

The background of the slide is a photograph of several surgeons in an operating room. They are wearing blue surgical gowns, masks, and hairnets. The scene is dimly lit, with the primary light source coming from the surgical lights, creating a professional and focused atmosphere. The surgeons are gathered around a patient, with various surgical instruments visible on a tray in the foreground.

ORACLE

# Patch me if you can

Database Patching News, Improvements and Secrets



## MIKE DIETRICH

---

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Database Upgrade, Migrations and Patching

 <https://mikedietrichde.com>

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**Roy Swonger**



**Daniel Overby Hansen**



**William Beauregard**



**Mike Dietrich**



**Rodrigo Jorge**





**\*NEW\*** Episode 1

### Release and Patching Strategy

105 minutes – Feb 4, 2021



**\*NEW\*** Episode 2

### AutoUpgrade to Oracle Database 19c

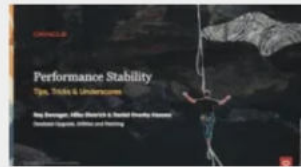
115 minutes – Feb 20, 2021



**\*NEW\*** Episode 3

### Performance Stability, Tips and Tricks and Underscores

120 minutes – Mar 4, 2021



**\*NEW\*** Episode 4

### Migration to Oracle Multitenant

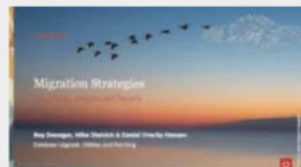
120 minutes – Mar 16, 2021



**\*NEW\*** Seminar 5

### Migration Strategies – Insights, Tips and Secrets

120 minutes – Mar 25, 2021



**\*NEW\*** Seminar 6

### Move to the Cloud – Not only for techies

115 minutes – Apr 8, 2021



**\*NEW\*** Episode 7

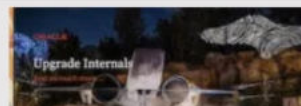
### Cool Features – Not only for DBAs

110 minutes – Jan 14, 2021



**\*NEW\*** Episode 8

Database Upgrade Internals – and so much more



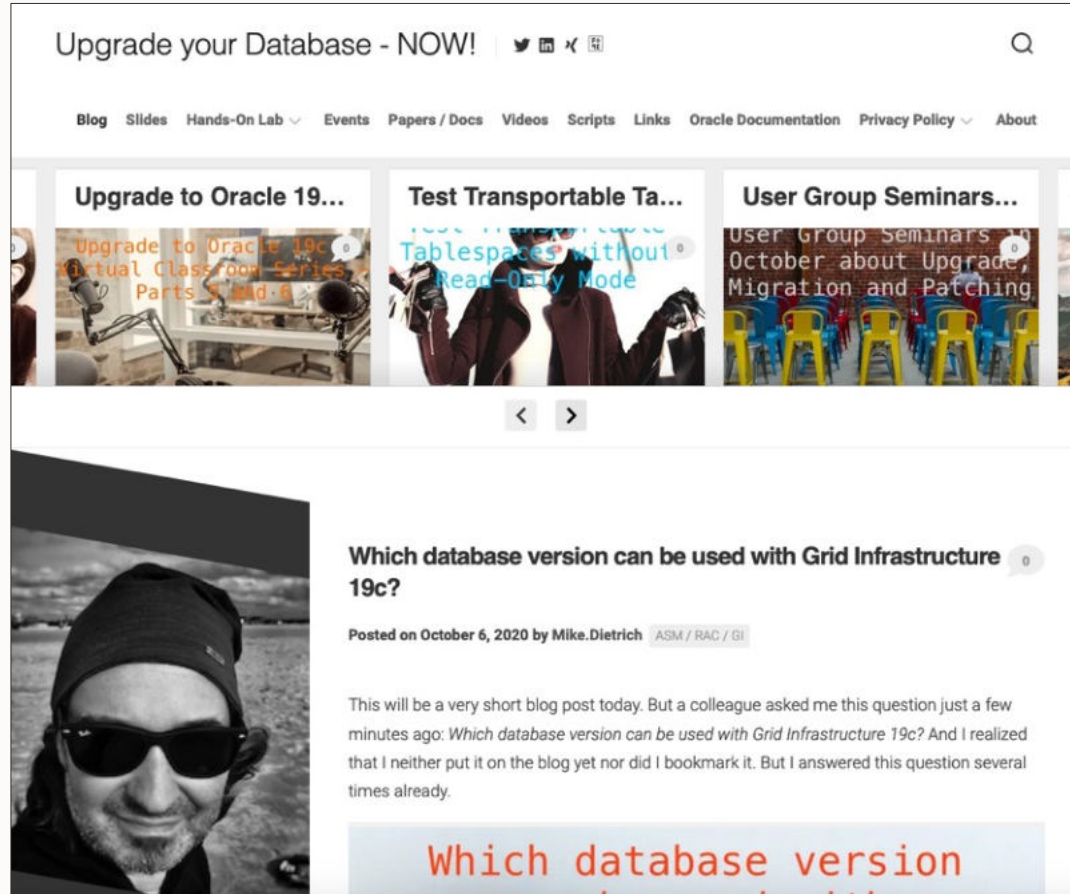
## Recorded Web Seminars

<https://MikeDietrichDE.com/videos/>

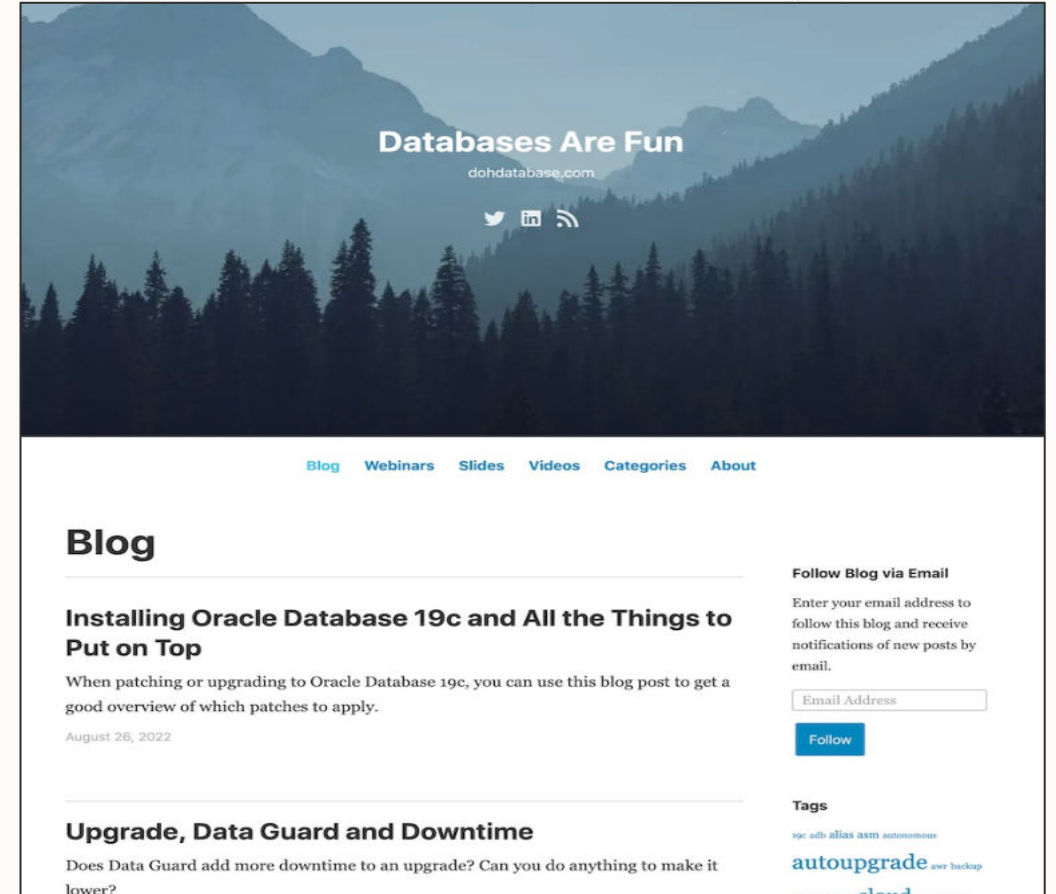
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ORACLE

# CloudWorld

October 17-20 Las Vegas



#OCW22

[oracle.com/cloudworld](https://oracle.com/cloudworld)



# Introduction Overview





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

Upgrade to Oracle Database 19c

# Patching Strategies

---

## Patching Basics

The Database Patching Process

Tips for Patching Success



# Basic Facts | What Is In A Patch

## FILES

New or changed executables, libs or files

```
bin/oracle  
bin/srvctl  
oracore/zoneinfo/timzone_34.dat
```

Apply and rollback scripts

```
sqlpatch/.../nnn_apply.sql  
sqlpatch/.../nnn_rollback.sql
```

---

## SQL PL/SQL

New or changed objects

```
alter table sys.tab$ ...  
create index sys.i_tab1 ...  
create or replace package sys.dbms_scheduler ...
```

# Basic Facts | How To Apply A Patch

`$ORACLE_HOME/OPatch`

```
[oracle@hol ~]$ cd $ORACLE_HOME/OPatch
[oracle@hol OPatch]$ ls -l
total 164
drwxr-x---. 6 oracle dba      68 Apr 22  2020 auto
drwxr-x---. 2 oracle dba      31 Apr 22  2020 config
-rwxr-x---. 1 oracle dba    589 Apr 22  2020 datapatch
-rwxr-x---. 1 oracle dba    627 Apr 22  2020 datapatch.bat
drwxr-x---. 2 oracle dba      90 Apr 22  2020 docs
-rwxr-x---. 1 oracle dba 23550 Apr 22  2020 emdpatch.pl
drwxr-x---. 2 oracle dba   4096 Apr 22  2020 jlib
drwxr-x---. 5 oracle dba   4096 Mar 26  2020 jre
drwxr-x---. 9 oracle dba   4096 Apr 22  2020 modules
drwxr-x---. 5 oracle dba      58 Apr 22  2020 ocm
-rwxr-x---. 1 oracle dba 49462 Apr 22  2020 opatch
-rwxr-x---. 1 oracle dba   1442 Apr 22  2020 opatchauto
-rwxr-x---. 1 oracle dba    393 Apr 22  2020 opatchauto.cmd
-rwxr-x---. 1 oracle dba 16412 Apr 22  2020 opatch.bat
-rwxr-x---. 1 oracle dba   4290 Apr 22  2020 opatch_env.sh
-rw-r-----. 1 oracle dba   2551 Apr 22  2020 opatch.pl
drwxr-x---. 4 oracle dba      62 Apr 22  2020 opatchprereqs
-rwxr-x---. 1 oracle dba   3159 Apr 22  2020 operr
-rwxr-x---. 1 oracle dba   4218 Apr 22  2020 operr.bat
-rw-r-----. 1 oracle dba   3177 Apr 22  2020 operr_readme.txt
drwxr-x---. 2 oracle dba      19 Apr 22  2020 oplan
drwxr-x---. 3 oracle dba      21 Apr 22  2020 oracle_common
drwxr-x---. 3 oracle dba      24 Apr 22  2020 plugins
-rw-r-----. 1 oracle dba   2980 Apr 22  2020 README.txt
drwxr-x---. 2 oracle dba   4096 Apr 22  2020 scripts
-rw-r-----. 1 oracle dba      27 Apr 22  2020 version.txt
```

## Basic Facts | How To Apply A Patch

opatch

Applies binaries to an  
Oracle Home

All instances are down

datapatch

Applies SQL and PL/SQL  
changes to a database

Database is up  
(normal, not upgrade)

Pro tip: Use `opatchauto` on  
RAC environments





## Basic Facts | Patch Inventory

opatch

```
$ opatch lsinventory  
DBMS_QOPATCH
```

datapatch

```
CDB_REGISTRY_SQLPATCH
```

## Basic Facts | Patch Inventory

opatch

```
$ opatch lsinventory
```

- Tells you what is installed in your software home

```
DBMS_QOPATCH
```

- Patches installed in the Oracle Home
- [MOS Note: 1530108.1](#) FAQ on Queryable Patch Inventory

datapatch

```
CDB_REGISTRY_SQLPATCH
```

- View detailed information about SQL patches installed in the database



Tim Hall ∞ 🤖 +∞  
@oraclebase



When patching your production Oracle GI/DB installations, which method do you use?

In-Place = Current ORACLE\_HOME  
Out-Of-Place = New ORACLE\_HOME

If you don't look after have production kit, then don't answer.

In-Place

55.4%

Out-Of-Place

44.6%

Twitter





Always patch out-of-place

## Recommendation | Out-of-Place Patching

```
[oracle@hol ~]$ cd $ORACLE_HOME
[oracle@hol 19]$ ls -l
total 132
drwxr-xr-x.  2 oracle dba    102 Apr 27  2019 addnode
drwxr-xr-x.  6 oracle dba  4096 Apr 17  2019 apex
drwxr-xr-x.  9 oracle dba    93 Apr 17  2019 assistants
drwxr-xr-x.  2 oracle dba  8192 Oct 21 11:49 bin
drwxr-xr-x.  5 oracle dba    44 Oct 16  2019 cfgtoollogs
drwxr-xr-x.  3 oracle dba    19 Oct 16  2019 client
drwxr-xr-x.  4 oracle dba    87 Apr 27  2019 clone
drwxr-xr-x.  6 oracle dba    55 Apr 17  2019 crs
drwxr-xr-x.  3 oracle dba    18 Apr 17  2019 css
drwxr-xr-x. 11 oracle dba  4096 Apr 17  2019 ctx
drwxr-xr-x.  7 oracle dba    71 Apr 17  2019 cv
drwxr-xr-x.  3 oracle dba    20 Apr 17  2019 data
drwxr-xr-x.  3 oracle dba    19 Apr 17  2019 dbjava
drwxr-xr-x.  2 oracle dba  4096 Feb  2 08:27 dbs
drwxr-xr-x.  5 oracle dba  4096 Apr 27  2019 deinstall
drwxr-xr-x.  3 oracle dba    20 Apr 17  2019 demo
drwxr-xr-x.  3 oracle dba    20 Apr 17  2019 diagnostics
```

# Recommendation | Out-of-Place Patching

Oracle Home, 19.9.0

```
[oracle@rac1 ~]$ cd $ORACLE_HOME
[oracle@rac1 ~]$ ls -l
total 132
drwxr-xr-x 2 oracle dba 102 Apr 27 2019 webnode
drwxr-xr-x 6 oracle dba 4096 Apr 17 2019 apex
drwxr-xr-x 9 oracle dba 93 Apr 17 2019 assistants
drwxr-xr-x 2 oracle dba 8192 Oct 21 11:49 aqm
drwxr-xr-x 5 oracle dba 44 Oct 18 2019 oigpnllogs
drwxr-xr-x 3 oracle dba 19 Oct 18 2019 oigpnl
drwxr-xr-x 4 oracle dba 87 Apr 27 2019 olapw
drwxr-xr-x 6 oracle dba 59 Apr 17 2019 oim
drwxr-xr-x 3 oracle dba 19 Apr 17 2019 oia
drwxr-xr-x 11 oracle dba 4096 Apr 17 2019 oia
drwxr-xr-x 7 oracle dba 71 Apr 17 2019 oia
drwxr-xr-x 3 oracle dba 29 Apr 17 2019 oia
drwxr-xr-x 3 oracle dba 19 Apr 17 2019 oia
drwxr-xr-x 2 oracle dba 4096 Feb 2 08:27 oia
drwxr-xr-x 5 oracle dba 4096 Apr 27 2019 oia
drwxr-xr-x 3 oracle dba 29 Apr 17 2019 oia
drwxr-xr-x 3 oracle dba 29 Apr 17 2019 oia
```



```
SQL> SHUTDOWN IMMEDIATE
```

```
[oracle@rac1 ~]$ cd $ORACLE_HOME
[oracle@rac1 ~]$ ls -l
total 132
drwxr-xr-x 2 oracle dba 102 Apr 27 2019 webnode
drwxr-xr-x 6 oracle dba 4096 Apr 17 2019 apex
drwxr-xr-x 9 oracle dba 93 Apr 17 2019 assistants
drwxr-xr-x 2 oracle dba 8192 Oct 21 11:49 aqm
drwxr-xr-x 5 oracle dba 44 Oct 18 2019 oigpnllogs
drwxr-xr-x 3 oracle dba 19 Oct 18 2019 oigpnl
drwxr-xr-x 4 oracle dba 87 Apr 27 2019 olapw
drwxr-xr-x 6 oracle dba 59 Apr 17 2019 oim
drwxr-xr-x 3 oracle dba 19 Apr 17 2019 oia
drwxr-xr-x 11 oracle dba 4096 Apr 17 2019 oia
drwxr-xr-x 7 oracle dba 71 Apr 17 2019 oia
drwxr-xr-x 3 oracle dba 29 Apr 17 2019 oia
drwxr-xr-x 2 oracle dba 4096 Feb 2 08:27 oia
drwxr-xr-x 5 oracle dba 4096 Apr 27 2019 oia
drwxr-xr-x 3 oracle dba 29 Apr 17 2019 oia
drwxr-xr-x 3 oracle dba 29 Apr 17 2019 oia
```



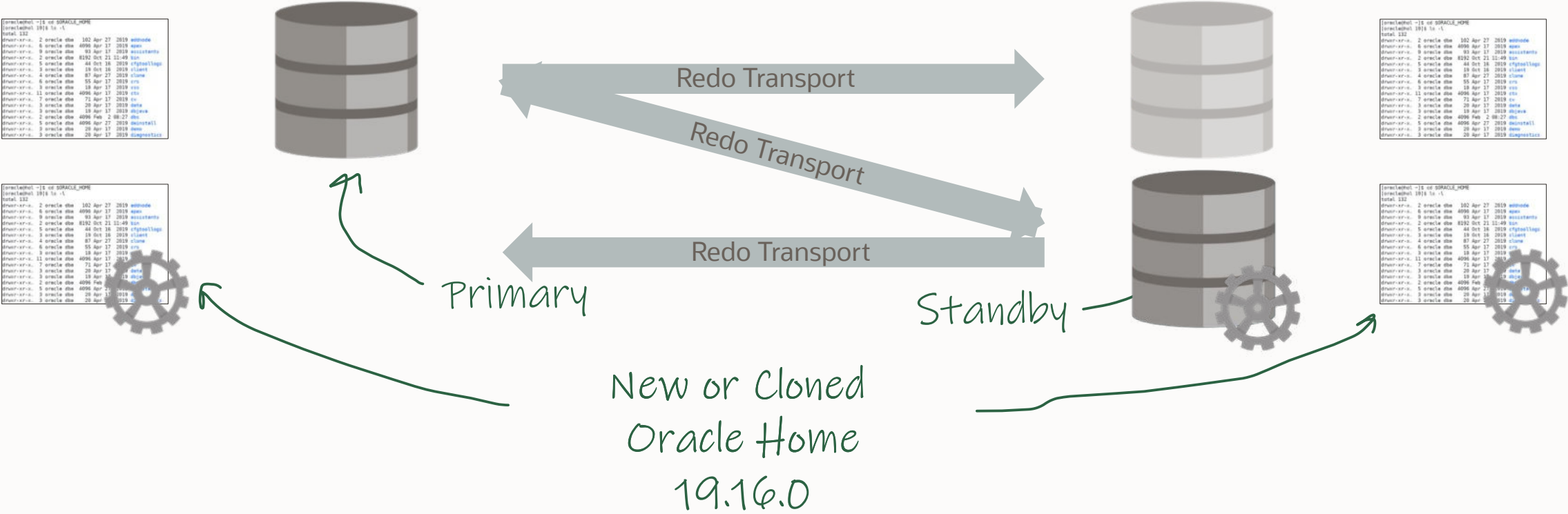
```
[oracle]$ $ORACLE_HOME/OPatch/datapatch -verbose
```

New or Cloned  
Oracle Home, 19.16.0





# Recommendation | Standby-First Patch Apply



```
D [oracle]$ $ORACLE_HOME/OPatch/datapatch -verbose
```



# Recommendation | Standby-First Patch Apply

## ★ Oracle Patch Assurance - Data Guard Standby-First Patch Apply (Doc ID 1265700.1)

### In this Document

[Purpose](#)

[Overview](#)

[Data Guard Standby-First Patch Apply](#)

[Scope](#)

[Applies To](#)

[Details](#)

[Considerations, Recommendations, and Restrictions](#)

[Steps to Perform Data Guard Standby-First Patch Apply](#)

[Phase 1: Perform Patch Binary Installation on Standby Only](#)

[Phase 2: Evaluate Patch on Standby Database](#)

[Phase 3: Complete Patch Installation or Rollback](#)

[Phase 3 Option 1: Apply Patch to Primary Database](#)

[Phase 3 Option 2: Data Guard Switchover and Apply Patch to New Physical Standby](#)

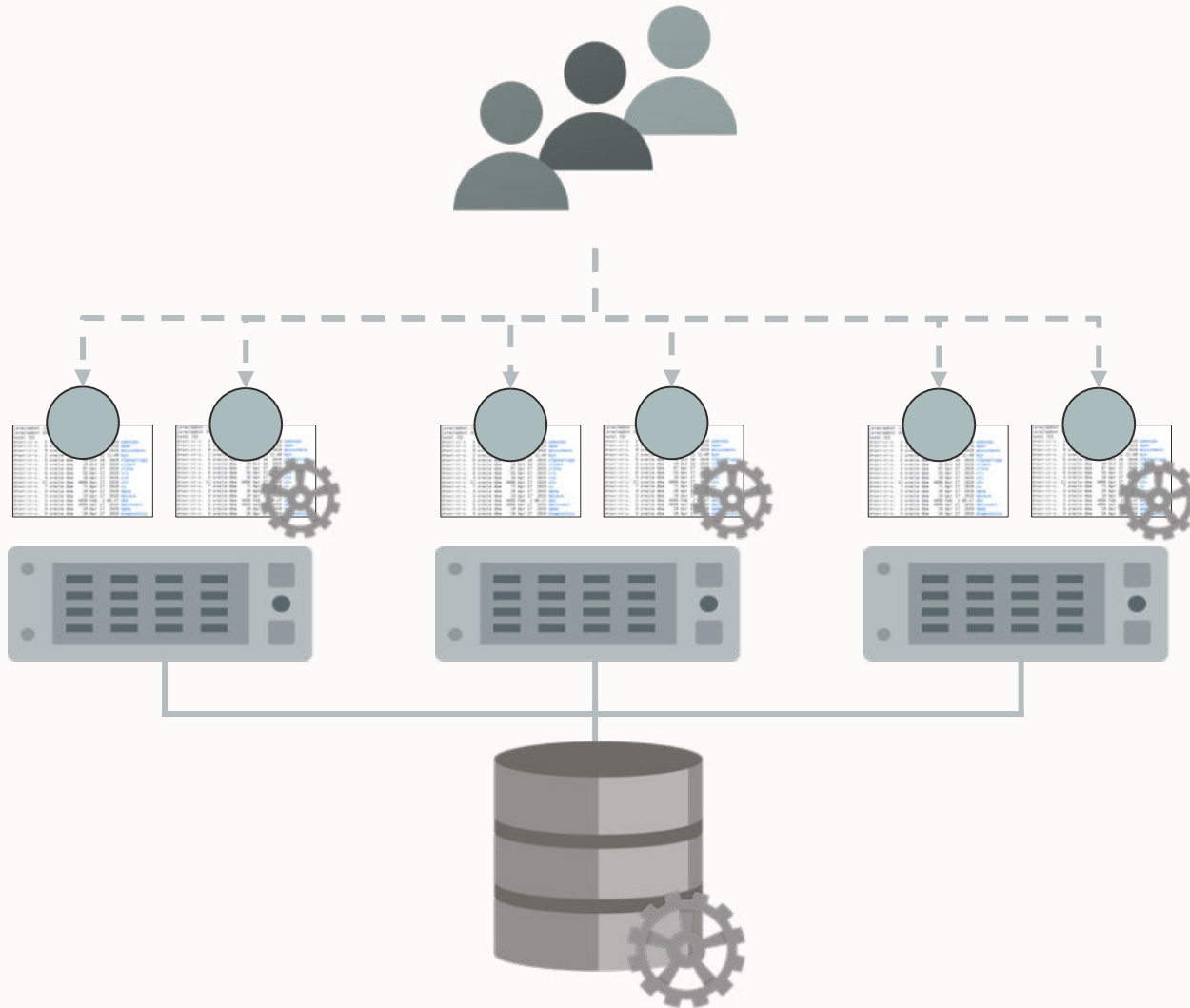
[Oracle Patch Assurance - Data Guard Standby-First Patch Apply \(Doc ID 1265700.1\)](#)



## Avoid downtime with RAC Rolling Patching



# Recommendation | RAC Rolling Patching



```
$ $ORACLE_HOME/OPatch/datapatch -verbose
```

Release updates are **always**:



Standby-First installable



RAC Rolling installable

Patching Strategies

—

Patching Basics

The Database Patching Process

Tips for Patching Success





# The Database Patching Process



## **FIND**

Find the right bundle and one-off patches



## **INSTALL**

Download and install the patches



## **APPLY**

Apply the patches to the database

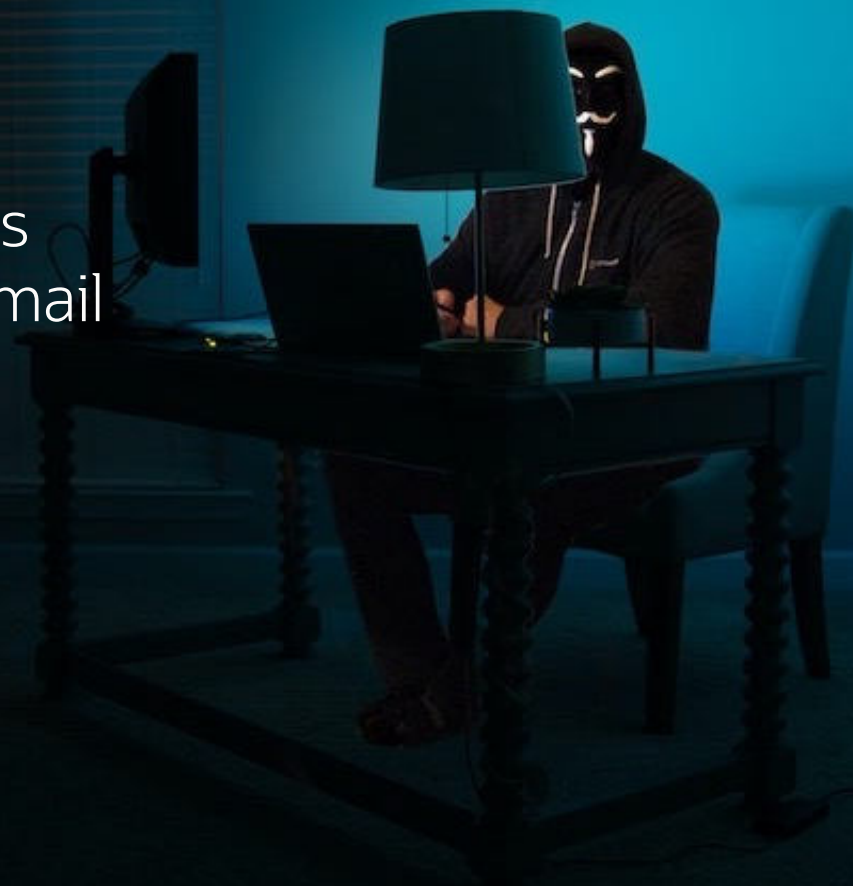


***My database is  
not facing the internet***



# 92%

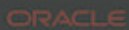
of malware gets  
delivered via email








# Finding the Right Patches | Quarterly

<https://www.oracle.com/security-alerts/>

[Products](#) [Industries](#) [Resources](#) [Customers](#) [Partners](#) [Developers](#) [Events](#)



 [View Accounts](#)

 [Contact Sales](#)

## Critical Patch Updates

This page lists announcements of security fixes made in Critical Patch Updates. Alerts and Bulletins are released.

- [Instructions for subscribing to email notifications of Critical Patch Updates](#)
- [Oracle Corporate Security Blog](#)
- [Guidelines for reporting security vulnerabilities](#)

This page contains the following sections:

- [Critical Patch Updates](#)
- [Security Alerts](#)
- [Solaris Third Party Bulletins](#)
- [Oracle Linux Bulletins](#)
- [Oracle VM Server for x86 Bulletins](#)
- [Map of CVE to Advisory/Alert](#)
- [Oracle CVEs not published in other Oracle public documents](#)
- [CVEs for Oracle open source projects not published in other Oracle public documents](#)
- [Policy on information provided in Critical Patch Updates](#)
- [Applicability of Critical Patch Updates and Security Alerts to Oracle Cloud](#)
- [References](#)

### Critical Patch Updates

Critical Patch Updates are collections of security fixes for Oracle products. They are available to customers with valid support contracts. Starting in April 2022, Critical Patch Updates will be released on the third Tuesday of January, April, July, and October (They were previously published on the Tuesday closest to the 17th day of January, April, July, and October). The next four dates are:

- 18 October 2022
- 17 January 2023
- 18 April 2023
- 18 July 2023

A pre-release announcement will be published on the Thursday preceding each Critical Patch Update release.



# Do I need to apply this bundle?

How to evaluate the risk





# Critical Patch Alert July 2022 | Risk Matrix

CVE#	Component	Package and/or Privilege Required	Protocol	Remote Exploit without Auth.?	CVSS VERSION 3.1 RISK (see <a href="#">Risk Matrix Definitions</a> )									Supported Versions Affected	Notes
					Base Score	Attack Vector	Attack Complex	Privs Req'd	User Interact	Scope	Confidentiality	Integrity	Availability		
CVE-2020-35169	Oracle Database - Enterprise Edition	None	TCPS	Yes	9.1	Network	Low	None	None	Un-changed	High	High	None	12.1.0.2, 19c, 21c	
CVE-2022-21510	Oracle Database - Enterprise Edition Sharding	Local Logon	None	No	8.8		Low	Low	None	Changed	High	High	High	None	See Note 1
CVE-2022-21511	Oracle Database - Enterprise Edition Recovery	EXECUTE ON DBMS_IR.EXECUTESQLSCRIPT	Oracle Net	No	7.2	Network	Low	High	None	Un-changed	High	High	High	None	See Note 1
CVE-2022-21565	Java VM	Create Procedure	Oracle Net	No	6.5	Network	Low	Low	None	Un-changed	None	High	None	12.1.0.2, 19c, 21c	
CVE-2022-24729	Oracle Application Express (CKEditor)	User Account	HTTP	No	5.7	Network	Low	Low	Required	Un-changed	None	None	High	Prior to 22.1.1	
CVE-2021-41184	Oracle Application Express (jQueryUI)	User Account	HTTP	No	5.4	Network	Low	Low	Required	Changed	Low	Low	None	Prior to 22.1.1	
CVE-2022-0839	Oracle SQLcl (Liquibase)	Local Logon	None	No	5.0	Local	Low	Low	Required	Un-changed	High	None	None	19c	
CVE-2021-45943	Oracle Spatial and Graph (GDAL)	Create Session	Oracle Net	No	4.3	Network	Low	Low	None	Un-changed	None	None	Low	19c, 21c	
CVE-2022-21432	Oracle Database - Enterprise Edition RDBMS Security	DBA role	Oracle Net	No	2.7	Network	Low	High	None	Un-changed	None	None	Low	12.1.0.2, 19c, 21c	

# The Database Patching Process



## FIND

Find the right bundle and one-off patches



## INSTALL

Download and install the patches



## APPLY

Apply the patches to the database



# Download & Install Patches



Check for newest opatch version

Download and unzip patch (bundle)

Check for patch conflicts

Shutdown instance using this home

Apply binary with opatch or opatchauto








Always use the latest OPatch

- Download [Patch 6880880](#)
- [MOS Note: 274526.1](#)
- [Why should you use the most recent version of OPATCH?](#)

# Patch Download Assistant | Download the most recent RU

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?**

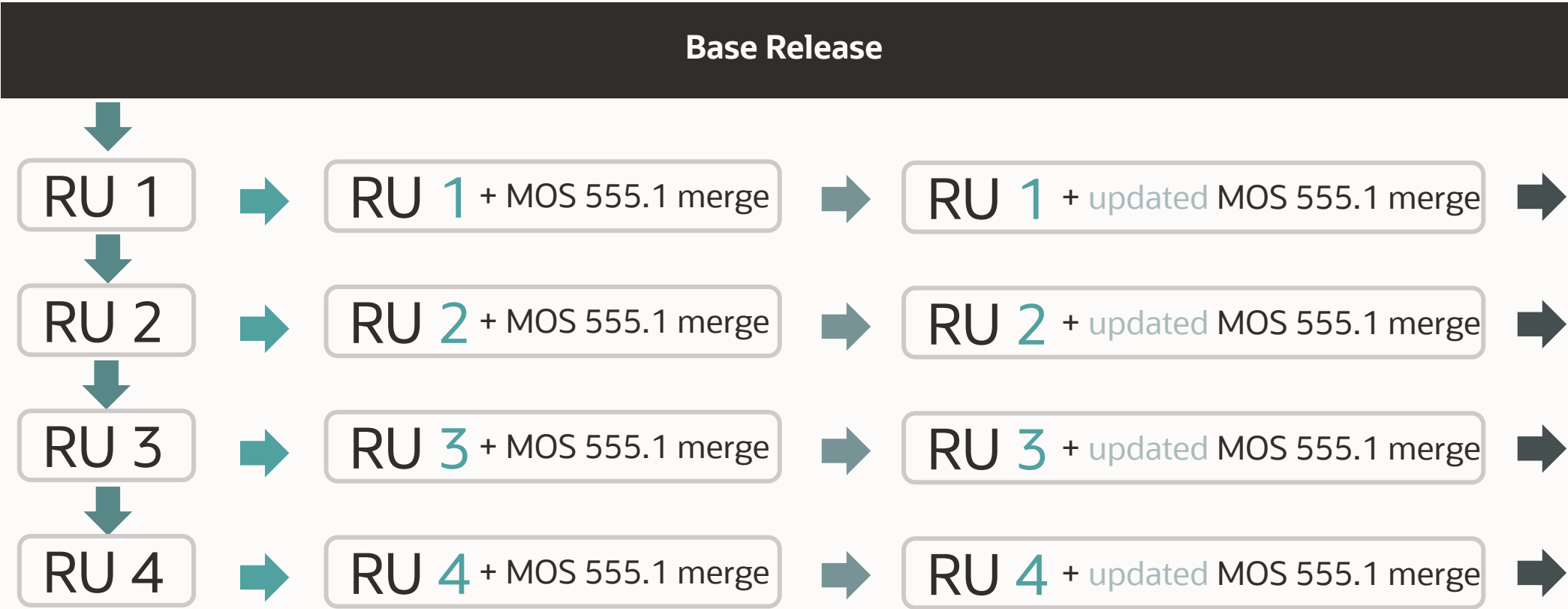
- ☐ Oracle Database Base Releases
- ☐ ~~Oracle Database Patchsets~~
- ☐ Oracle Database Updates (Versions 12.2 & higher)
- ☐ ~~Oracle Database Update Revisions (Versions 12.2 & higher)~~
- ☐ Oracle Database PSU, SPU(CPU), Bundle Patches (Versions 12.1 & lower)
- ☐ OJVM Update/PSU/Bundle Patches
- ☐ Latest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

### Solution(s)

Possible Solutions will appear once you make your selection.



# Patching | From Oracle Database 19.17.0 (Oct 2022)





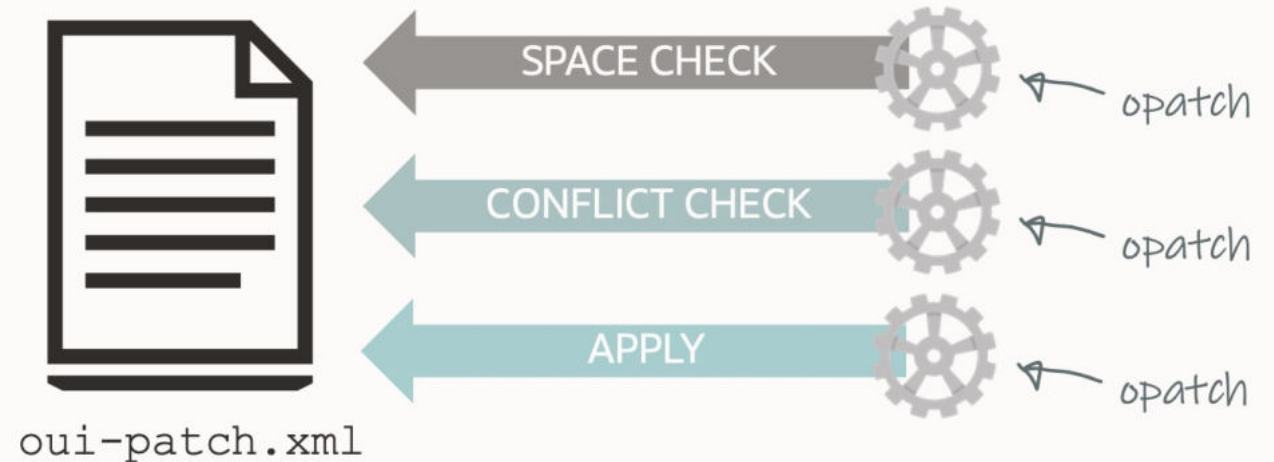
If OPatch takes too long, use out-of-place patching with a brand-new Oracle Home

Avoid cloned Oracle Homes and in-place patching

# Patching Performance

Many customer encountered increasing patching duration

- opatch maintains an **ever-growing patch history** in `$ORACLE_HOME/inventory/ContentsXML/oui-patch.xml`
- This file gets queried multiple times and can delay patching massively



## opatch | Experiment with an edited oui-patch.xml

### Original oui-patch.xml with 12 RUs

- 1001 lines
- Space check: 5:29 min
- Conflict check: 5:26 min
- Check during apply: 5:29 min
- Raw patch apply: 3:58 min
- Total time taken: **19:22 min**

### Edited oui-patch.xml with only 2 RUs

- 136 lines
- Space check: 0:09 min
- Conflict check: 0:08 min
- Check during apply: 0:12 min
- Raw patch apply: 3:51 min
- Total time taken: **4:20 min**



# Patching Performance

## Workaround

- Don't clone your home, don't patch in-place
- Instead, **install and patch a new home**
  - You may use `./runInstaller -applyRU ... -applyOneOffs ...`
- Editing `oui-patch.xml` is not officially supported

## Further Information

- <https://mikedietrichde.com/2022/05/10/binary-patching-is-slow-because-of-the-inventory/>

# The Database Patching Process



## FIND

Find the right bundle and one-off patches



## INSTALL

Download and install the patches



## APPLY

Apply the patches to the database



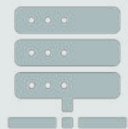
Recompile invalid objects  
before invoking datapatch

# Apply changes to the Database



Startup the database instance in the new or patched home

Start all pluggable databases



Patch the database using  
`$ORACLE_HOME/OPatch/datapatch`

CDB\$ROOT, PDB\$SEED and all open PDBs will be patched

One database per invocation

Multiple datapatch sessions in parallel

Does update REGISTRY\$SQLPATCH

[Datapatch User Guide \(Doc ID 2680521.1\)](#)



`$ORACLE_HOME/OPatch/datapatch`

↳ `$ORACLE_HOME/sqlpatch/sqlpatch`

↳ `$ORACLE_HOME/sqlpatch/sqlpatch.pl`

```
use strict;  
use Getopt::Long;  
  
use sqlpatch.pm
```

# Datapatch | Patch Apply Sequence

datapatch



1



Java patches

2



Bundle patches

3



One-off patches

# Datapatch | Patch Rollback and Apply Queue

Binary Registry after opatch:

- Patch 444 – Java Patch
- Patch 555 – Bundle Patch
- Patch 666 – One-off Patch

SQL Registry before datapatch:

- Patch 111 – Java Patch
- Patch 222 – Bundle Patch
- Patch 333 – One-off Patch

```
$ ./datapatch
```

datapatch queue

Rollback:

Apply:

Rollback:

Cumulative:

Patch 222 to 555 – Bundle Patch

Apply:



# Datapatch | Rollback Script



Apply/rollback scripts:

```
$ORACLE_HOME/sqlpatch/.../nnn_apply.sql
```

```
$ORACLE_HOME/sqlpatch/.../nnn_rollback.sql
```



Rollback scripts (zipped as BLOB):

```
SELECT PATCH_DIRECTORY  
FROM   REGISTRY$SQLPATCH
```



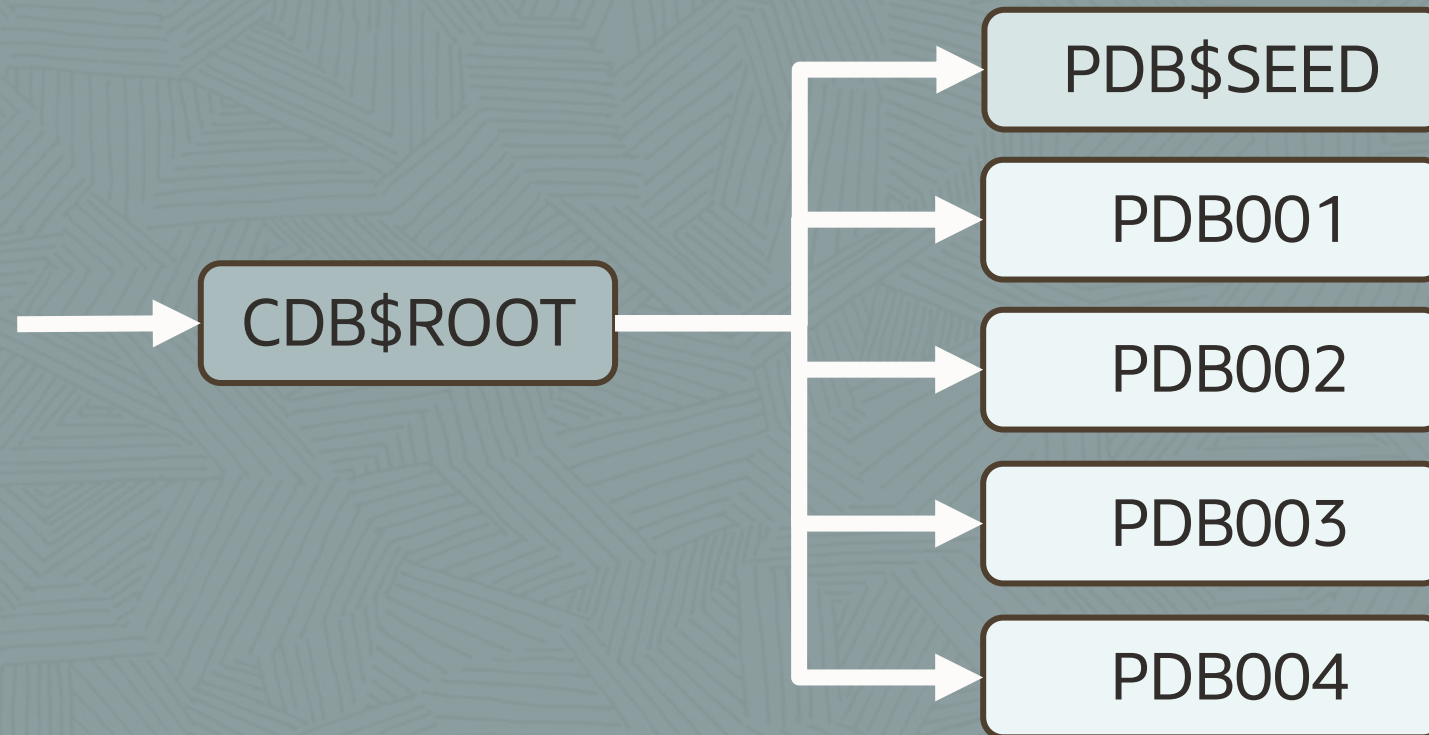
# Patching a Container Database

datapatch simply "does the right thing"

Only open PDBs will be patched

Sequence:

datapatch





Significantly speed up patching using  
AutoUpgrade Distributed Patching

# Distributed Patching



# Distributed Patching





# Distributed Patching

To enable distributed patching

```
$ cat RACCDB.cfg

upg1.source_home=/u01/app/oracle/product/19/dbhome_19_15
upg1.target_home=/u01/app/oracle/product/19/dbhome_19_16
upg1.sid=RACCDB
upg1.tune_setting=distributed_upgrade=true

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



## Less components, Faster patching

Typical candidates:

- JAVAVM
- ORDIM
- SDO

# opatchauto datapatch Performance Improvement

## Old behavior

- opatchauto invokes opatch on every node
- opatchauto then invokes datapatch on every node

### Result:

Many useless datapatch calls since it needs to be executed only once the last node has been patched

## New behavior

- opatchauto invokes opatch on every node
- opatchauto invokes datapatch on last patched node

### Result:

Useless datapatch calls avoided, faster patch runs. Fix is included in the current opatch

# Patching Strategies

---

Patching Basics

The Database Patching Process

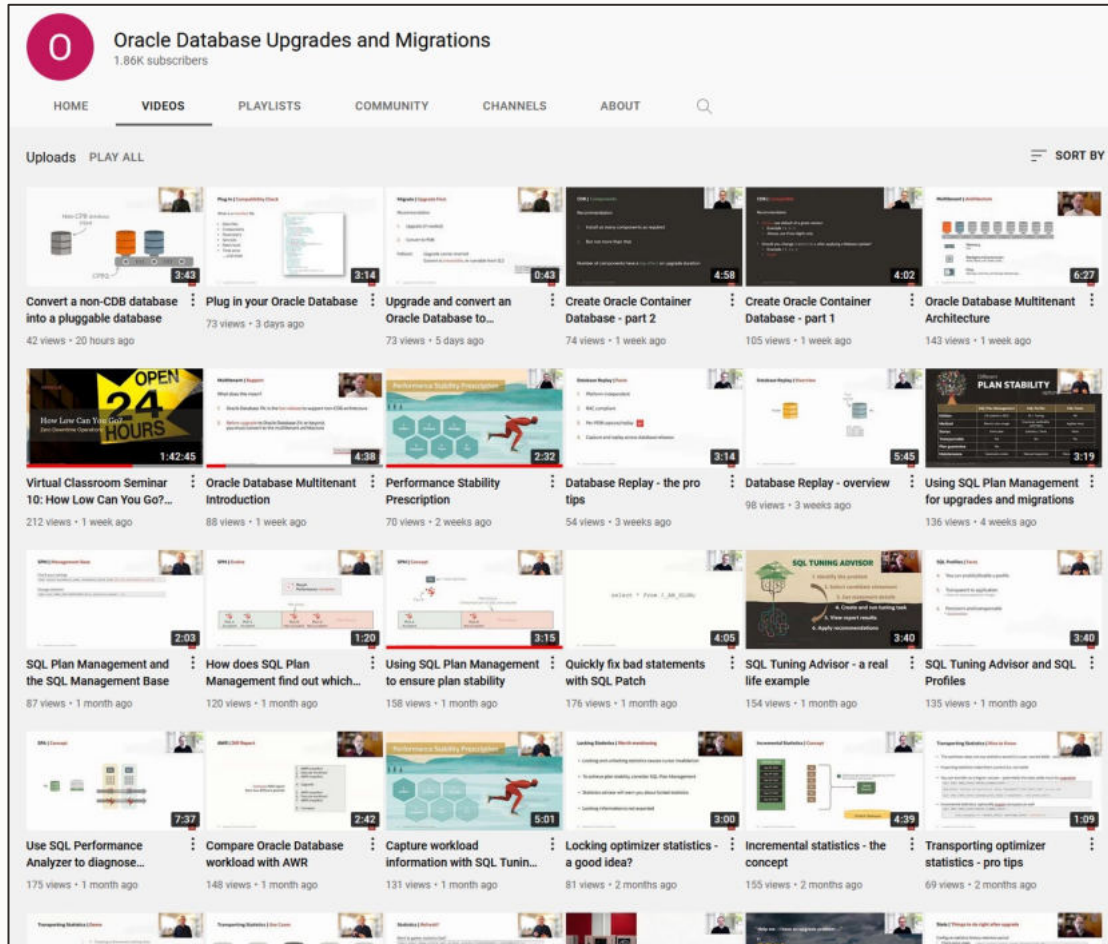
Tips for Patching Success





- Upgrade to Oracle Database 19c
- Always patch out-of-place
- Avoid downtime with RAC Rolling Patching
- Always use the latest OPatch
- Use out-of-place patching with a brand-new Oracle Home
- Recompile invalid objects before invoking datapatch
- Significantly speed up patching using Distributed Patching
- Less components, faster patching

# YouTube | Oracle Database Upgrades and Migrations



[Link](#)

- 200+ videos
- New videos every week
- No marketing
- No buzzwords
- All tech



# THANK YOU



**Visit our blogs:**

<https://MikeDietrichDE.com>

<https://DOHdatabase.com>

<https://www.dbarj.com.br/en>

# THANK YOU



## Webinars:

<https://MikeDietrichDE.com/videos>

## YouTube channel:

[OracleDatabaseUpgradesandMigrations](#)



**THANK**  
**YOU**



# Appendix

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Things we would have loved to talk about, but didn't have time to

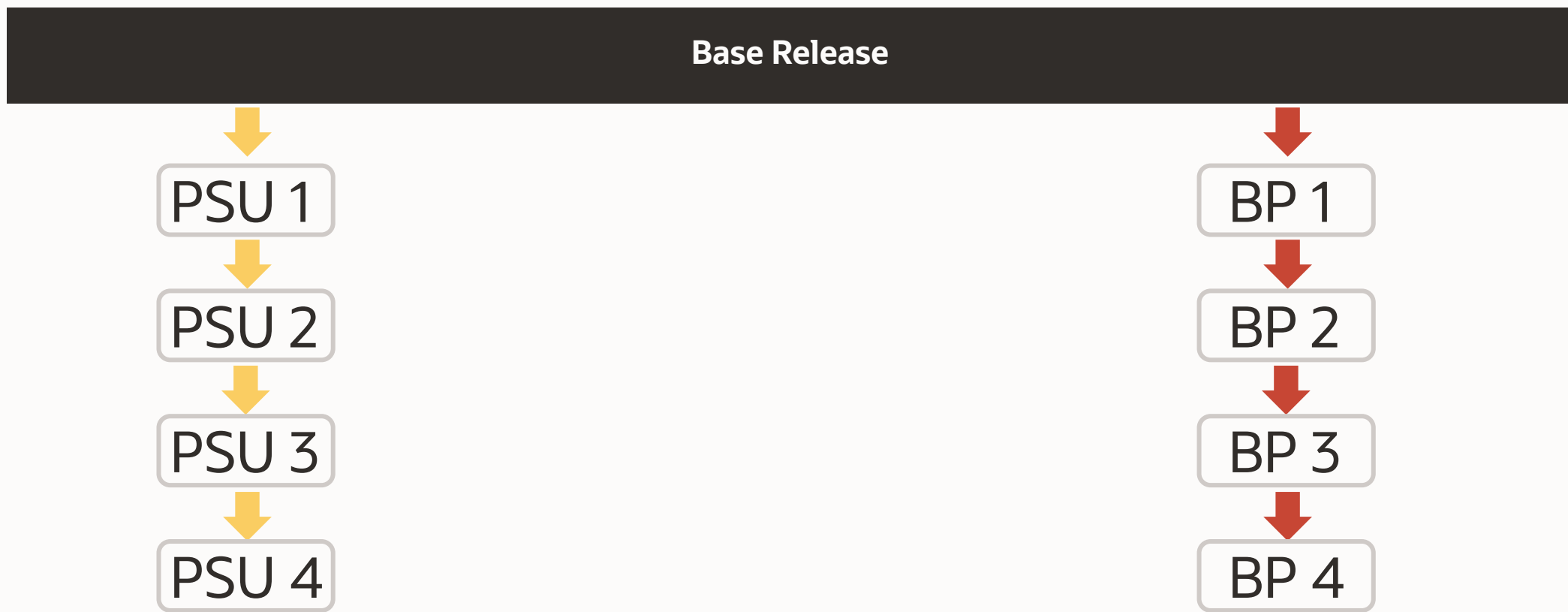


## Overview

---

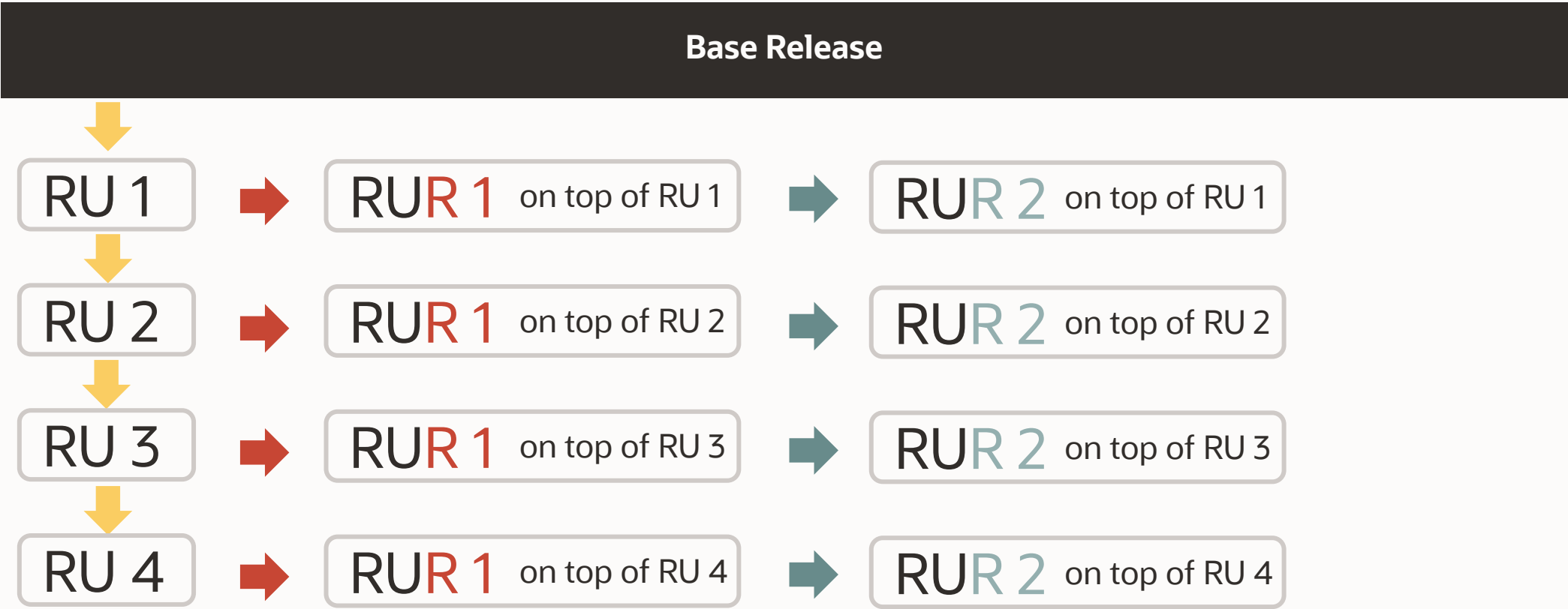
Patch Set Updates, Bundle Patches,  
Release Updates, Release Update Revisions

## Patching | **Before** Oracle Database 12.2

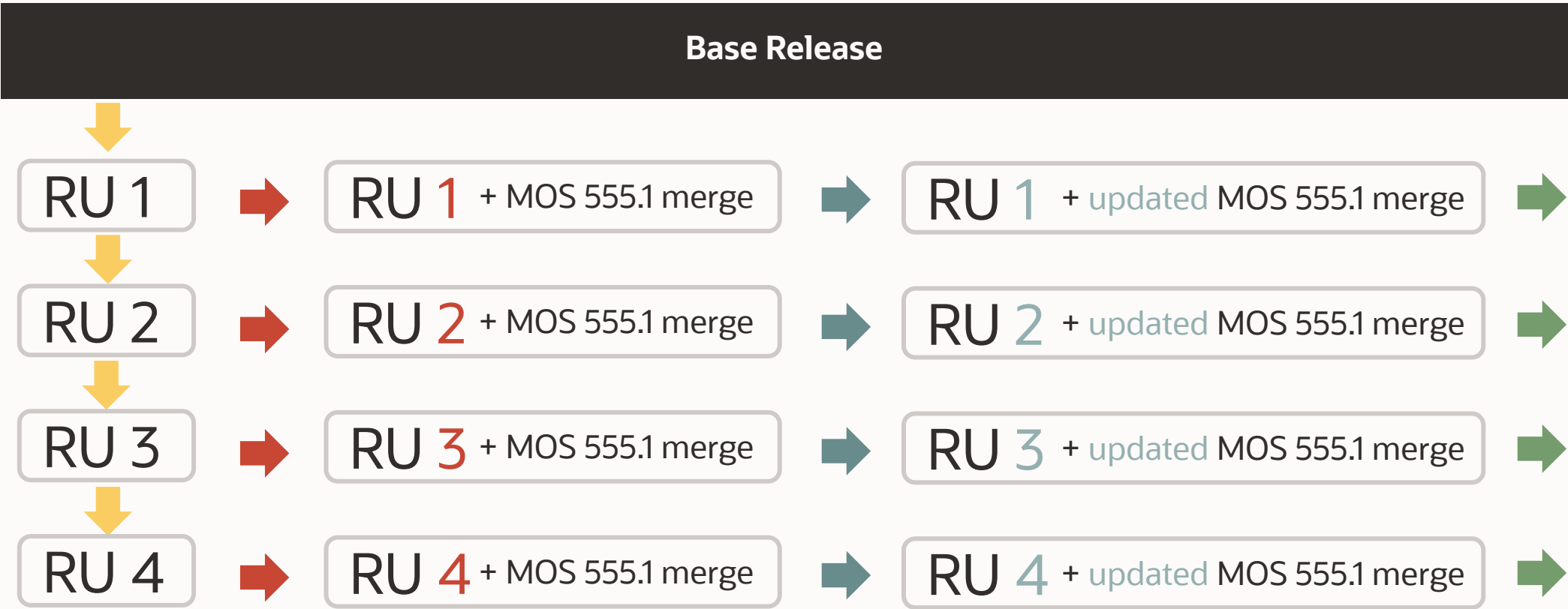




# Patching | **Since** Oracle Database 12.2



# Patching | **From** Oracle Database 19.17.0 (Oct 2022)



# Timeline | Release Updates

	2020				2021				2022				2023		
	January	April	July	October	January	April	July	October	January	April	July	October	January	April	July
19c	19.6.0	19.9.0	19.8.0	19.9.0	19.10.0	19.11.0	19.12.0	19.13.0	19.14.0	19.15.0	19.16.0	19.17.0	19.18.0	19.19.0	19.20.0
21c						21.3.0	21.4.0	21.5.0	21.6.0	21.7.0	21.8.0	21.9.0	21.10.0	21.11.0	21.12.0





Photo by [Michiel Leunens](#) on [Unsplash](#)

## Oracle Java Virtual Machine

Do you have OJVM?

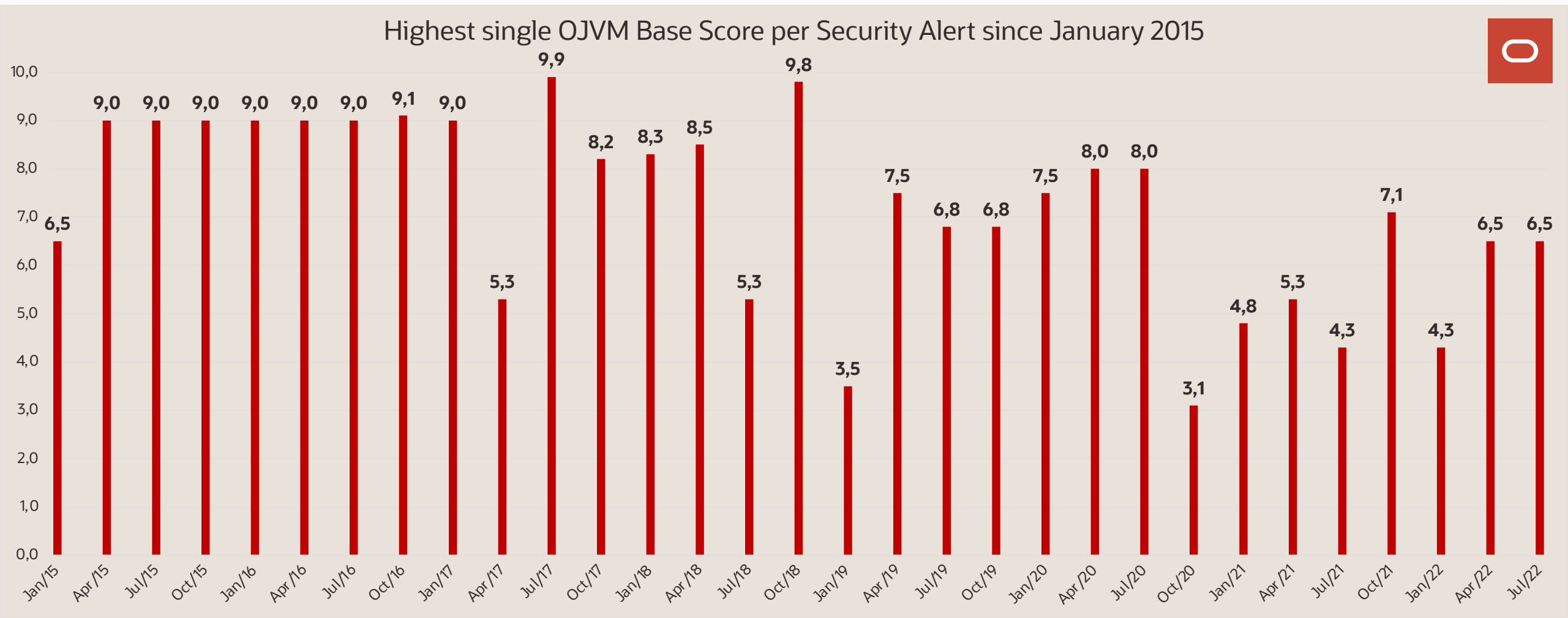
Do you need OJVM?

Do you use OJVM?



# Oracle Java Virtual Machine | OJVM

OJVM Security Fixes – average risk score in quarterly patches:  $\varnothing$  7.2



# Check | OJVM

Is OJVM installed?

```
select COMP_ID, COMP_NAME, VERSION from DBA_REGISTRY order by 1;
```

COMP_ID	COMP_NAME	VERSION
CATALOG	Oracle Database Catalog Views	19.13.0.0.0
CATJAVA	Oracle Database Java Packages	19.13.0.0.0
CATPROC	Oracle Database Packages and Types	19.13.0.0.0
JAVAVM	JServer JAVA Virtual Machine	19.13.0.0.0
OLS	Oracle Label Security	19.13.0.0.0
ORDIM	Oracle Multimedia	19.13.0.0.0
OWM	Oracle Workspace Manager	19.13.0.0.0
XDB	Oracle XML Database	19.13.0.0.0
XML	Oracle XDK	19.13.0.0.0



# Recommendation | OJVM – Option 1

## Patch

Disable  
Remove

## Patch it quarterly

- Separate download  
or
- Combo patch bundles

# Recommendation | OJVM – Option 1

## Patch

Disable  
Remove

## Single Instance

- Straight forward, instance is down during patching
- Java system patched during downtime

## RAC

- See [MOS Note: 2217053.1](#)  
RAC Rolling Install Process for the "Oracle JavaVM Component Database PSU/RU"

### Is OJVM used?

If the component 'JAVAVM' is installed, then the OJVM PSU must be applied. The application options you can choose from depend on your tolerance for maintenance windows.

Use the following SQL to collect OJVM usage for your applications. This SQL includes Oracle utilities and internal usage and will show usage from when the instance started. The SQL should be executed on each instance. The SQL are verified against Oracle Database 12.1.0.2 and 11.2.0.4.

```
select count(*) from x$kglob where KGLOBTYP = 29 OR KGLOBTYP = 56;
```

In order to determine the user of OJVM we can examine V\$SESSION via the following SQL to show SERVICE, PROGRAM or USER that invoked Java in the database. This SQL will show active users only (so may have to be run periodically to fully collect data). Note that ORACHK utility can be used to automatically run the SQL listed below and generate an HTML report for all databases in a cluster. The ORACHK command is listed below the SQL statements.

```
col service_name format a20  
col username format a20  
col program format a20  
set num 8
```

```
select sess.service_name, sess.username, sess.program, count(*)  
from  
v$session sess,
```



# Recommendation | OJVM – Option 1

Patch	Oracle Database 21c	Oracle Database 19c
Disable	Fully RAC Rolling Installable	RAC Rolling Installable
Remove	No Datapatch downtime	No Datapatch downtime, but java system is patched which requires ~10 second outage. Connected clients using java will receive ORA-29548



# Recommendation | OJVM – Option 2

Patch

**Disable**

Remove

## Disable OJVM with the Mitigation Patch

- For cases when
  - Patching the OJVM is not immediately possible
  - OJVM can't be removed
- Not RAC Rolling installable
- Mitigation Patch must be disabled when you upgrade or patch
- Present in all PSUs, BPs and RUs since 2018
- Can be enabled/disabled on PDB level
- Further information:
  - [MOS Note: 1929745.1](#)
  - [OJVM and the Mitigation Patch – Things to Know in 2020](#)
  - [Do you need the Mitigation Patch in CDB\\$ROOT and all PDBs?](#)

## Recommendation | OJVM – Option 2

Patch

**Disable**

Remove

Enable the Mitigation Patch option

```
@?/rdbms/admin/dbmsjdev.sql
```

Disable JVM

```
exec DBMS_JAVA_DEV.DISABLE
```

Before you patch or upgrade

```
exec DBMS_JAVA_DEV.ENABLE
```

**Important:**

Disable JAVAVM in PDB\$SEED to ensure newly provisioned PDBs have JAVAVM disabled out of the box

## Recommendation | OJVM – Option 3

Patch

Disable

**Remove**

### Remove OJVM from the database

- non-CDB
  - [MOS Note: 2314363.1](#)  
Safe repair/reinstall of the JVM Component in 11.2 and up
    - Just stop after removal
- CDB
  - [MOS Note: 2262919.1](#)  
Repairing/Reinstalling JVM To A Multitenant Database (CDB and all PDBs)
- See also:
  - [JAVAVM and XML Cleanup in the database](#)



# Recommendation | OJVM

*Does OJVM require STARTUP UPGRADE?*

- **No!**
- Blog: [Do you need STARTUP UPGRADE for OJVM?](#)
  - If you ran it in STARTUP UPGRADE before, use:
    - `./datapatch -verbose -skip_upgrade_check`

## Do you need STARTUP UPGRADE for OJVM?

Posted on January 23, 2020 by Mike.Dietrich JVM Patch Recommendation

Actually I carry around this topic with me since the October 2019 workshop in Dubai. We've had one of these OJVM Patching discussions I'd like to escape usually. Anyhow, during this session, it dawned me that the STARTUP UPGRADE requirement in the OJVM readme may be not correct anymore. So the question will be: Do you need STARTUP UPGRADE for OJVM?

Do you need STARTUP UPGRADE for OJVM?

Photo by Nik Shuliahin on Unsplash



### **TIP #3 – UPTIME**

No `STARTUP UPGRADE` for datapatch.  
Not even when you patch OJVM.

# Apply changes to the Database

## Recompilation threshold for invalid objects

- Now: 300 invalid objects
  - No recompilation attempted when less than 300 objects are invalid
- Can be controlled by `-recomp_threshold` parameter
  - Oracle 12.2.0.1 and higher since RU July 2019
  - [Bug 30485255 - Datapatch: Increase Automatic Revalidation Threshold To 300](#)