

Database Upgrade and Migration Best Practices

Thomas Goop

Senior Consultant, Tradeware AG

Rodrigo Jorge

Senior Principal Product Manager, Oracle

Mike Dietrich

Senior Director Product Management, Oracle





Mike Dietrich

Senior Director Product Management
Database Upgrade, Migration and Patching



MikeDietrich



@MikeDietrichDE



<https://MikeDietrichDE.com>





Rodrigo Jorge

Senior Principal Product Manager
Cloud Migration and Patching



RodrigoArauJorge



@RodrigoJorgeDBA



<https://dbaRJ.com.br/en>



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>

Database Upgrade and Migration Best Practices



Upgrade

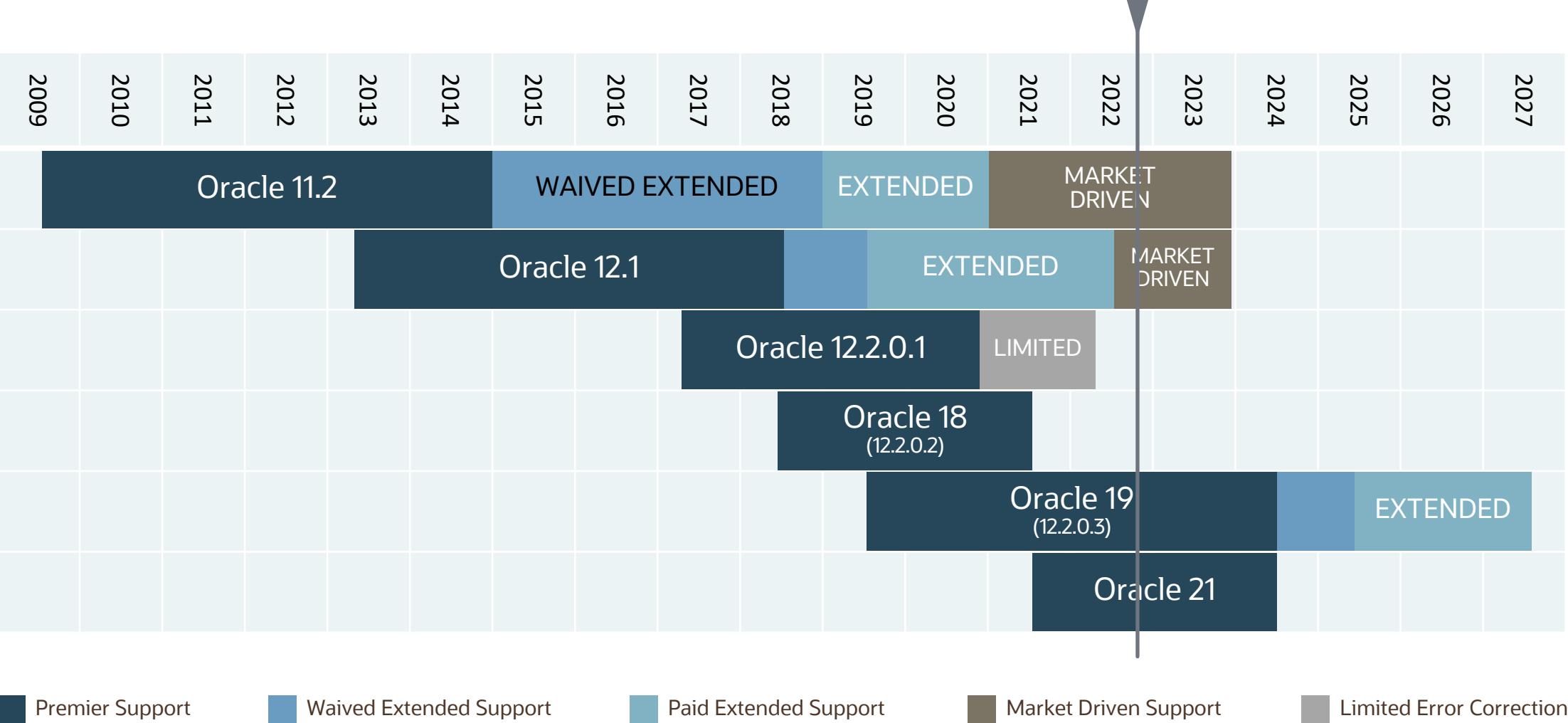


Migration



Customer Case

Lifetime Support Policy



Copyright (c) 2022, Oracle. All rights reserved. Oracle Confidential.

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

In this Document

[Details](#)

[What's New](#)

[Oracle Database Release Roadmap](#)

[Recommended Upgrade Path](#)

[Oracle Database Release Schedule](#)

[Oracle Public Cloud Releases](#)

[On-Premises Engineered Systems](#)

[On-Premises Server Releases \(includes client\)](#)

[Instant Client-Only Releases](#)

[Actions](#)

[Contacts](#)

[Change History \(2020-2021\)](#)

[References](#)

Lifetime Support Policy

Different Support Periods

- Premier Support
 - Bug fixing support regardless of severity
- Paid Extended Support
 - Extra cost extension, **10% / 20% extra cost**
 - Included in ULA/PULA contracts
- Waived Extended Support
 - Extended support gets waived to everybody having a valid Support contract for the product
- Market Driven Support
 - Extra cost extension after Extended Support
 - Fixes done only for critical and security issues
- Limited Error Correction
 - Extension for Oracle 12.2.0.1 at **no extra cost**
 - Only applicable for Sev.1 and security issues
- Sustaining Support
 - Oracle Support assists as long as the customer is using the product – but no new fixes will be delivered

Release Types



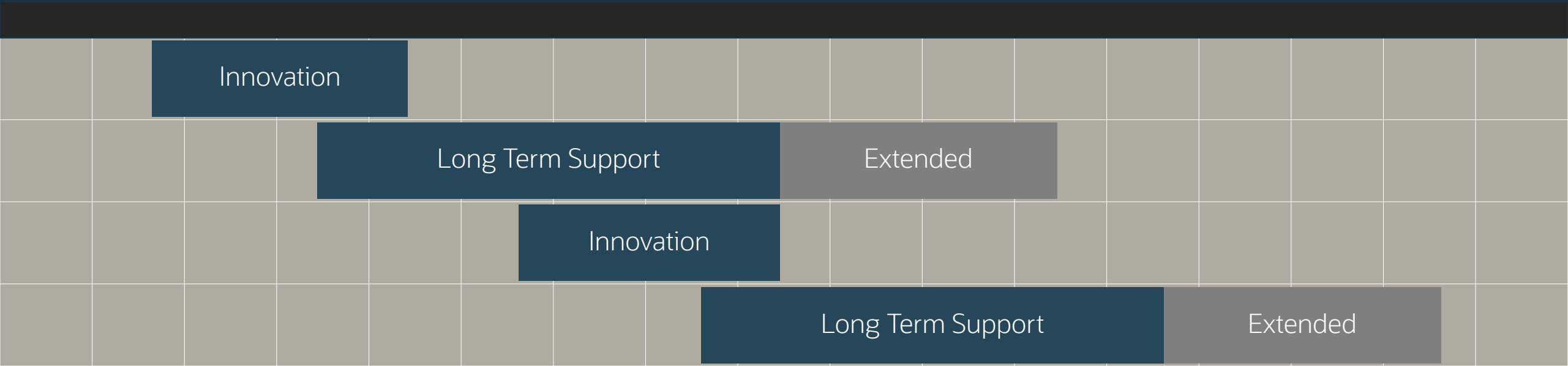
LONG TERM SUPPORT

5+ years of Premier Support followed by
3+ years of Extended Support



INNOVATION

2 years of Premier Support
No Extended Support





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



Next Long Term Support release

Oracle Database 23c

Upgrade possible only from:

- Oracle Database 19c
- Oracle Database 21c

Do you want to upgrade?

Oracle Database 11.2.0.4

Oracle Database 12.1.0.2

Oracle Database 12.2.0.1

Oracle Database 18c



Oracle Database 11.2.0.4
Oracle Database 12.1.0.2
Oracle Database 12.2.0.1
Oracle Database 18c



Oracle Database 19c



Oracle Database 23c



Everybody must **upgrade to Oracle Database 19c**, with or without Multitenant

3

user-created

pluggable databases

are always included - even in SE2

since **Oracle Database 19c**



Protection

```
alter system set MAX_PDBS=3 scope=both;
```

3 User-Created Pluggable Databases

CON_ID	CON_NAME	OPEN	MODE	RESTRICTED
2	PDB\$SEED	READ	ONLY	NO
3	PDB1	READ	WRITE	NO
4	PDB2	READ	WRITE	NO
5	PDB3	READ	WRITE	NO

SQL> create pluggable database PDB4 ...

ORA-65010: maximum number of pluggable databases created

Prepare your upgrades and migrations

1

Install Oracle Home
including RU and MRP

MOS Note: 2118136.2
MOS Note: 555.1

2

Download and deploy the
most recent AutoUpgrade


MOS Note: 2485457.1





3

Collect performance
information from current
source and test thoroughly

Before upgrading, apply the most recent RU

- Always use the [Patch Download Assistant](#) note [MOS Note: 2118136.2](#)

 **Assistant: Download Reference for Oracle Database/GI Update, Revision, PSU, SPU(CPU), Bundle Patches, Patchsets and Base Releases (Doc ID 2118136.2)** [To Bottom](#)

Selection(s)

What would you like to download?

- ☐ Oracle Database Base Releases
- ☐ Oracle Database Patchsets
- ☒ Oracle Database Updates (Versions 12.2 & higher)
- ☐ Oracle Database Update Revisions (Versions 12.2 & higher)
- ☐ Oracle Database PSU, SPU(CPU), Bundle Patches (Versions 12.1 & lower)
- ☐ OJVM Update/PSU/Bundle Patches
- ☐ Latest Available Microsoft Windows Patches

Solution(s)

Possible Solutions will appear once you make your selection.

Always add the most recent MRP on top

- Always check [Recommended Patches](#) note [MOS Note:555.1](#)
 - [Monthly Recommended Patch \(MRP\) bundles](#) will be available from November 2022 for Oracle 19c

ORACLE MY ORACLE SUPPORT for EMPLOYEES PowerView is Off

Knowledge RCA DWB Customer Exceptions CMS Service Requests Patches & Updates More... 555.1

Copyright (c) 2022, Oracle. All rights reserved. Oracle Confidential.

★ Oracle Database 19c Important Recommended One-off Patches (Doc ID 555.1)

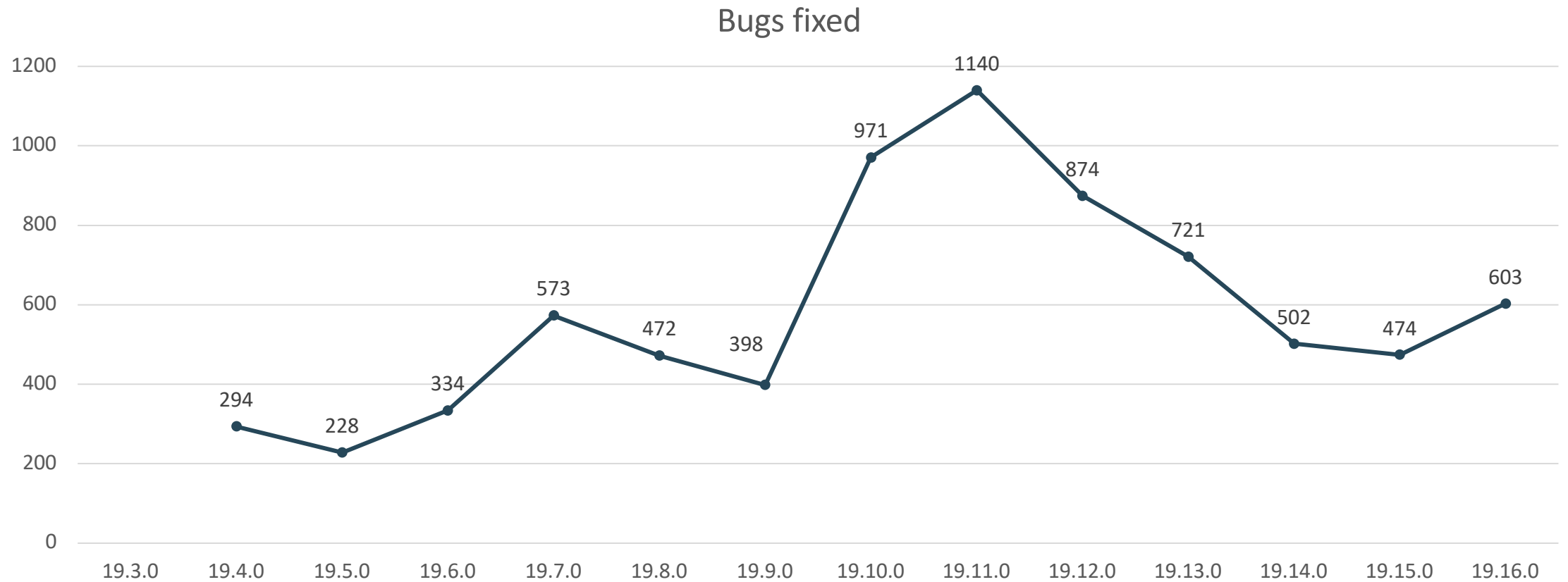
Through our review of service requests, we often find that issues encountered are the result of customers being on an older Release Update (RU) or Release Update Revision (RUR). Many issues will have been fixed in the latest updates, which we always recommend.

As noted in the update-specific tables below, fixes for known issues are targeted for inclusion in the first available RU or RUR. You can always find the latest RUs, RURs, other patches, lists of fixed bugs and known issues in [Primary Note for Database Proactive Patch Program \(Doc ID 888.1\)](#). Identifying and installing the latest updates (patches) helps ensure you are using the most current content for security, functional, regression and bug fixes, as well as minor enhancements and any emergency one-offs.

In addition to the relevant patches listed below, you should apply patches based on the specific RU after reviewing the following My Oracle Support knowledge documents:

1. [Database PSU/BP/Update/Revision - Known Issues Primary Note \(Doc ID 1227443.1\)](#)
2. [Oracle Database Patches to Consider for 19c \(Doc ID 2781612.2\)](#) which contains patches to consider for specific areas such as Data Pump, Golden gate etc.

Release Update Contents



[Database 19 Release Updates and Revisions Bugs Fixed Lists \(Doc ID 2523220.1\)](#)





If you don't apply **one of the most recent Release Updates**, you will miss thousands of fixes

AutoUpgrade automates your migration to Multitenant completely

Including Transparent Data Encryption
with AutoUpgrade's new keystore functionality



Always use the latest
version of AutoUpgrade

Download it from
[MOS Note 2485457.1](#)

Backwards Compatible

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

```
build.version 22.5.221011
```

```
build.date 2022/10/11 14:23:59 -0400
```

```
build.hash e9428661
```

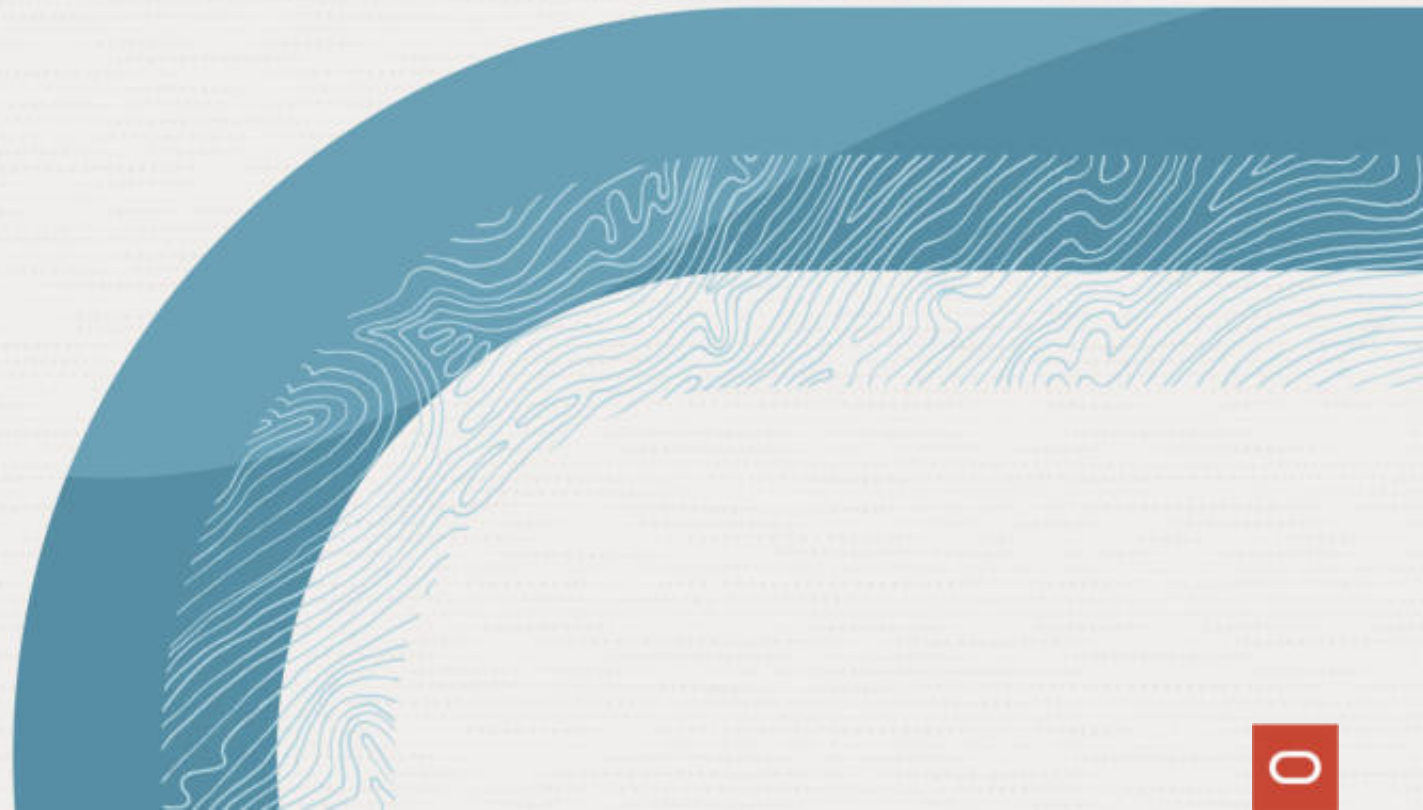
```
build.hash_date 2022/10/11 12:55:45 -0400
```

```
build.supported_target_versions 12.2,18,19,21
```

```
build.type production
```

Checklist

Essential things to do before you
upgrade or migrate your
databases





Execute **database health checks** at least
two weeks before an upgrade or migration

Database Health Check



Health check script

- Download from [MOS Note: 136697.1](#)
- In Multitenant, it must be run in each PDB separately



ORAchk Upgrade Readiness Assessment

- Part of Autonomous Health Framework (AHF)
- Download from [MOS Note: 1457357.1](#)
- Upgrade Readiness Check – [MOS Note: 2550798.1](#)



Collect at least **one full month of performance data** before any upgrade or migration

Performance Information



AWR – Automatic Workload Repository

Change the retention to a minimum of 40 days

exec

```
dbms_workload_repository.modify_snapshot_settings  
(retention=>57600, interval=>30);
```



Collect SQL statements and plans

Use AWR as main source

Capture from Cursor Cache for OLTP

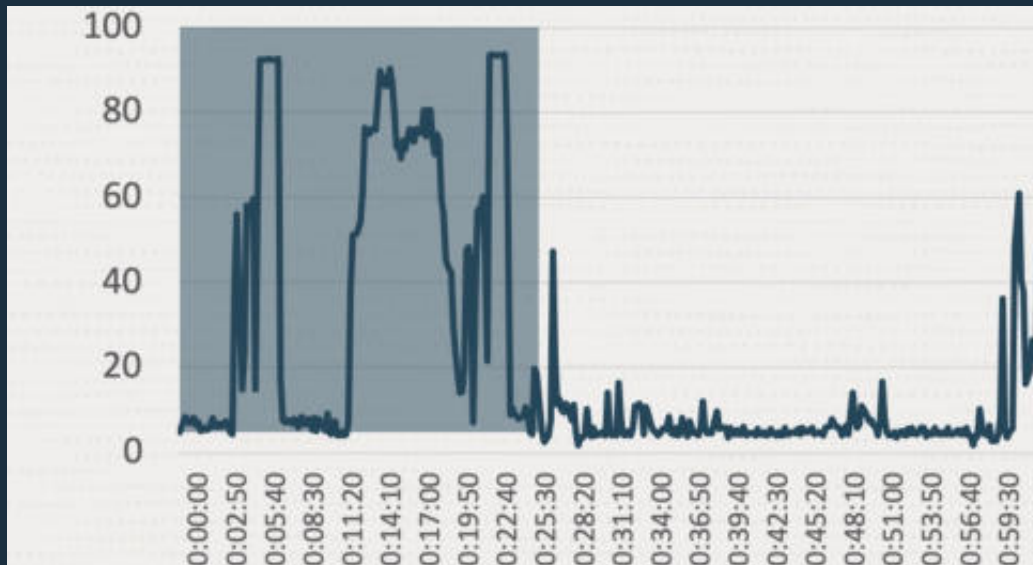
Collect statements, plans and stats in SQL Tuning Sets



Refresh dictionary statistics, especially on
SYS and SYSTEM before upgrade or migration

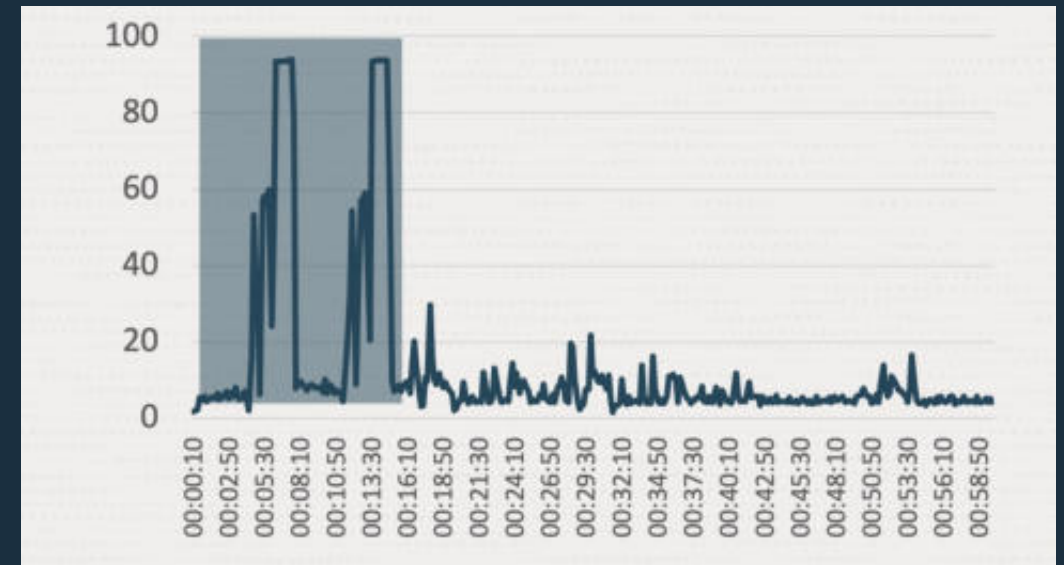


Gather dictionary and fixed objects stats



Without stats refresh

- Initial upgrade phase: 25 min



With stats refresh

- Initial upgrade phase: 13 min

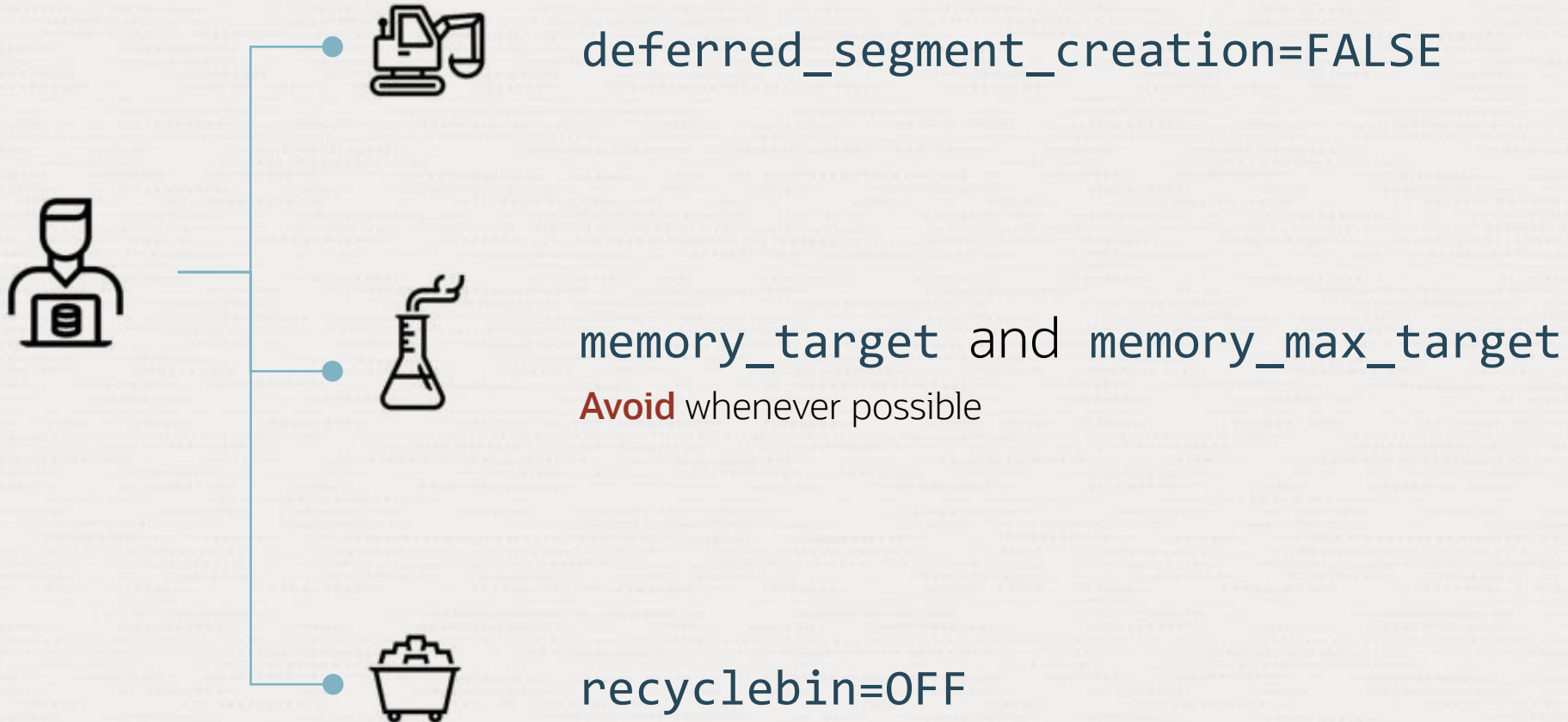
12 minutes saving in upgrade time



Remove outdated parameters, especially
underscores and events, and set recommendations



Questionable Parameters



Questionable Parameters



`deferred_segment_creation=FALSE`

Disable it!

[MOS Note 1216282.1 – DEFERRED_SEGMENT_CREATION](#)

`memory_target` and `memory_max_target`

Avoid whenever possible

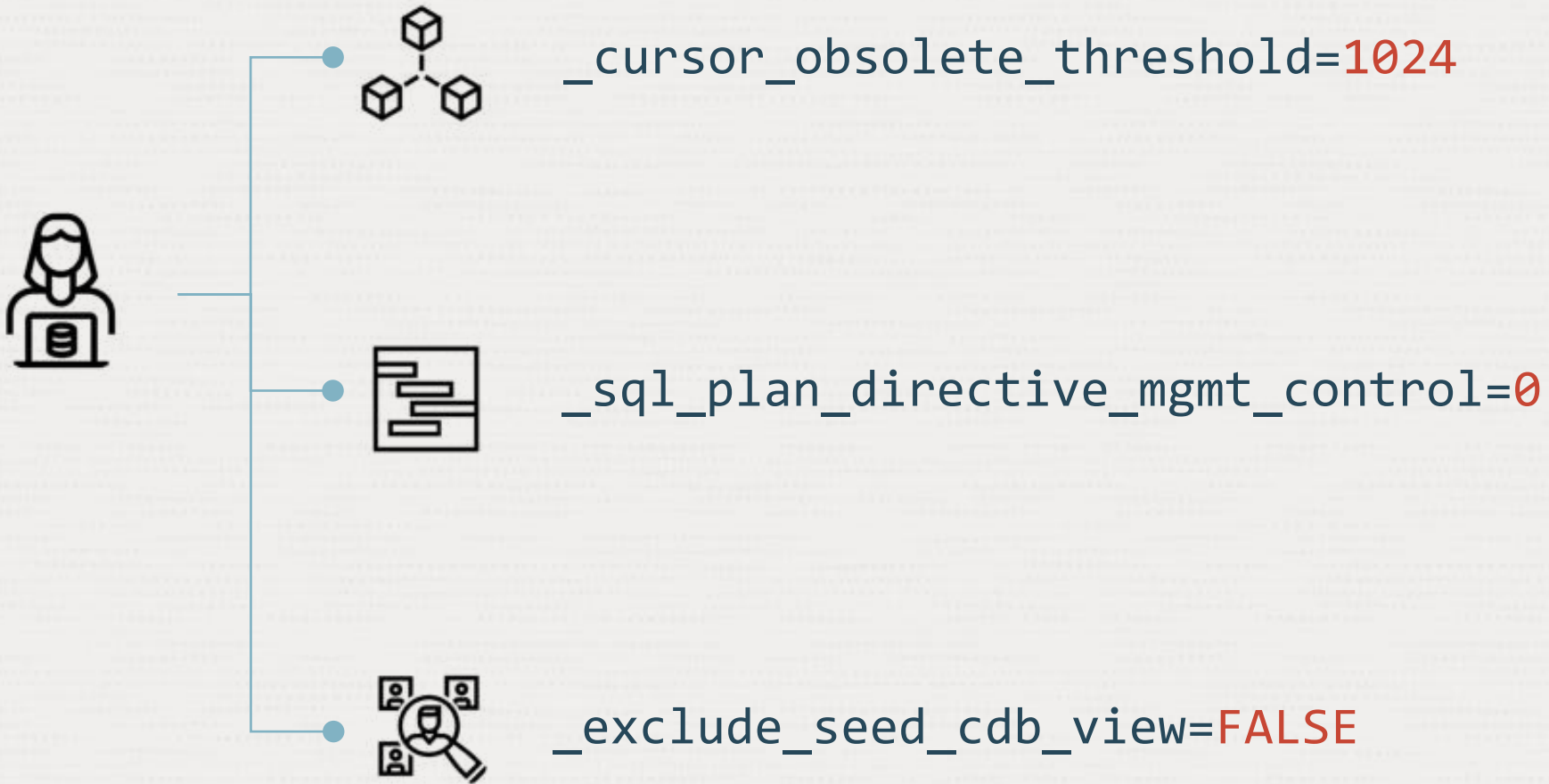
- Disables huge pages
- Can *rob* SGA memory
- Overhead on memory resizing operations
- Only very few platforms support AMM

`recyclebin=OFF`

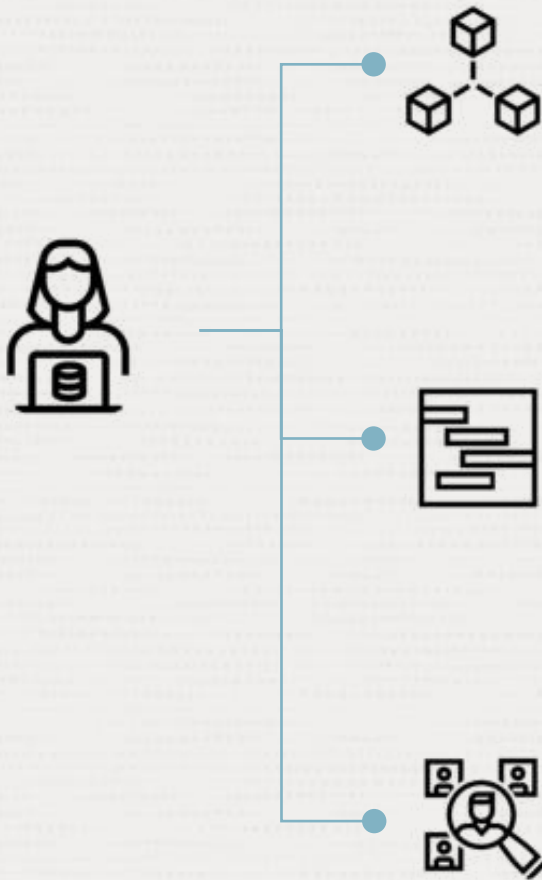
Disable it if not used. ON by default.



Essential Underscore Parameters



Essential Underscore Parameters



`_cursor_obsolete_threshold=1024`

Use the 12.1.0.2 default to avoid performance issues

[MOS Note: 2431353.1](#)

[High Version Counts Causing Slow Performance](#)

`_sql_plan_directive_mgmt_control=0`

If `optimizer_adaptive_statistics=FALSE` (default), then disable SQL Plan Directives completely

[MOS Note: 2209560.1 - How To Disable SQL Plan Directives](#)

`_exclude_seed_cdb_view=FALSE`

Otherwise, you won't see what's happening in PDB\$SEED



Try to avoid `optimizer_features_enable`





Do not change **COMPATIBLE** – if possible



Comparison

Fully independent from each other

COMPATIBLE

- Enables features
- Changes on-disk structures

OPTIMIZER_FEATURES_ENABLE

- Just reverts to the parameters used in a previous release
- Avoid using it if possible
- This is **not** a Swiss Army knife!
- You will turn off a lot of great features



Comparison

Fully independent from each other

COMPATIBLE

- Enables features
- Changes on-disk structures

OPTIMIZER_FEATURES_ENABLE

- Just reverts to the parameters used in a previous release
- Avoid using it if possible
- This is **not** a Swiss Army knife!
- You will turn off a lot of great features

”

Modifying the OPTIMIZER_FEATURES_ENABLE parameter generally is strongly discouraged and should only be used as a short-term measure at the suggestion of Oracle Global Support.

[Use Caution if Changing the OPTIMIZER_FEATURES_ENABLE Parameter After an Upgrade \(Doc ID 1362332.1\)](#)





Enable disabled optimizer fixes with
`DBMS_OPTIM_BUNDLE` when you
upgrade and migrate

Disabled Optimizer Fixes

```
SQL> set serverout on
SQL> execute dbms_optim_bundle.getBugsforBundle;
```

19.16.0.0.220719DBRU:

```
Bug: 28044739,  fix_controls: 28044739
Bug: 30771009,  fix_controls: 30771009
Bug: 33636280,  fix_controls: 33636280
Bug: 33089096,  fix_controls: 31545400
Bug: 30618406,  fix_controls: 30618406
Bug: 32614157,  fix_controls: 32614157
Bug: 33329027,  fix_controls: 33329027
Bug: 33311488,  fix_controls: 33311488
Bug: 32396085,  fix_controls: 32396085
Bug: 32122197,  fix_controls: 29972495
Bug: 32363981,  fix_controls: 32363981
```

Enable with:

```
execute
dbms_optim_bundle.enable_optim_fixes(
'ON','BOTH','YES')
```

- Consider careful testing
- SQL Performance Analyzer
- Adds lengthy `_fix_control` to SPFILE
- Granular on/off possible

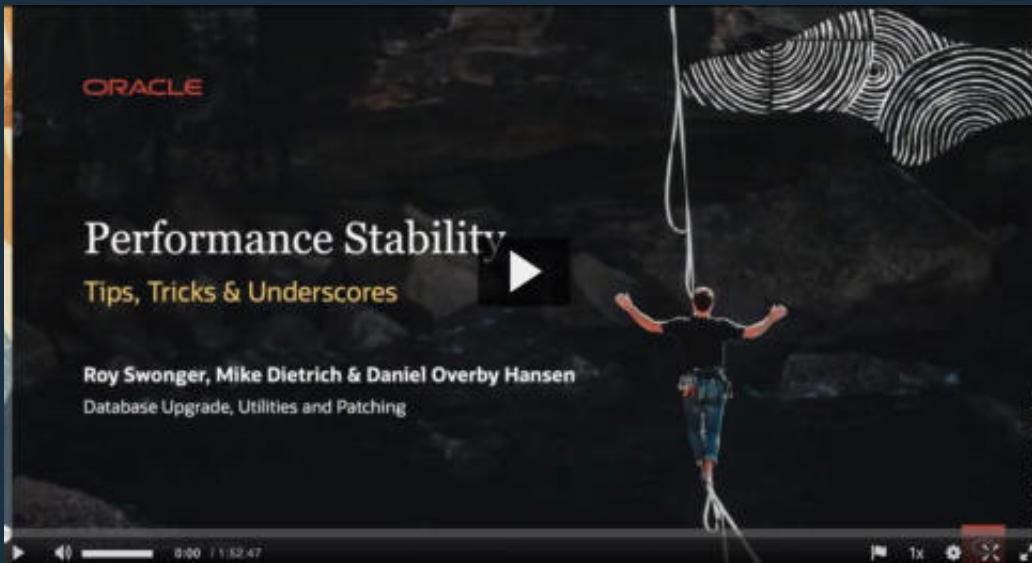




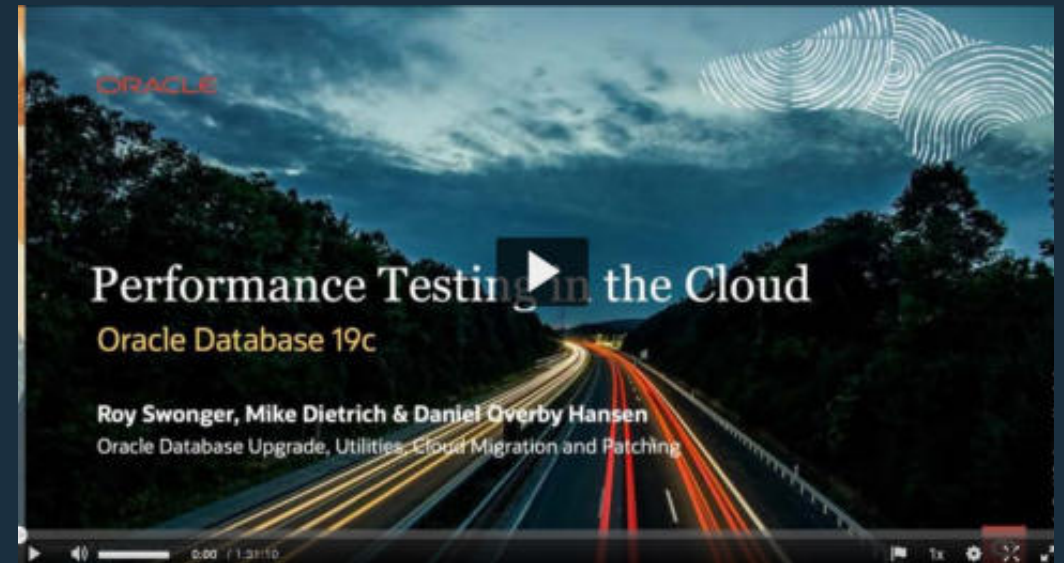
Transporting statistics via a staging table
is often **faster** than regathering statistics



Virtual Classroom Seminars



Episode 3:
Performance Stability – Tips and Tricks



Episode 9:
Performance Testing in the Cloud

<https://MikeDietrichDE.com/videos>



Use **SQL Performance Analyzer** to detect failing plans before going live.





Use **SQL Plan Management** and **SQL Tuning Advisor** to fix misbehaving SQL before going live.

Detect and fix misbehaving SQL



1

Capture plans from AWR and Cursor Cache

2

Simulate with SQL Performance Analyzer

3

Fix SQL using binds with SQL Plan Management

- Use captured plan and accept it with **DBMS_SPM** or EM CC

4

Fix SQL using literals with SQL Profiles

- Accept SQL profiles with **FORCE_MATCH=>TRUE**

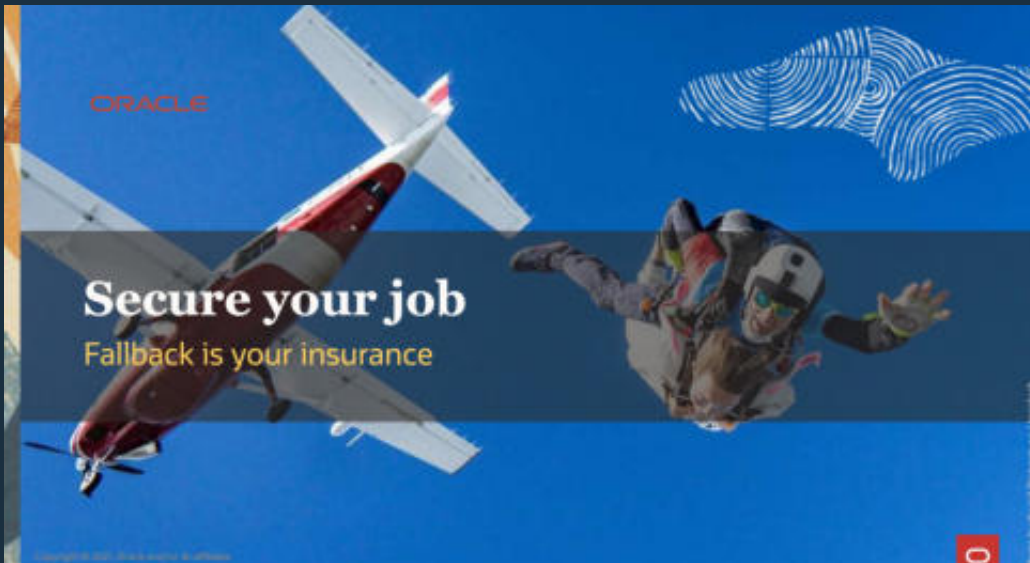




Never ever upgrade or migrate without evaluating and testing **your rollback and fallback options** successfully



Virtual Classroom Seminars



Episode 10:
Secure your job - Fallback is your insurance



More than 30 hours of pure technical
content are available on demand – 24x7

<https://MikeDietrichDE.com/videos>

Oracle Cloud World 2022 – Upgrade and Patching Labs

1

Hitchhiker's Guide to Database Upgrades to 19c

Bring your device – upgrade to 19c and ensure performance stability

Tuesday, October 18

3:00 p.m.

2

Hitchhiker's Guide to Database Upgrades to 19c

Bring your device – upgrade to 19c and ensure performance stability

Wednesday, October 19

9:00 a.m.

3

No Slides Zone – Database Patching Insights

Discuss all topics around database patching, issues, improvements, secrets and much much more – no device needed, just you and your questions

Thursday, October 20

9:00 a.m.

Database Upgrade and Migration Best Practices



Upgrade



Migration



Customer Case

CROSS PLATFORM MIGRATION OF A VERY COMPLEX DATABASE

Thomas Goop, Tradeware AG

TRADEWARE

TRADEWARE

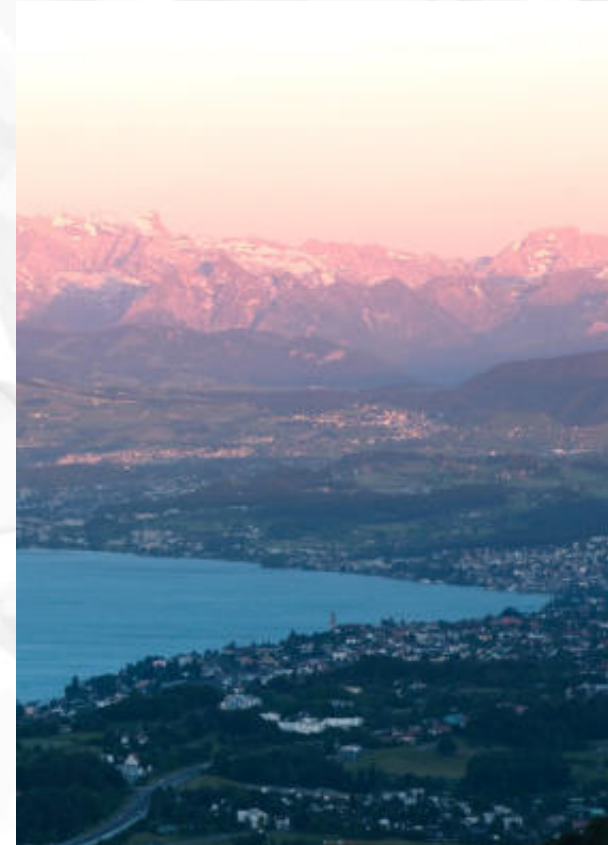
PERSONAL – SYMPATHIC – STRONG

Founded
1990

Company form
Public limited company,
privately owned

Employees
28

Locations
Thalwil
St. Gallen
Basel
Bern (planned)



TRADEWARE

THOMAS GOOP



Senior Consultant

Engineered Systems, HA/DR, Backup/Recovery,
Migration

PROJECT

- Top 5 Swiss Finance Institute
- Core Application Database
 - High load for daily business as well for batch jobs
- POC for Exadata

SOME FIGURES

- Source
 - AIX 7 on P9 HW, Oracle RDBMS 19.13
- Target
 - Exadata X8, Oracle RDBMS 19.13, Single Instance
- Database
 - 40+ TB
 - Storage Mirroring for DR
 - Data Guard as DR backup, async

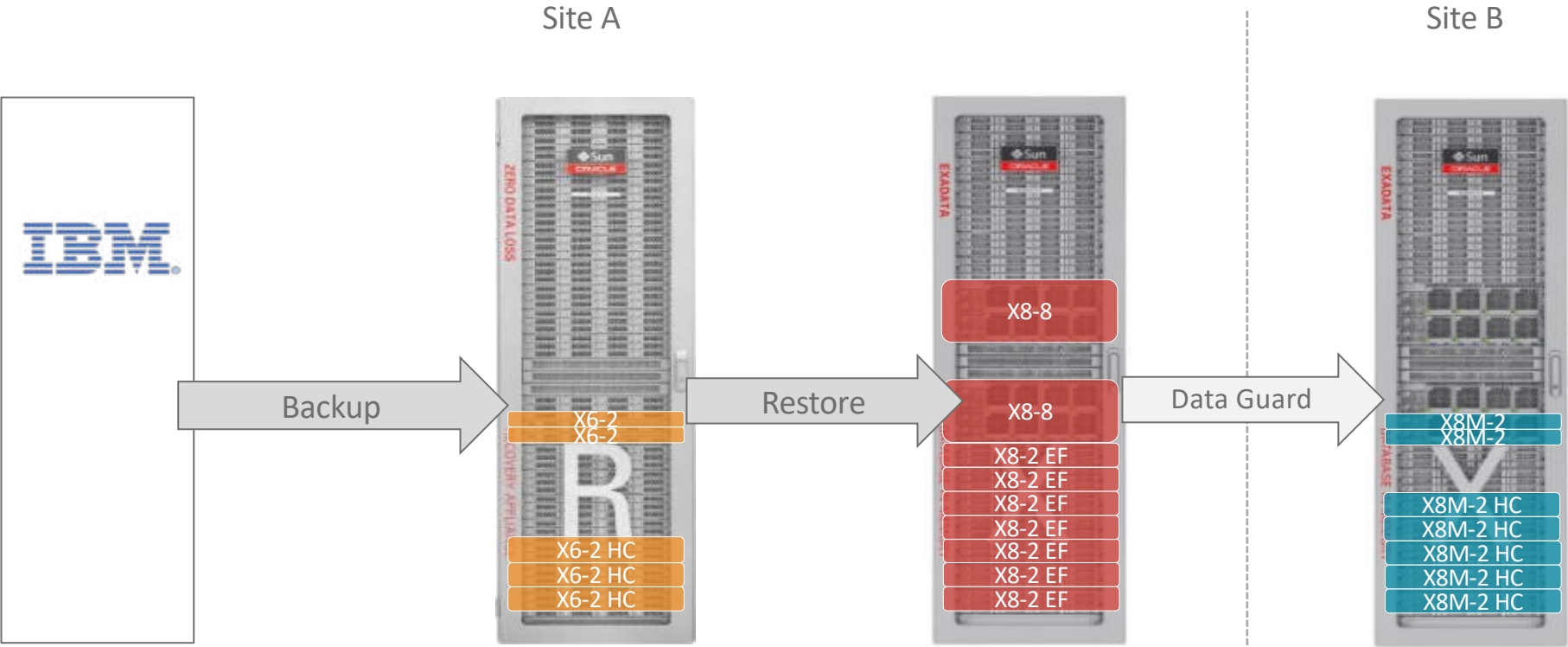
CHALLENGES

- Max downtime 36h (16h)
- 700+ TBS, changes every night
- 3.5 Mil. Partitions
- ~1TB redo/h

PREPARATION

- Getting a RA
- Reading Mike's «Migrating Very Large Databases»
- Distributing the TBS based on size into 16 RA XTTS PERL homes

ENVIRONMENT



IMPROVEMENTS

- Activate BCT on source database
- Set PARALLEL parameter for the jobs depending on the TBS count (between 1 and 10)
- Execute multiple Datapump jobs, export and import

MIGRATION

Online

— Full backup	26h	Restore	8h
— 1st Incremental	10h	Recover	2h
— 2nd incremental	3h	Recover	1h

Read-Only

— Final Incremental	1h	Recover	0.5h
— Expdp	4h	Impdp	2h

QUESTIONS

ANSWERS



TRADEWARE

Upgrade to Oracle Database 19c

LIT4101 Tuesday 16:00 Ascend Lounge, CloudWorld Hub, The Venetian

Hitchhiker's Guide for Upgrading to Oracle Database 19c

HOL3999 Tuesday 16:00 Bellini 2002, The Venetian, Level 2
HOL3999 Wednesday 09:00 Titian 2201A, The Venetian, Level 2

From SR to Patch - Insider Insights into the Oracle Database Development Process

LRN1506 Wednesday 15:45 Murano 3202, The Venetian, Level 3

No Slide Zone - Database Patching Insights

HOL4093 Thursday 09:00 Bellini 2001A , The Venetian, Level 2
HOL4093 Thursday 11:00 Bellini 2001A , The Venetian, Level 2

Oracle Data Pump Deep Dive with Development

LRN3501 Thursday 11:30 Murano 3202, The Venetian, Level 3

AutoUpgrade 2.0: Internals and New Features

LRN3500 Thursday 13:15 Murano 3202, The Venetian, Level 3

Cloud Premigration Advisor Tool - Your Cloud Premigration Advisor

LIT4104 Thursday 13:40 Ascend Lounge, CloudWorld Hub, The Venetian



ORACLE
CloudWorld

Thank you

Thomas Goop

Senior Consultant, Tradeware AG

Rodrigo Jorge

Senior Principal Product Manager, Oracle

Mike Dietrich

Senior Director Product Management, Oracle

