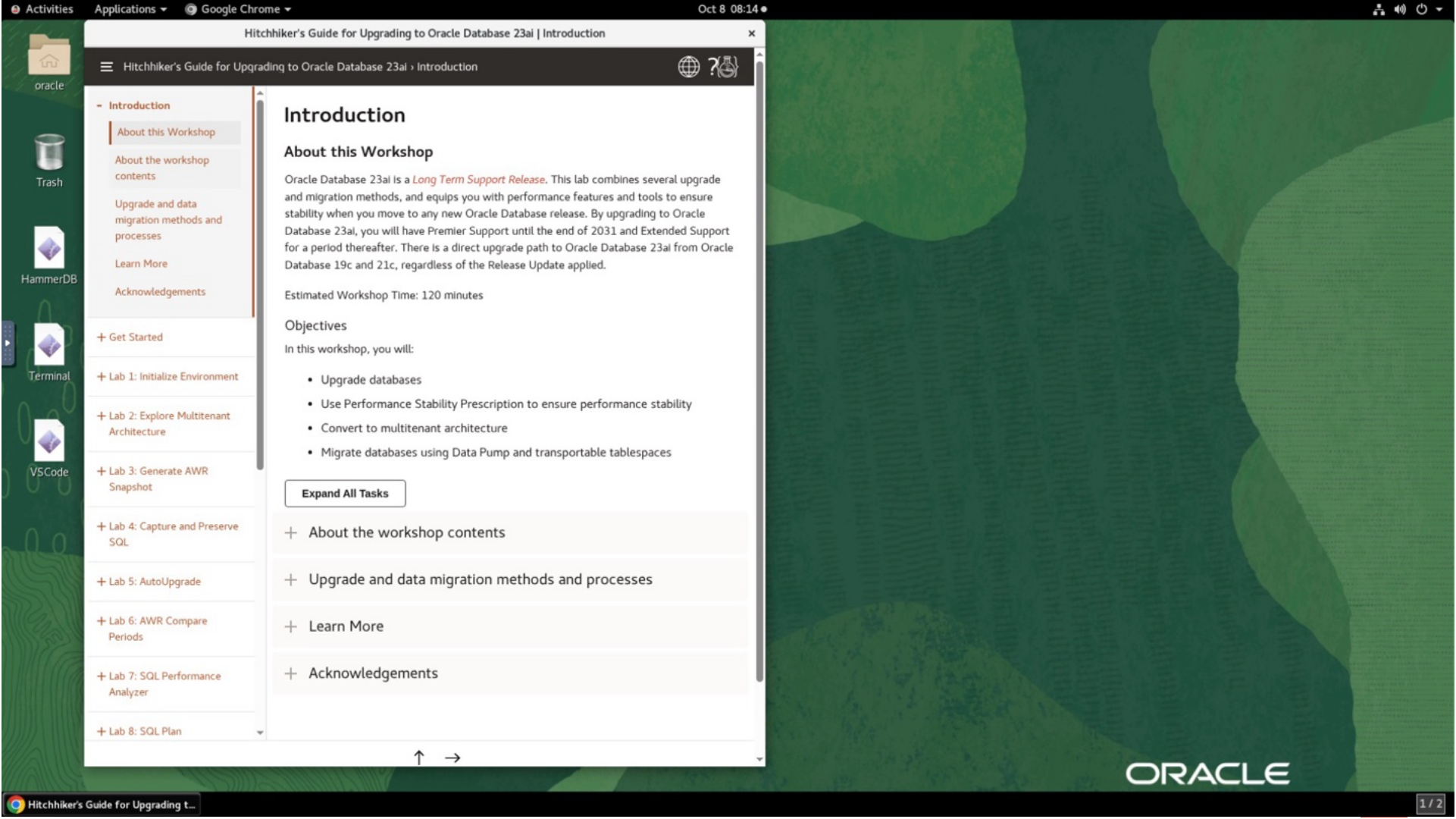
Learn More...

What could be causing this?

- Most likely, the website simply does not support HTTPS.
- It's also possible that an attacker is involved. If you decide to visit the website, you should not enter any sensitive information like passwords, emails, or credit card details.

If you continue, HTTPS-Only Mode will be turned off temporarily for this site.

Continue to HTTP Site | Go Back


Activities
Applications
Google Chrome
Oct 8 08:14
Hitchhiker's Guide for Upgrading to Oracle Database 23ai | Introduction
Hitchhiker's Guide for Upgrading to Oracle Database 23ai › Introduction
oracle
Trash
HammerDB
Terminal
VSCode
Introduction
About this Workshop
About the workshop contents
Upgrade and data migration methods and processes
Learn More
Acknowledgements
Get Started
Lab 1: Initialize Environment
Lab 2: Explore Multitenant Architecture
Lab 3: Generate AWR Snapshot
Lab 4: Capture and Preserve SQL
Lab 5: AutoUpgrade
Lab 6: AWR Compare Periods
Lab 7: SQL Performance Analyzer
Lab 8: SQL Plan
Introduction
About this Workshop
Oracle Database 23ai is a Long Term Support Release. This lab combines several upgrade and migration methods, and equips you with performance features and tools to ensure stability when you move to any new Oracle Database release. By upgrading to Oracle Database 23ai, you will have Premier Support until the end of 2031 and Extended Support for a period thereafter. There is a direct upgrade path to Oracle Database 23ai from Oracle Database 19c and 21c, regardless of the Release Update applied.
Estimated Workshop Time: 120 minutes
Objectives
In this workshop, you will:
Upgrade databases
Use Performance Stability Prescription to ensure performance stability
Convert to multitenant architecture
Migrate databases using Data Pump and transportable tablespaces
Expand All Tasks
About the workshop contents
Upgrade and data migration methods and processes
Learn More
Acknowledgements
ORACLE
Hitchhiker's Guide for Upgrading t...
1 / 2

You can copy/paste from the instructions

- SHIFT + CTRL + C
- SHIFT + CTRL + V

Copyright © 2025, Oracle and/or its affiliates

Introduction

Fast Track: Upgrade to Oracle AI Database 26ai

Overview

	Database	PDBs	Set environment
Oracle Database 19c /u01/app/oracle/product/19	UPGR		. upgr
	FTEX		. ftex
	CDB19	ORANGE	. cdb19
Oracle Database 21c /u01/app/oracle/product/21			
Oracle Database 23ai /u01/app/oracle/product/23	CDB23	RED, BLUE, GREEN	. cdb23
	CDB23COM	YELLOW	. cdb23com

Copyright © 2025, Oracle and/or its affiliates

Overview

Labs									
1	2	Track 1	3	4	5	6	7	8	9
		Track 2	10	15					14
		Track 3	11	12	13				

Copyright © 2025, Oracle and/or its affiliates

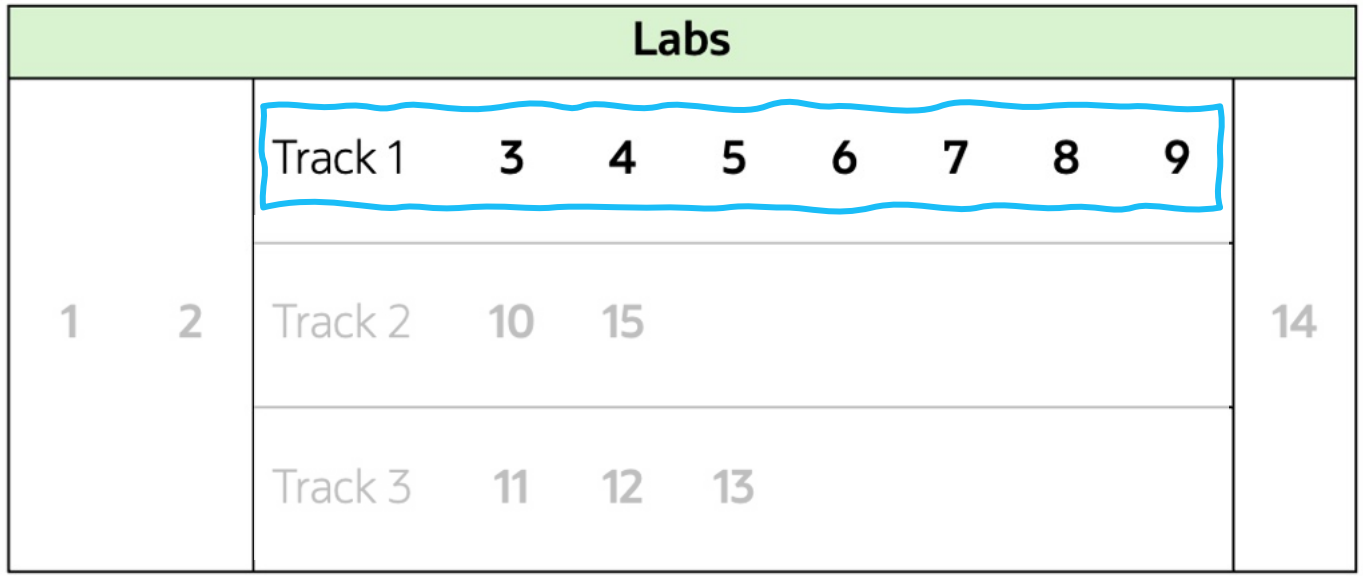
Labs

1. Initialize the environment

2. Explore multitenant architecture

Copyright © 2025, Oracle and/or its affiliates

Overview



Copyright © 2025, Oracle and/or its affiliates

Labs

3. Generate AWR snapshot
   - Run a load generator
   - Capture SQL from cursor cache

4. Capture and preserve SQL
   - Capture SQL from AWR

Copyright © 2025, Oracle and/or its affiliates

Labs

Take a break while it upgrades

5. Upgrade to Oracle Database 23ai

6. Compare AWR diff report
   - Run load generator again

7. Analyze with SQL Performance Analyzer

8. Fix with SQL Plan Management

9. Fix with SQL Tuning Advisor

Copyright © 2025, Oracle and/or its affiliates

Start Your Engines

Let's Get Started

https://livelabs.oracle.com

09281-HUKB-AIRK

Copyright © 2025, Oracle and/or its affiliates

Refreshable Clone PDBs

Copyright © 2026, Oracle and/or its affiliates

Non-CDB to PDB conversion is irreversible

What are your rollback options?

Copyright © 2026, Oracle and/or its affiliates

ROLLBACK

Backup / restore

Ensure you have a recent backup and requires time to restore and recover

Copy data files

Requires time and disk space to hold a copy of the data files

Copyright © 2026, Oracle and/or its affiliates

ROLLBACK

Backup / restore

Ensure you have a recent backup and requires time to restore and recover

Copy data files

Requires time and disk space to hold a copy of the data files

Refreshable clone PDB

Requires ~~time and~~ disk space to hold a copy of the data files

Requires Oracle Database 12.2 or newer

Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone PDB

CREATE

Create PDB from non-CDB over a database link

REFRESH

Apply redo from non-CDB to keep PDB up-to-date

OUTAGE

Disconnect users and refresh PDB for the last time

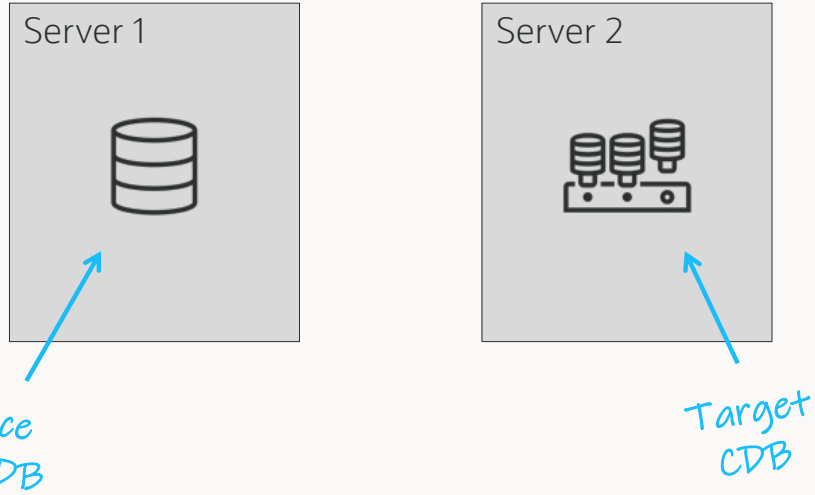
CONVERT

To become a proper PDB, it must be converted

Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone PDB

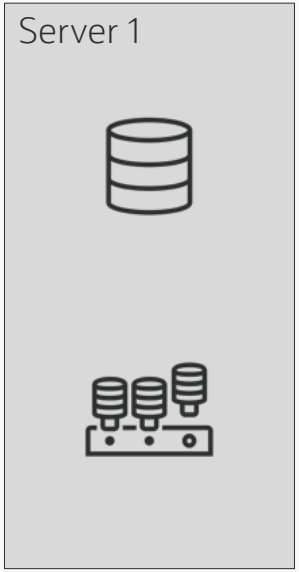
```
system01.dbf
sysaux01.dbf
users01.dbf
undo01.dbf
...
```



Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone PDB

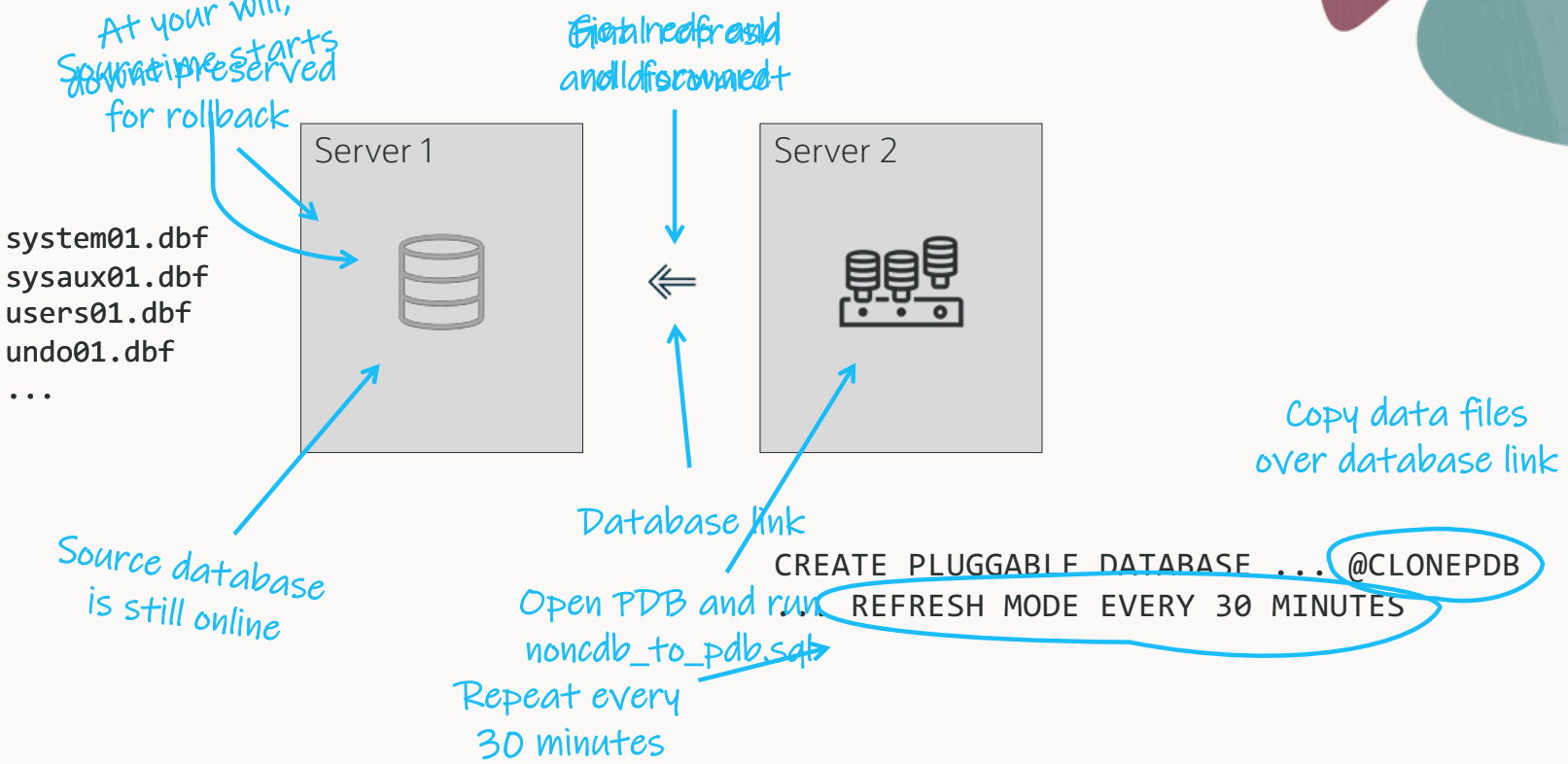
```
system01.dbf
sysaux01.dbf
users01.dbf
undo01.dbf
...
```



Could be same server as well

Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone



Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone PDB

Source non-CDB	Target CDB

```
CREATE USER dblinkuser
       IDENTIFIED BY ... ;

GRANT CREATE SESSION,
      CREATE PLUGGABLE DATABASE,
      SELECT_CATALOG_ROLE TO dblinkuser;

GRANT READ ON sys.enc$ TO dblinkuser;
```

```
CREATE DATABASE LINK CLONEPDB
       CONNECT TO dblinkuser
       IDENTIFIED BY ...
       USING 'noncdb-alias';
```


Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone

Source non-CDB	Target CDB

```
upg1.source_home=/u01/app/oracle/product/dbhome_19_30
upg1.target_home=/u01/app/oracle/product/dbhome_26_1
upg1.sid=NONCDB1
upg1.target_cdb=CDB1
upg1.target_version=26
upg1.source_dblink.NONCDB1=CLONEPDB
upg1.target_pdb_name.NONCDB1=PDB1
```


Copyright © 2026, Oracle and/or its affiliates

You can drop user and database link after migration

- Config file parameter **`drop_dblink`**

Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone PDB

Source non-CDB	Target CDB

```
upg1.source_home=/u01/app/oracle/product/dbhome_19_30
upg1.target_home=/u01/app/oracle/product/dbhome_26_1
upg1.sid=NONCDB1
upg1.target_cdb=CDB1
upg1.target_version=26
upg1.source_dblink.NONCDB1=CLONEPDB 300
upg1.target_pdb_name.NONCDB1=PDB1
```


Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone PDB

Source non-CDB	Target CDB

```
upg1.source_home=/u01/app/oracle/product/dbhome_19_30
upg1.target_home=/u01/app/oracle/product/dbhome_26_1
upg1.sid=NONCDB1
upg1.target_cdb=CDB1
upg1.target_version=26
upg1.source_dblink.NONCDB1=CLONEPDB 300
upg1.target_pdb_name.NONCDB1=PDB1
```


Copyright © 2026, Oracle and/or its affiliates

Rename your PDB to avoid name collision

- If CDB is on same host,
  it also registers for the default service

Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone

Source non-CDB	Target CDB

```
upg1.source_home=/u01/app/oracle/product/dbhome_19_30
upg1.target_home=/u01/app/oracle/product/dbhome_26_1
upg1.sid=NONCDB1
upg1.target_cdb=CDB1
upg1.target_version=26
upg1.source_dblink.NONCDB1=CLONEPDB 300
upg1.target_pdb_name.NONCDB1=PDB1
upg1.start_time=19/01/2038 03:14:07
```


Copyright © 2026, Oracle and/or its affiliates

```
--When a job is in REFRESHPDB stage,
--you can force it to start immediately
upg> proceed -job 101
```


Copyright © 2026, Oracle and/or its affiliates

```
--When a job is in REFRESHPDB stage,
--you can force it to start immediately
upg> proceed -job 101

--Or postpone it
upg> proceed -job 101 -newstarttime +2h30m
```


Copyright © 2026, Oracle and/or its affiliates

```
--When a job is in REFRESHPDB stage,
--you can force it to start immediately
upg> proceed -job 101

--Or postpone it
upg> proceed -job 101 -newstarttime +30m

--Or reschedule it
upg> proceed -job 101 -newstarttime 03/05/2026 02:30:00
```


Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone PDB

Source non-CDB	Target CDB

```
upg1.source_home=/u01/app/oracle/product/dbhome_19_30
upg1.target_home=/u01/app/oracle/product/dbhome_26_1
upg1.sid=NONCDB1
upg1.target_cdb=CDB1
upg1.target_version=26
upg1.source_dblink.NONCDB1=CLONEPDB 300
upg1.target_pdb_name.NONCDB1=PDB1
upg1.start_time=19/01/2038 03:14:07
upg1.parallel_pdb_creation_clause=4
```


Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone

1

Run on source

```
autoupgrade.jar ... -mode analyze
autoupgrade.jar ... -mode fixups
```

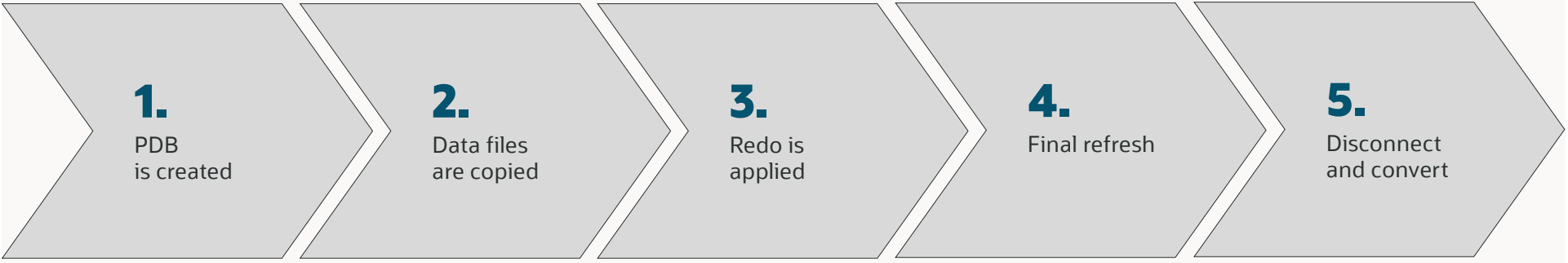
2

Run on target

```
autoupgrade.jar ... -mode deploy
```


Copyright © 2026, Oracle and/or its affiliates

Refreshable Clone PDB




```
autoupgrade.jar ... –mode deploy
```

```
upg1.start_time=19/01/2038 03:14:07
```


Copyright © 2026, Oracle and/or its affiliates

Works for unplug-plug upgrades as well

Copyright © 2026, Oracle and/or its affiliates

The source non-CDB stays intact to allow rollback

Copyright © 2026, Oracle and/or its affiliates

Techniker Krankenkasse

Move hundreds of Oracle Database19c PDBs to Oracle Database 23ai with ExaScale-only

Copyright © 2026, Oracle and/or its affiliates

Customer Case | Techniker Krankenkasse

Customer

Project

Constraints

Preparation

Upgrade

Success?

Remarks

Large German Public Health Insurance

- **Founded**: 1884
- **Legal Form**: Public Corporation
- **Headquarters**: Hamburg, Germany
- **Members**: 11.9 million
- **Employees**: aprx. 19,000
- **Customer Service**: 174 service centers
- **Budget 2024**: €62.5 billion

Copyright © 2026, Oracle and/or its affiliates

Customer Case | Techniker Krankenkasse

Customer

Project

Constraints

Preparation

Upgrade

Success?

Remarks

Move to Oracle Database 23ai with ExaScale

- No ASM, no Oracle Database 19c anymore

Copyright © 2026, Oracle and/or its affiliates

Customer Case | Techniker Krankenkasse

Customer

Project

Constraints

Preparation

Upgrade

Success?

Remarks

`COMPATIBLE=23.0.0`

No ASM, no Oracle Database 19c anymore

Data Pump as rollback

Copyright © 2026, Oracle and/or its affiliates

Customer Case | Techniker Krankenkasse

Customer

Project

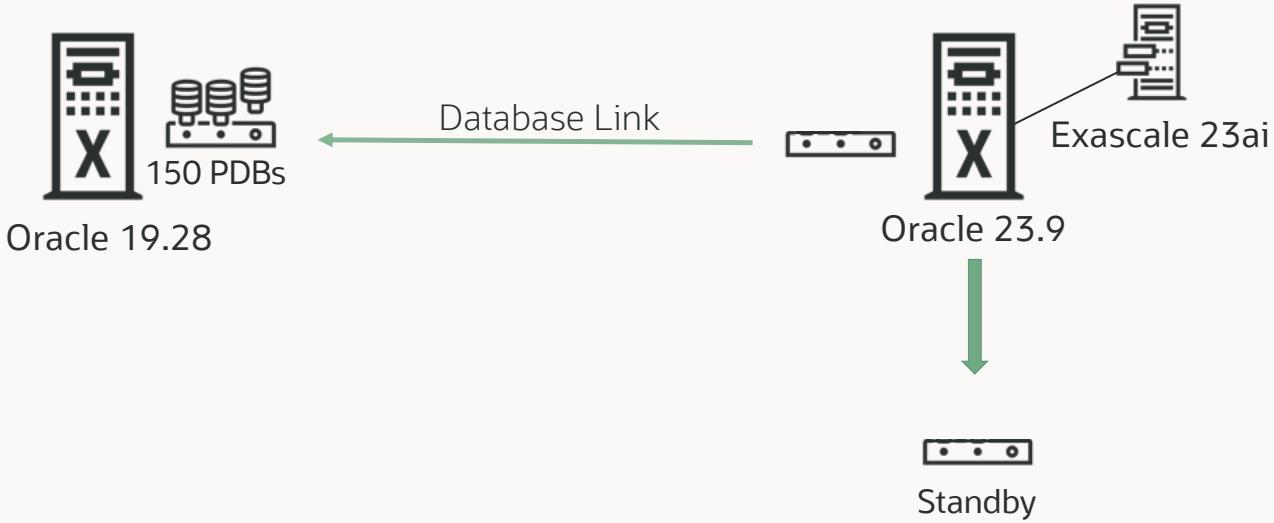
Constraints

Preparation

Upgrade

Success?

Remarks



Copyright © 2026, Oracle and/or its affiliates

Customer Case | Techniker Krankenkasse

Customer

Project

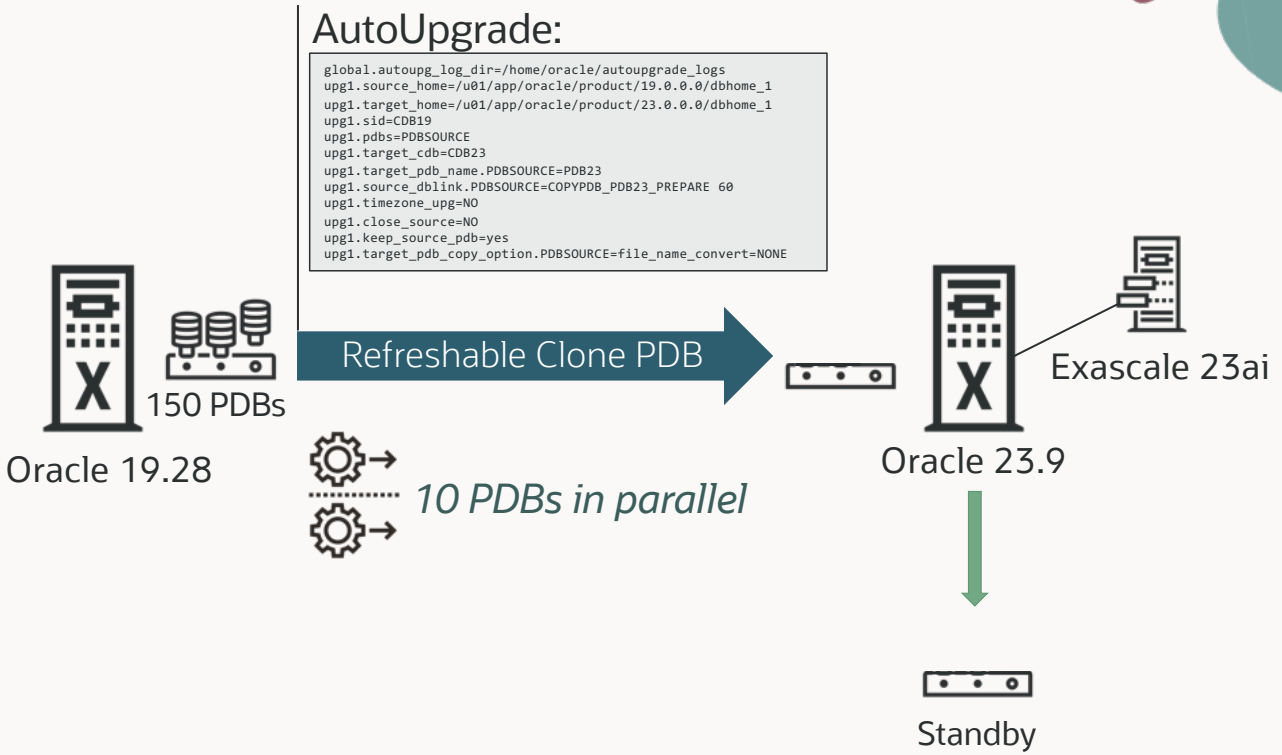
Constraints

Preparation

Upgrade

Success?

Remarks



Copyright © 2026, Oracle and/or its affiliates

Customer Case | Techniker Krankenkasse

- Customer
- Project
- Constraints
- Preparation
- **Upgrade**
- Success?
- Remarks

Oracle 19.28

Oracle 23.9

Standby

Copyright © 2026, Oracle and/or its affiliates

Customer Case | Techniker Krankenkasse

Customer

Project

Constraints

Preparation

Upgrade

Success?

Remarks

Yes!!

- Migrated 150 PDBs from TEST & DEV within less than 4 weeks
- Migration of all Oracle Database 19c instances completed by end of 2025
- Exascale snapshots are super-fast

Copyright © 2026, Oracle and/or its affiliates

Customer Case | Techniker Krankenkasse

Customer

Project

Constraints

Preparation

Upgrade

Success?

Remarks

Standby building

- There were some issues
- Refreshable Clones don't propagate
- PDB recovery isolation doesn't work as expected

A number of SRs had to be opened for various areas

Optimizer works very well

Copyright © 2026, Oracle and/or its affiliates

Refreshable clone works only with deferred recovery on standby database

- You must restore the PDB on standby database after disconnect from non-CDB

Copyright © 2026, Oracle and/or its affiliates

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

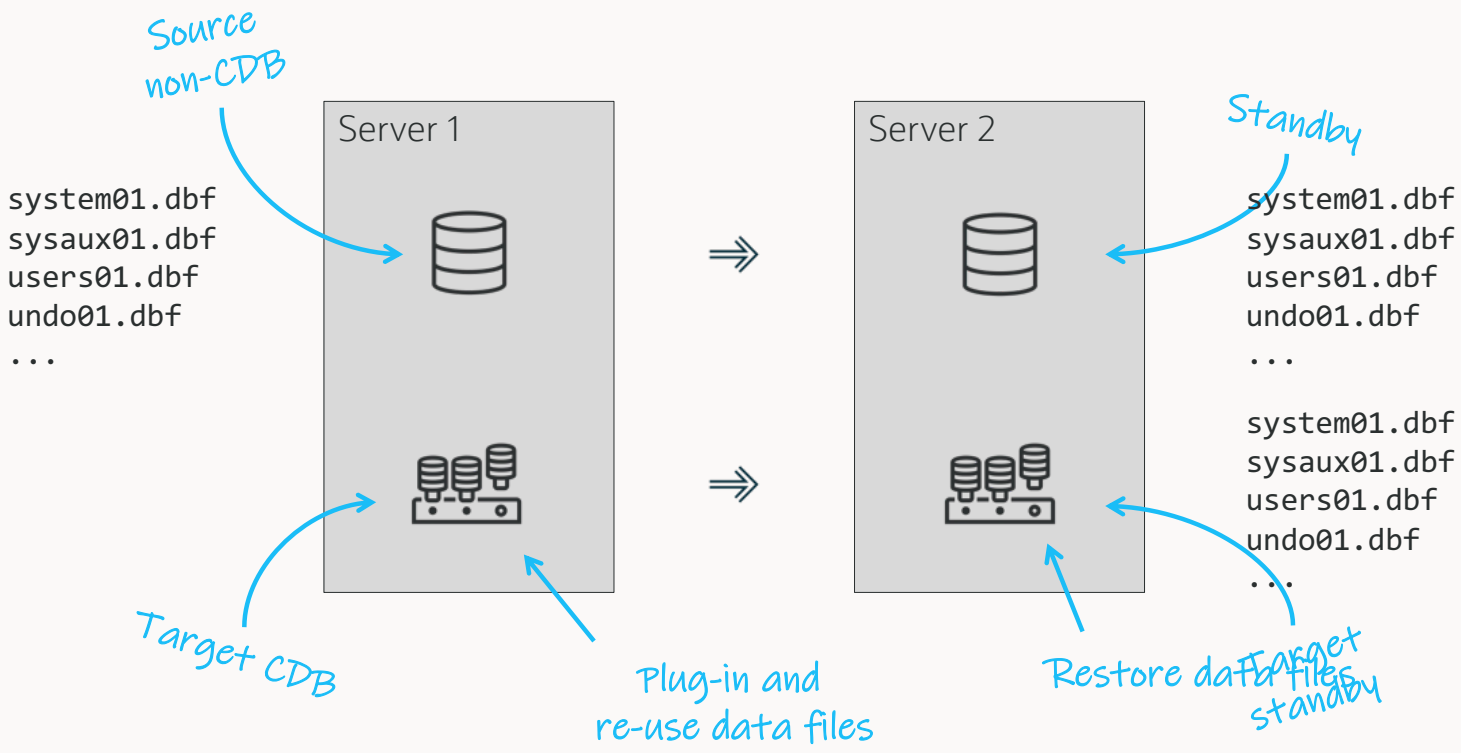
Standby ignores data files

MRP skips redo

PDB protected after restore

Copyright © 2026, Oracle and/or its affiliates

Deferred Recovery



Copyright © 2026, Oracle and/or its affiliates

Deferred Recovery

Source
Non-CDB

Target
Primary

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

Target
Standby

Copyright © 2026, Oracle and/or its affiliates

Deferred Recovery

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

PDB created
Data files missing

Copyright © 2026, Oracle and/or its affiliates

Deferred Recovery

```
SQL> show pdbs

CON_NAME    OPEN MODE
PDB1        READ WRITE
```

```
SQL> show pdbs

CON_NAME    OPEN MODE
PDB1        MOUNTED
```


Copyright © 2026, Oracle and/or its affiliates

Deferred Recovery

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

NAME    RECOVERY_STATUS
PDB1    DISABLED
```


Copyright © 2026, Oracle and/or its affiliates

Deferred Recovery

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

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


Copyright © 2026, Oracle and/or its affiliates

Further Details

Multitenant Conversion

- Move to Oracle Database 23ai –

  Everything you need to know about Oracle Multitenant – Part 1

Copyright © 2026, Oracle and/or its affiliates

Don't jeopardize your Data Guard

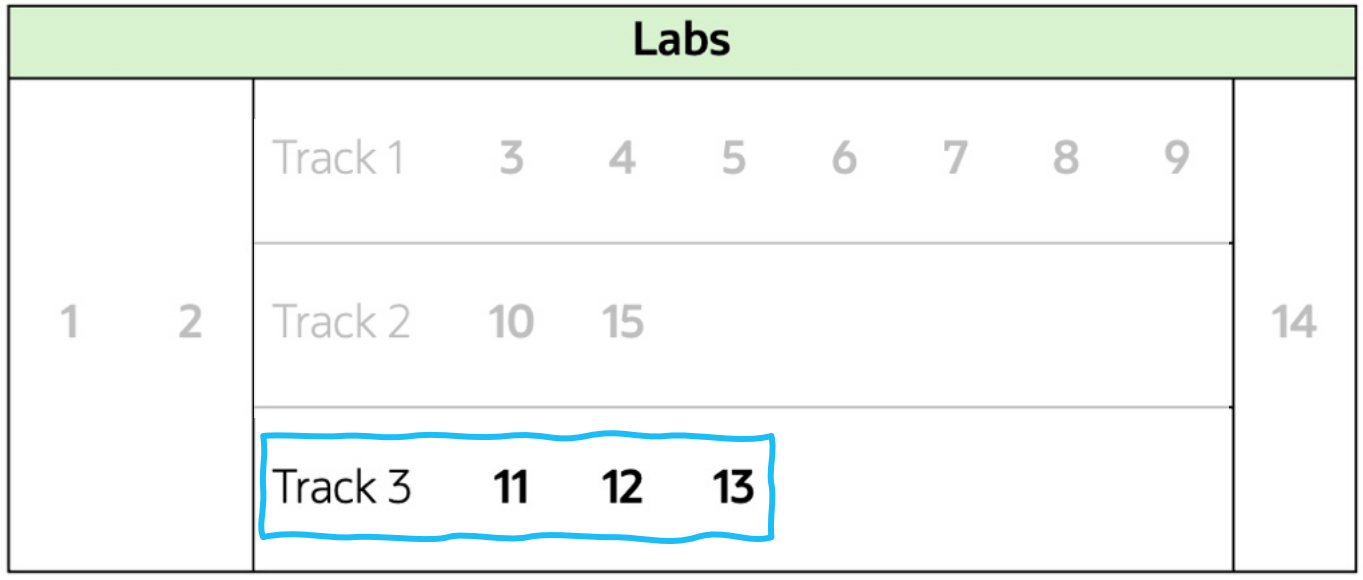
- Test the procedure and verify your environment

Copyright © 2026, Oracle and/or its affiliates

More Labs

Fast Track: Upgrade to Oracle AI Database 26ai

Overview



Copyright © 2025, Oracle and/or its affiliates

Labs

11. Upgrade Non-CDB Using Refreshable Clone PDB
    - Upgrade and convert
    - Use PROCEED command

12. Migrate Using Data Pump
    - Full database export/import

13. Migrate Using Full Transportable Export/Import
    - Transportable tablespaces

Copyright © 2025, Oracle and/or its affiliates

Let's Get Started

https://livelabs.oracle.com

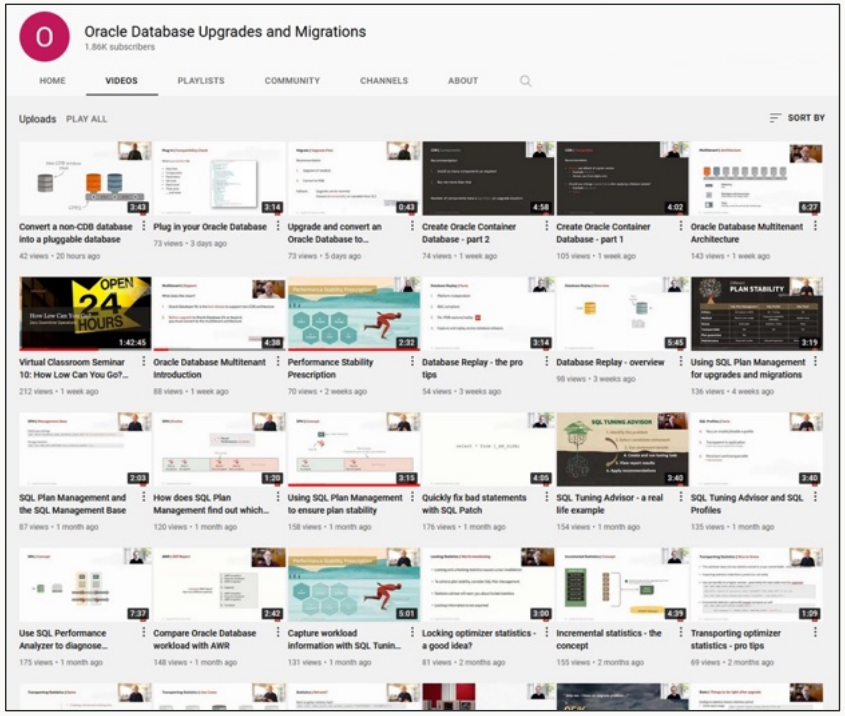
Copyright © 2025, Oracle and/or its affiliates

Key Learnings

1. Use AutoUpgrade
2. Collect workload information
3. Use Refreshable Clone PDB

Copyright © 2026, Oracle and/or its affiliates

YouTube Channel



https://www.youtube.com/@upgradenow

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

SCAN ME

Copyright © 2026, Oracle and/or its affiliates

Find Slides and Much More on Our Blogs

MikeDietrichDE.com

Mike.Dietrich@oracle.com

dohdatabase.com

Daniel.Overby.Hansen@oracle.com

DBArj.com.br

Rodrigo.R.Jorge@oracle.com

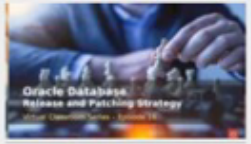
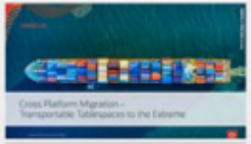
AlexZaballa.com

Alex.Zaballa@oracle.com

axdiaz.com

jorge.a.diaz@oracle.com

Copyright © 2026, Oracle and/or its affiliates

Virtual Classroom Seminars	Slides
Episode 16 (replaces Episode 1 from Feb 2021) Oracle Database Release and Patching Strategy for 19c and 23c *115 minutes – May 10, 2023*	
Episode 17 From SR to Patch – Insights into the Oracle Database Development process *55 minutes – June 22, 2023*	
Episode 18 Cross Platform Migration – Transportable Tablespaces to the Extreme *145 min – February 22, 2024*	
Episode 19 Move to Oracle Database 23ai – Everything you need to know about Multitenant PART 1 *145 min – May 16, 2024*	
Episode 20 Move to Oracle Database 23ai – Everything you need to know about Multitenant PART 2 *100 min – June 28, 2024*	
Episode 21 One-Button Patching with AutoUpgrade – Easing every DBA's life *55 min – October 24, 2024*	

Recorded Web Seminars

https://MikeDietrichDE.com/videos

More than 45 hours of technical content
On-demand, anytime, anywhere

Please rate our session

Copyright © 2026, Oracle and/or its affiliates


ORACLE