



# ORACLE DATABASE UPGRADE BEST PRACTICE

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ORACLE

## MICHIGAN ORACLE USERS SUMMIT 2022

Wednesday October 26, 2022

IN-PERSON event





## Roy Swonger

Vice President

Database Upgrade, Utilities & Patching

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royfswonger



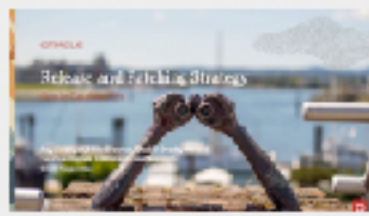
@royfswonger



Episode 1

Release and Patching Strategy

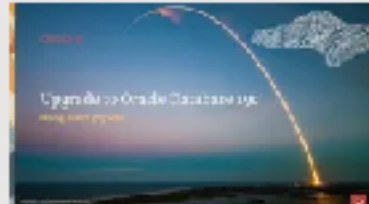
105 minutes - Feb 4, 2021



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

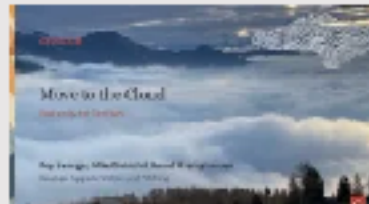
120 minutes - Mar 25, 2021



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

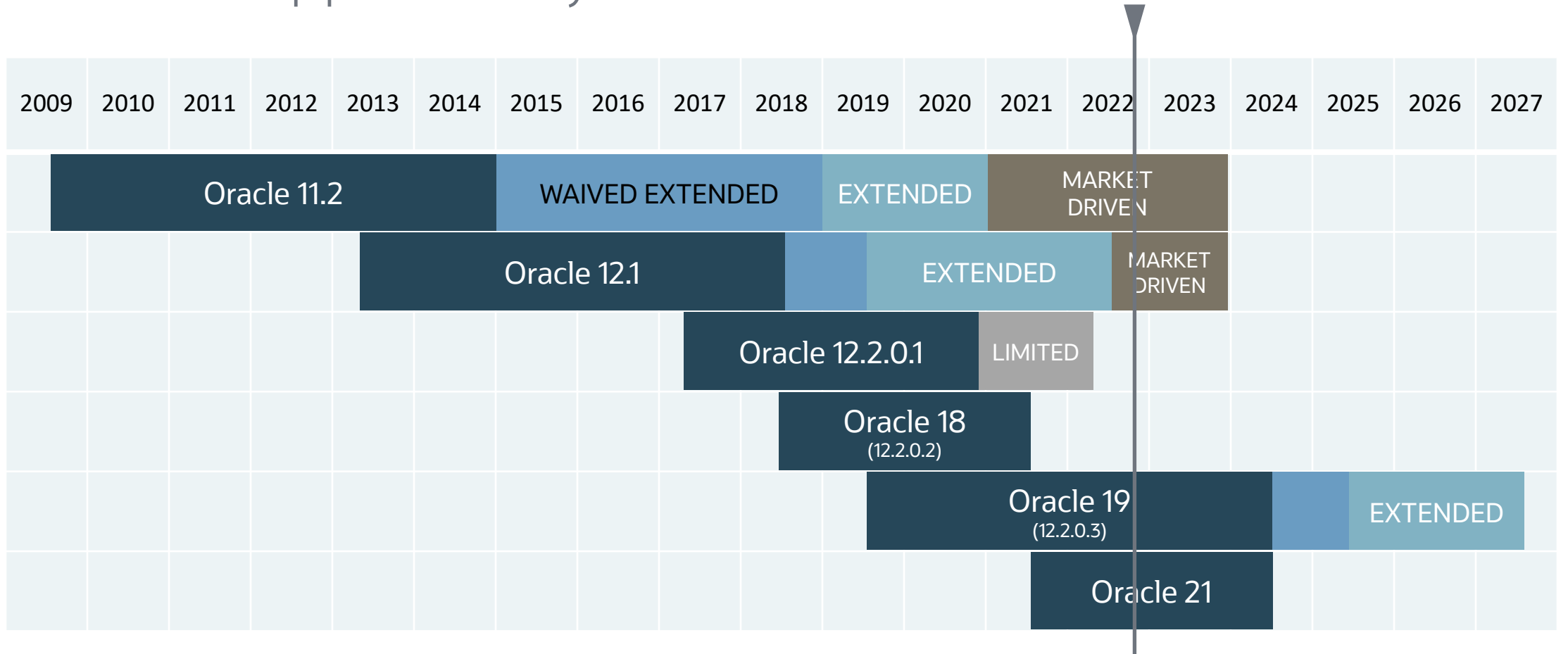


Migration



Customer Case

# Lifetime Support Policy



Premier Support
  Waived Extended Support
  Paid Extended Support
  Market Driven Support
  Limited Error Correction



[Knowledge](#)[RCA](#)[DWB](#)[Customer Exceptions](#)[CMS](#)[Service Requests](#)[Patches & Updates](#)[Certifications](#)[Systems](#)[More...](#)

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## ★ **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

Innovation

Long Term Support

Extended

Innovation

Long Term Support

Extended





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?**

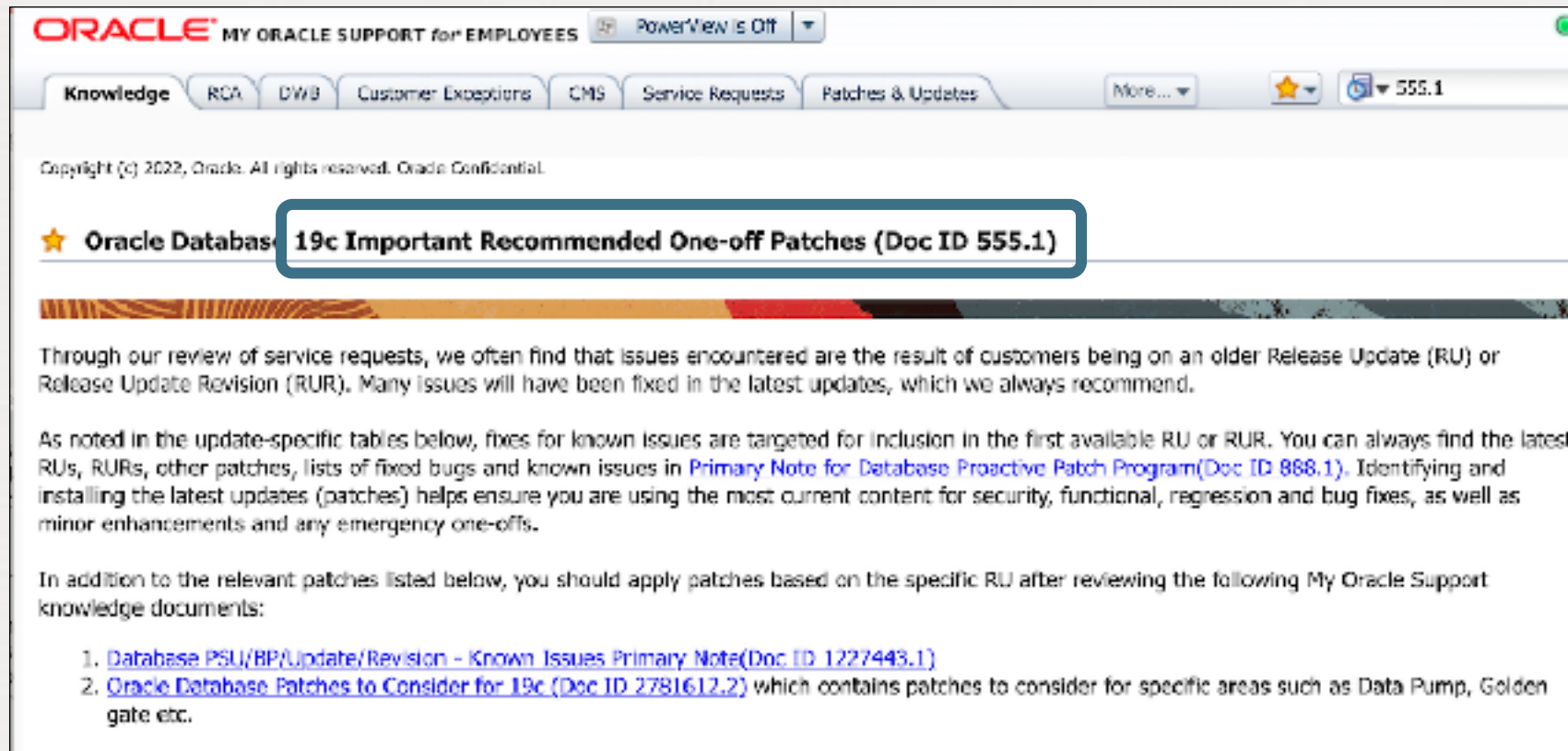
- Oracle Database Base Releases
- Oracle Database Patchsets
- Oracle Database Updates (Versions 12.2 & higher)**
- Oracle Database Update Revisions (Versions 12.2 & higher)
- Oracle Database PSU, SPU(CPU), Bundle Patches (Versions 12.1 & lower)
- OJVM Update/PSU/Bundle Patches
- Latest Available Microsoft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

**Solution(s)**

Possible Solutions will appear once you make your selection.

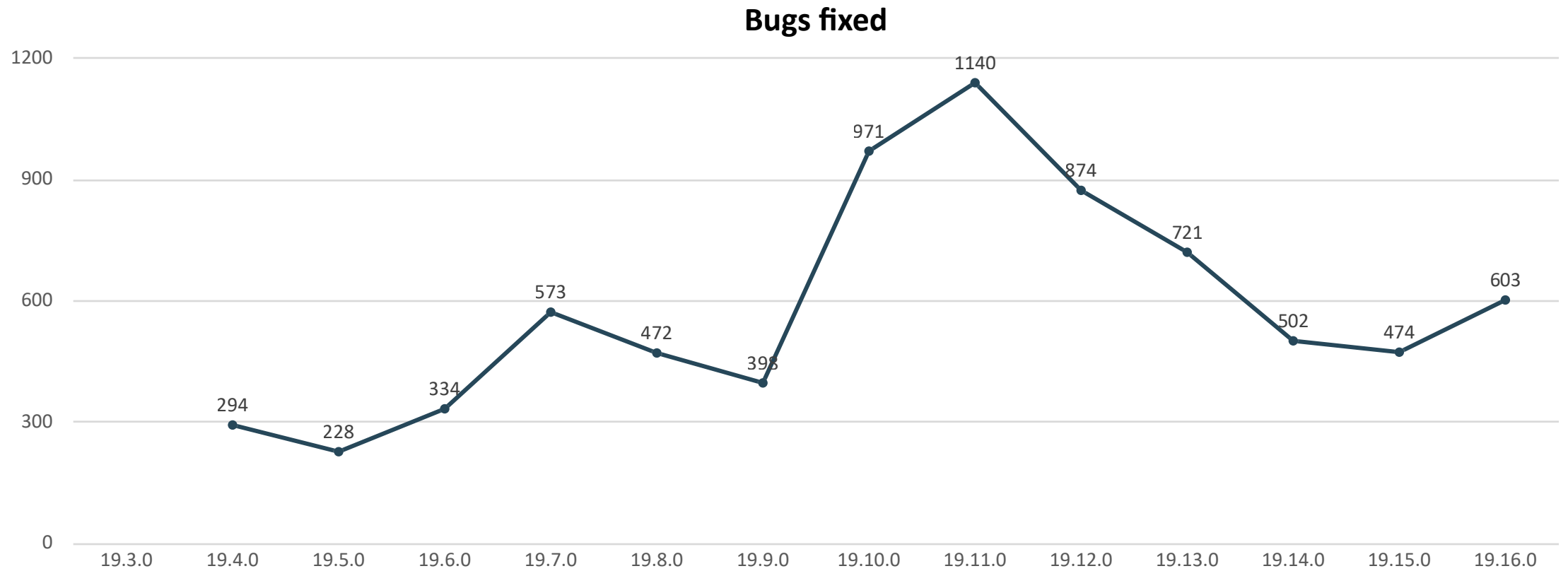
# Always add the most recent MRP on top

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



The screenshot shows the Oracle My Oracle Support interface. At the top, there is a navigation bar with tabs for Knowledge, RCA, DWB, Customer Exceptions, CMS, Service Requests, and Patches & Updates. The 'Patches & Updates' tab is selected. Below the navigation bar, there is a search bar containing '555.1'. The main content area displays the title 'Oracle Database 19c Important Recommended One-off Patches (Doc ID 555.1)' in a blue box. Below the title, there is a decorative banner with a sunburst pattern. The text below the banner reads: '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 \(Doc ID 868.1\)](#). 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: 1366971](#)
- In Multitenant, it must be run in each PDB separately

## ORAchk Upgrade Readiness Assessment

- Part of Autonomous Health Framework (AHF)
- Download from [MOS Note: 14573571](#)
- 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

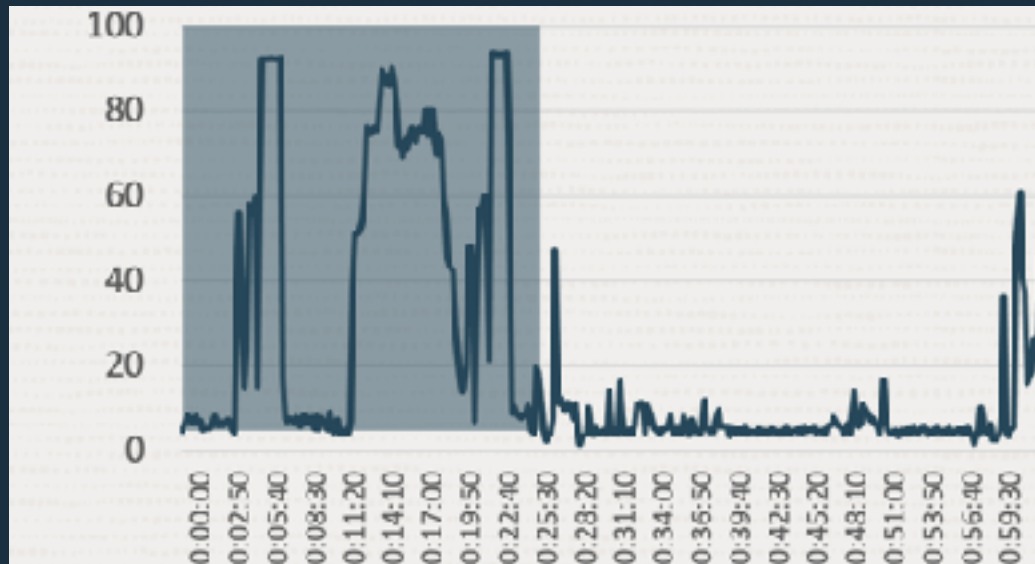




**Refresh dictionary statistics**, especially on `SYS` and `SYSTEM` before upgrade or migration

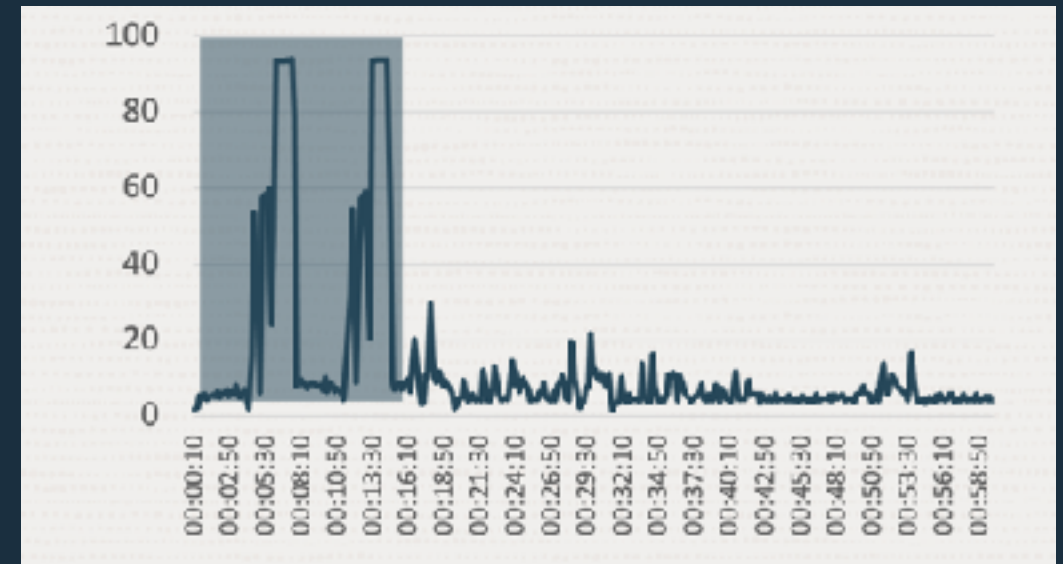


# Gather dictionary and fixed objects stats



Without stats refresh

- Initial upgrade phase: 25 min



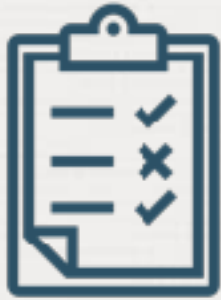
With stats refresh

- Initial upgrade phase: 13 min

12 minutes saving in upgrade time





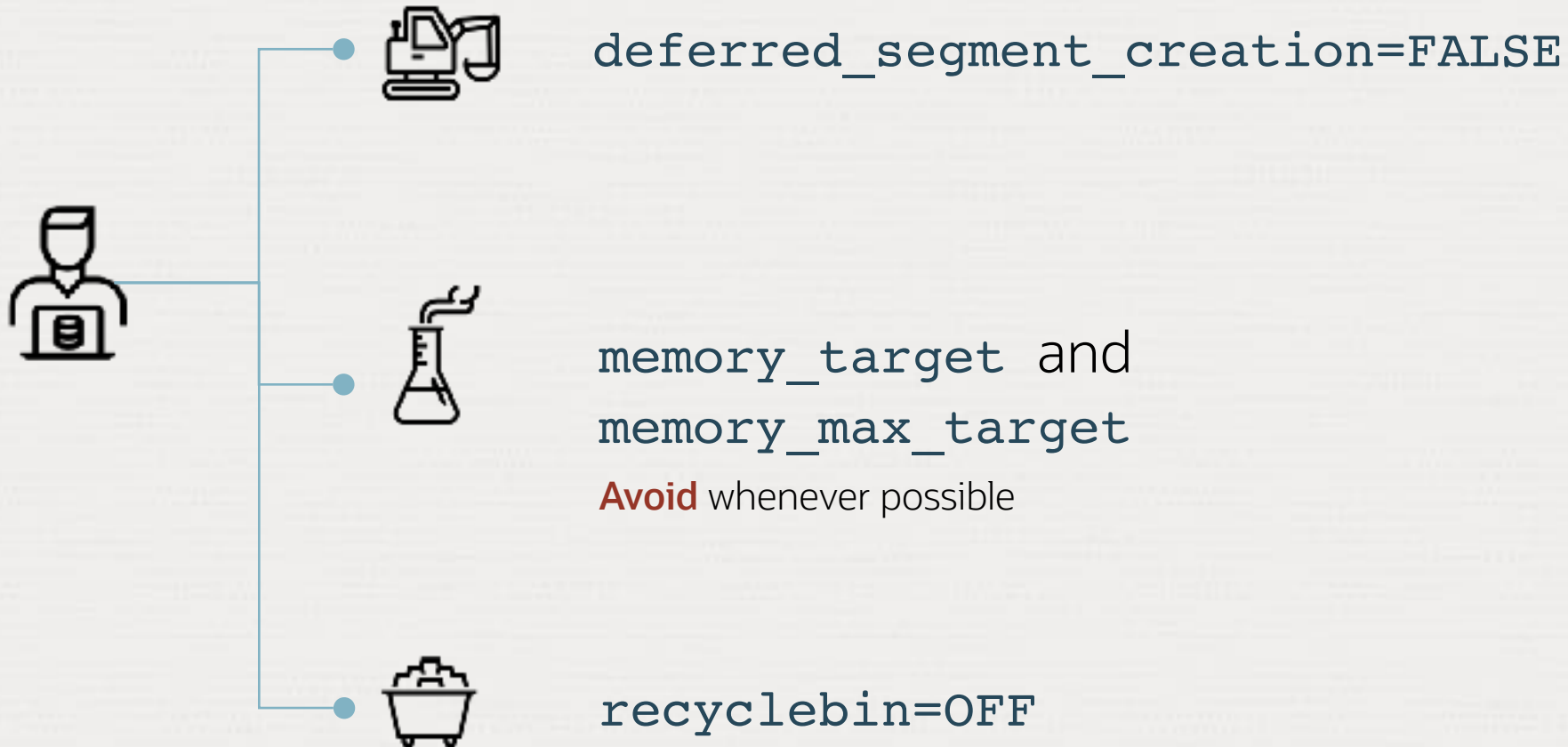


**Remove outdated parameters**, especially underscores and events, and set recommendations

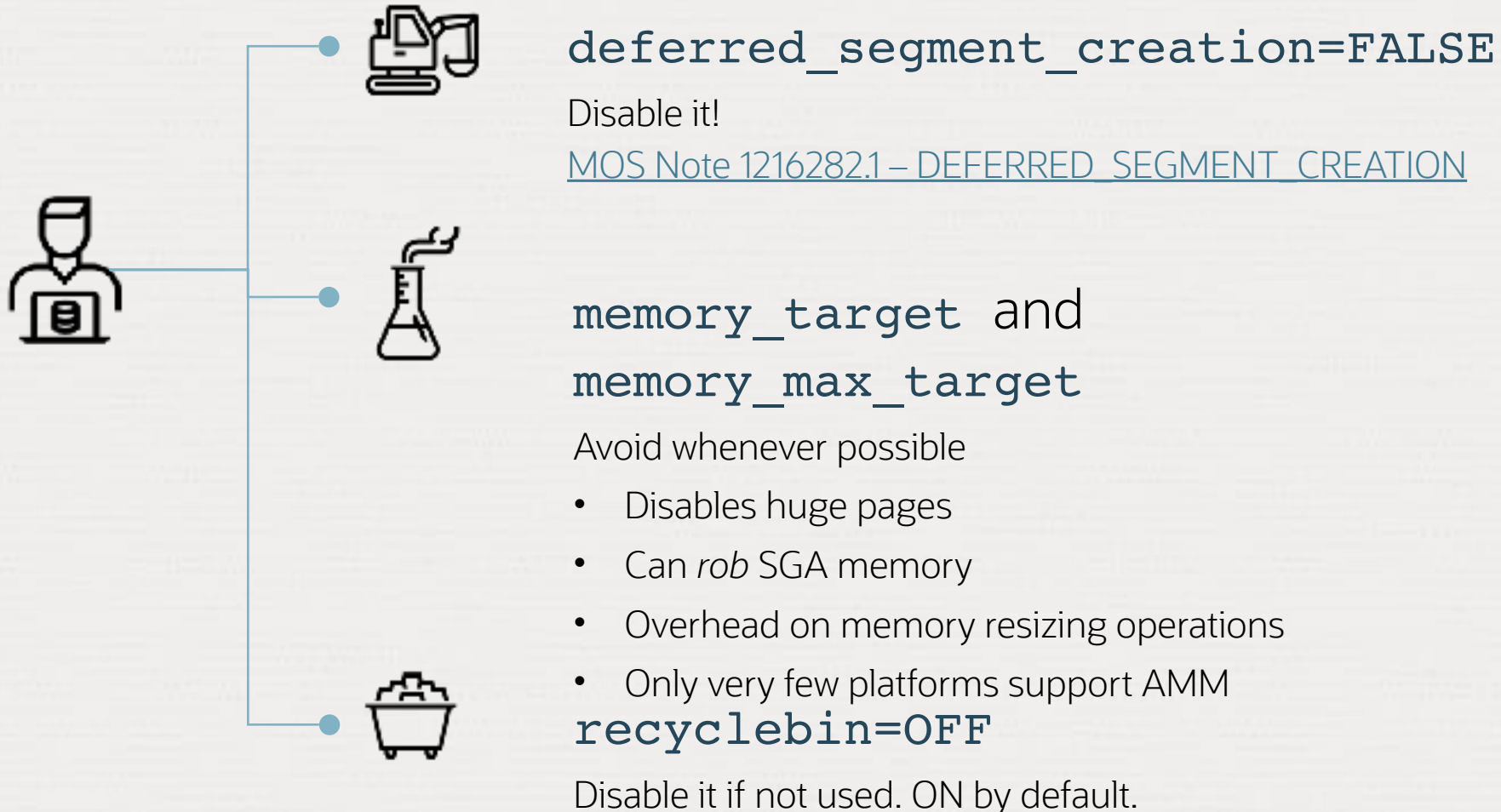




# Questionable Parameters

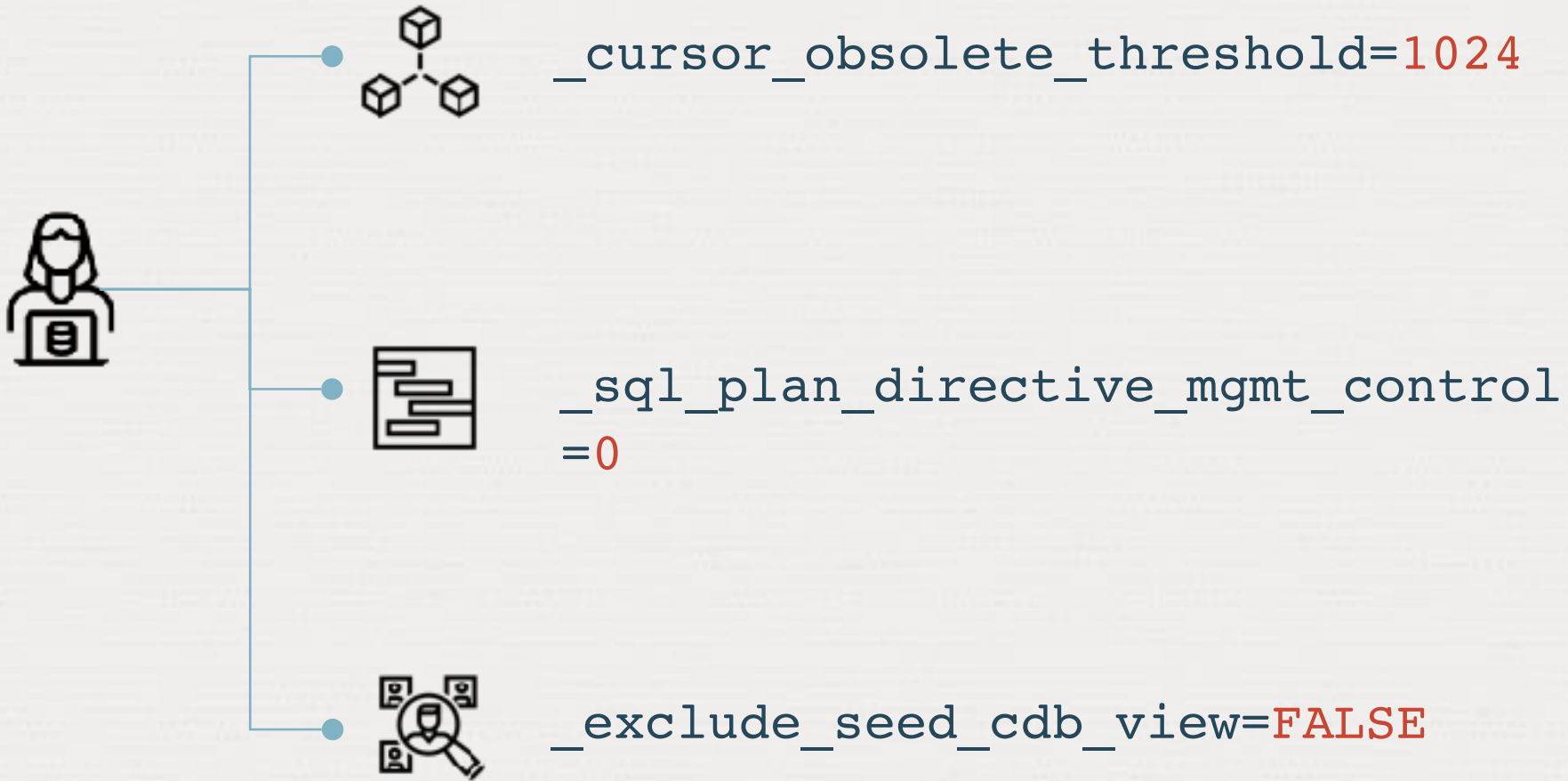


# Questionable Parameters





# 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

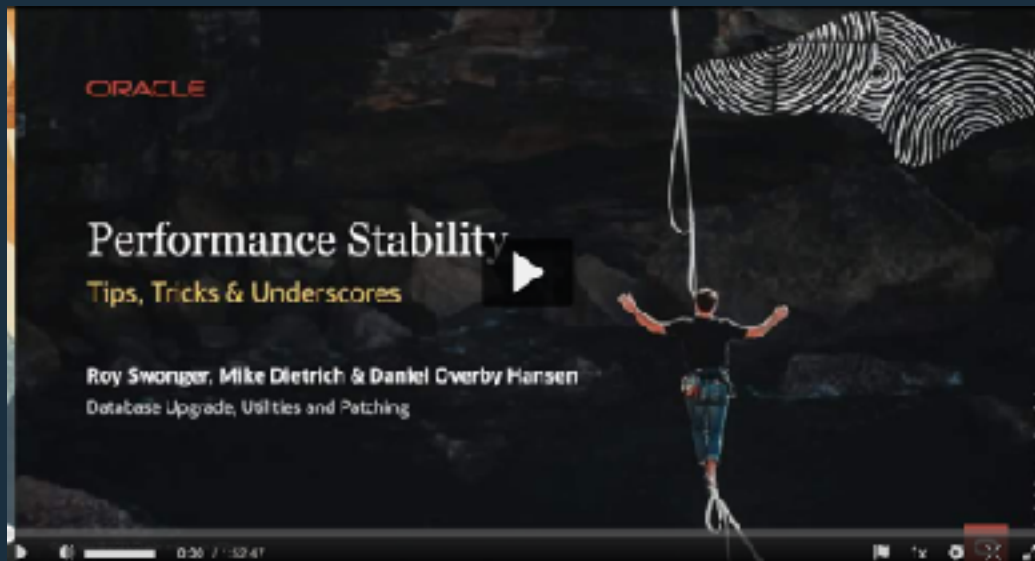




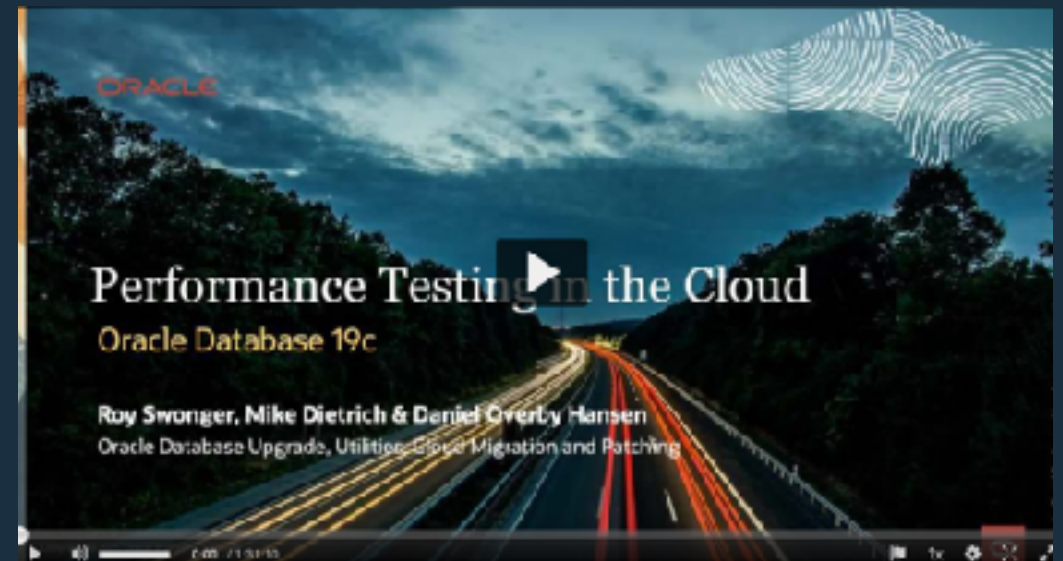
**Transporting statistics** via a staging table is often **faster** than regathering statistics



# 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

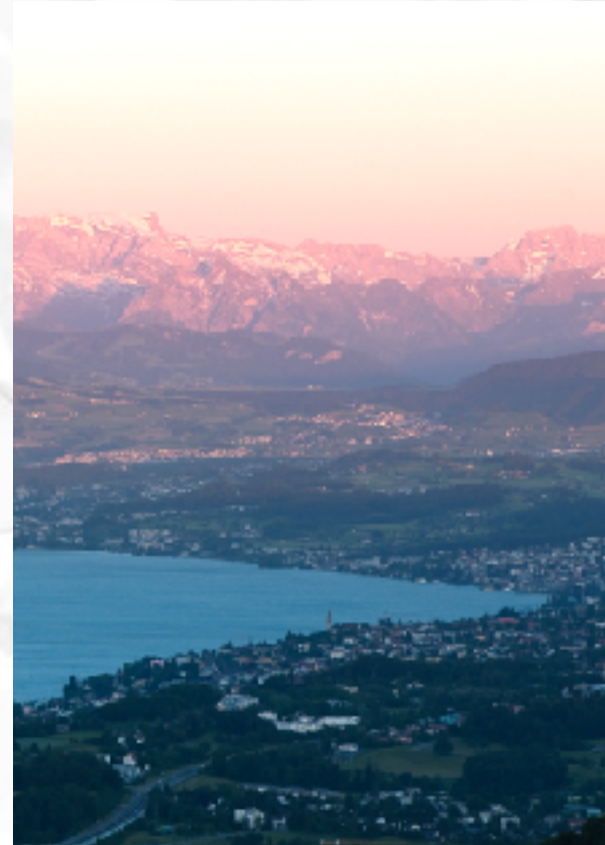
**Founded**  
**1990**

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



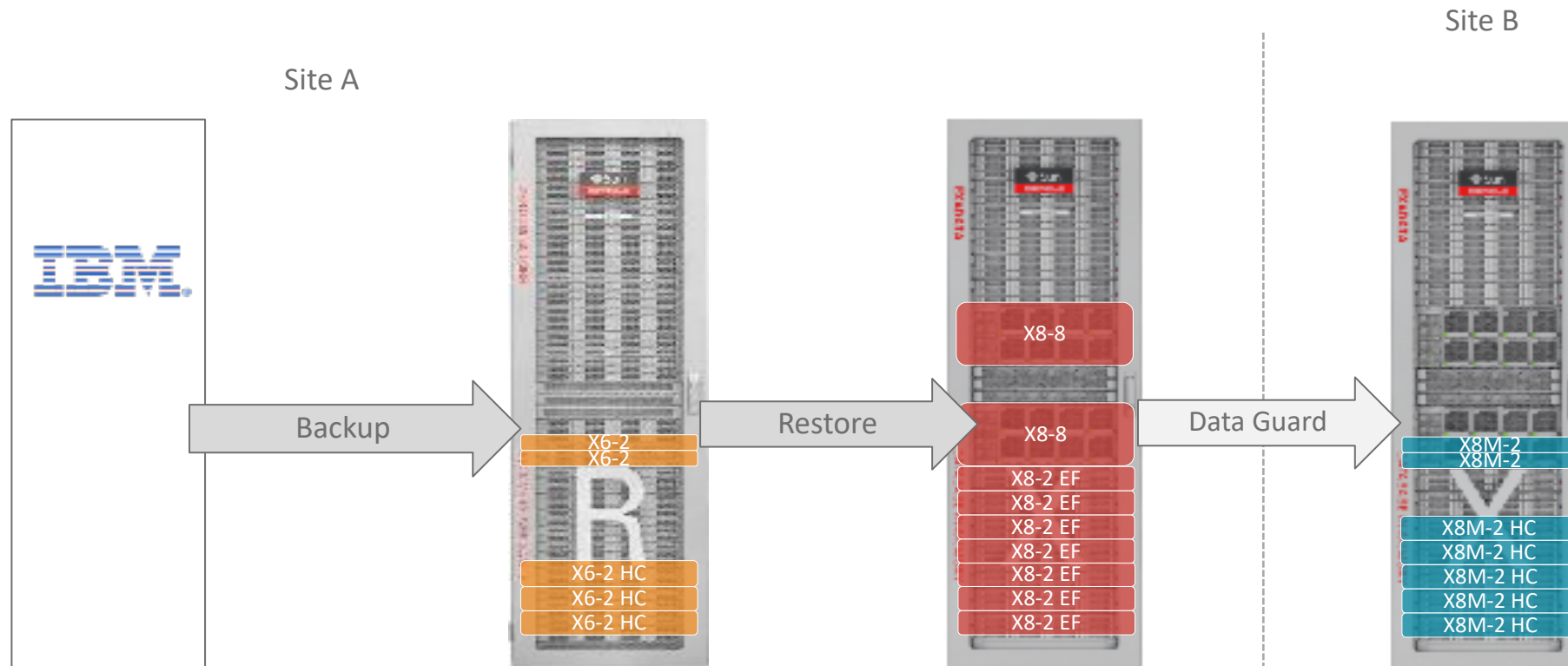
# CHALLENGES

- 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



# IMPROVMENTS

- 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



# SAVE THE DATE

- ASCEND CONFERENCE 2023

June 11-14, 2023

Caribe Royale Resort

Orlando, Florida

<https://ascendusersconference.com>



- MOUS 2023

October 25, 2023

Schoolcraft College - VisTaTech Center,  
18600 Haggerty Rd, Livonia, MI

<https://www.mous.us>



THANK YOU

[www.mous.us](http://www.mous.us)



# SURVEYS

- Session Surveys

Please complete the session survey for this session.

The survey will be provided to each attendee.



THANK YOU

[WWW.MOUS.US](http://WWW.MOUS.US)

