ORACLE

Patch Me If You Can

Oracle Database Patching

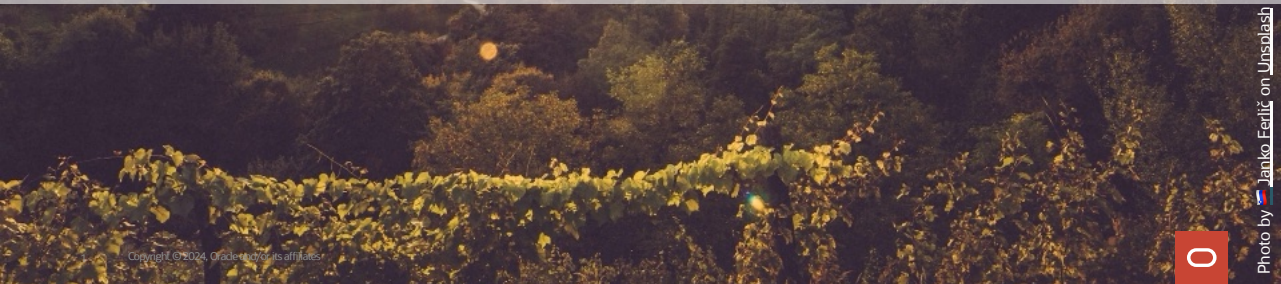

Photo by Janko Ferlič on Unsplash

Oracle

DBAs

run the world

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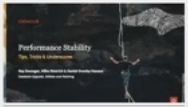
Web Seminar	Slides
Episode 16 (replaces Episode 1 from Feb 2021) Oracle Database Release and Patching Strategy for 19c and 23c *115 minutes – May 10, 2023*	
Episode 17 From SR to Patch – Insights into the Oracle Database Development process *55 minutes – June 22, 2023*	
NEW Episode 18 Cross Platform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

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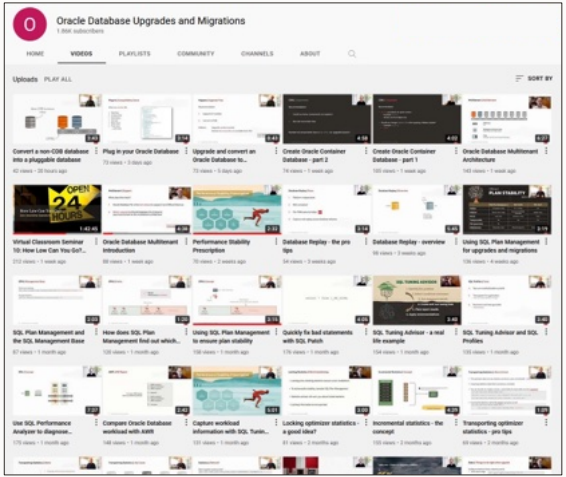
YouTube | Oracle Database Upgrades and Migrations



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

SCAN ME

Patching Best Practices

Installation

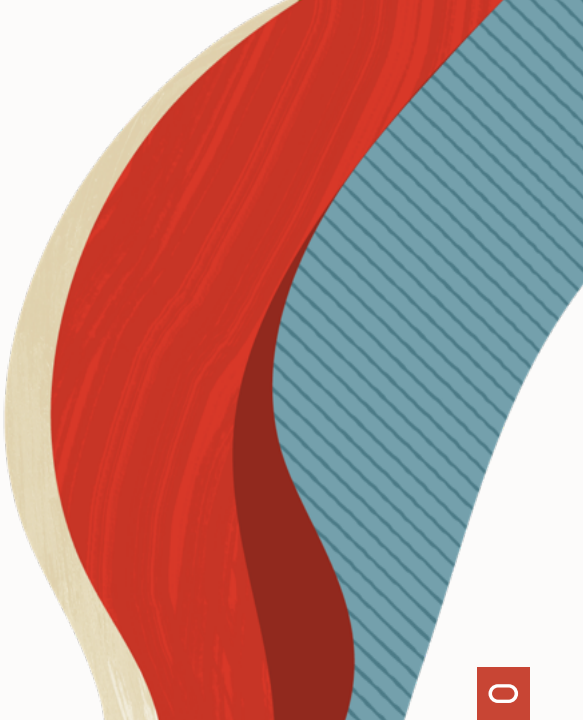
Basics

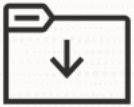
Methods

Grid Infrastructure

Datapatch

AutoUpgrade





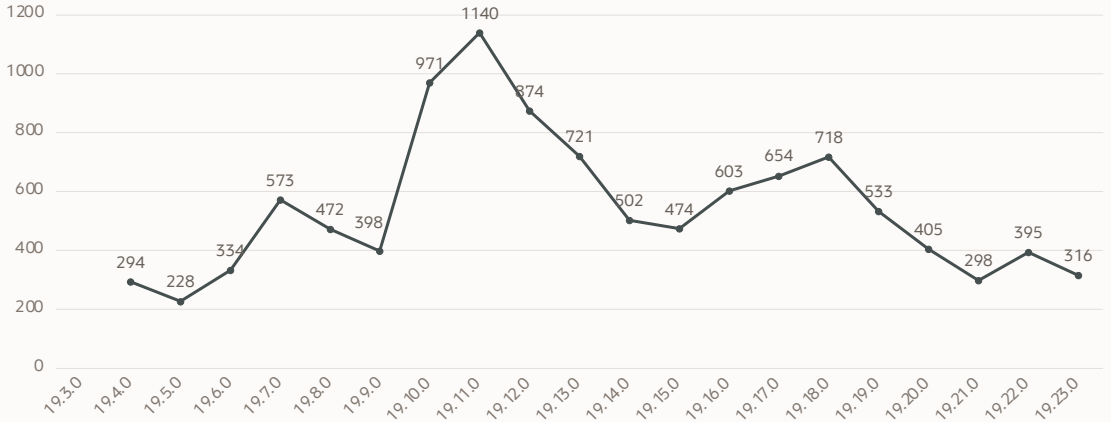
You always start with Oracle Database base release

- Oracle Database 19.3.0

Always Apply the Most Recent RU

Use the Patch Download Assistant MOS Note: 2118136.2

Release Update Contents



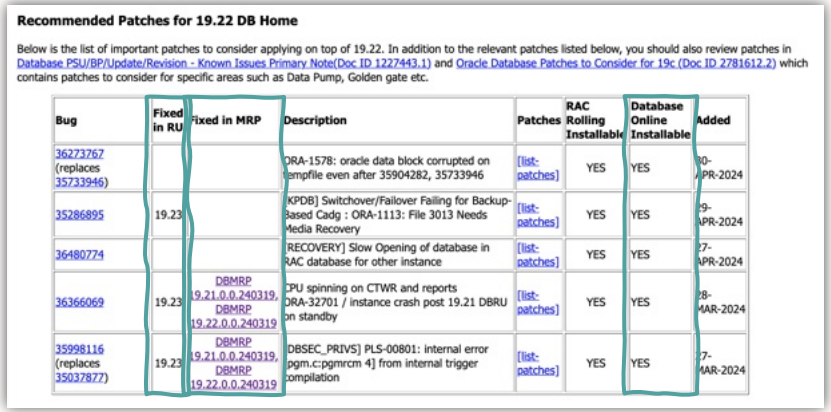
Database 19 Release Updates and Revisions Bugs Fixed Lists (Doc ID 2523220.1)

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

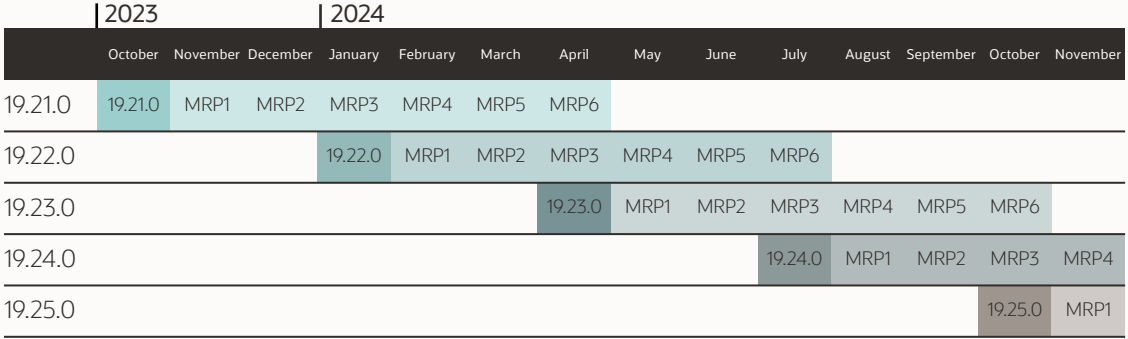
Monthly Recommended Patches

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

Monthly Recommended Patches

Introducing Monthly Recommended Patches (MRPs) and FAQ (Doc ID 2898740.1)

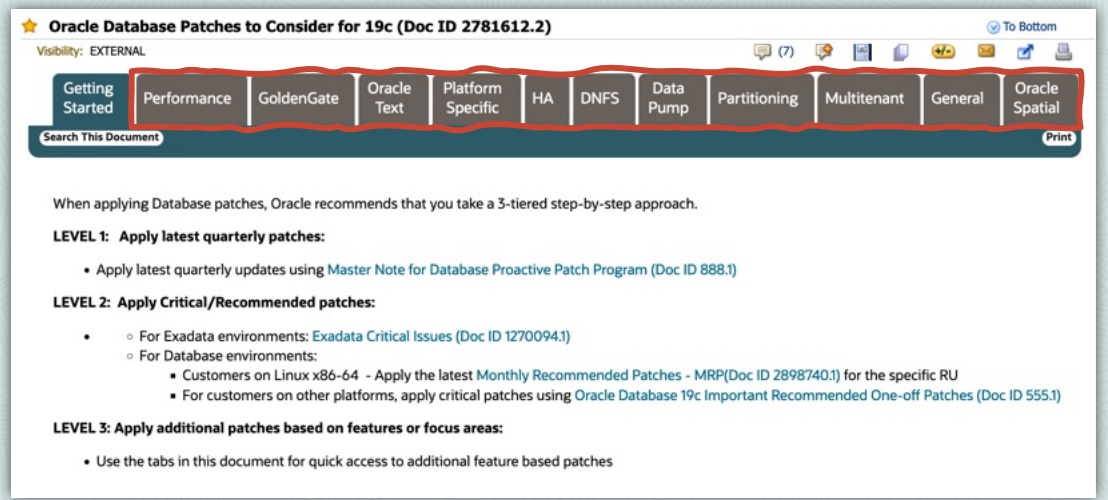
Patching News: RURs are gone – long live MRPs (Blog Post)

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

Oracle Database Patch Maintenance

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 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
```

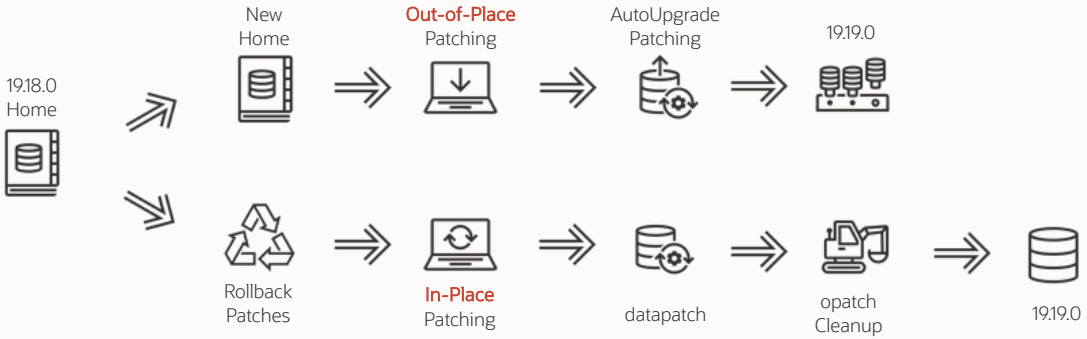
ONE SINGLE COMMAND

```
./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
```

Exercise Patching?

Use our brand new Patch Me If You Can LiveLabs

- https://apexapps.oracle.com/pls/apex/dbpm/r/livelabs/view-workshop?wid=3740



Patching Best Practices

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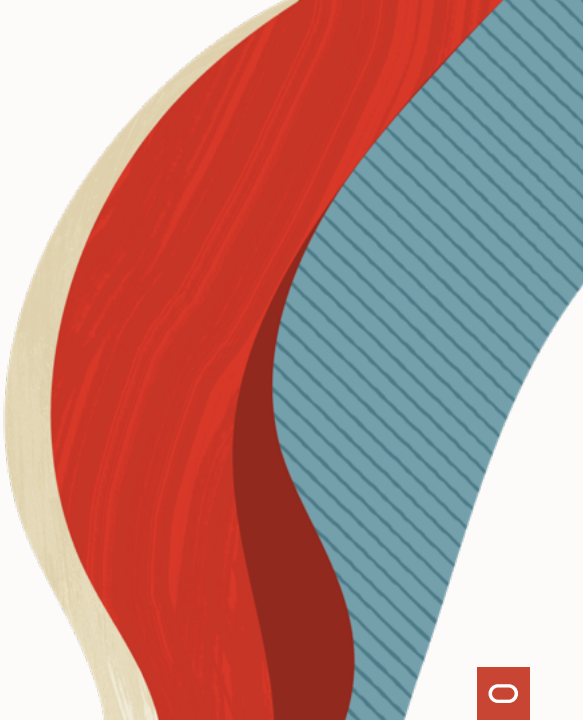
AutoUpgrade



What Can Be in a Patch?

FILES

New or changed executables, libs or files

```
bin/oracle
bin/srvctl
oracore/zoneinfo/timezone_42.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 ...
```

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;
```

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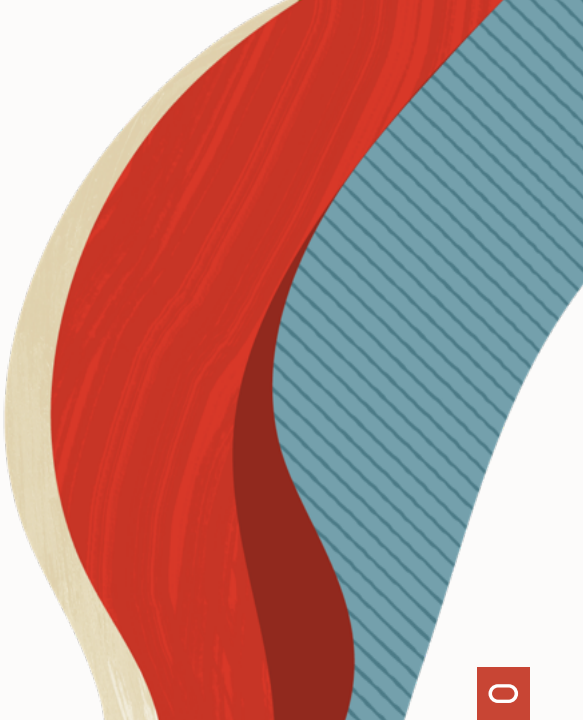
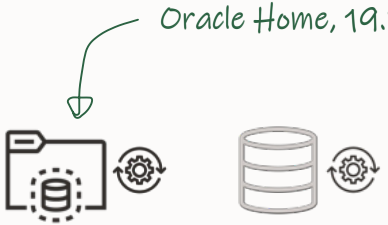
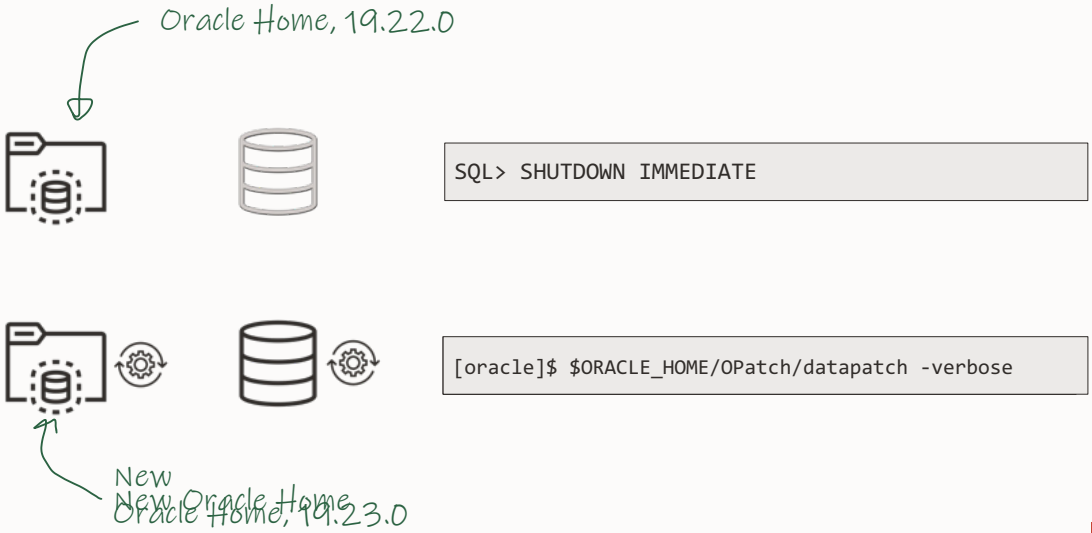


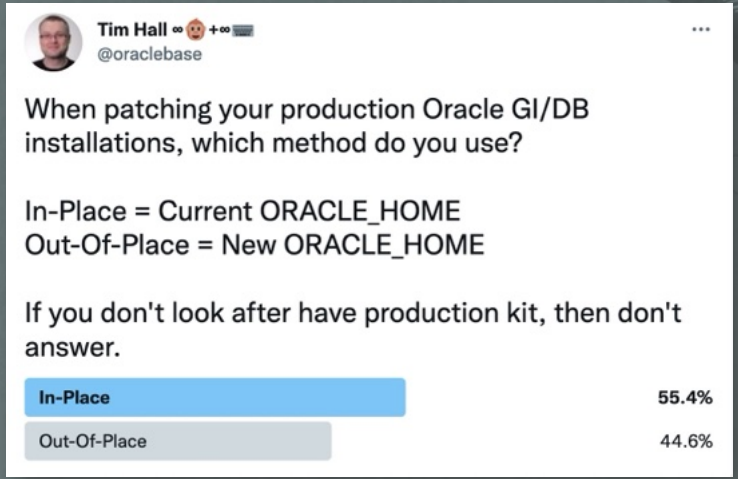
In-Place Patching




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

Out-of-Place Patching





Always patch Out-of-Place

- Don't argue with us ☺

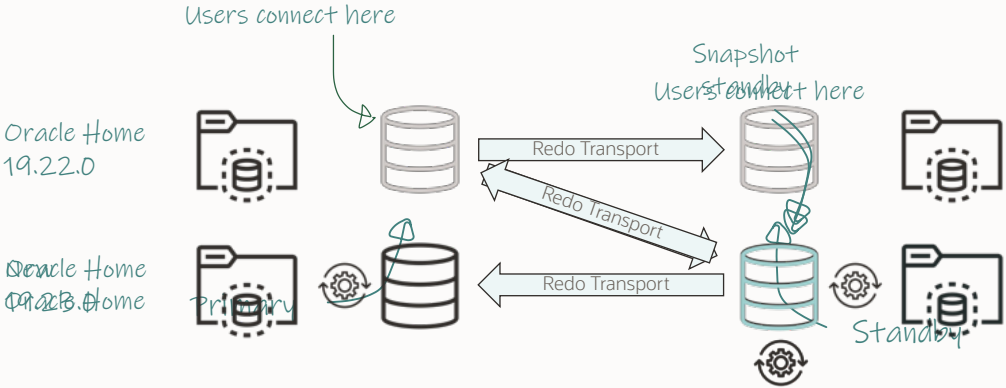
Reduce downtime to the time it takes to perform a switchover

- 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

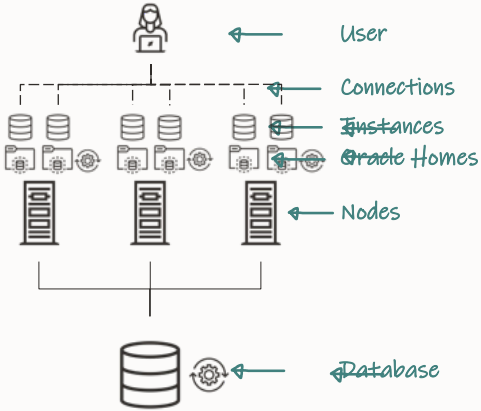
- Check the patch readme

Execute datapatch on the primary database

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

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

Patching Best Practices

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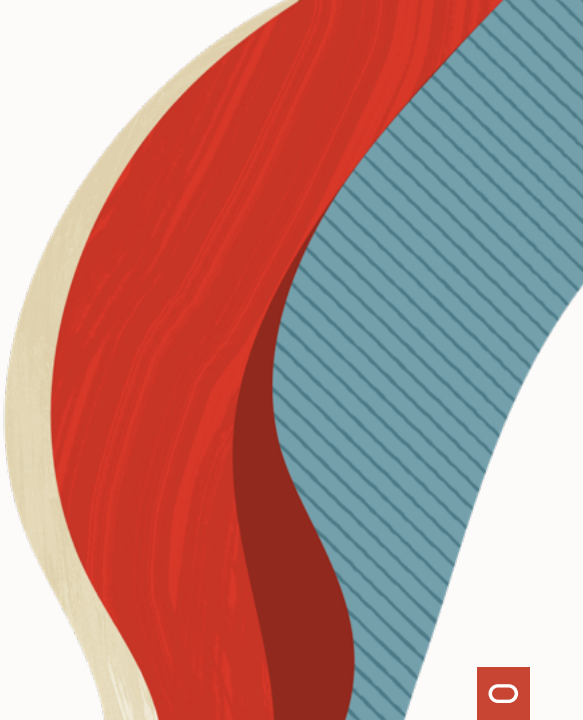


Grid Infrastructure Patching Methods

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`**

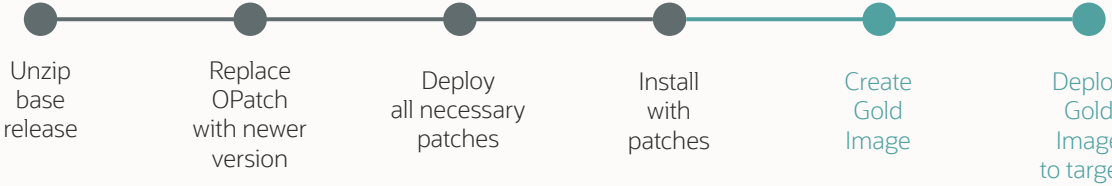
23ai GI home disk space greatly reduced to 3 GB

- 12 GB in 19c

Use golden images

- Blog post

Golden Images



```
--Unzip base release and update OPatch

unzip -oq LINUX.X64_193000_grid_home.zip

mv OPatch OPatch_old
unzip p6880880...zip
```

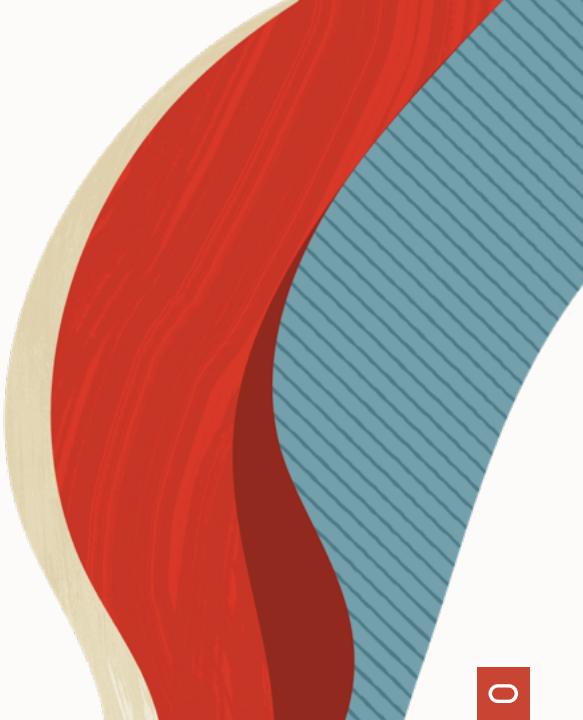

```
--Install the Oracle Home and apply Release Update and one-offs
--Specify multiple one-offs using comma-separated list

./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 \
               ...
```


Demo

Install GI home
Apply Release Update
Create golden image



Watch on YouTube

Works for database homes as well

- Use `runInstaller` instead

Should you patch Grid Infrastructure and Database Homes together, or separately?

Patching GI and DB Homes Together?

Option 1

TOGETHER

One maintenance window

Longer, single patching window

Several changes

Option 2

SEPARATELY

Two maintenance windows

Shorter window, but longer overall patching

One change at a time

Keep GI and DB patch levels in synch

- This is what we test and run in our Cloud

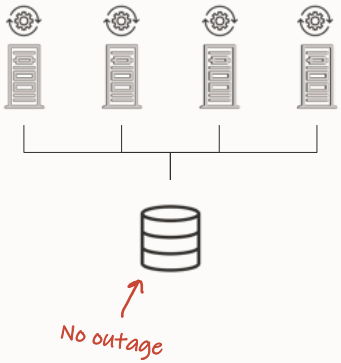
Unusual combinations are supported, but we strongly advice against it

- GI 19.20.0 and DB 19.23.0
- Node 1 with GI 19.23.0, node 2 with GI 19.22.0
- Patching node 1 on Monday, node 2 on Tuesday …
- Mix of GI and DB versions on various nodes

Complete a rolling patching operation always as quickly as possible

- RAC: Frequently Asked Questions (Doc ID 220970.1)

Grid Infrastructure Patching Concepts

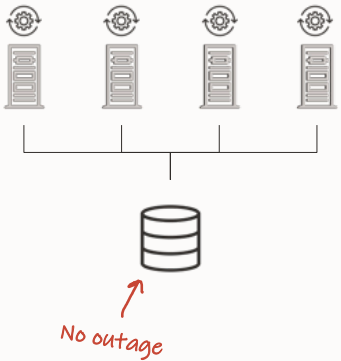


ROLLING

- 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

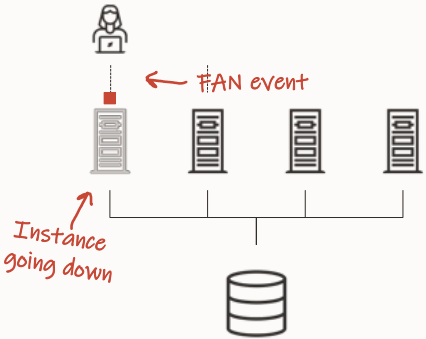
- Patch a subset together
- Useful when draining is a problem
- No database outage
- Patch must be RAC rolling installable
- Other nodes must handle workload while one node is patched

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

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

Comply with Maximum Availability Architecture (MAA) principles

- Continuous Availability - MAA Checklist for Applications for the Oracle Database

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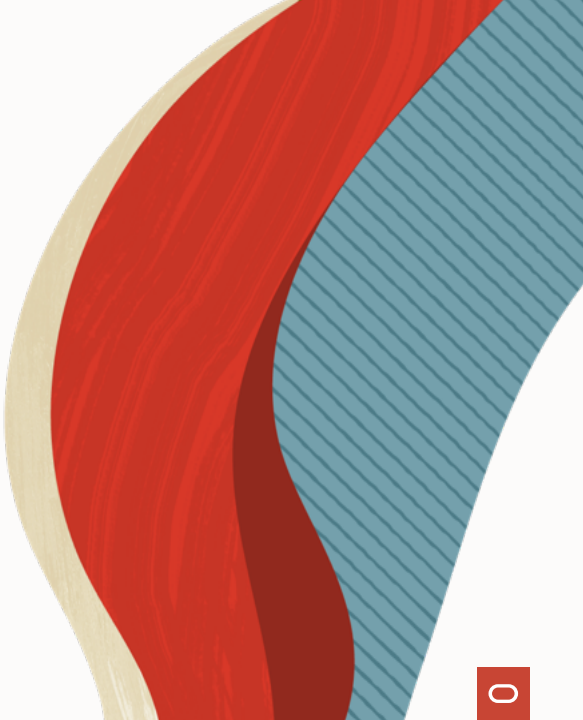


Patching a Database

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

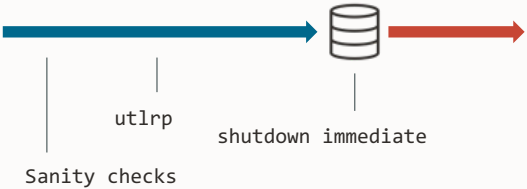
```
$ ./datapatch -sanity_checks

...

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`

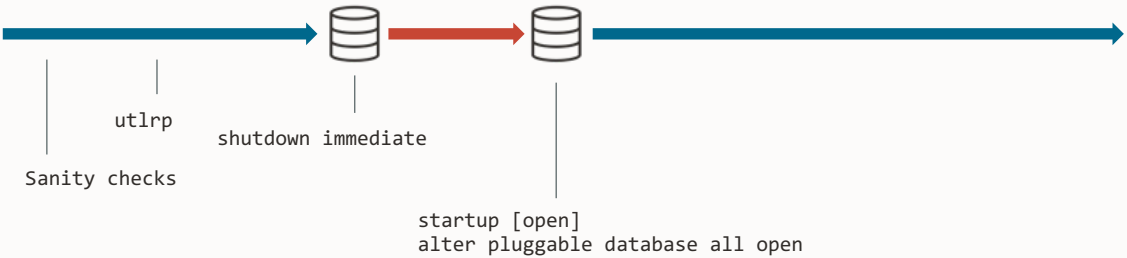
Patching Timeline



The database must be open
Only open PDBs are patched

- Upgrade mode or restricted session is not needed

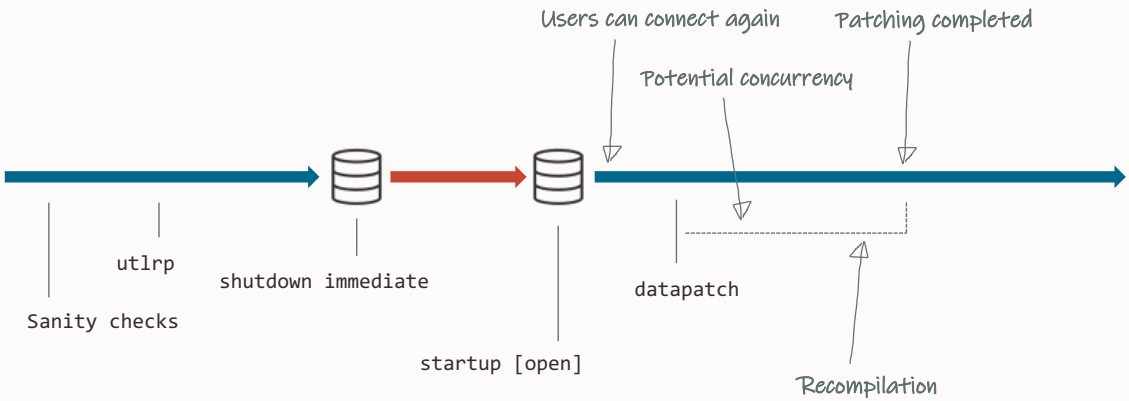
Patching Timeline



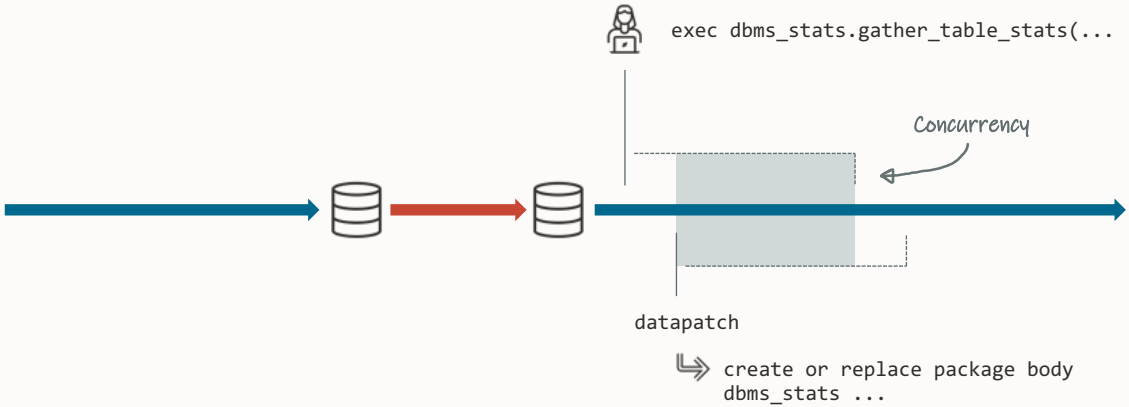
You can run `datapatch` while users are connected to the database

- Details in blog post

Patching Timeline



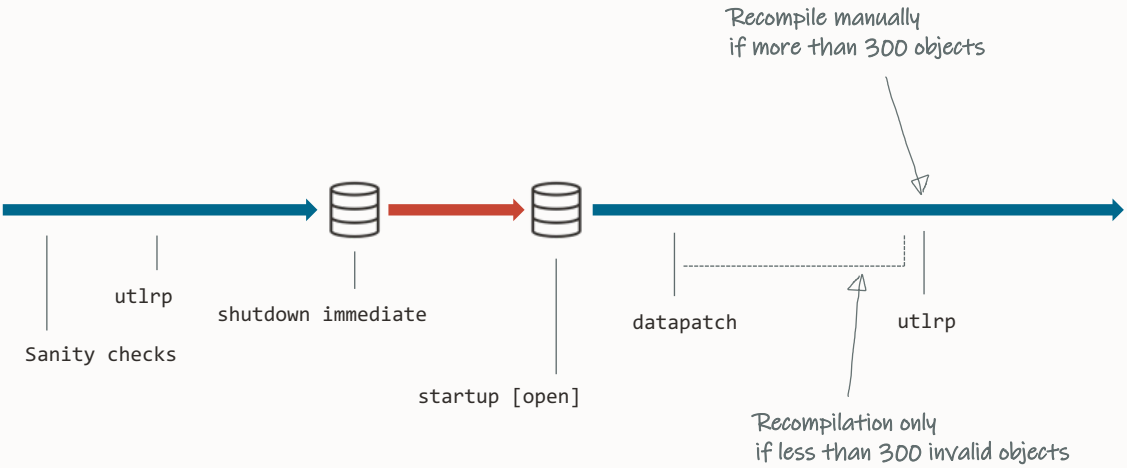
Patching Timeline



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>`

Patching Timeline



```
$ ./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 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
```

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

Patching Best Practices

Installation

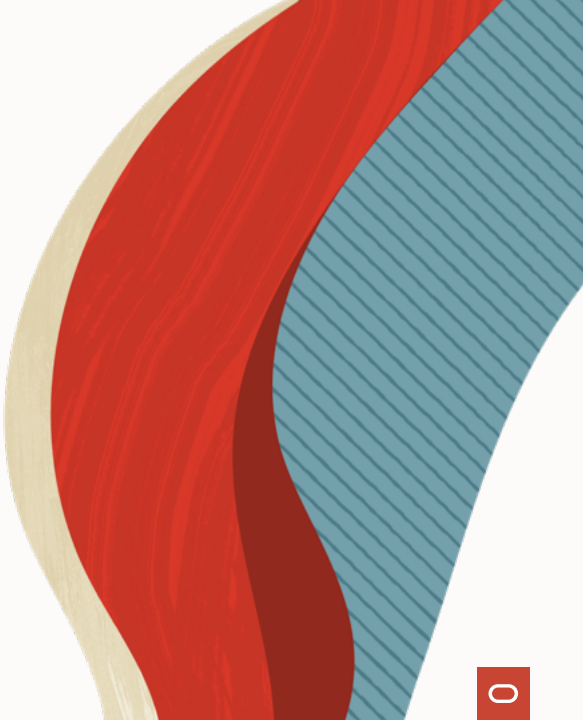
Basics

Methods

Grid Infrastructure

Datapatch

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
```


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

Thank You