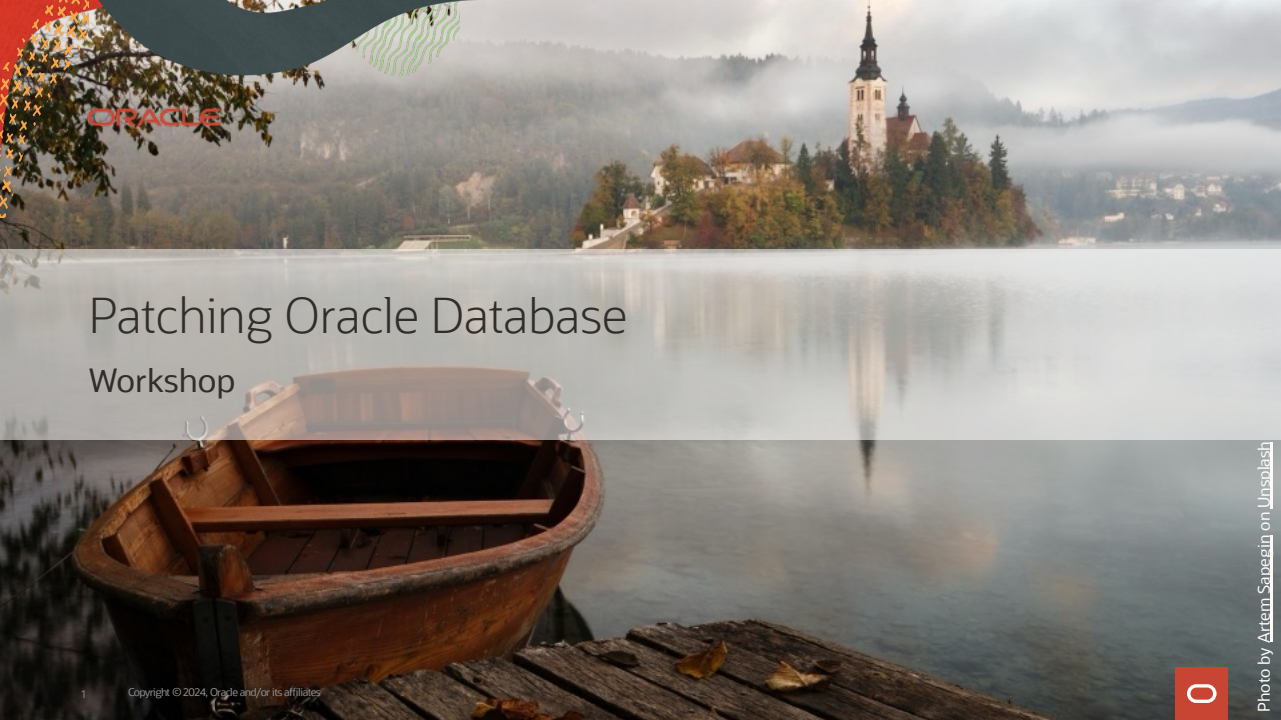


Patching Oracle Database

Workshop

Photo by Artem Sapegin on Unsplash

Oracle

DBAs

run the world

Daniel Overby Hansen

Senior Principal Product Manager

dohdatabase

@dohdatabase

https://dohdatabase.com

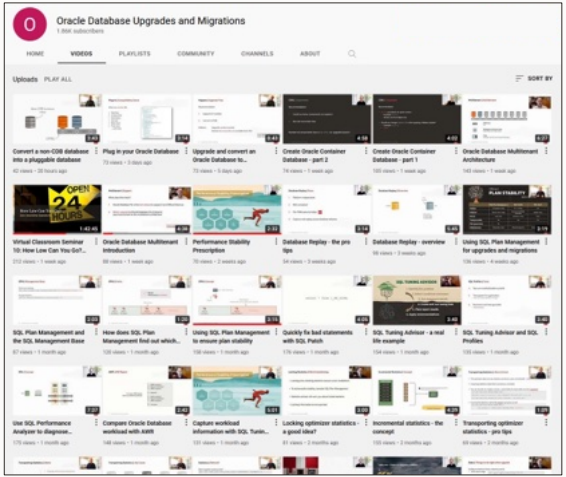
Web Seminar	Slides
Episode 16 (replaces Episode 1 from Feb 2021) Oracle Database Release and Patching Strategy for 19c and 23c *115 minutes – May 10, 2023*	
Episode 17 From SR to Patch – Insights into the Oracle Database Development process *55 minutes – June 22, 2023*	
NEW Episode 18 Cross Platform Migration – Transportable Tablespaces to the Extreme *145 min – February 22, 2024*	
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	

Recorded Web Seminars

https://MikeDietrichDE.com/videos

More than 35 hours of technical content, on-demand, anytime, anywhere

YouTube | Oracle Database Upgrades and Migrations



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

SCAN ME

AGENDA

13:30
Database Patching

14:45
Break

15:00
Hands-On Lab

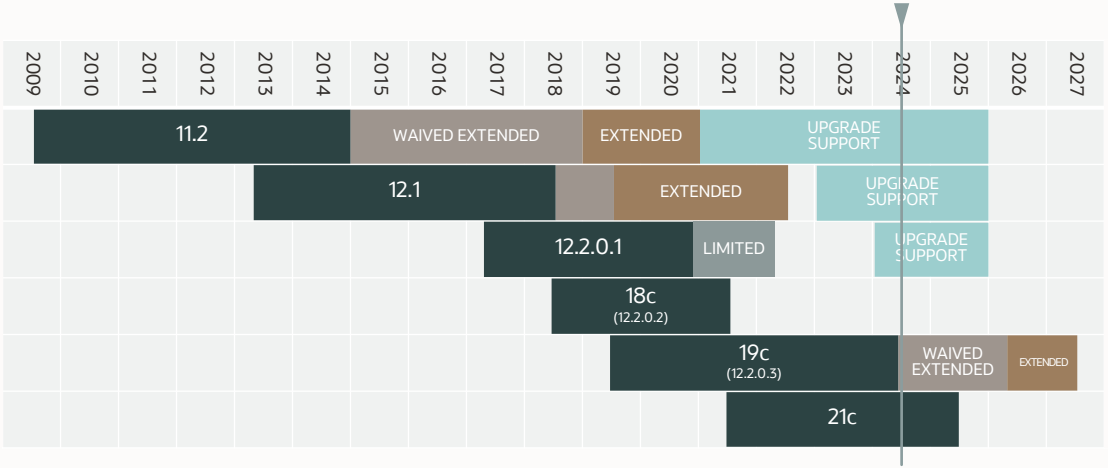
16:15
Break

16:30
Grid Infrastructure OJVM

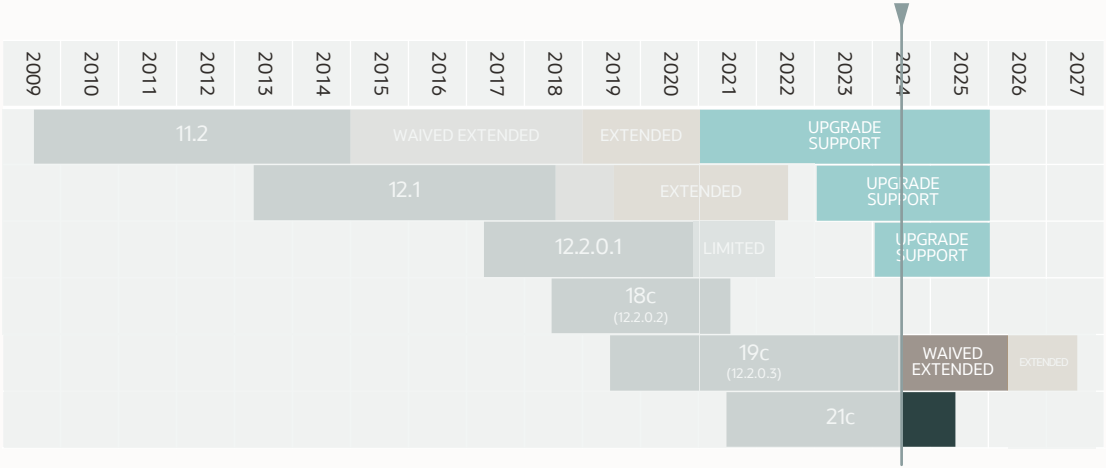
17:00
End of workshop

Release Strategy

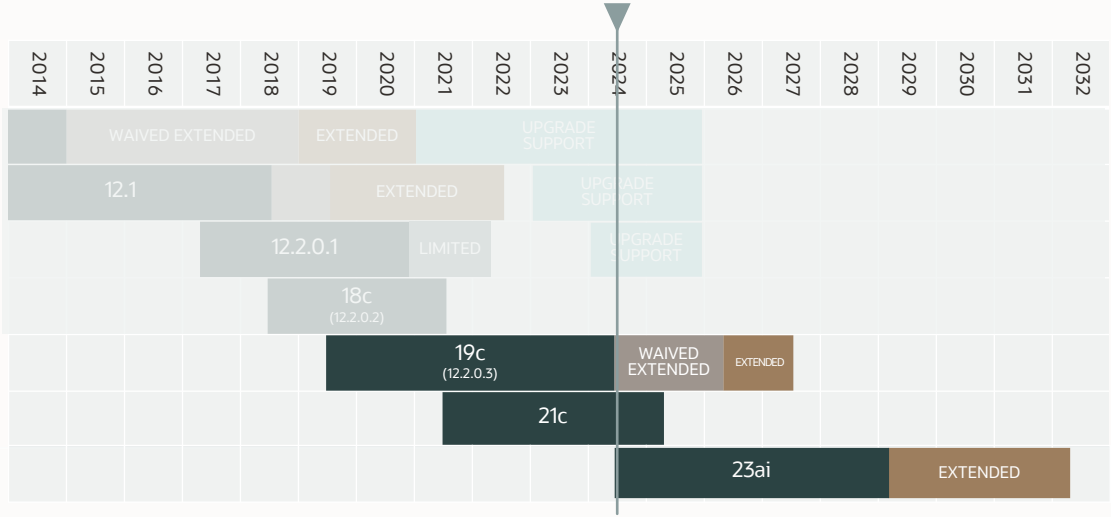
Lifetime Support Policy



Lifetime Support Policy



Lifetime Support Policy



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

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

Next Long Term Support release

Oracle Database 23ai

Upgrade possible only from:

- Oracle Database 19c
- Oracle Database 21c

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 23ai

Oracle Database 23ai supports the multitenant architecture only

- You must convert your database to a PDB

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

alter system set max_pdbs=3;
```


Have at least a few environments in Oracle Database 19c using Oracle Multitenant

Quaterly Patching

My database is not facing the internet

Photo by Ben White on Unsplash

Finding the Right Patches | Quarterly

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

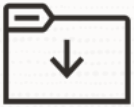
Do I need to apply this bundle?

How to evaluate the risk

Photo by Kubo_Minar on Unsplash

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 Risk Matrix Definitions)								Supported Versions Affected	Notes
					Base Score	Attack Vector	Attack Complex	Privs Req'd	User Interact	Scope	Confid-entiality	Inte-grity	Avail-ability	
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	



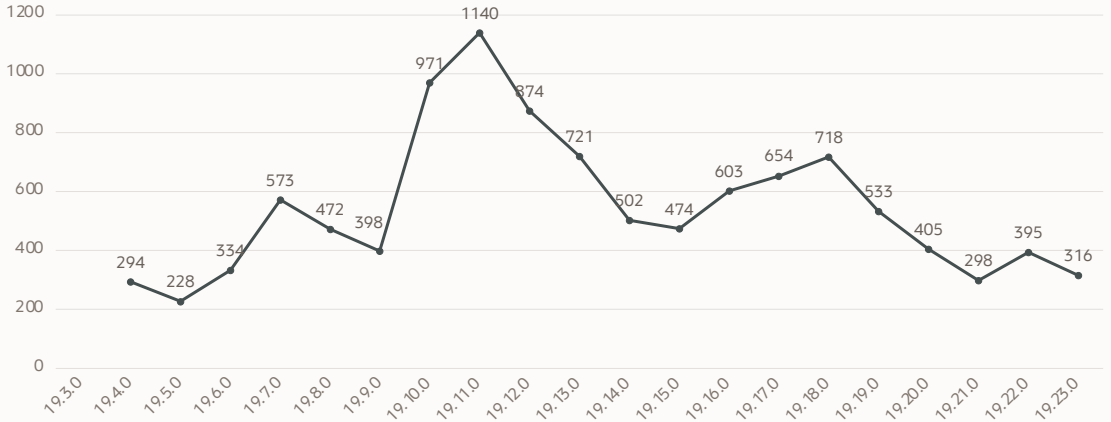
You always start with Oracle Database base release

- Oracle Database 19.3.0

Always apply the most recent RU

Use the Patch Download Assistant MOS Note: 2118136.2

Release Update Contents



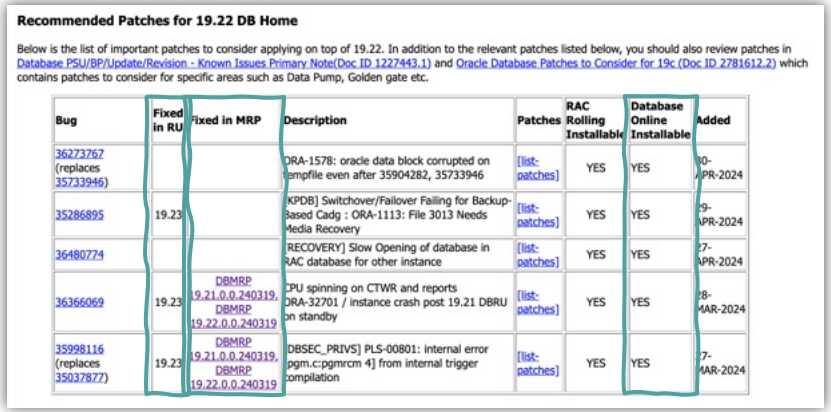
Database 19 Release Updates and Revisions Bugs Fixed Lists (Doc ID 2523220.1)

If you don't apply a recent Release Update, you will miss thousands of fixes

- Almost 11k fixes with 19.23.0
- Almost 300 security fixes

Apply the Most Important Patches

Always use Important Recommended One-Off Patches: MOS Note: 555.1



Recommended Patches for 19.22 DB Home

Below is the list of important patches to consider applying on top of 19.22. In addition to the relevant patches listed below, you should also review patches in Database PSU/BP/Update/Revision - Known Issues Primary Note(Doc ID 1227443.1) and 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.

Bug	Fixed in RU	Fixed in MRP	Description	Patches	RAC Rolling Installable	Database Online Installable	Added
36273767 (replaces 35733946)			ORA-1578: oracle data block corrupted on tempfile even after 35904282, 35733946	[list-patches]	YES	YES	30-APR-2024
35286895	19.23		[KPDB] Switchover/Failover Failing for Backup-Based Cadg : ORA-1113: File 3013 Needs Media Recovery	[list-patches]	YES	YES	29-APR-2024
36480774			[RECOVERY] Slow Opening of database in RAC database for other instance	[list-patches]	YES	YES	27-APR-2024
36366069	19.23	DBMRP 19.21.0.0.240319, DBMRP 19.22.0.0.240319	CPU spinning on CTWR and reports ORA-32701 / instance crash post 19.21 DBRU on standby	[list-patches]	YES	YES	28-MAR-2024
35998116 (replaces 35037877)	19.23	DBMRP 19.21.0.0.240319, DBMRP 19.22.0.0.240319	[DBSEC_PRIVS] PLS-00801: internal error [pgm.c:pgmrcm 4] from internal trigger compilation	[list-patches]	YES	YES	27-MAR-2024

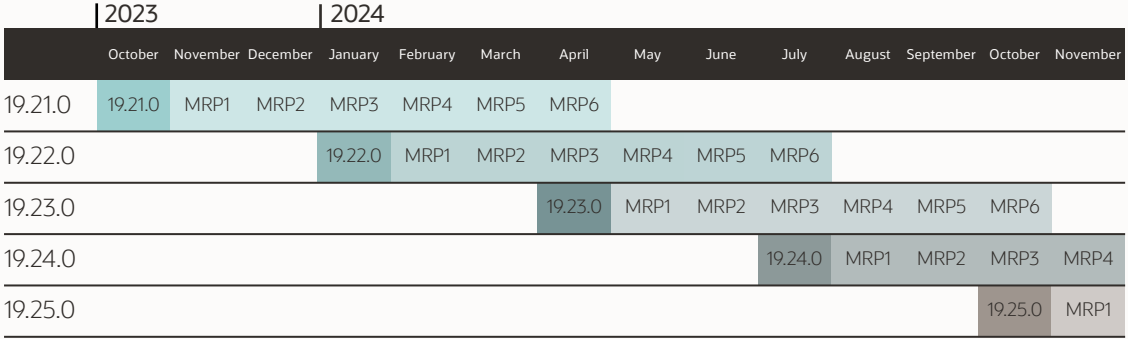
Monthly Recommended Patches

A collection of recommended one-off fixes
provided at monthly intervals
via a single downloadable patch

Quarterly Release Updates

	2023				2024				2025				2026		
	January	April	July	October	January	April	July	October	January	April	July	October	January	April	July
19c	19.18.0	19.19.0	19.20.0	19.21.0	19.22.0	19.23.0	19.24.0	19.25.0	19.26.0	19.27.0	19.28.0	19.29.0	19.30.0	19.31.0	19.232.0
21c	21.10.0	21.11.0	21.12.0	21.13.0	21.14.0	21.15.0	21.16.0	21.17.0	21.18.0	21.19.0					
23ai							23.5.0	23.6.0	23.7.0	23.8.0	23.9.0	23.10.0	23.11.0	23.12.0	23.13.0

Monthly Recommended Patches



An MRP is an optional collection of several important one-off patches

- Delivered as a merge patch

An MRP does not change the release number

- Like `v$instance.version_full`

MRPs are cumulative but only within one MRP line

- Example: 19.21.0 MRP6 contains all previous MRPs done for Oracle 19.21.0

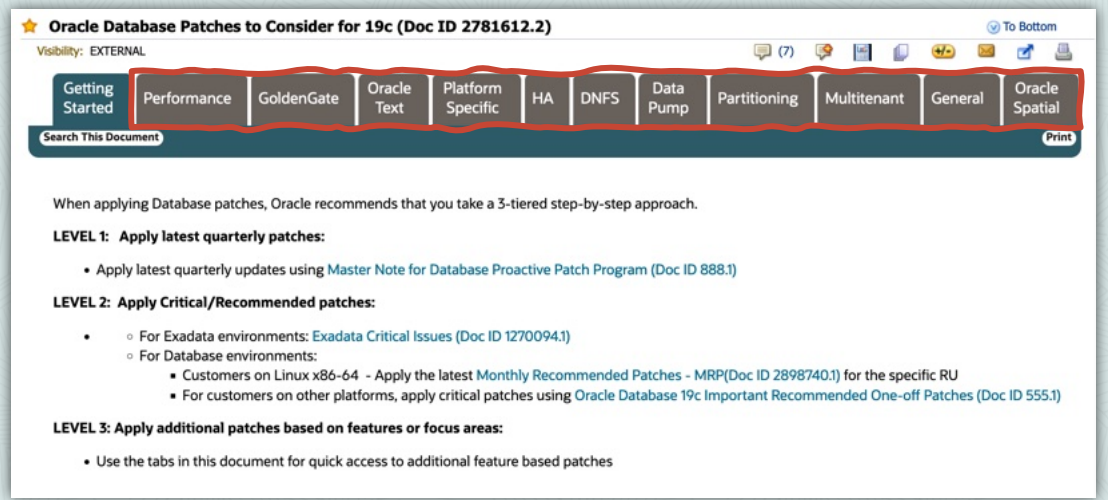
MRPs are Linux only

MRPs can contain security fixes

- Release Updates remain the primary security fix delivery mechanism

Sorry, but there is more to talk about …

Apply Additional Important Fixes and Bundles



Oracle Database Patches to Consider for 19c (Doc ID 2781612.2)

To Bottom

Visibility: EXTERNAL

(7)

Getting Started | Performance | GoldenGate | Oracle Text | Platform Specific | HA | DNFS | Data Pump | Partitioning | Multitenant | General | Oracle Spatial

Search This Document | Print

When applying Database patches, Oracle recommends that you take a 3-tiered step-by-step approach.

LEVEL 1: Apply latest quarterly patches:

- Apply latest quarterly updates using Master Note for Database Proactive Patch Program (Doc ID 888.1)

LEVEL 2: Apply Critical/Recommended patches:

- For Exadata environments: Exadata Critical Issues (Doc ID 1270094.1)
- For Database environments:
  - Customers on Linux x86-64 - Apply the latest Monthly Recommended Patches - MRP(Doc ID 2898740.1) for the specific RU
  - For customers on other platforms, apply critical patches using Oracle Database 19c Important Recommended One-off Patches (Doc ID 555.1)

LEVEL 3: Apply additional patches based on features or focus areas:

- Use the tabs in this document for quick access to additional feature based patches

Always use the latest OPatch

- Patch 6880880

Patching Basic

Basic Facts | Patch Types

One-off

Single bug fix on top of the base release or a patch bundle
Sometimes called interim-patch

Backport

Fix made for a newer code line, now created on top of the base release or a patch bundle

Merge

Multiple one-off fixes combined into a single fix
Required to resolve conflicts

Bundle

Many fixes together on top of the base release or another bundle
Usually available on a quarterly schedule
Cumulative
Always RAC Rolling and Standby-First
PSU, BP, RU, RUR

What Can Be in a Patch?

FILES

New or changed executables, libs or files

```
bin/oracle
bin/srvctl
oracore/zoneinfo/timezone_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
```

How to Apply a Patch?

`opatch`		Applies binaries to an Oracle Home		All instances using this Oracle Home are down
`datapatch`		Applies SQL and PL/SQL changes to a database		Database is up

What is installed?

In the Oracle Home?

```
$ opatch lsinventory
$ opatch lspatches
```

```
SQL> select
xmltransform(dbms_qopatch.get_opatch_lsinventory,
dbms_qopatch.get_opatch_xslt) from dual;
```

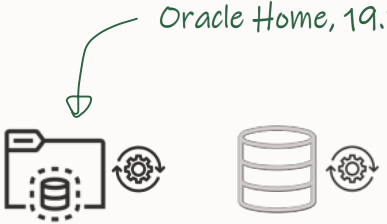
- Oracle Database 12.1 : FAQ on Queryable Patch Inventory (Doc ID 1530108.1)

In the database / PDB?

```
SQL> select * from cdb_registry_sqlpatch;
```

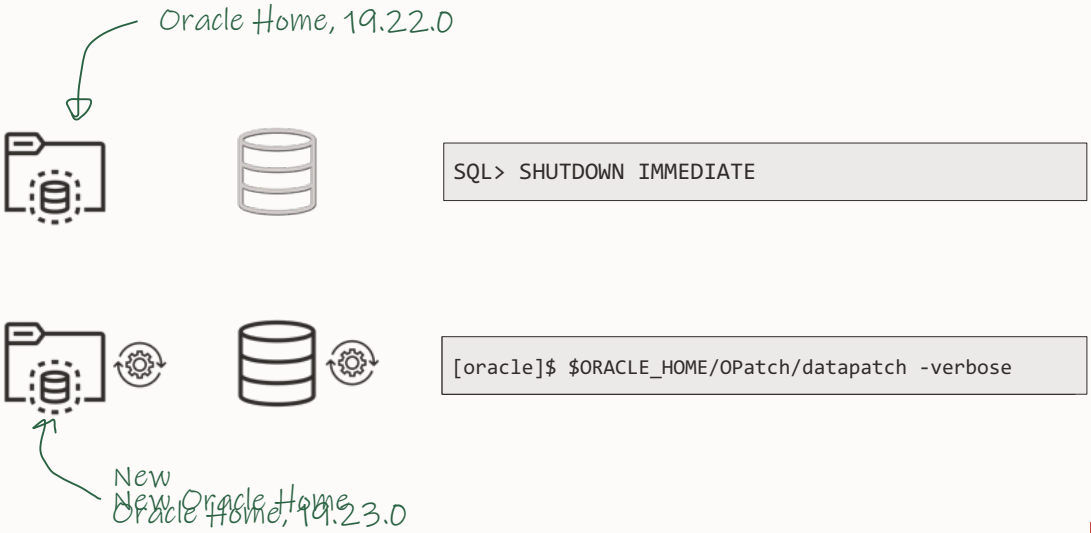
Patching Methods

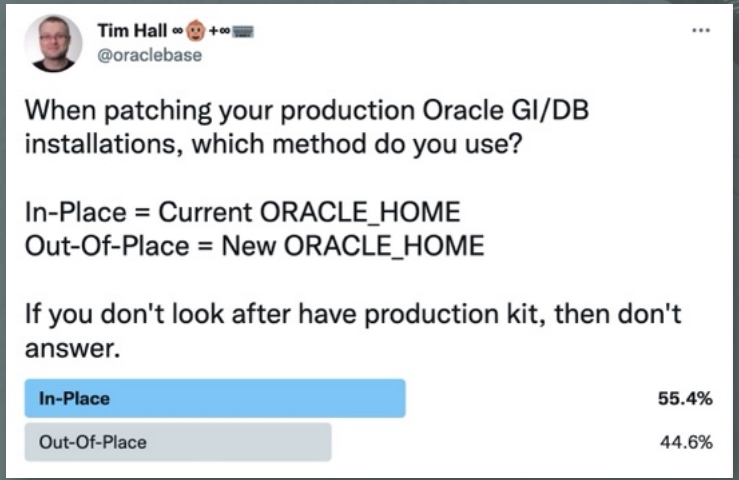
In-Place Patching




```
$ORACLE_HOME/OPatch/opatch rollback -id ...
```

Out-of-Place Patching





Always patch Out-of-Place

- Don't argue with us ☺

Patching Oracle home is faster when you use a brand new home

- Avoid cloned Oracle Homes and In-Place Patching
- Use `./opatch util deleteinactivepatches`

Installation Tip

```
/home/oracle/stage
├── DPBP
│   ├── 35261302
│   │   └── PatchSearch.xml
├── MRP
│   ├── 35333937
│   │   ├── 34340632
│   │   ├── 35012562
│   │   ├── 35037877
│   │   ├── 35116995
│   │   └── 35225526
│   │   └── PatchSearch.xml
├── OJVM
│   ├── 35050341
│   │   └── PatchSearch.xml
└── RU
    ├── 35042068
    │   └── PatchSearch.xml
```

ONE SINGLE COMMAND

```
./runInstaller \
  -applyRU /home/oracle/stage/RU/35042068 \
  -applyOneOffs /home/oracle/stage/RU/35261302,
                /home/oracle/stage/RU/35050341,
                /home/oracle/stage/RU/34340632,
                ...
                /home/oracle/stage/RU/35225526
```

Be sure to copy all configuration files to the new Oracle Home

- AutoUpgrade does it for you
- Additional details in blog post

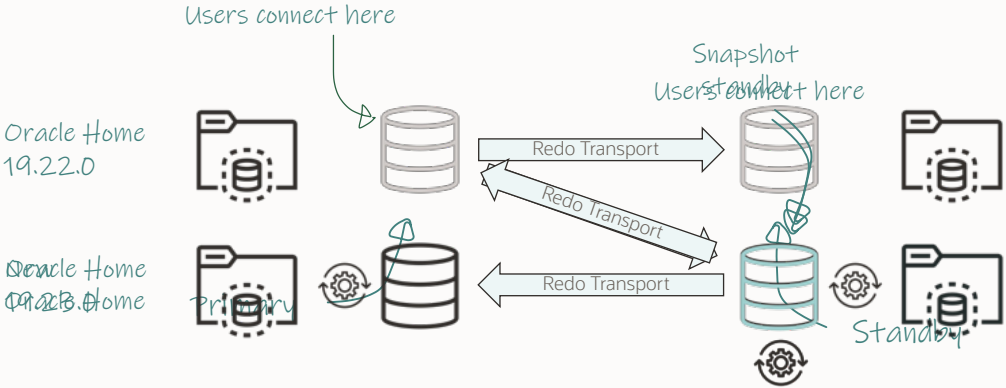
Reduce downtime to the time it takes to perform a switchover

- Data Guard Standby-First Patch Apply (Doc ID 1265700.1)

Safely test and verify patches with Standby-First Patch Apply

- Data Guard Standby-First Patch Apply (Doc ID 1265700.1)

Standby-First Patching




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

Patch must Standby-First installable

- Check the patch readme

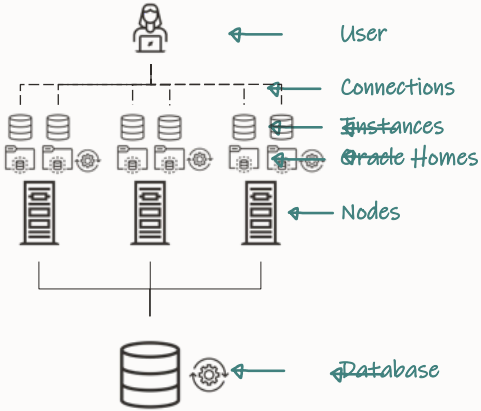
Execute datapatch on the primary database

- Only execute datapatch when all homes are on the new patch

Find additional restrictions in Data Guard Standby-First Patch Apply (Doc ID 1265700.1)

Avoid database downtime with RAC Rolling Patch Apply

RAC Rolling Patching



- New Oracle Home
- Patch Oracle Home
- Move to new Oracle Home
- Execute datapatch

Release updates are **always**:

Standby-First installable

RAC Rolling installable

Datapatch

Patching a database

1

Start database in new Oracle Home

Start in normal open
Open all PDBs

2

Complete patching with `datapatch`

Found in `$ORACLE_HOME/OPatch`
One database per invocation
Multiple datapatch sessions in parallel
Datapatch User Guide (Doc ID 2680521.1)

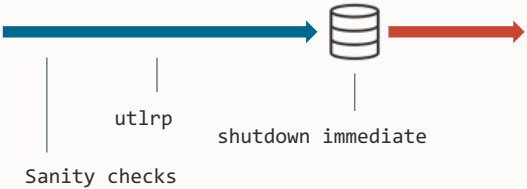
Analyze the database for patching readiness using Datapatch Sanity Checks

- Datapatch User Guide (Doc ID 2680521.1)
- Executed by AutoUpgrade in analyze mode

```
$ ./datapatch -sanity_checks

...

Check: DB Components status - OK
Check: PDB Violations - OK
Check: System invalid objects - OK
Check: Tablespace Status - OK
Check: Backup jobs - OK
Check: Temp Datafile exists - OK
Check: Datapump running - OK
Check: Container status - OK
Check: Encryption wallet - OK
Check: Dictionary statistics gathering - OK
Check: Scheduled Jobs - NOT OK (WARNING)
  Message: There are current running or scheduled jobs set to run on the next hour.
  Scheduled jobs may have an impact when run during patching.
  :
    JOB_NAME,NEXT_RUN_DATE,SCHEMA_NAME,STATE
    CLEANUP_TRANSIENT_PKG,23-MAY-23 11.08.53.000000 AM +01:00,APPUSER,SCHEDULED
```

Recompile invalid objects
before invoking **`datapatch`**

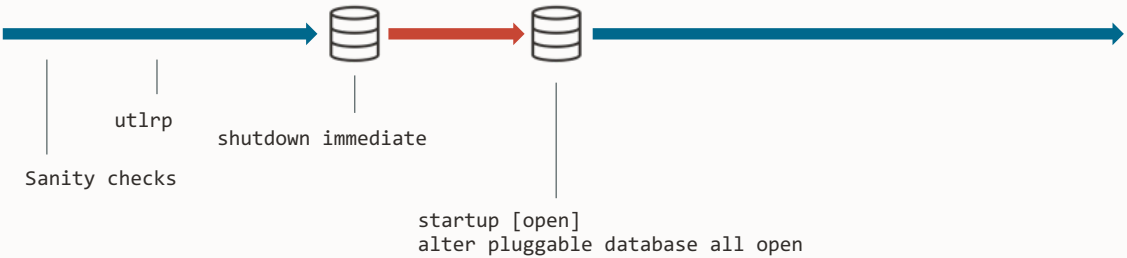
Patching Timeline



The database must be open
Only open PDBs are patched

- Upgrade mode or restricted session is not needed

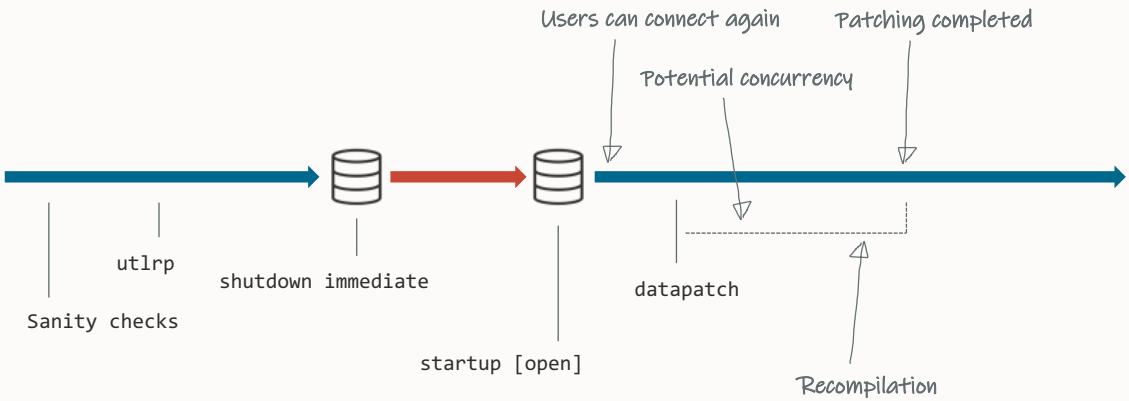
Patching Timeline



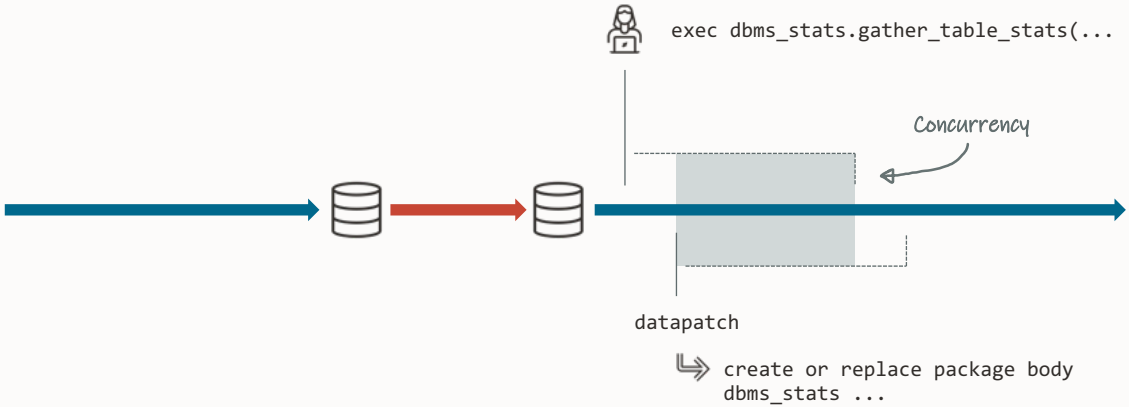
You can run `datapatch` while users are connected to the database

- Details in blog post

Patching Timeline



Patching Timeline



Concurrency

- Datapatch waits 15 min to acquire a lock
  - On timeout, `ORA-04021 timeout occurred while waiting to lock object`

- Optionally, find blocking session and kill it

- Increase timeout using `-ddl_lock_timeout` *`<time-in-seconds>`*

Disable the database scheduler (`job_queue_processes=0`)

- Also disables refresh of materialized views

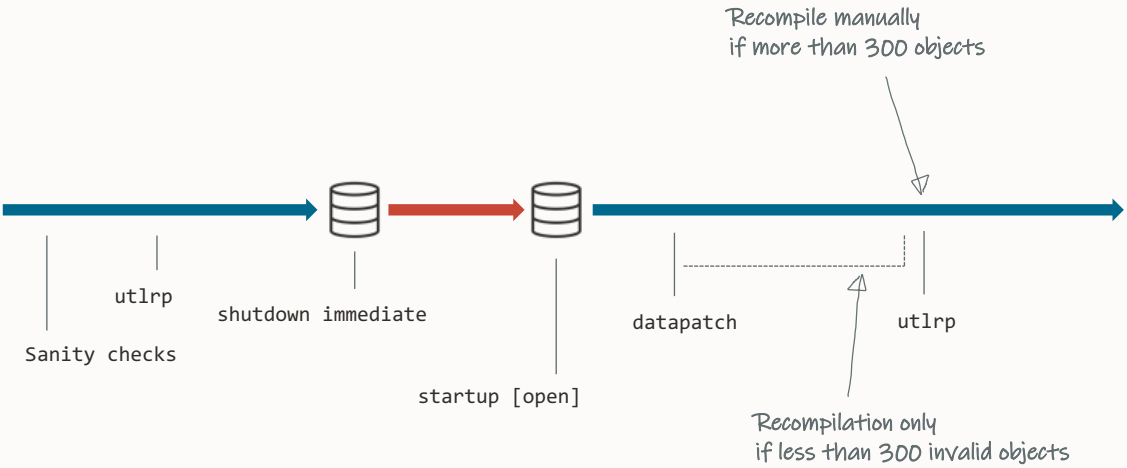
Postpone RMAN backups

Stop Oracle GoldenGate while you are running datapatch

Get a fix for bug 29245570

- Reduces invalidation of dependent objects
- Pending Release Update inclusion

Patching Timeline



Recompilation

Datapatch recompiles objects invalidated during patching

If more than 300 objects are invalidated no recompilation takes places

- Recompile manually
- Or, objects will be recompiled on usage

Adjust the threshold

```
datapatch ... -recomp_threshold 300
```

Consider recompiling invalid objects after patching

```
$ ./datapatch -verbose
SQL Patching tool version 19.19.0.0.0 Production on Sun Jun 25 07:12:19 2023

.
.
.
.

Automatic recompilation incomplete; run utlrp.sql to revalidate.
  PDBs: PDB1 PDB$SEED

SQL Patching tool complete on Sun Jun 25 07:12:19 2023
```


Datapatch uses **REGISTRY$SQLPATCH_RU_INFO** to control the patching operations

If in doubt run `datapatch` again

- Datapatch only does what is needed
- You can run `datapatch` as many times as you like

Datapatch Workflow

- Connect with SYSDBA privilege
- Using local connection

Datapatch Workflow

- Check Datapatch infrastructure (tables/view/packages)
- *Patches Datapatch*

Datapatch Workflow

- Uses queryable inventory (`DBMS_QOPATCH`)
- Checks all nodes in a cluster
- May use local inventory

Datapatch Workflow

- Checks tables to learn which patches are present
  - `REGISTRY$SQLPATCH_RU_INFO`
  - `REGISTRY$SQLPATCH`

Datapatch Workflow

- Compare binary and SQL inventory
- Check patch metadata
- Build plan
- Check Oracle home for apply/rollback scripts

Datapatch Workflow

Patch	Node 1	Node 2	SQL inv.	Action
Patch 1	Not present	Not present	Present	Rollback
Patch 2	Present	Present	Not present	Apply
Patch 3	Present	Present	Present	No action
Patch 4	Present	Not present	Not present	No action

Datapatch Workflow

- Performs actions according to plan
- Errors in this phase are most likely a *bad patch*

Datapatch Workflow

- Check the log files
- Looks for specific patterns
- Updates the result of the actions to the Datapatch tables

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

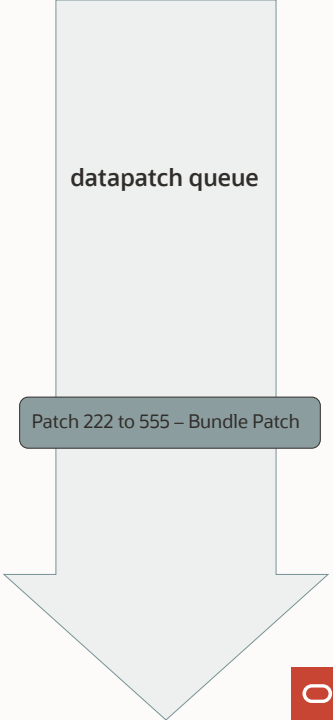
Oracle Home

SQL Registry before `datapatch`:

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

Database

```
$ ./datapatch
```



Datapatch Rollback Scripts

Apply/rollback scripts:

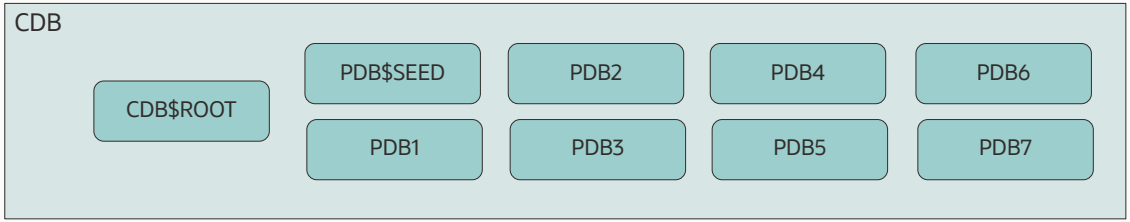
```
$ORACLE_HOME/sqlpatch/.../nnn_apply.sql
$ORACLE_HOME/sqlpatch/.../nnn_rollback.sql
```

Rollback scripts (zipped as BLOB):

```
SELECT  PATCH_DIRECTORY
FROM    REGISTRY$SQLPATCH_RU_INFO
```

(*) Datapatch stores rollback scripts for one-offs in `REGISTRY$SQLPATCH`

Multitenant



- Datapatch patches CDB$ROOT and PDB$SEED automatically
- Datapatch sorts PDBs by *priority* and *con_id*
  - Set priority using `ALTER PLUGGABLE DATABASE ... PRIORITY`
- Datapatch determines parallel degree based on CPU count

Update database directories using
`rdbms/admin/utlfixdirs.sql`

AutoUpgrade

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

AutoUpgrade functionality extended to patching

```
$ cat DB19.cfg

patch1.source_home=/u01/app/oracle/product/19/dbhome_19_22_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_23_0
patch1.sid=DB19


$ java -jar autoupgrade.jar -config DB19.cfg -mode deploy
```


Patching

USE

Familiar interface

Console

Logging

ANALYZE

Prechecks

Summary report

PROTECT

Resumable

Restoration

Restore point

Fallback

AUTOMATE

`srvctl`

`/etc/oratab`

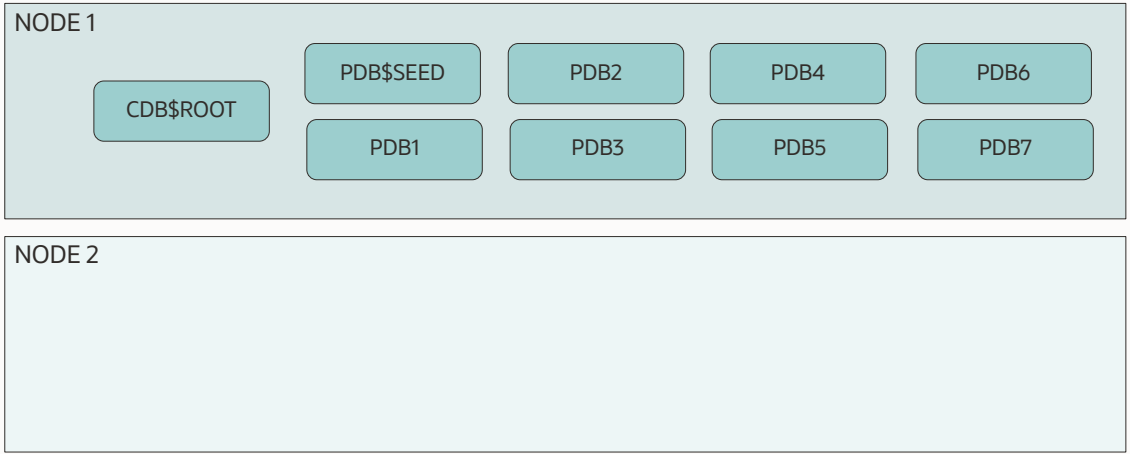
Files

Datapatch

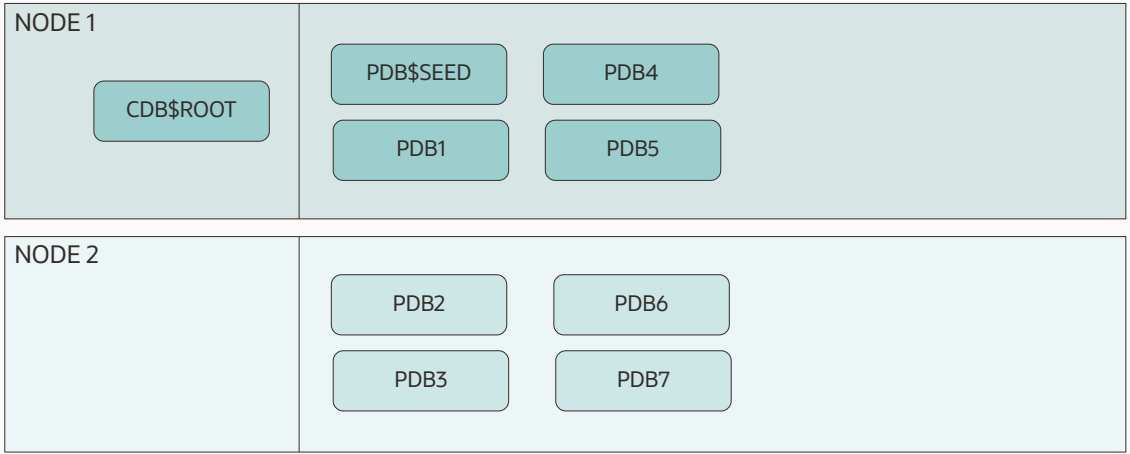
Significantly speed up patching using AutoUpgrade

- Applies to multitenant databases on RAC only

Distributed Patching



Distributed Patching



Distributed Patching

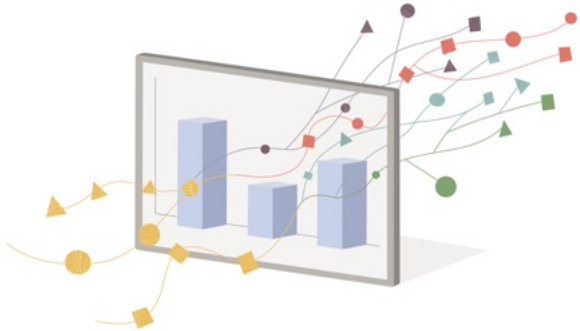
To enable distributed patching

```
$ cat RACCDB.cfg

upg1.source_home=/u01/app/oracle/product/19/dbhome_19_18
upg1.target_home=/u01/app/oracle/product/19/dbhome_19_19
upg1.sid=RACCDB
upg1.tune_setting=distributed_upgrade=true


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

41%

In benchmark, time saved
by using distributed PDB patching

- 2 node RAC database
- 4 CPUs each
- CDB with 8 PDBs



Fleet Patching

AutoUpgrade

Automate your patching process and benefit from the familiar AutoUpgrade

Fleet Patching and Provisioning

Go fleet scale with FPP and benefit from additional functionality like deployment of Oracle Home

AGENDA

13:30
Database Patching

14:45
Break

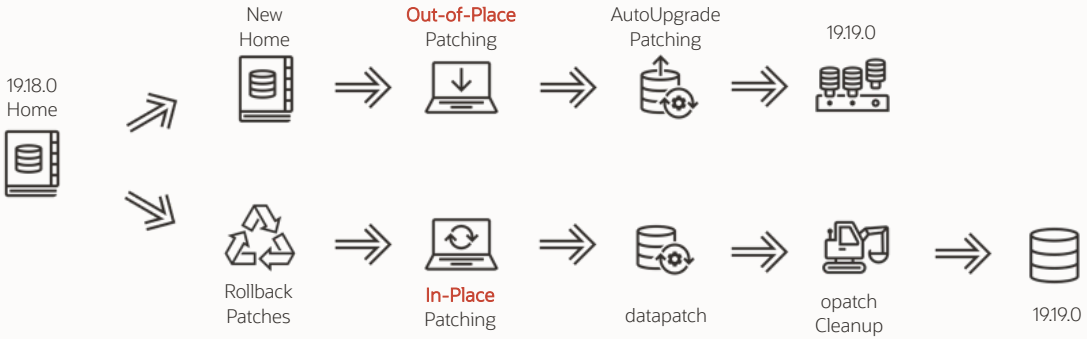
15:00
Hands-On Lab

16:15
Break

16:30
Grid Infrastructure OJVM

17:00
End of workshop

Hands-On Lab



Get Started

https://bit.ly/makeit2024patch

AGENDA

13:30
Database Patching

14:45
Break

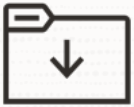
15:00
Hands-On Lab

16:15
Break

16:30
Grid Infrastructure OJVM

17:00
End of workshop

Grid Infrastructure Patching



You always start with the base release

- Oracle Grid Infrastructure 19.3.0

Most Recent Release Update

Use the Patch Download Assistant MOS Note: 2118136.2

Most Important Patches

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

Recommended Patches for 19.21 GI Home

Below is the list of important patches to consider applying on top of 19.21. In addition to the relevant patches listed below, you should also review patches in Database PSU/BP/Update/Revision - Known Issues Primary Note(Doc ID 1227443.1) and 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.

Only one OCW (Oracle Clusterware) patch should be applied to GI homes. Ensure you apply the patch starting with X8M if you are on an X8M system

Bug	Fixed in RU	Fixed in MRP	Description	Patches	NON ROLLING	Added
35739076		Not Applicable	[VOS] Linux: ORA-800 / Set Priority / DB Performance Merge Patch for 19.21 (Requires Root Access) - 34286265 34318125	[list-patches]		20-OCT-2023

Version GI 19.21_555.1: 35739076

If you don't apply a recent Release Update, you will miss hundreds of fixes

Together or separately
… that's the question

Patching Oracle Grid Infrastructure and Oracle Database

Patching GI and DB together?

Option 1

TOGETHER

One maintenance window

Longer, single patching window

Several changes

When draining is a problem

Option 2

SEPARATELY

Two maintenance windows

Shorter window, but longer overall patching

One change at a time

For well-behaving applications

Keep GI and DB patch levels in synch

- This is what we test and run in our Cloud

Unusual combinations are supported, but we strongly advice against it

- GI 19.16.0 and DB 19.20.0
- Node 1 with GI 19.16.0, node 2 with GI 19.18.0
- Patching node 1 on Monday, node 2 on Tuesday …
- Mix of GI and DB versions on various nodes

Grid Infrastructure Patching Methods

1 In-place

Replaces existing Oracle Home

Uses `opatchauto`

2 Out-of-place

Creates a new Oracle Home

Uses `opatchauto` or `gridSetup`

Grid Infrastructure Patching Methods

1 In-place

Replaces existing Oracle Home

Uses `opatchauto`

2 Out-of-place

Creates a new Oracle Home

Uses **`opatchauto`** or **`gridSetup`**

23ai GI home disk space greatly reduced to 3 GB

- 12 GB in 19c

Use golden images

- Blog post

Golden Images

Unzip base release

Replace OPatch with newer version

Deploy all necessary patches

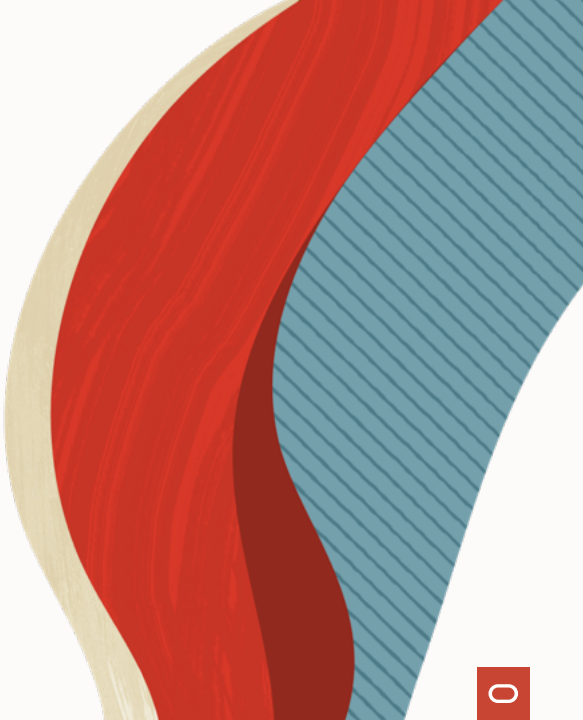
Install with patches

Create Gold Image

Deploy Gold Image to targets

Demo

Install GI home
Apply Release Update
Create golden image



Watch on YouTube

Works for database homes as well

- Use `runInstaller` instead

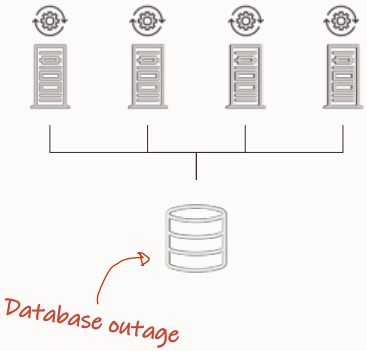
```
--Unzip base release and update OPatch

unzip -oq LINUX.X64_193000_grid_home.zip
mv OPatch OPatch_old
unzip p6880880...zip
```


```
--Install the Oracle Home and apply Release Update and one-offs
--Specify multiple one-offs using comma-separated list

./gridSetup.sh -silent -applyRU <patch_dir> \
                       -applyOneOffs <patch_dir> \
                       ...
```


```
--Always create your golden image from a "fresh" home
--Never use a production home

./gridSetup.sh -createGoldImage \
               -destinationLocation $GOLDIMAGEDIR \
               -silent
```


```
--Deploy golden image throughout your environment
--Just unzip and attach on node 1, installer copies to other nodes

unzip -oq my_golden_image.zip
./gridSetup.sh -silent \
               oracle.install.db.CLUSTER_NODES=node1,node2 \
               ...
```


Grid Infrastructure Patching Concepts

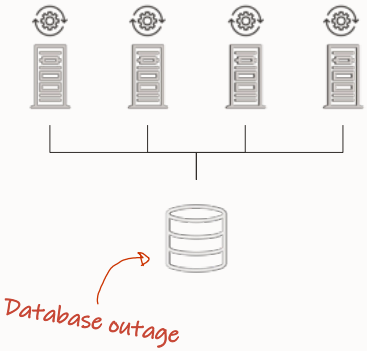


ALL NODE

- All nodes patched at one time
- One long database outage
- Works for all patches, including non-rolling
- Cluster at full capacity except for outage

Rolling Patch - OPatch Support for RAC (Doc ID 244241.1)

Grid Infrastructure Patching Concepts

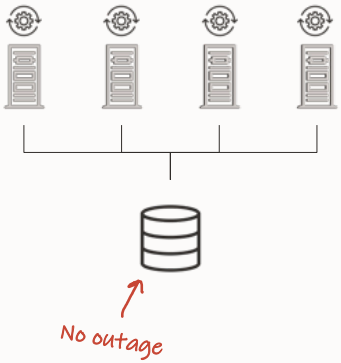


MINIMUM DOWNTIME

- Nodes patched in two batches
- One short database outage
- Works for all patches, including non-rolling
- Other nodes must handle workload while another batch is patched

Rolling Patch - OPatch Support for RAC (Doc ID 244241.1)

Grid Infrastructure Patching Concepts

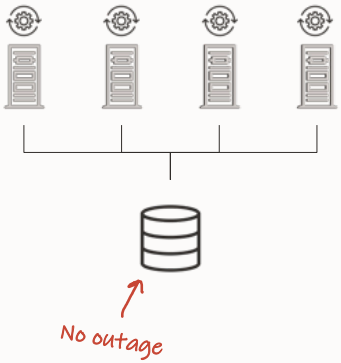


ROLLING

- Each node patched separately
- No database outage
- Patch must be RAC rolling installable
- Other nodes must handle workload while one node is patched

Rolling Patch - OPatch Support for RAC (Doc ID 244241.1)

Grid Infrastructure Patching Concepts



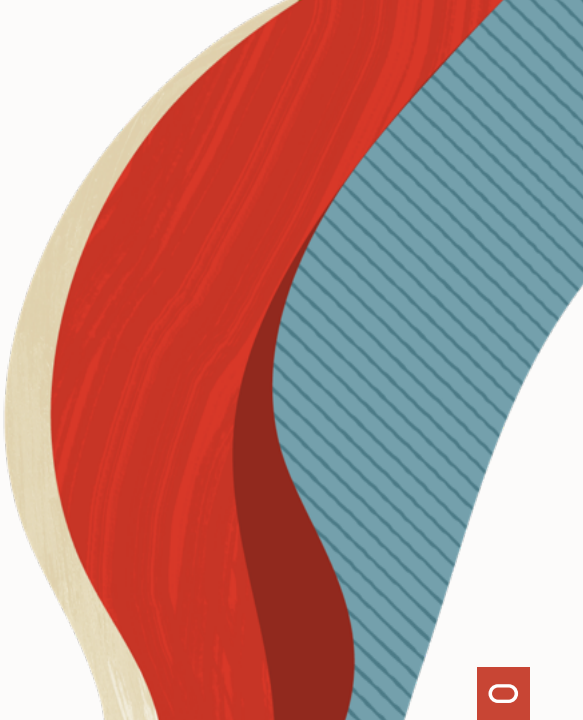
ROLLING IN GROUPS

- Patch a subset together
- Useful when draining is a problem
- No database outage
- Patch must be RAC rolling installable
- Other nodes must handle workload while one node is patched

Rolling Patch - OPatch Support for RAC (Doc ID 244241.1)

Demo

Patch a 2-node RAC system
GI and database



Watch on YouTube

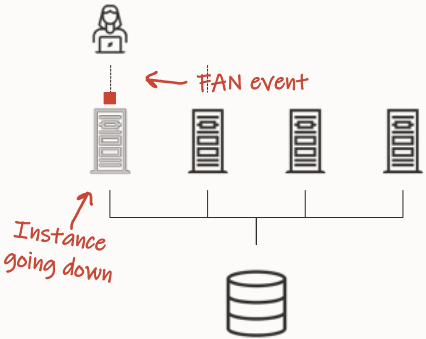
Complete a rolling patching operation always as quickly as possible

- RAC: Frequently Asked Questions (Doc ID 220970.1)

Rolling patching requires efficient draining

- Optionally, consider a *batched* approach

Draining Connections



DRAINING

- Allows users to finish their work and reconnect to another instance
- New sessions connect to other instances
- Sessions that don't drain in time are forcefully terminated
- Controlled by **`drain_timeout`** parameter in `srvctl` and `DBMS_SERVICE`

Drain Timeout

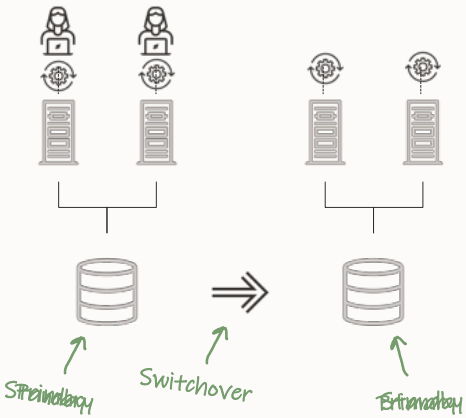
Setting `drain_timeout` very low?

- This may cause login storms
  - Be cautions on databases with many connections

Setting `drain_timeout` very high?

- Load is spread on fewer instances
  - Cluster is in rolling patch mode for an extended period of time

Grid Infrastructure | Data Guard



ALTERNATIVE

- If draining is a problem
- Downtime limited to a switchover
- Test your Data Guard configuration

Data Guard | Additional Information

INTERVIEW WITH LUDOVICO CALDERA

Ludovico is Data Guard Product Manager and
he shares his top tips for patching Oracle Grid Infrastructure and Data Guard

PATCHING ORACLE GRID INFRASTRUCTURE AND ORACLE DATA GUARD

Blog post with additional details plus instructions on
how to patch GI and database at the same time when you have Data Guard

top tips

PATCHING SUCCESS

Cluster Verification Utility

Patch Level

Application Continuity

OPatch

Use CVU before and after patching

Preferably through EXAchk or ORAchk

Identifies potential issues

Light-weight, non-intrusive

Always use the latest version

```
$ cluvfy stage -pre patch

Performing following verification checks ...

  cluster upgrade state ...PASSED
  OLR Integrity ...PASSED
  Hosts File ...PASSED

  ...

  Check for parameter kernel.shmmni ...PASSED
  /tmp directory free space ...PASSED
  Check for parameter kernel.shmall ...PASSED
  ORAchk checks ...PASSED

Pre-check for Patch Application was successful.
```

top tips

PATCHING SUCCESS

Cluster Verification Utility

Patch Level

Application Continuity

OPatch

- Apply patches regularly
- Apply recent Release Updates
- Apply MRPs
- Keep GI and DB patch levels in sync

top tips

PATCHING SUCCESS

Cluster Verification Utility

Patch Level

Application Continuity

OPatch

- Completely hide interruptions from users
- Hides planned and unplanned events
- Comply with MAA guidelines
- See also Transparent Application Continuity

top tips

PATCHING SUCCESS

Cluster Verification Utility

Patch Level

Application Continuity

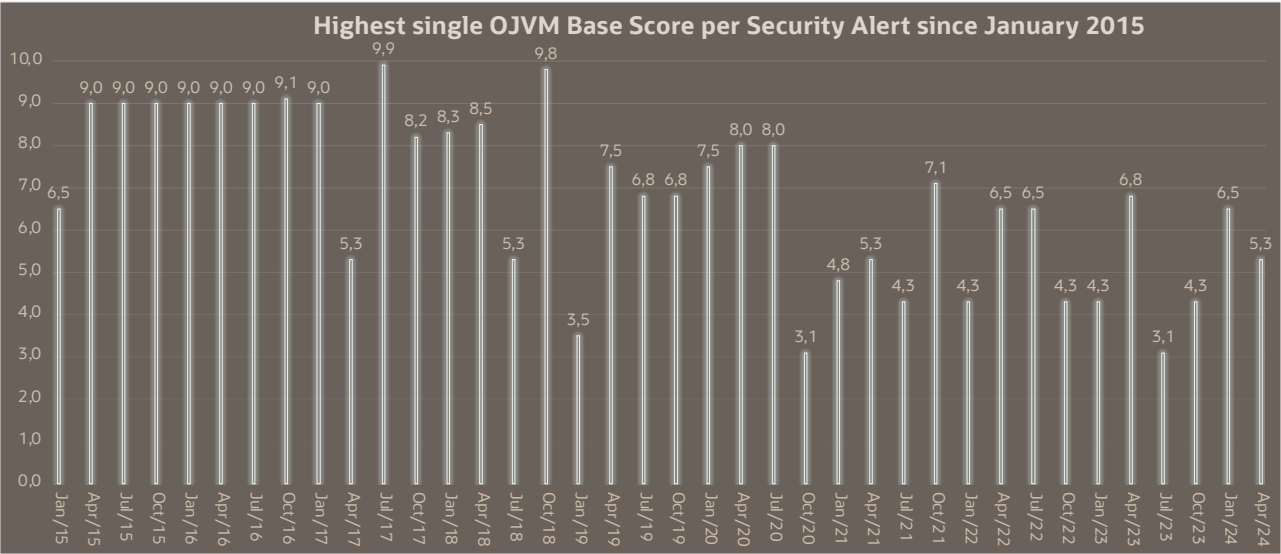
OPatch

Always use the latest version of OPatch

Use in GI and DB homes

OJVM

Oracle Java Virtual Machine | OJVM



Check | OJVM

Is OJVM installed?

```
select comp_id, comp_name, full_version from dba_registry order by 1;
```

COMP_ID	COMP_NAME	FULL_VERSION
CATALOG	Oracle Database Catalog Views	19.19.0.0.0
CATJAVA	Oracle Database Java Packages	19.19.0.0.0
CATPROC	Oracle Database Packages and Types	19.19.0.0.0
JAVAVM	JServer JAVA Virtual Machine	19.19.0.0.0
OLS	Oracle Label Security	19.19.0.0.0
ORDIM	Oracle Multimedia	19.19.0.0.0
OWM	Oracle Workspace Manager	19.19.0.0.0
XDB	Oracle XML Database	19.19.0.0.0
XML	Oracle XDK	19.19.0.0.0

Is OJVM in use

- Check blog post for details

OJVM Patching | Option 1

Patch
Disable
Remove

PATCH QUARTERLY

- OJVM bundle patch is a separate download until Oracle 19c
- From Oracle 21c onward, OJVM is part of the RU

OJVM Patching | Option 1

- Patch
- Disable
- Remove

Single instance

- Database is down

Real Application Cluster

- Database stays up
- Each instance must go down in a rolling manner
- See MOS Doc ID 2217053.1 for details

Data Guard

- Not standby-first installable

OJVM Patching | Option 1

- Patch
- Disable
- Remove

Oracle Database 21c / 23ai

Fully RAC Rolling installable

No interruption during `datapatch`

Oracle Database 19c

RAC Rolling installable

No `datapatch` downtime but:

- Java subsystem is patched which requires ~10 second outage
- Connected clients using OJVM will receive `ORA-29548`

OJVM Patching | Option 2

Patch
Disable
Remove

DISABLE OJVM

using mitigation patch

- Disables the Java subsystem
- Java subsystem must be re-enabled during patching and upgrade
- Can be used on PDB level

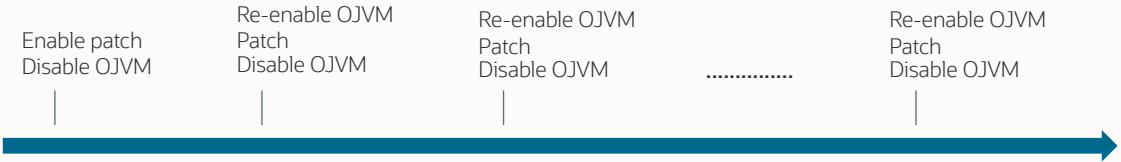
OJVM Patching | Option 2

Patch
Disable
Remove

How do you use the **Mitigation Patch**?

- Enable patch `@?/rdbms/admin/dbmsjdev.sql`
- Disable OJVM `exec DBMS_JAVA_DEV.DISABLE`
- Re-enable OJVM, `exec DBMS_JAVA_DEV.ENABLE`
  e.g. before database patching
- Important note:
  Disable OJVM with the Mitigation Patch in PDB$SEED to prevent new PDBs being provisioned with an enabled OJVM – see Blog Post

OJVM Patching | Option 2



@?/rdbms/admin/ exec DBMS_JAVA_ @?/rdbms/admin/	exec DBMS_JAVA_DI Patch exec DBMS_JAVA_DI	exec DBMS_ Patch exec DBMS_	exec DBMS_JAVA_DEV.ENABLE Patch exec DBMS_JAVA_DEV.DISABLE

AutoUpgrade detects the use of the mitigation patch and acts accordingly

- No additional configuration needed

OJVM Patching | Option 3

Patch
Disable
Remove

REMOVE OJVM

Exercise caution in an existing database

Conduct thorough testing

Non-CDB	MOS Note: 2314363.1
CDB	MOS Note: 22629191
See also	JAVAVM and XML Cleanup in the database

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

- Even if the readme says so
- See blog post for details
- If needed, use `./datapatch -skip_upgrade_check`

Thank You