ORACLE

Out-Of-Place Patching Automation
The answer to almost everything

DOAG Conference, Oct 22, 2023

Photo by Thomas Winkler on Unsplash

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MIKE DIETRICH
Senior Director Product Management
Database Upgrade, Migrations & Patching

in mikedietrich

🐦 @mikedietrichde

B https://mikedietrichde.com

PHILIPPE FIERENS
Senior Principal Product Manager
Fleet Patching and Provisioning, Exadata Fleet Update,
Exadata MAA

in pfierens

🐦 @pfierens

B https://philippefierens.eu

Episode 1

Release and Patching Strategy

105 minutes – Feb 4, 2021

Episode 2
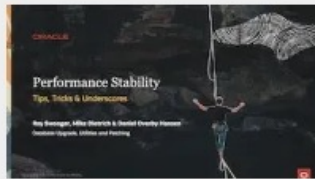
AutoUpgrade to Oracle Database 19c

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

More than 30 hours of technical content,
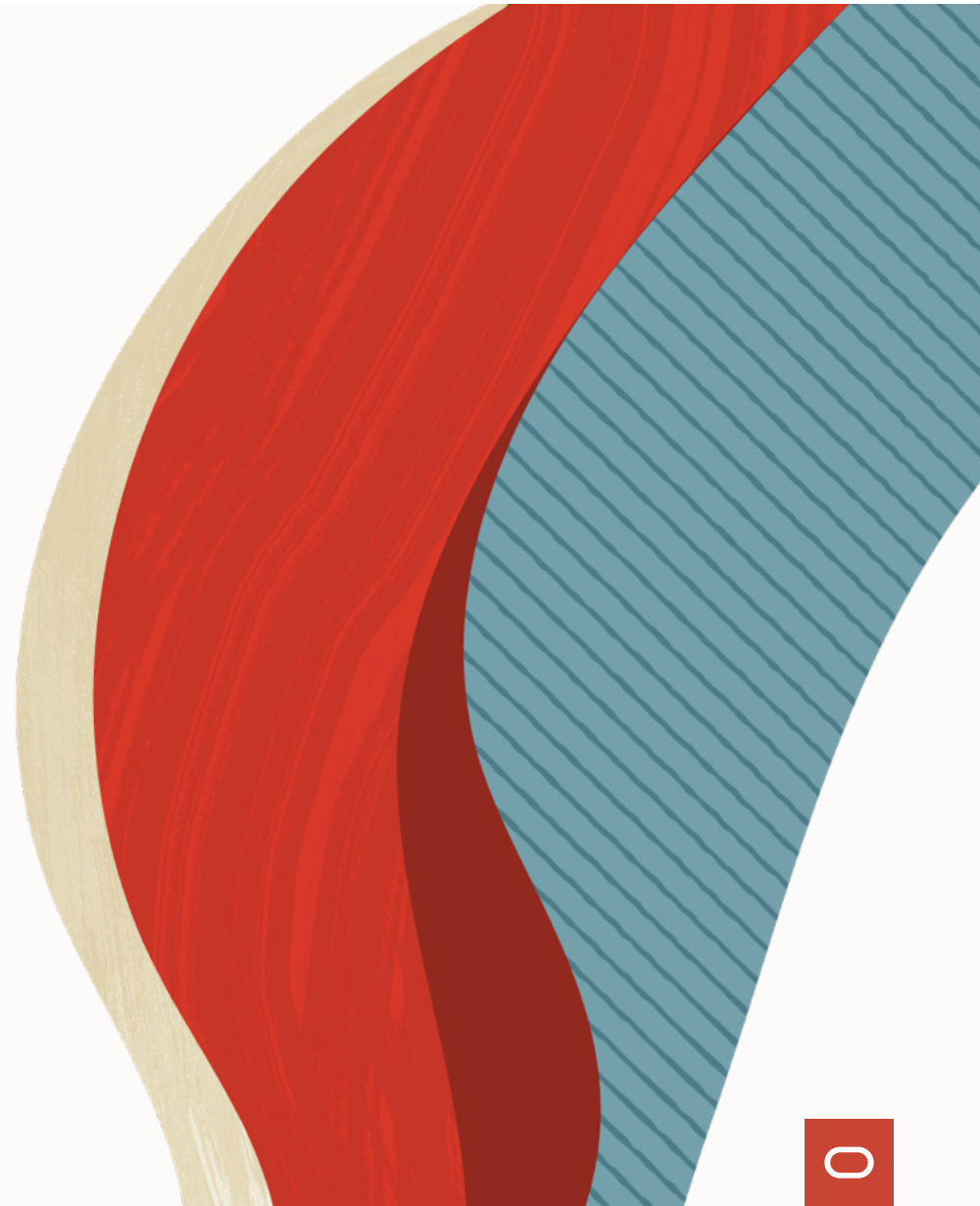on-demand, anytime, anywhere

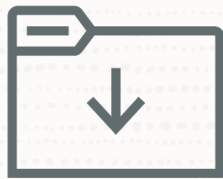# Patching

DIY and Out-Of-Place

Patching Best Practices

Installation

Basics

Methods

You **always** start with
Oracle Database 19c base release

- Oracle Database 19.3.0

Always apply the most recent RU

Use the Patch Download Assistant <u>MOS Note: 2118136.2</u>

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

Visibility: EXTERNAL   💬 (98)

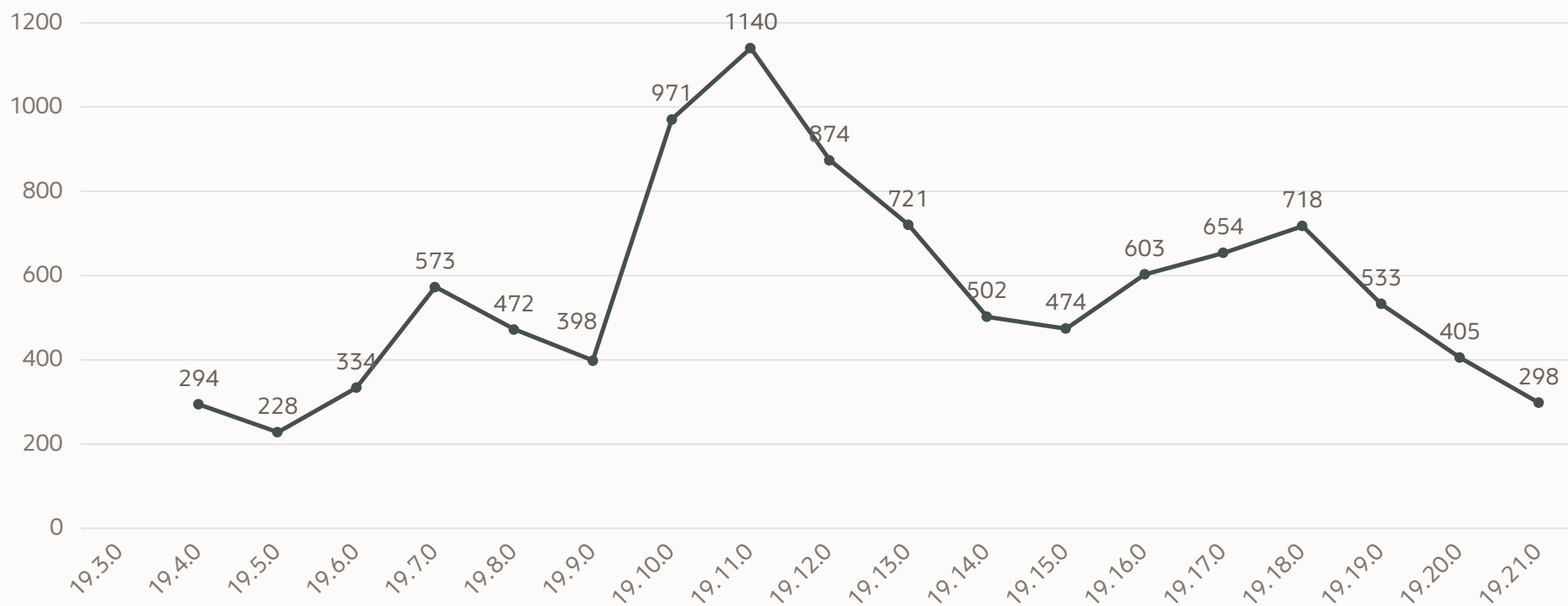| **Selection(s)**	**Solution(s)**
What would you like to download?	Possible Solutions will appear once you make your selection.
○ Oracle Database Base Releases	
○ Oracle Database Patchsets	
○ Oracle Database Release Updates (RUs)	
○ Oracle Database Release Update Revisions (RURs - discontinued since Apr 2023)	
○ Oracle Database PSU, SPU(CPU), Bundle Patches (Versions 12.1 & lower)	
○ OJVM Update/PSU/Bundle Patches	
○ Latest Available Microsoft Windows Patches	
○ Monthly Recommended Patches (MRPs)	

Release Update Contents

Data points by release version:
- 19.4.0: 294
- 19.5.0: 228
- 19.6.0: 334
- 19.7.0: 573
- 19.8.0: 472
- 19.9.0: 398
- 19.10.0: 971
- 19.11.0: 1140
- 19.12.0: 874
- 19.13.0: 721
- 19.14.0: 502
- 19.15.0: 474
- 19.16.0: 603
- 19.17.0: 654
- 19.18.0: 718
- 19.19.0: 533
- 19.20.0: 405
- 19.21.0: 298

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

- More than 10k fixes with 19.21.0
- Over 230 security fixes

Apply the most important patches

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

Recommended Patches for 19.20 DB Home

Below is the list of important patches to consider applying on top of 19.20. 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	NON ROLLING	Added
35395648		DBMRP 19.19.0.0.230815, DBMRP 19.20.0.0.230815	Domain Name Is Missing For Service Post GI Patch To 19.18	[list-patches]		23-AUG-2023
33974554			[RAM INDEX] ORA-600 [kcbb_prepare_4], Logical block corruption detected, error code 6057 against indexes	[list-patches]		19-AUG-2023
35372179		Not Applicable	[VOS] Linux: ORA-800 / Set Priority / DB Performance Merge Patch for 19.20 (Requires Root Access) - 34286265 34318125	[list-patches]		07-AUG-2023
35156218		DBMRP 19.19.0.0.230815, DBMRP 19.20.0.0.230815	[BLOCK TRACK] CTWR: Instance crashed with ORA-600:[krccsio_1] when Block Change Tracking (BCT) in place	[list-patches]		13-JUL-2023
34774667			[AQ] Global-buffer-overflow in pga at kwqalockqtwithinfo with ORA-00700 During PURGE_QUEUE_TABLE.	[list-patches]		11-JUL-2023
32627280		DBMRP 19.19.0.0.230815, DBMRP 19.20.0.0.230815	[DICTIONARY] Datapump Export Fails With ORA-39166 And ORA-31655 On Newly Created Tables	[list-patches]		15-JUN-2023
31061145		DBMRP 19.19.0.0.230815, DBMRP 19.20.0.0.230815	[RAC] Remove requirement to set TARGET_PDBS for RAC on multitenant deployments in 18c onwards	[list-patches]		03-JUN-2023
		DBMRP				

Monthly Recommended Patches

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

Quarterly Release Updates

	2021				2022				2023				2024		
	January	April	July	October	January	April	July	October	January	April	July	October	January	April	July
19c	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	19.21.0	19.22.0	19.23.0	19.24.0
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	21.13.0	21.14.0	21.15.0	

Monthly Recommended Patches

	2022			2023										
	October	November	December	January	February	March	April	May	June	July	August	September	October	November
19.17.0	19.17.0	MRP1	MRP2	MRP3	MRP4	MRP5	MRP6							
19.18.0				19.18.0	MRP1	MRP2	MRP3	MRP4	MRP5	MRP6				
19.19.0							19.19.0	MRP1	MRP2	MRP3	MRP4	MRP5	MRP6	
19.20.0										19.20.0	MRP1	MRP2	MRP3	MRP4
19.21.0													19.21.0	MRP1

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: 19.18.0 MRP5 contains all previous MRPs
  done for Oracle 19.18.0

MRPs are Linux only

And there is more to talk about …

Apply additional important fixes and bundles

In addition, use Patches to Consider for 19c: MOS Note: 2781612.2

As of Oracle 19.18.0, PERL patches are included in Release Updates

- Consider patching JDK as well (Doc ID 2584628.1)

As of Oracle 19.18.0, Time Zone patches are included in Release Updates

- Be aware when you create a new database

Always use the latest OPatch – always!!

- Patch 6880880

Binary patching runtime gets shorter when you use a brand new home

- Avoid cloned Oracle Homes and In-Place Patching
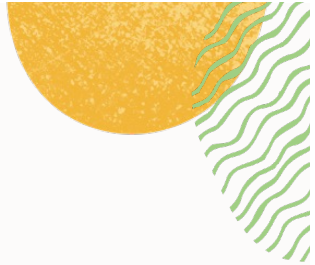
Installation Tip

```
/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 ...
```

Patching Best Practices

Installation

Basics

Methods
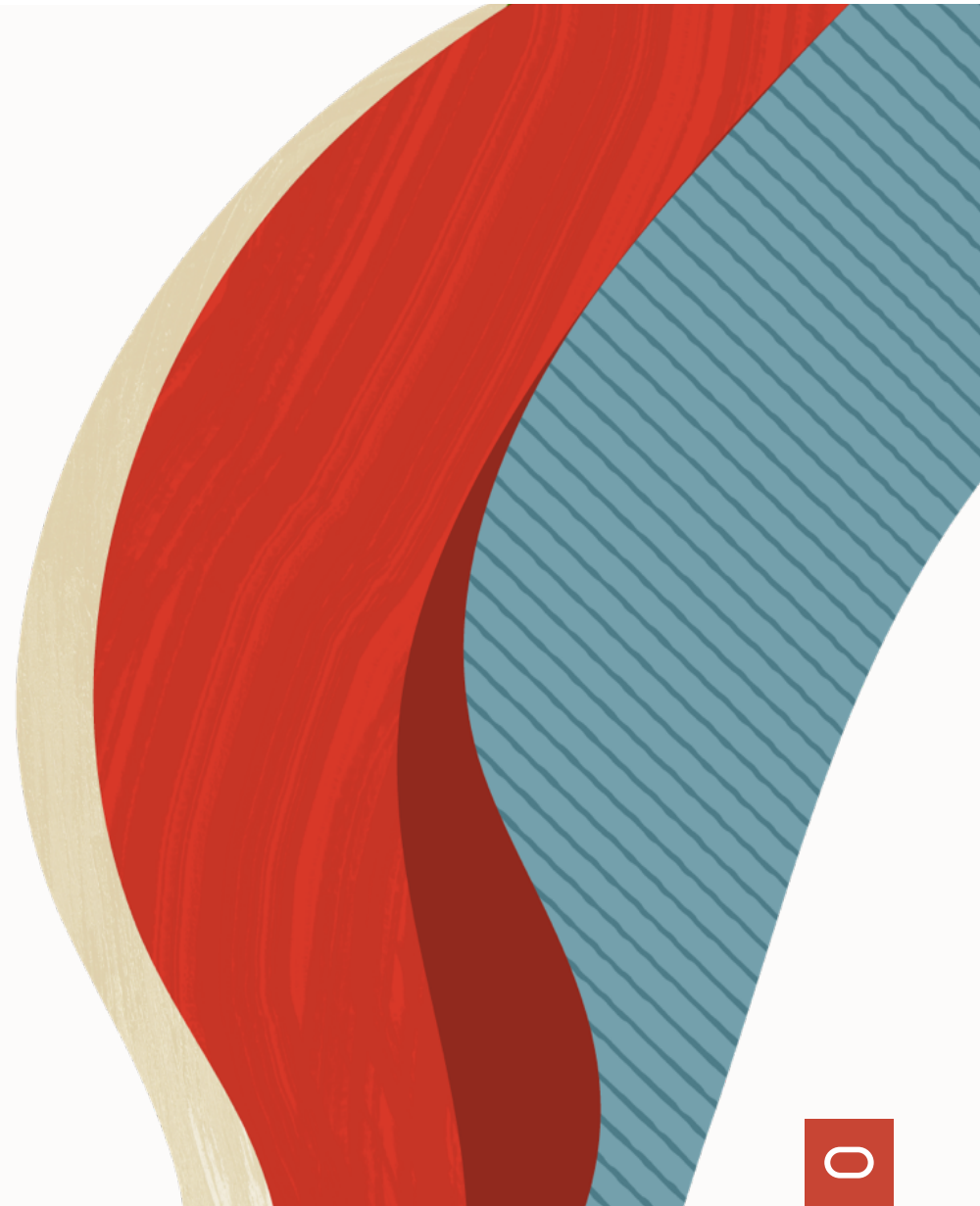
What can be in a patch?

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 ...`

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
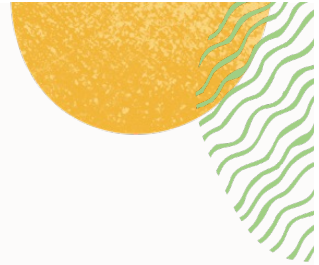
What is installed?

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)
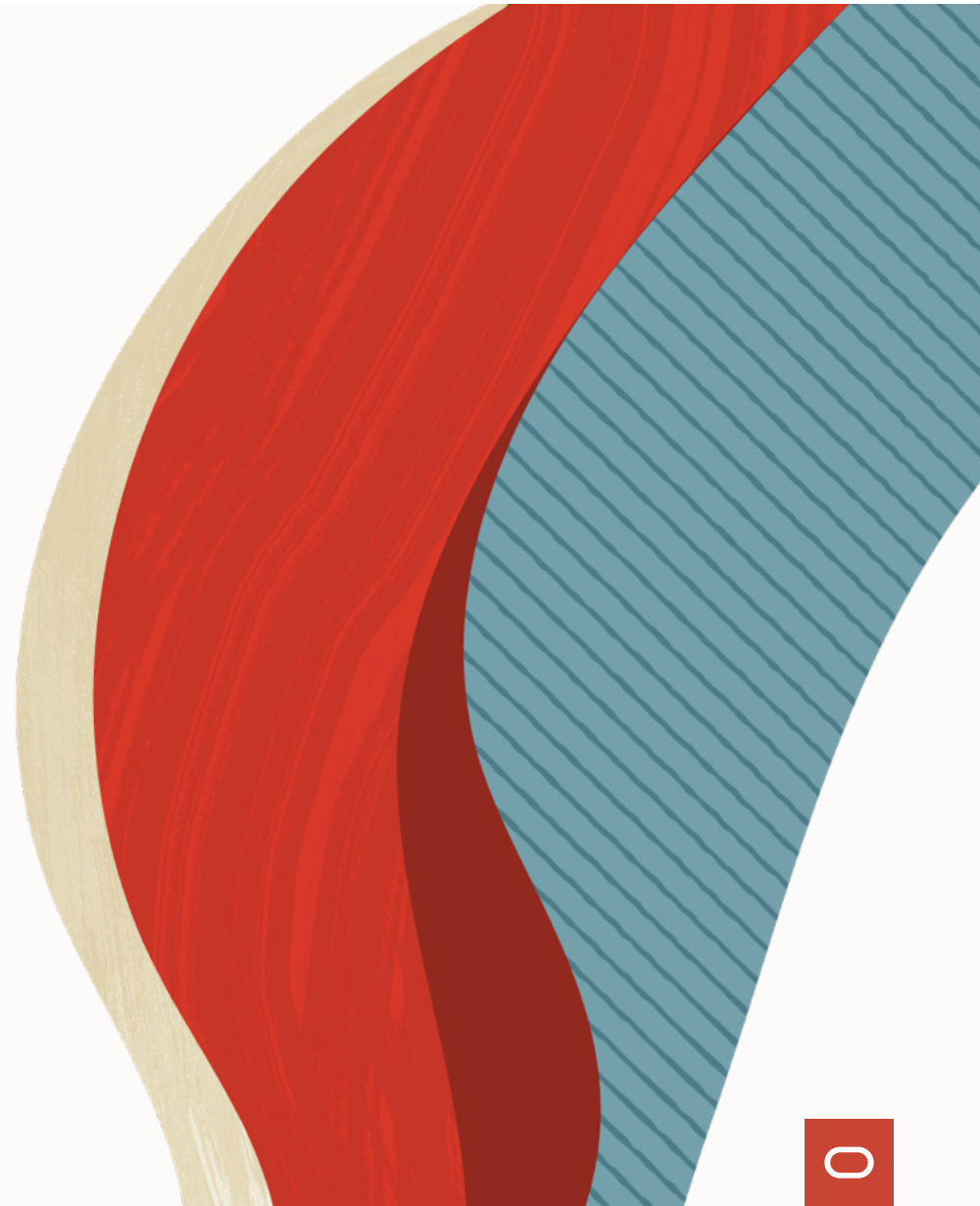
In the database / PDB?

```
SQL> select * from cdb_registry_sqlpatch;
```
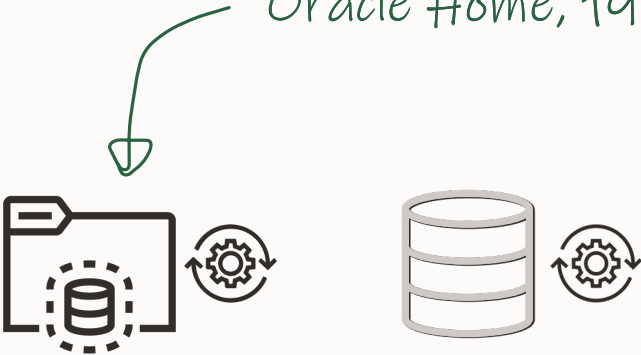
Patching Best Practices

Installation

Basics

Methods

In-Place Patching

Oracle Home, 19.29.0.0

```
SQL> SHUTDOWN IMMEDIATE
```

In-Place Patching

Why is in-place patching such a bad idea?

- Deinstall all one-offs and bundle patches (DPBP, OJVM etc)
- Inventory accumulates a massive history
- Downtime is much longer
- Risk is way higher

And for a potential rollback, you need to go through the entire exercise again

Out-of-Place Patching

Oracle Home, 19.19.0

```
SQL> SHUTDOWN IMMEDIATE
```

```
[oracle]$ $ORACLE_HOME/OPatch/datapatch -verbose
```
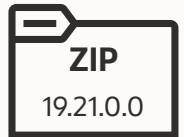
*New or Cloned
Oracle Home, 19.20.0*

Creating Oracle Database gold images

Install new home
```
./runInstaller
   -applyRU /home/oracle/stage/RU/35042068
   -applyOneOffs ...
```

ZIP
19.21.0.0

Create gold home zip
```
./runInstaller
   -createGoldImage
   –destinationLocation /u01/stage
```

Creating Grid Infrastructure gold images


```
Install new home
./gridSetup
  -applyRU /home/grid/stage/RU/35042068
  -applyOneOffs ...
```

```
Create gold home zip
./gridSetup
  -createGoldImage
  –destinationLocation /u01/stage
```
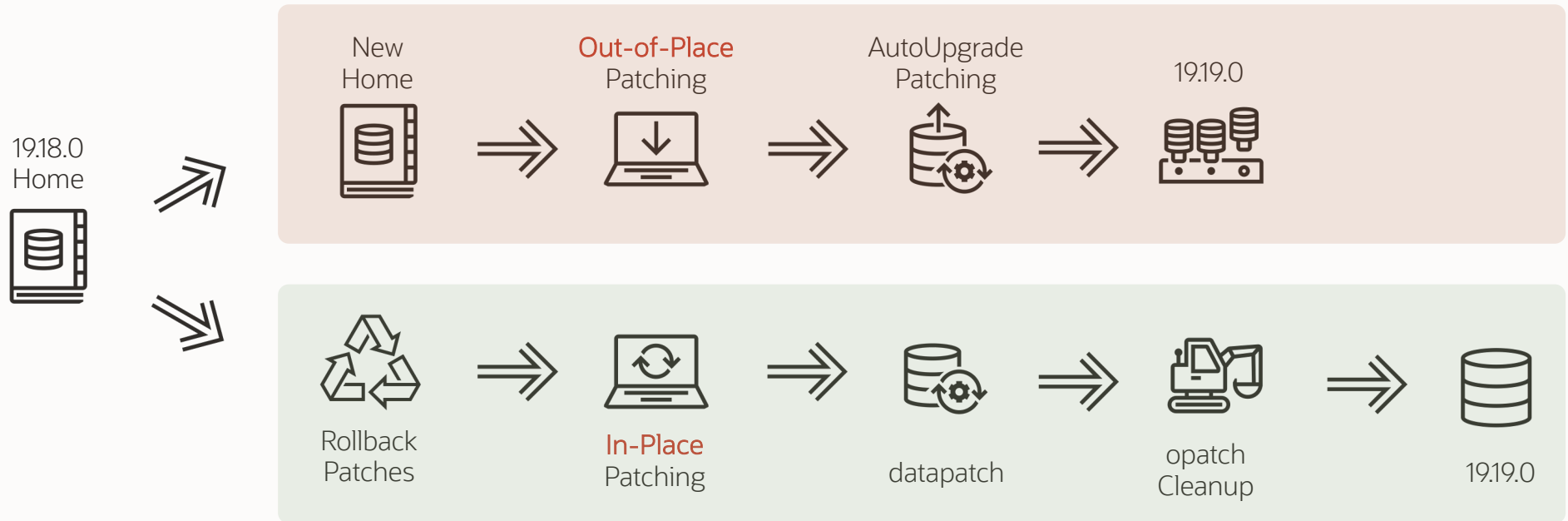
👍 **Always patch Out-of-Place**

- Don't argue with us ☺

You don't believe it?

Experience it in our brand new Patch Me If You Can lab

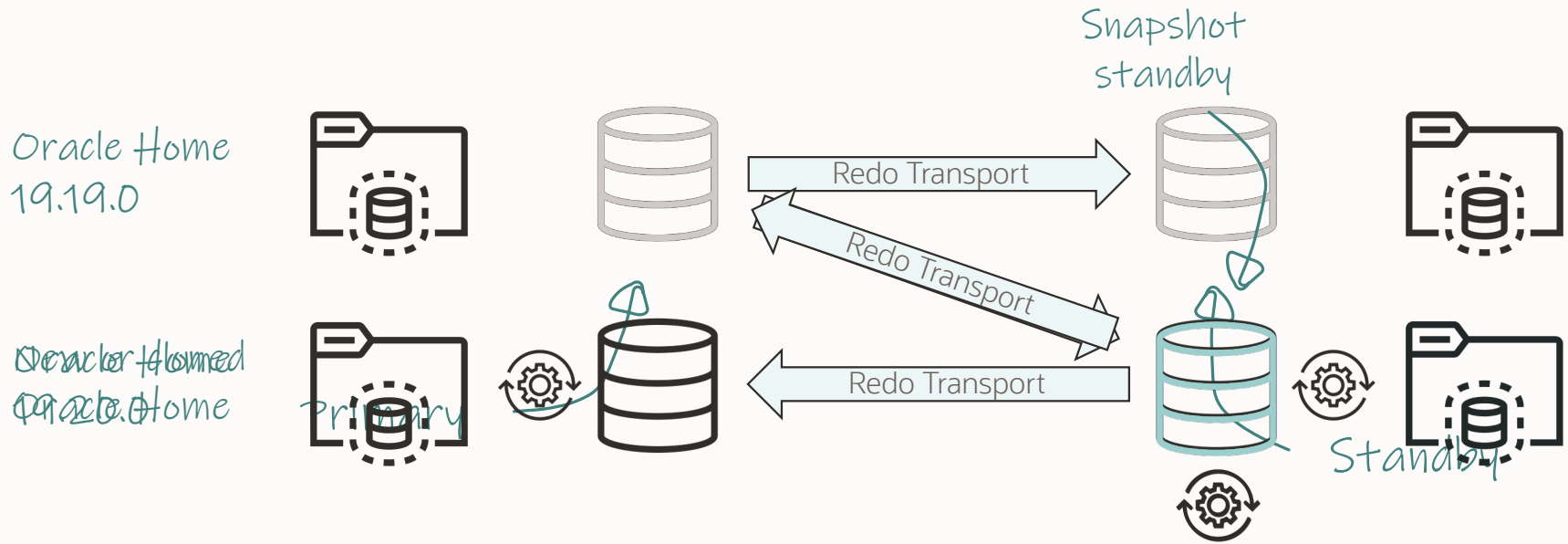- https://apexapps.oracle.com/pls/apex/dbpm/r/livelabs/view-workshop?wid=3740

Safely test and verify patches with Standby-First Patch Apply

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

Standby-First Patching

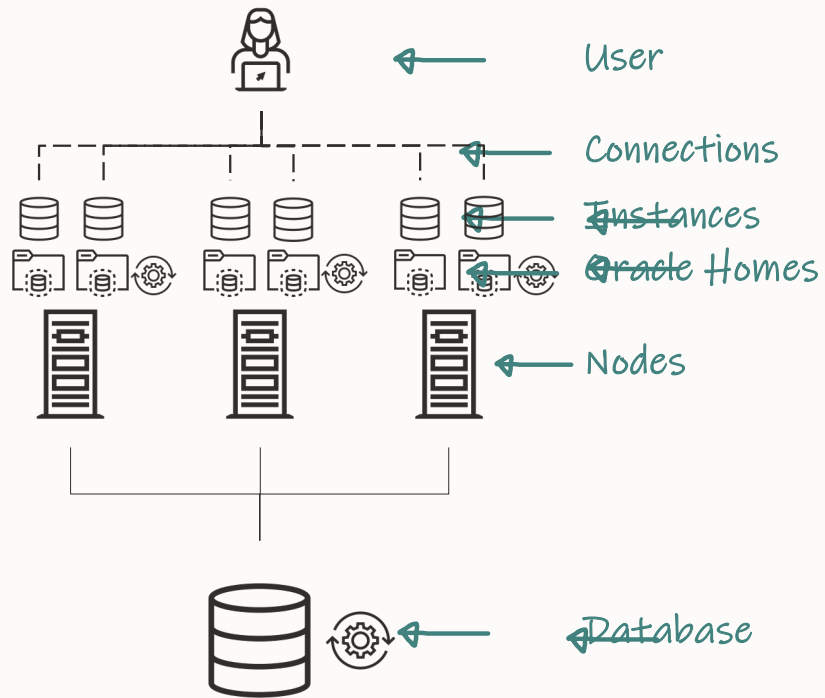
Snapshot standby

Oracle Home 19.19.0

Redo Transport

Redo Transport

Oracle Home 19.20.0

Primary

Redo Transport

Standby

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

Avoid database downtime with RAC Rolling Patch Apply

RAC Rolling Patching

User

Connections

Instances

Oracle Homes

Nodes

Database

```
$ $ORACLE_HOME/OPatch/opatchauto
```

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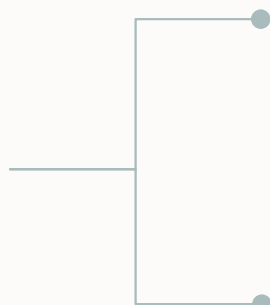- Execute datapatch

Release updates are **always**:

Standby-First installable

RAC Rolling installable

Grid Infrastructure Patching Methods

1 In-place

Replaces existing Oracle Home

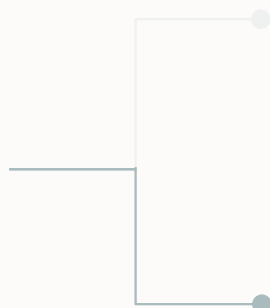Uses opatchauto

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`

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

AutoUpgrade functionality extended to patching
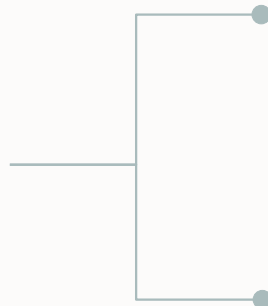
```
$ cat DB19.cfg

patch1.source_home=/u01/app/oracle/product/19/dbhome_19_18_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_20_0
patch1.sid=DB19


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

Out of place patching tools

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 and full automation of the patching and upgrade process
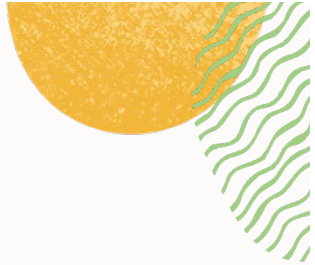
What about automation?

Fleet Patching and Provisioning

Out of place patching pioneer since 12.1

Fleet Patching and Provisioning (FPP) – Overview
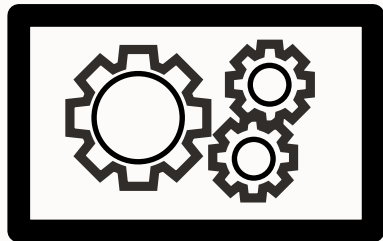
Automated software mgmt engine for Oracle deployments

Gold image based out-of-place software maintenance

Powerful CLI / Rest API

FPP Flavours

Local mode

Central mode

Start small
DB and GI patching in local cluster
Little configuration needed
Custom user scripts possible
Resumable actions
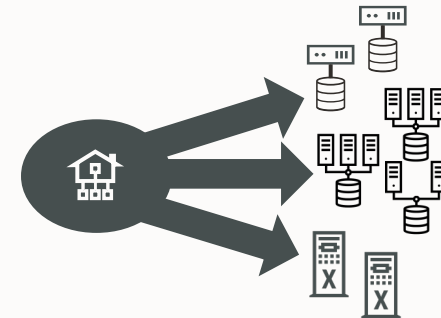
Complete Lifecycle Management
Full functionality
Rich feature set
Centralized Management
Centralized Image repository

Lifecycle management of the Oracle Database Stack

Rich feature set

Install

Remove

Series

Drift detection

FPP peering

REST APIs

Role separation

Exadata Updates

Custom User Actions
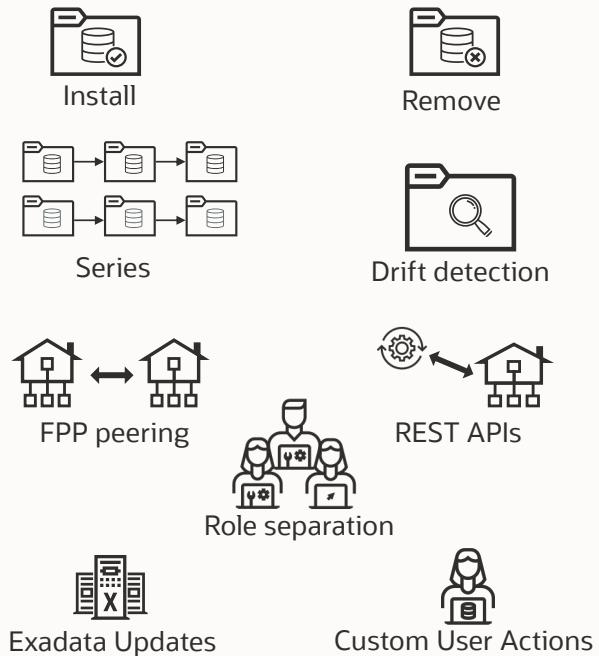
Oracle Database (SI, RAC, RACONE)

Provision

Patch

Upgrade

Scale

Oracle Grid Infrastructure

Provision

Patch

Upgrade

Scale

EXADATA

AUTONOMOUS DATABASE

X
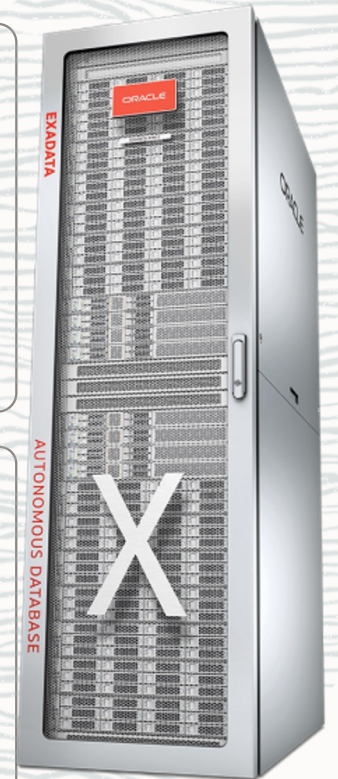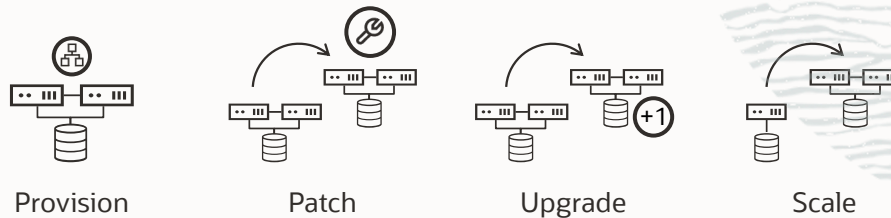
Resolving complexity

Leverages existing tools in one single flow

`rhpctl add / move / import`

Single entry point

Fleet Patching and Provisioning

runInstaller

gridSetup

lsinventory

datapatch

opatch

srvctl

dbca

Autoupgrade*

patchmgr

~~dbua~~

* Used for upgrades

Used to query patches

Used by FPP
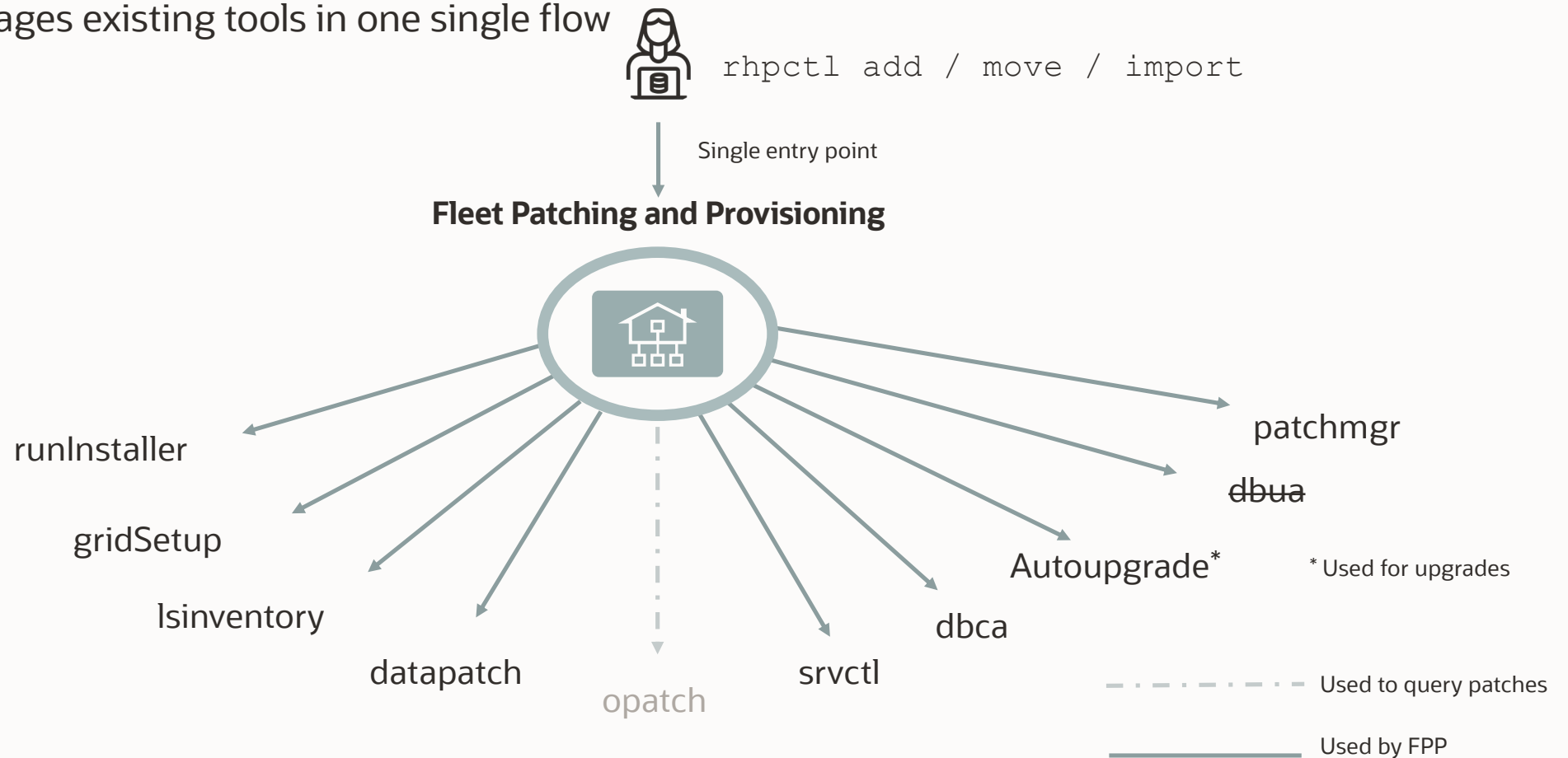
FPP uses out-of-place patching

Leading the way to standardization and rolling patching

In-place patching:

PATCH BINARIES   SERVICES UP

STOP ALL   PATCH DBs

UP	DOWN	UP
UP	DOWN	UP
UP	DOWN	UP
UP	DOWN	UP

Out-of-place patching:

INSTALL
NEW BINARIES   STOP, MOVE, PATCH
ONE BY ONE

ORACLE RECOMMENDED

UP	DOWN		UP		
	UP	DOWN		UP	
		UP	DOWN		UP
			UP	DOWN	UP
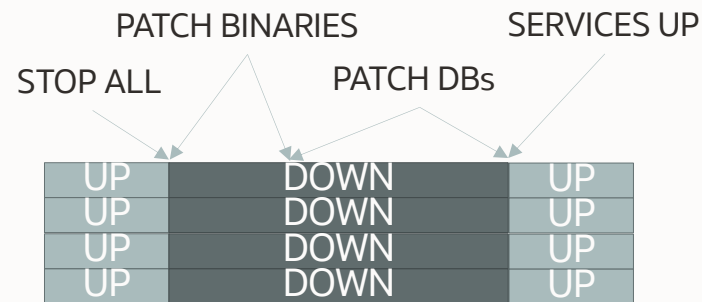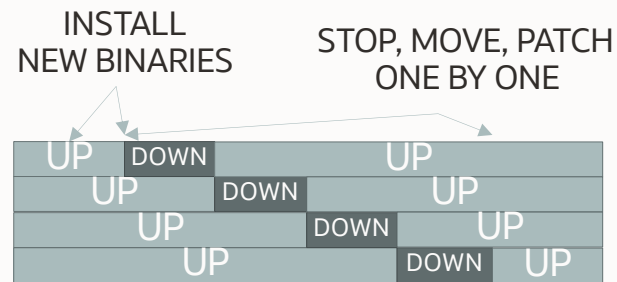
Standardization is key

DEVELOPMENT

| patch A | patch B | patch F |

QA/TEST

| patch A | patch B | patch G |

PRODUCTION

| patch A | patch B | patch C |
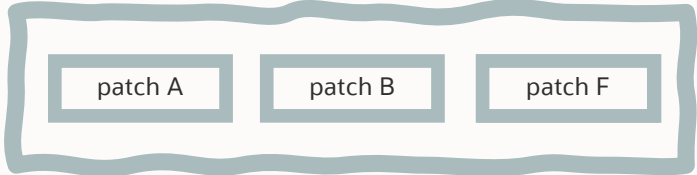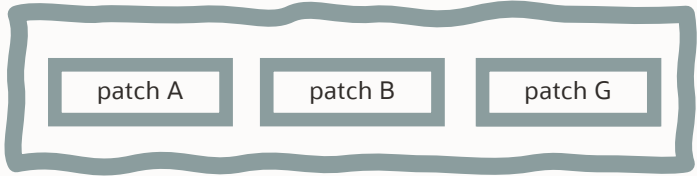
Lifecycle management using gold images

Create once use many times in an automated way

FPP server

Gold image repository

- 11.2.0.4
- 12.1.0.2
- 12.2.0.1
- 19.21.0
- 21.8.0
- 23.4.0
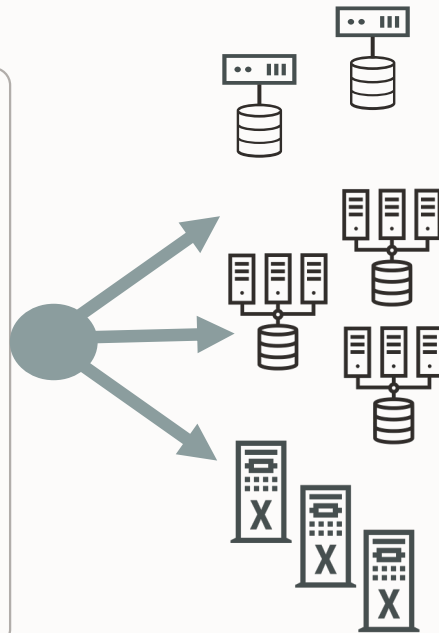
Create and import the gold image **once**

Deploy **many** times across the fleet

Centrally in an **automated** fashion

Workflow

01 Create gold image

02 Import gold image

03 Add working copy (new Oracle home)

04 Move to new working copy

05 Remove old working copy
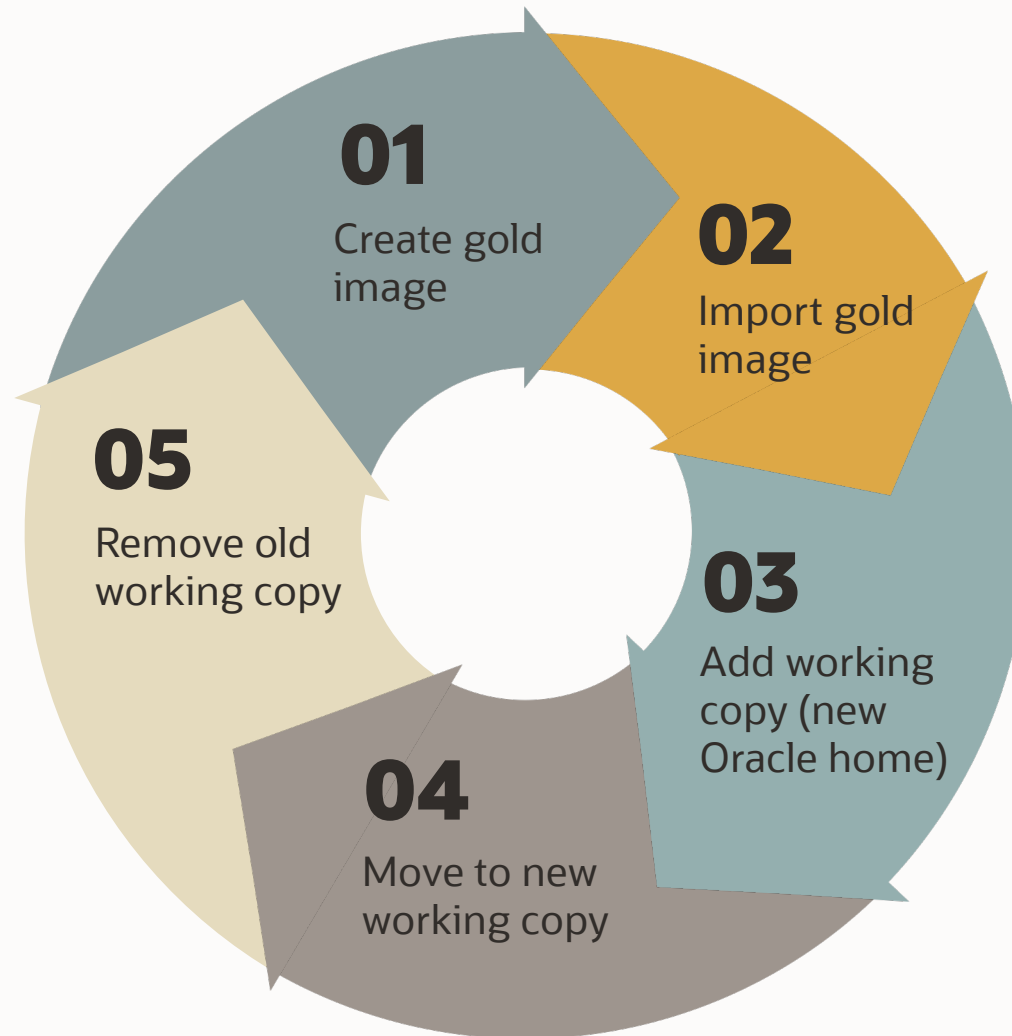
FPP in practice
Importing an image

rhpctl import image
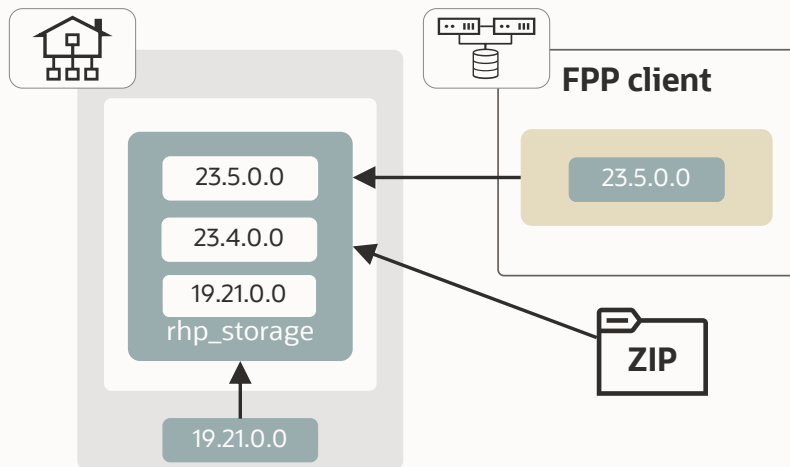

```
rhpctl import image
    -image DB_1921000
    -path | -zip
    ...
```

FPP in practice
Deploying a new home

rhpctl add workingcopy
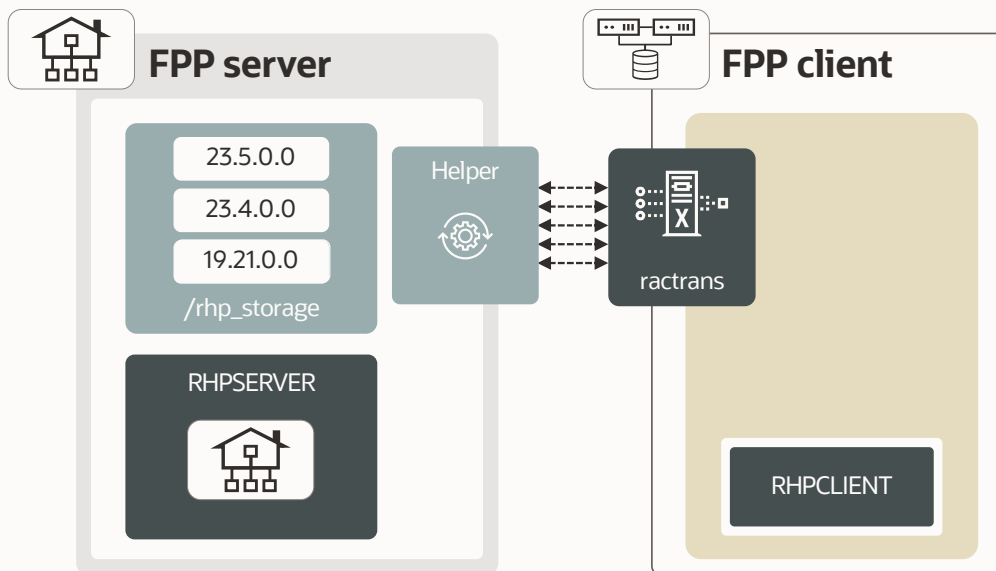

```
rhpctl add workingcopy
    –workingcopy WC_DB192100_cl1
    -image DB_192100
    …
```

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FPP in practice

Rolling patching to new database home

FPP server

RHPSERVER

FPP client

Target Cluster Node 1

19.20   19.21

Target Cluster Node 2

19.20   19.21
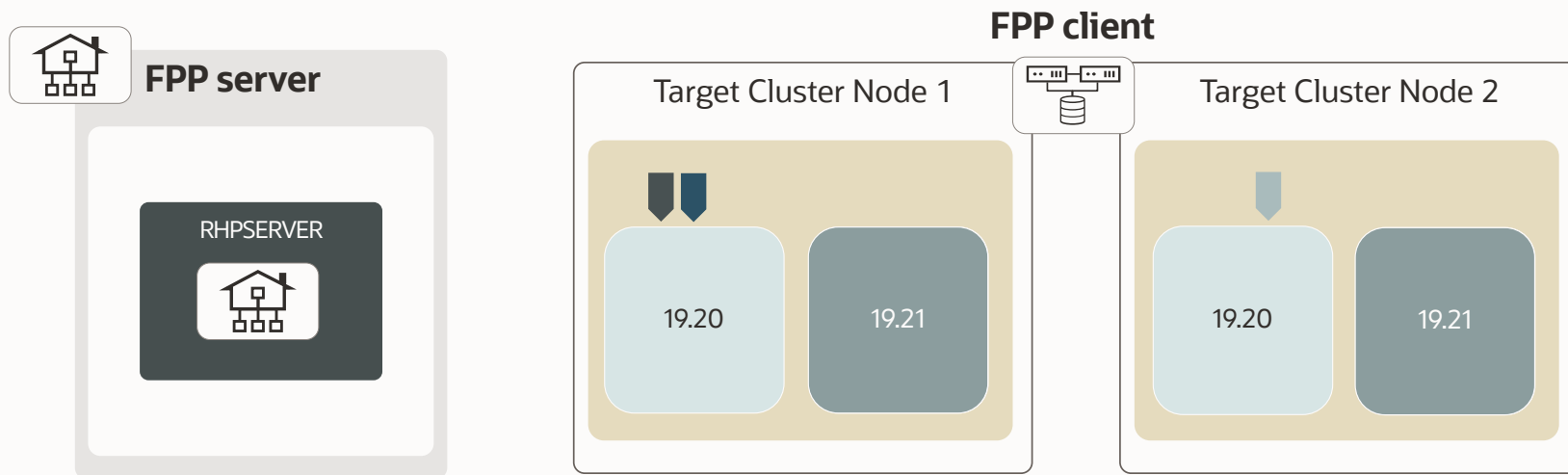
```
rhpctl move database \
  -sourcewc WC_db192000_cl1 \
  -patchedwc WC_db192100_cl1 \
  -drain_timeout 600
```

- Rolling by default
- Automated datapatch execution
- Service Drain Timeout honored

FPP in practice
Vertical Patching

FPP server

RHPSERVER

FPP client

Target Cluster Node 1

DB 19.20   DB 19.21

GI 19.20   GI 19.21

Target Cluster Node 2

DB 19.20   DB 19.21
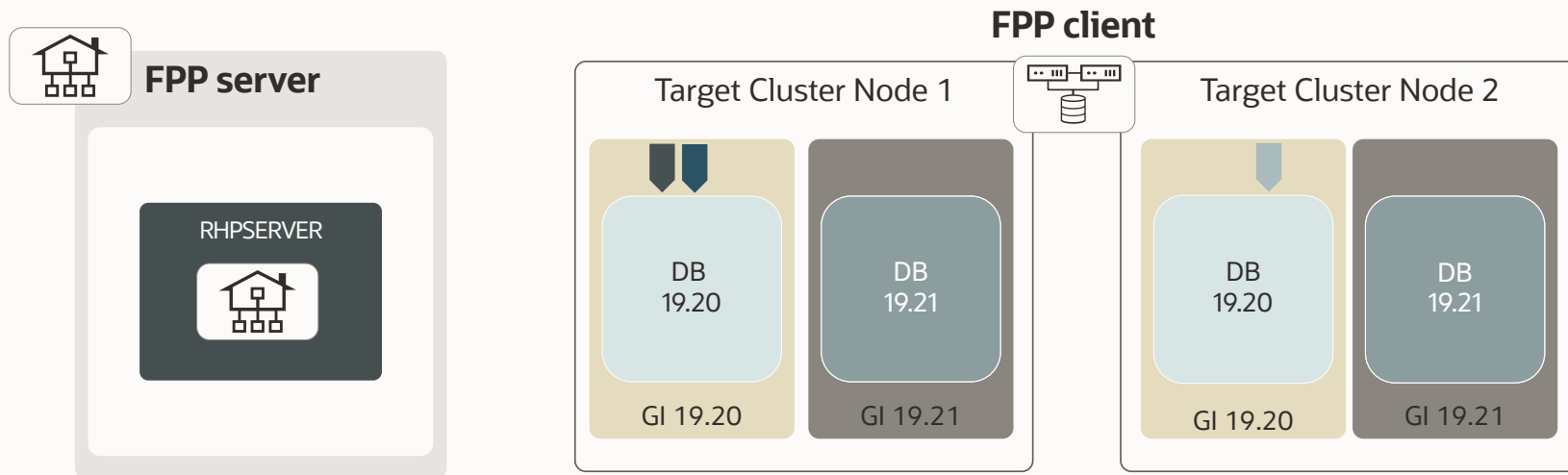
GI 19.20   GI 19.21

```
rhpctl move gihome -destwc WC_GI_1921_cl1 \
-sourcewc WC_GI_1920_cl1 -auto \
-dbhomes WC_DB_1920_cl1=WC_DB_1921_cl1 \
-drain_timeout 600
```

- Compute OS + GI patching possible on Exadata

Fleet Patching & Provisioning
Patch Simple

- Fleet Patching & Provisioning (FPP) offers repeatable standardized out-of-place patching automation at scale for the Oracle Database

- Fleet Patching & Provisioning provides features such as :
  - Gold image-based drift detection
  - Integrated job scheduling
  - User actions for extensibility
  - Comprehensive Exadata Patching

- Always adheres to the latest MAA best practices
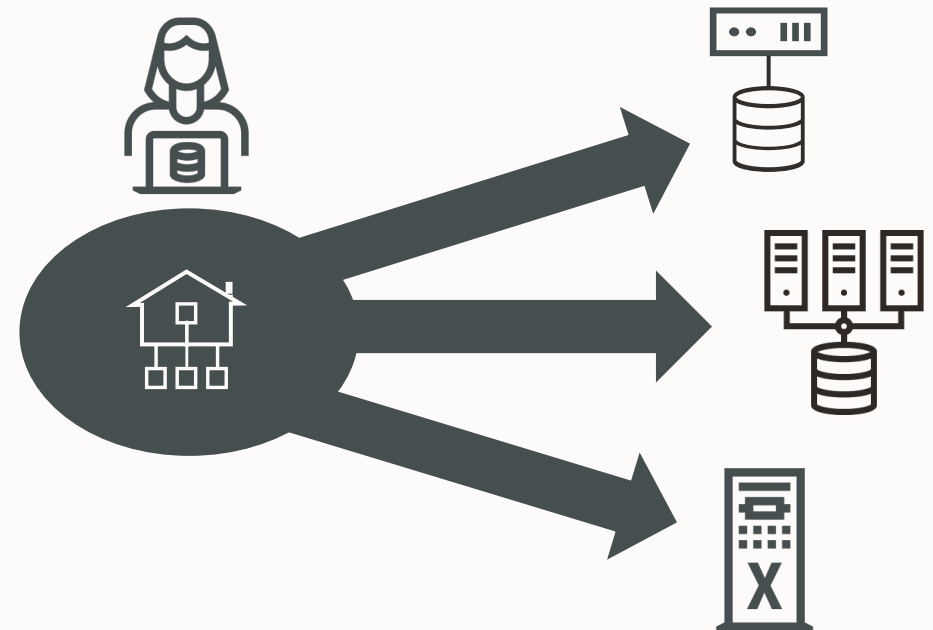
Available on-Premises and Oracle Cloud

Announcing Exadata Fleet Update

August 2, 2023 | 2 minute read

Philippe Fierens
Product Manager for Fleet Patching & Provisioning - Exadata MAA

What we are announcing

Oracle Cloud Infrastructure (OCI) Exadata Fleet Update for Oracle's Exadata Database Service on Cloud@Customer (ExaDB-C@C) and Exadata Database Service on Dedicated Infrastructure (ExaDB-D) is now generally available!

Exadata Fleet Update simplifies, standardizes, and enhances the Oracle Database and Grid Infrastructure patching experience. Exadata Fle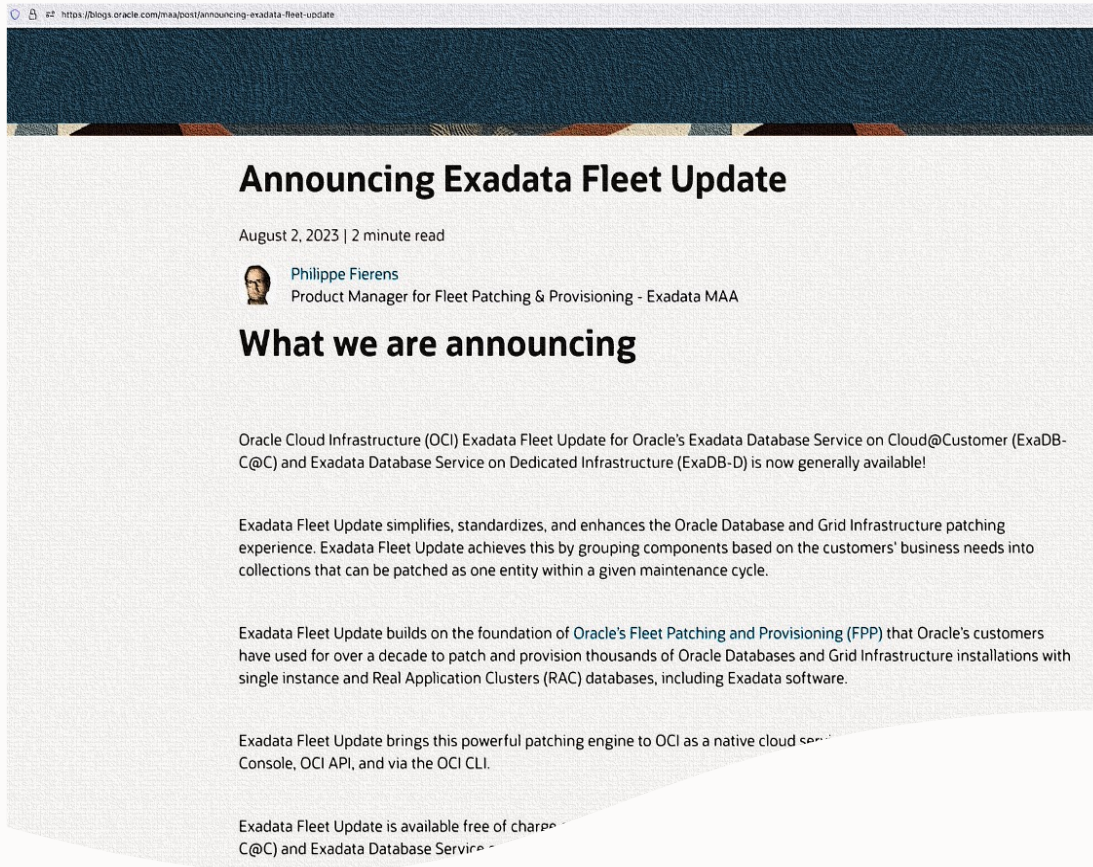et Update achieves this by grouping components based on the customers' business needs into collections that can be patched as one entity within a given maintenance cycle.

Exadata Fleet Update builds on the foundation of Oracle's Fleet Patching and Provisioning (FPP) that Oracle's customers have used for over a decade to patch and provision thousands of Oracle Databases and Grid Infrastructure installations with single instance and Real Application Clusters (RAC) databases, including Exadata software.

Exadata Fleet Update brings this powerful patching engine to OCI as a native cloud ser... Console, OCI API, and via the OCI CLI.

Exadata Fleet Update is available free of charge... C@C) and Exadata Database Service...

Please checkout our blogs :

https://blogs.oracle.com/maa/post/announcing-exadata-fleet-update

https://blogs.oracle.com/maa/post/exadata-fleet-update-concepts

Licensing

Targets need to be licensed with either :

- Oracle RAC or RAC One Node licenses
- Oracle Database Lifecycle Management Pack for Single Instances

When using FPP through Enterprise Manager Oracle Database Lifecycle Management Pack is needed for all targets.

Additional information

Oracle fleet patching and provisioning landing page
https://www.oracle.com/goto/fpp

Fleet patching and provisioning and maintenance 19c documentation
https://docs.oracle.com/en/database/oracle/oracle-database/19/fppad/fleet-patching-provisioning.html

FPP workshop on LiveLabs
https://apexapps.oracle.com/pls/apex/dbpm/r/livelabs/view-workshop?wid=599

FPP by Example Blog Series
https://blogs.oracle.com/maa/post/fleet-patching-provisioning-by-example-intro

Thank You