Supercharging your out-of-place patching experience with Fleet Patching and Provisioning (Part One)

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Photo by SpaceX on Unsplash

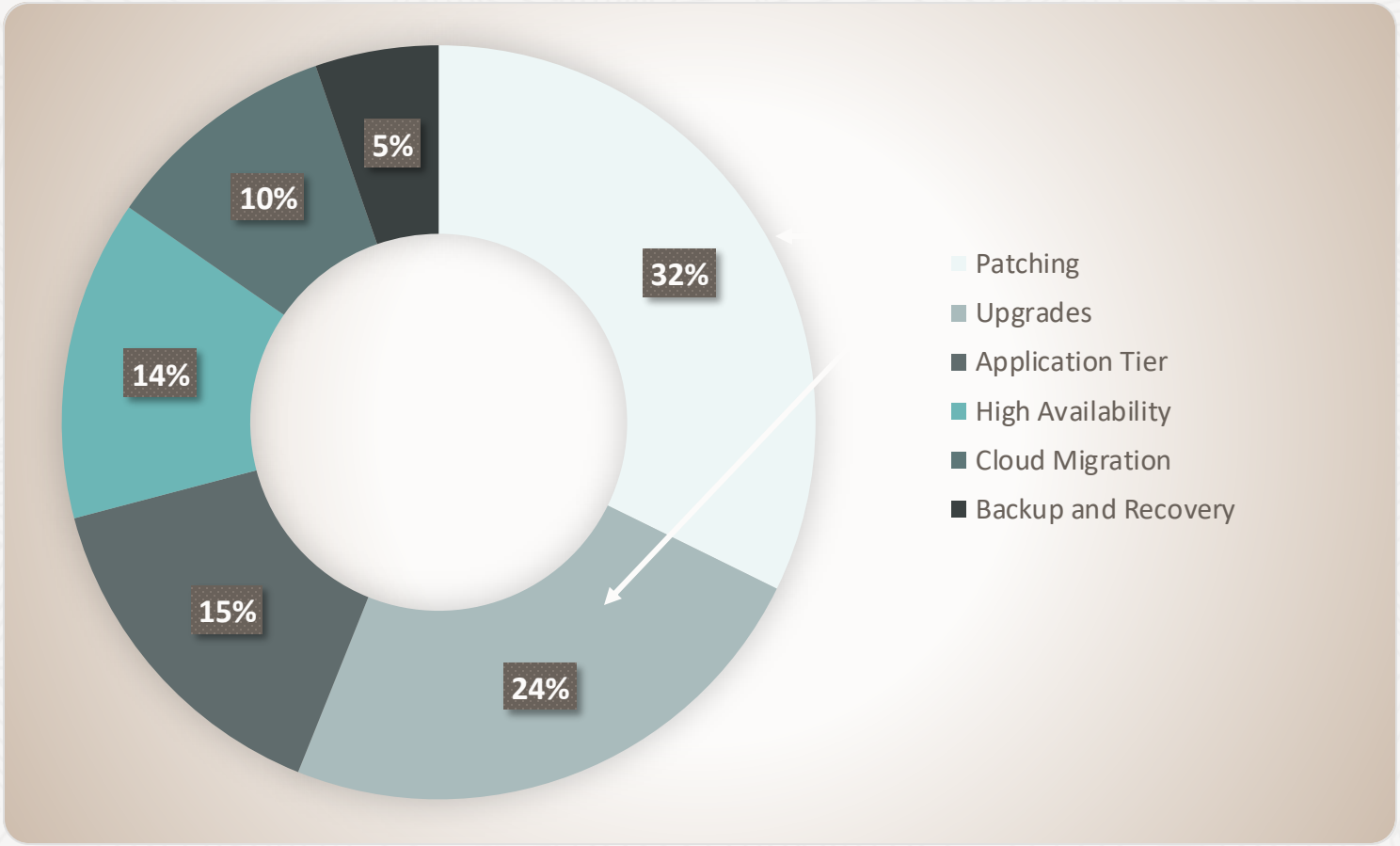
PHILIPPE FIERENS
Senior Principal Product Manager
Fleet Patching and Provisioning, Exadata Fleet Update,
Exadata MAA

pfierens philippe.fierens@oracle.com

@pfierens

https://philippefierens.eu

Planned Maintenance – a major pain point*



*Maximum Availability Architecture (MAA) Customer Summit survey results

Lifecycle management challenges

Top lifecycle management challenges

Keeping up with updates is time-consuming

Quarterly & Monthly patches are released to reduce risk of :

- Security issues
- Functional issues

Maintenance windows are difficult to obtain from application owners

Non-rolling patching requires longer downtime windows

Patching is a complex and labor intensive activity

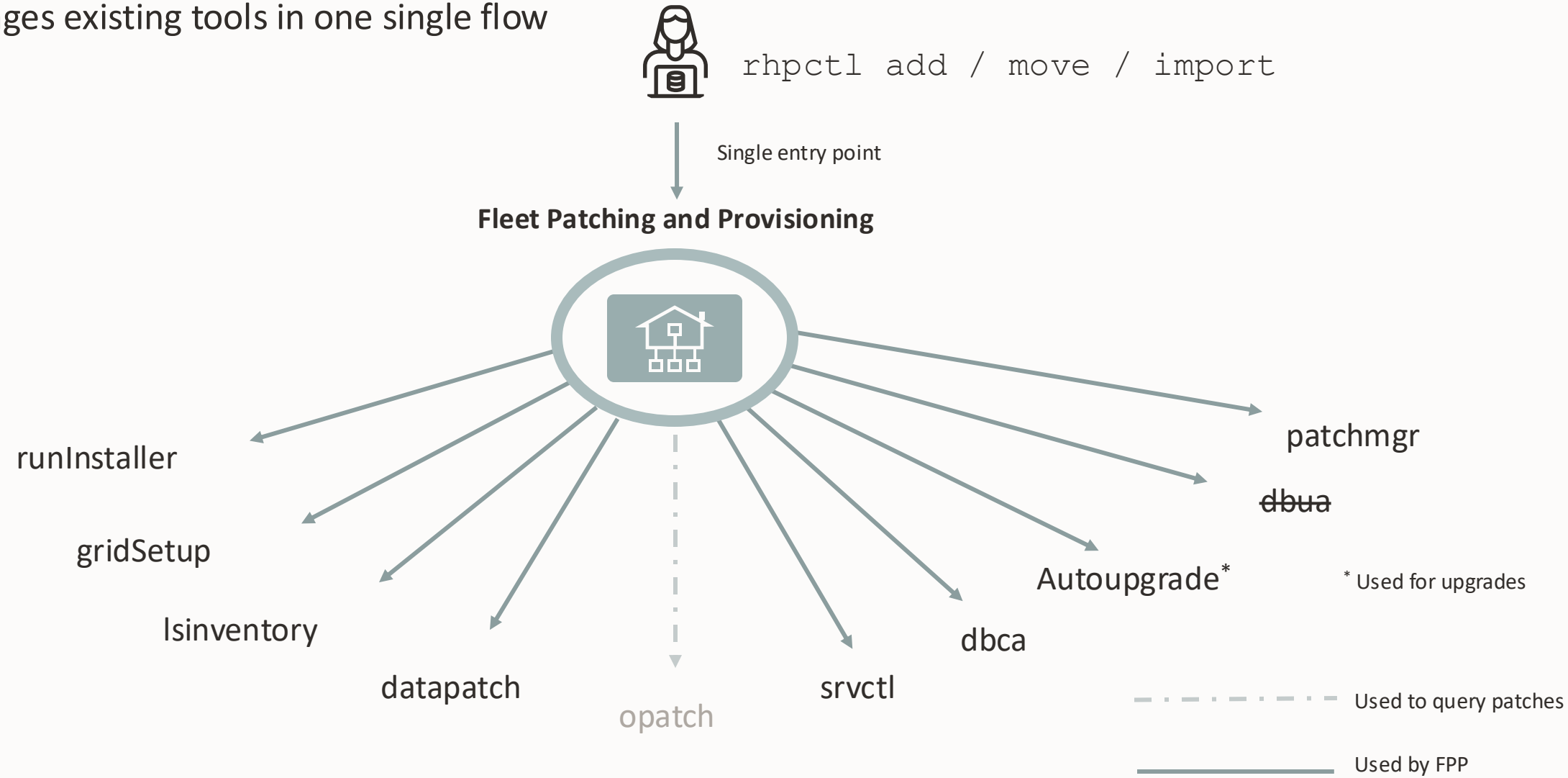
Expanding fleets need more personnel to maintain

Keeping software releases standardized is difficult

Configuration drift can lead to unexpected results and avoidable downtime

Patching complexity

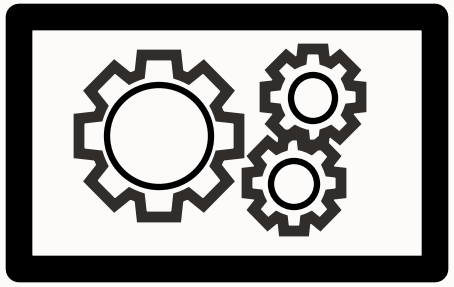
Leverages existing tools in one single flow



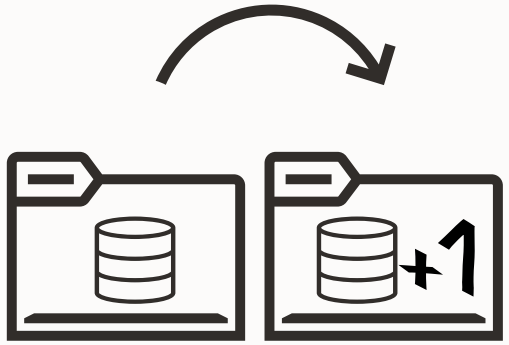
Fleet Patching and Provisioning

Automating out-of-place patching of the Oracle Database and Exadata Stack

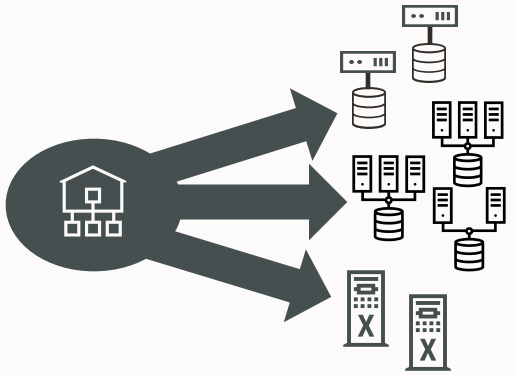
Fleet Patching and Provisioning (FPP) – Overview



Automated software mgmt engine for Oracle deployments



Gold image based out-of-place software maintenance



Allows for centralized lifecycle management

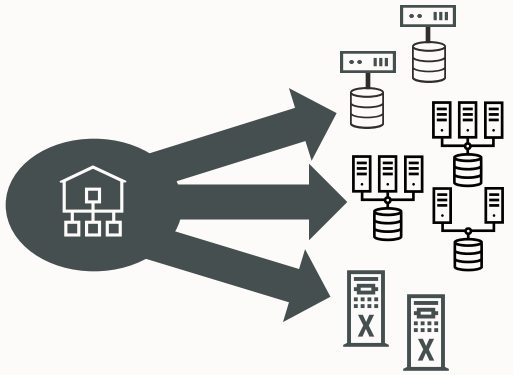
FPP Flavours

New In 23ai

FPP Lite

Start small
DB and GI patching in local cluster
Zero configuration needed
Custom user scripts are possible
Resumable actions
Formerly knows as FPP Local mode

FPP



Complete Lifecycle Management
Full functionality
Rich feature set
Centralized Management
Centralized Image repository

Some history

A brief History of Fleet Patching and Provisioning

Pioneers in Gold Image based Patching

- First release of Rapid Home Provisioning (RHP) as part of Grid Infrastructure
- DB Home Provisioning
- Database Patching

- Grid Infrastructure Support (deployment, patching, upgrade)
- Database Major Upgrades (with DBUA)

- Zero Downtime Upgrade
- REST APIs
- Exadata Support
- Dry-run evaluation
- Drift Reporting
- Authentication Plugins
- Command Scheduler
- Local Mode (DB patching and GI patching)

- Renamed to FPP
- Zero Downtime Oracle Grid Infrastructure Patching
- PDB Patching and Relocation
- Oracle Restart Support
- Automated Session Draining
- Server Peering
- Autoupgrade integration

- Autoupgrade integration
- Exadata patching enhancements

What's New in Oracle FPP 23ai

New In 23ai

Exadata Full Stack Patching enhancements

Full standby Database Maintenance Automation

Oracle Fleet Patching & Provisioning 23ai

Support for RAC Two Stage Rolling Updates

Backup restore and relocation FPP server

Store images as zip files

Move pre and post check enhancements (CVU, Exachk, Datapatch)

Transfer working copies as ZIP files

Scheduler improvements

Archiving & unarchiving of gold images

Local mode without Java Container

Single Server Rolling Database Maintenance

Register home as working copy

Add tags to resources for easy filtering and scheduling

Overview

Central mode Fleet Patching and Provisioning – Benefits

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

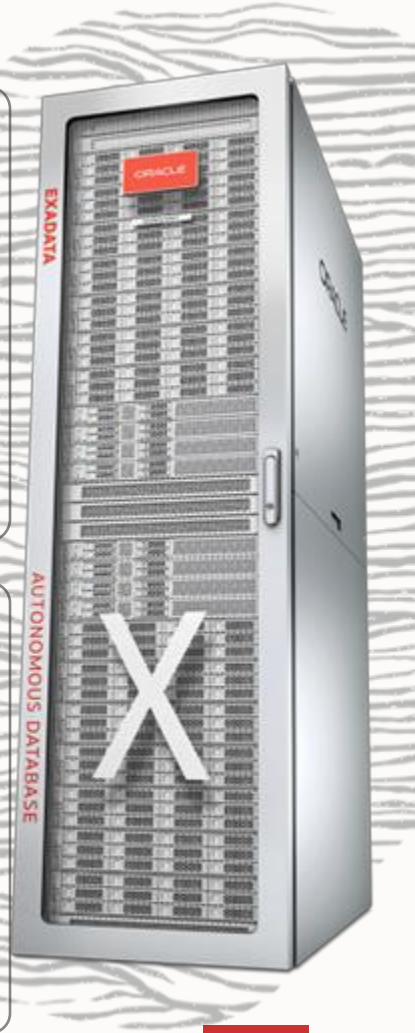
Oracle Grid Infrastructure

Provision

Patch

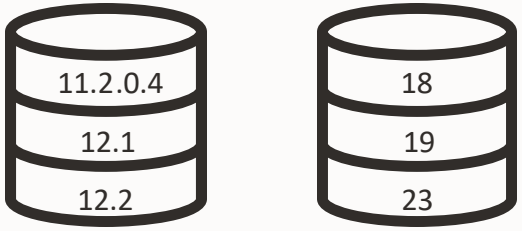
Upgrade

Scale

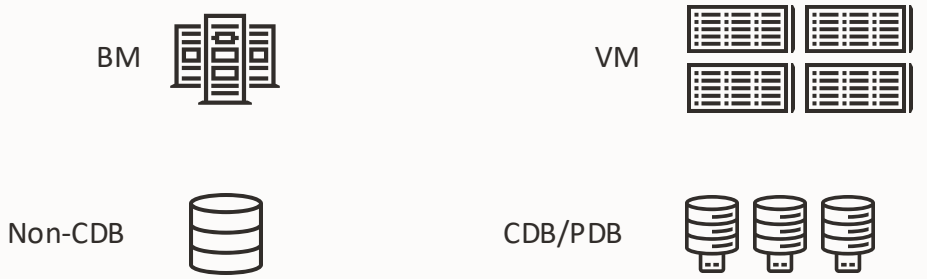


Fleet patching and provisioning support

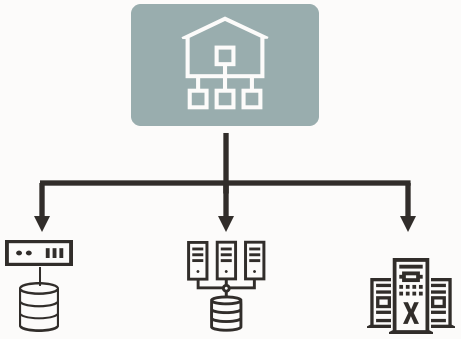
Database, GoldenGate and grid infrastructure



- Single instance
- Oracle restart
- Oracle RAC one
- Oracle RAC



FPP server



- Generic Software
- Customizable

Multi-OS

How to make use of FPP?

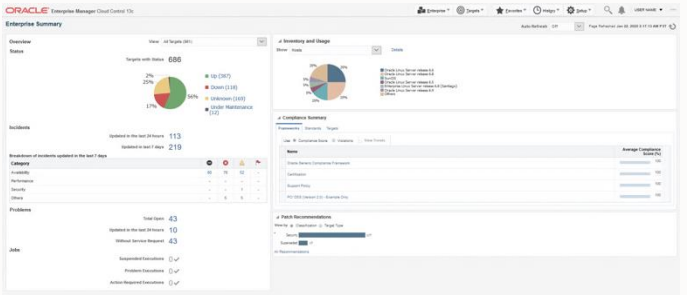
Command line

```
>
```

Rest API Calls

```
{ "xxx":
  { ….}
}, …
```

Using Enterprise Manager*



* Available since Oracle Enterprise Manager 13c Release 5 Update 14 (13.5.0.14)

Licensing

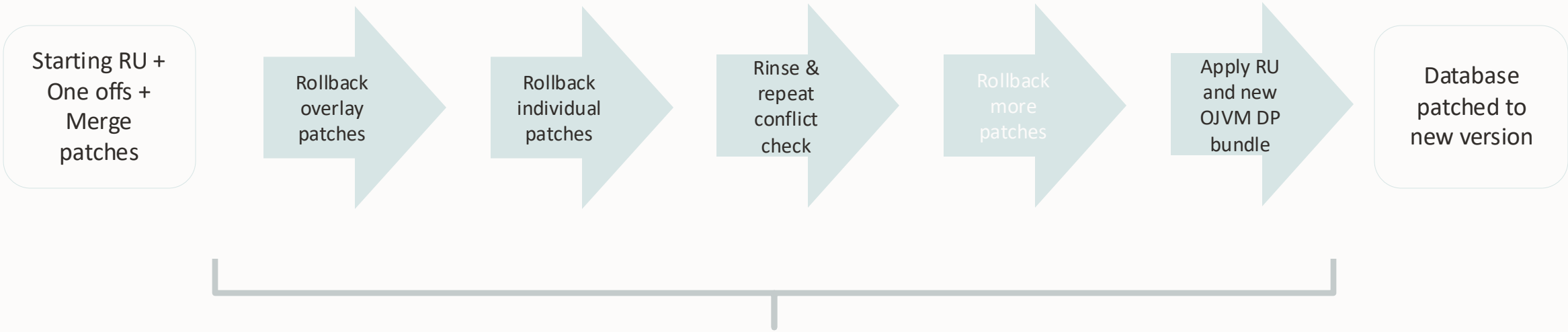
Targets need to be licensed with either :

- 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.

Workflow and Methodology

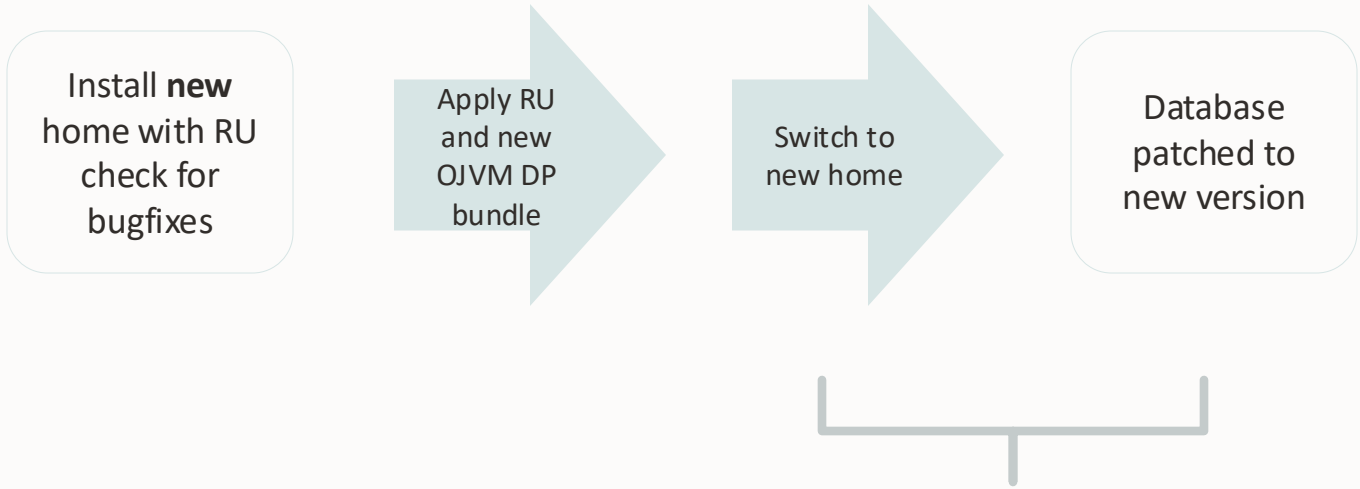
In-place patching



Database instance down during rollback and instance stop/start and datapatch apply

Example from https://mikedietrichde.com/2024/01/10/the-downsides-of-in-place-patching-and-a-patching-lab/

Out-of-place patching

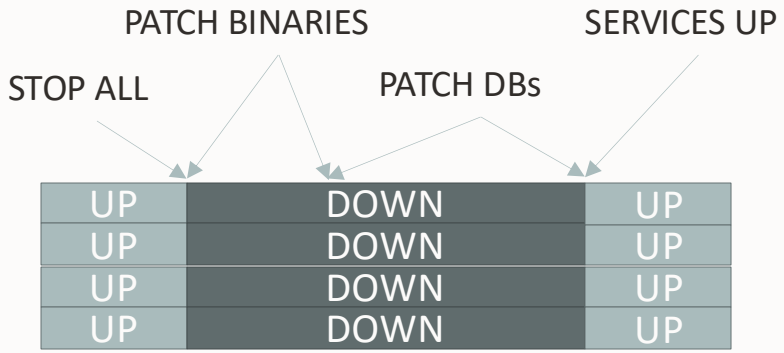


Database instance down for instance reboot and datapatch execution

FPP uses out-of-place patching

Leading the way to standardization and rolling patching

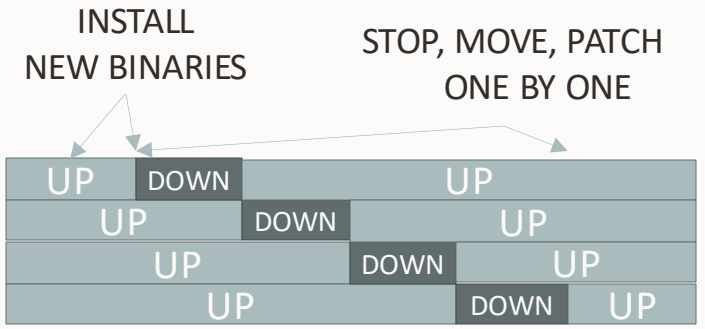
In-place patching:



- No easy rollback
- Longer downtime
- Complex process
- Error prone
- Standards not enforced

Out-of-place patching:

ORACLE RECOMMENDED

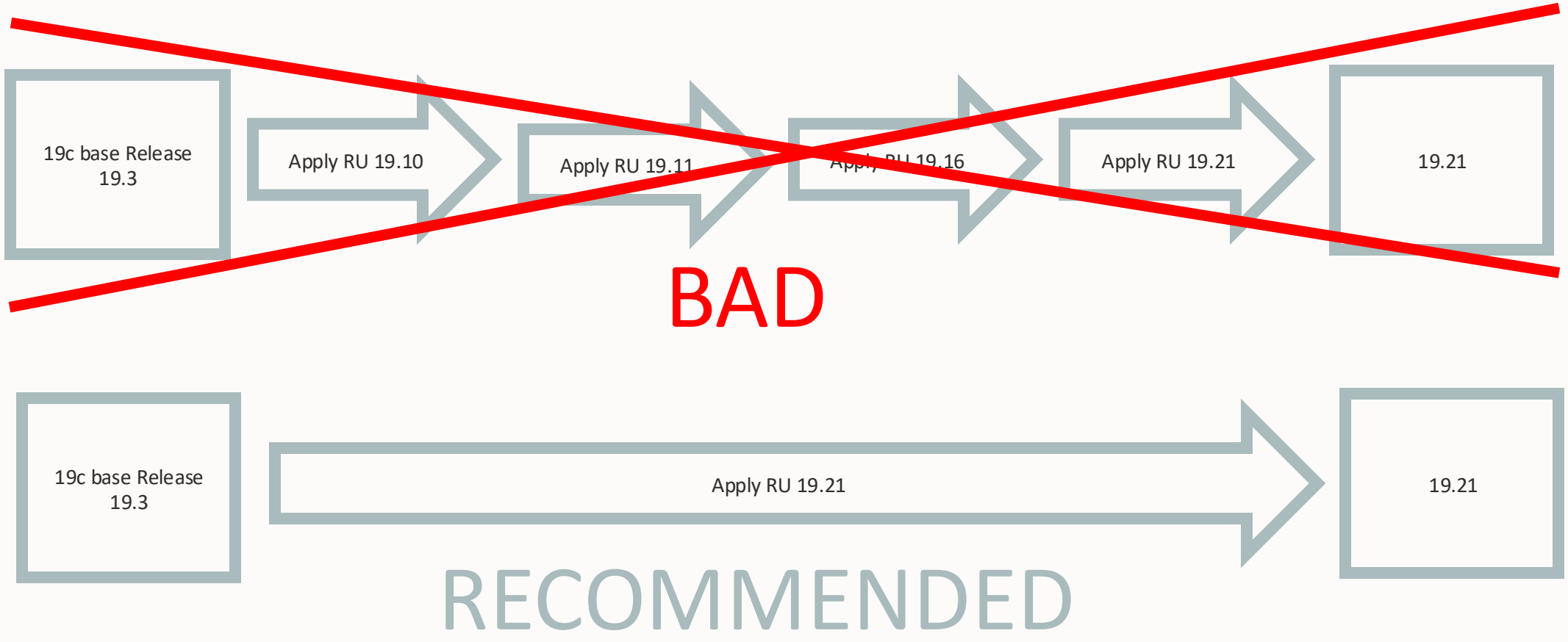


- Easy rollback
- Shorter downtime
- **Build binaries once** and use everywhere
- Easier Planning
- Built-in standardization

Workflow

Recommended strategy for gold image creation

Example creating a gold image for 19.16



How to get gold images

19c

Create yourself check :

https://blogs.oracle.com/maa/post/fpp-by-example-part-3-creating-gold-images

Create MOS ticket and ask support to create

Check MOS note :

Creating Gold Image for Oracle Database and Grid Infrastructure Installations (Doc ID 2915366.2)

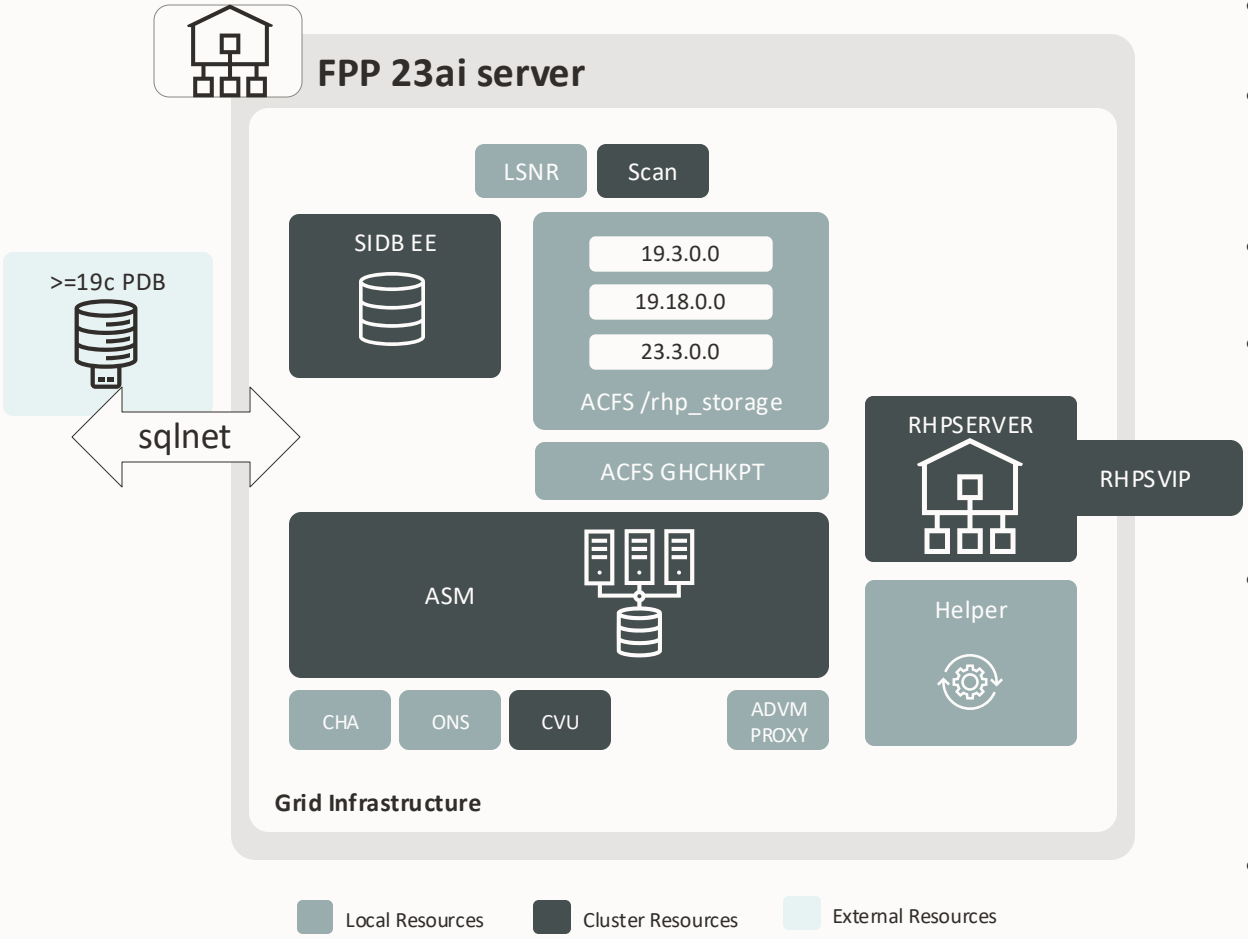
23ai

RUs are distributed as Full versions

Architecture and concepts

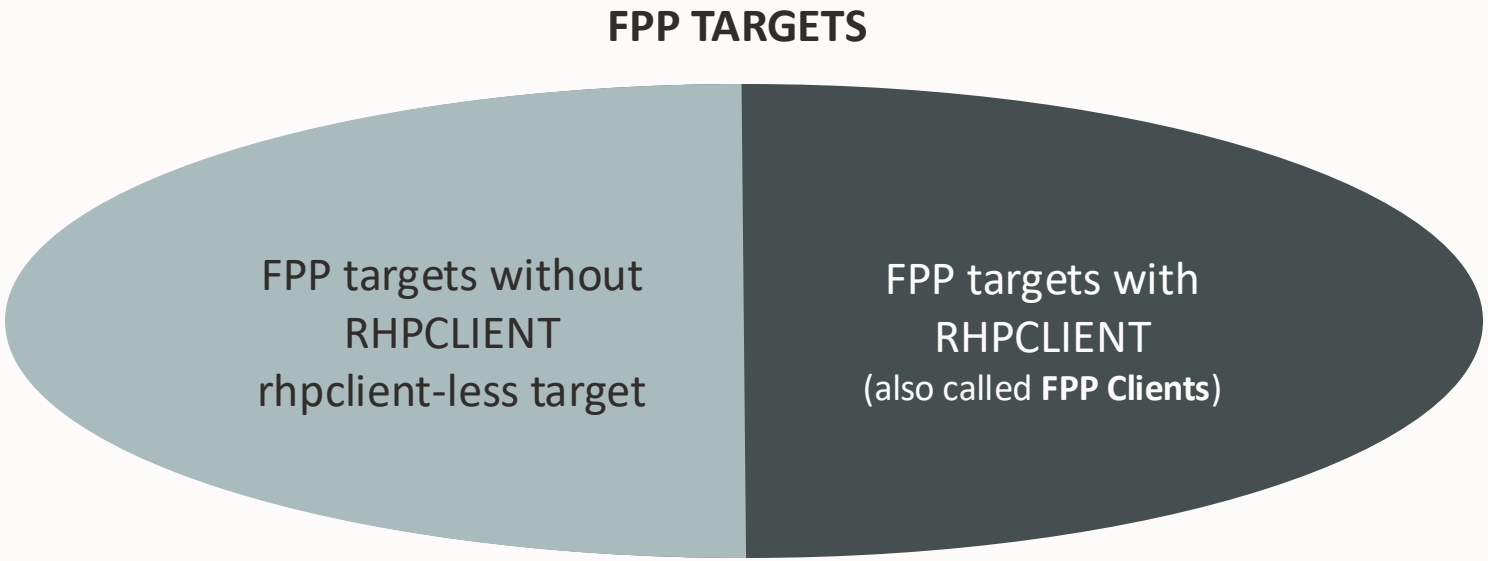
FPP server architecture 23ai

New In 23ai



- Server installed, ready to host Grid Infrastructure
  Required firewall ports are open between FPP server and targets
- As from 23ai metadata can be stored in :
  - Single Instance Oracle EE database (Limited license included)
  - Oracle Database of choice RAC (One)
- Remove the local automaton
  ```
  # srvctl remove rhpserver -f
  ```
- Create the Oracle EE Single Instance Database
  ```
  $GRID_HOME/crs/install/reposScript.sh
  -db_home=database_home -mode="Install"
  -diskgroup=disk_group_name
  ```
- Configure and start the RHPSERVER (as root)
  ```
  # srvctl add rhpserver -storage /rhp_storage
  -diskgroup data -rhpsvip_address xxx.xxx.xxx.xxx
  -dbType FPPDB
  # srvctl start rhpserver
  ```
- Start working with RHPCTL
  ```
  # rhpctl import image -image DB233_Base \
    -zip /tmp/LINUX.X64_233000_db_home.zip \
    -imagetype ORACLEDBSOFTWARE
  ```

Target Types

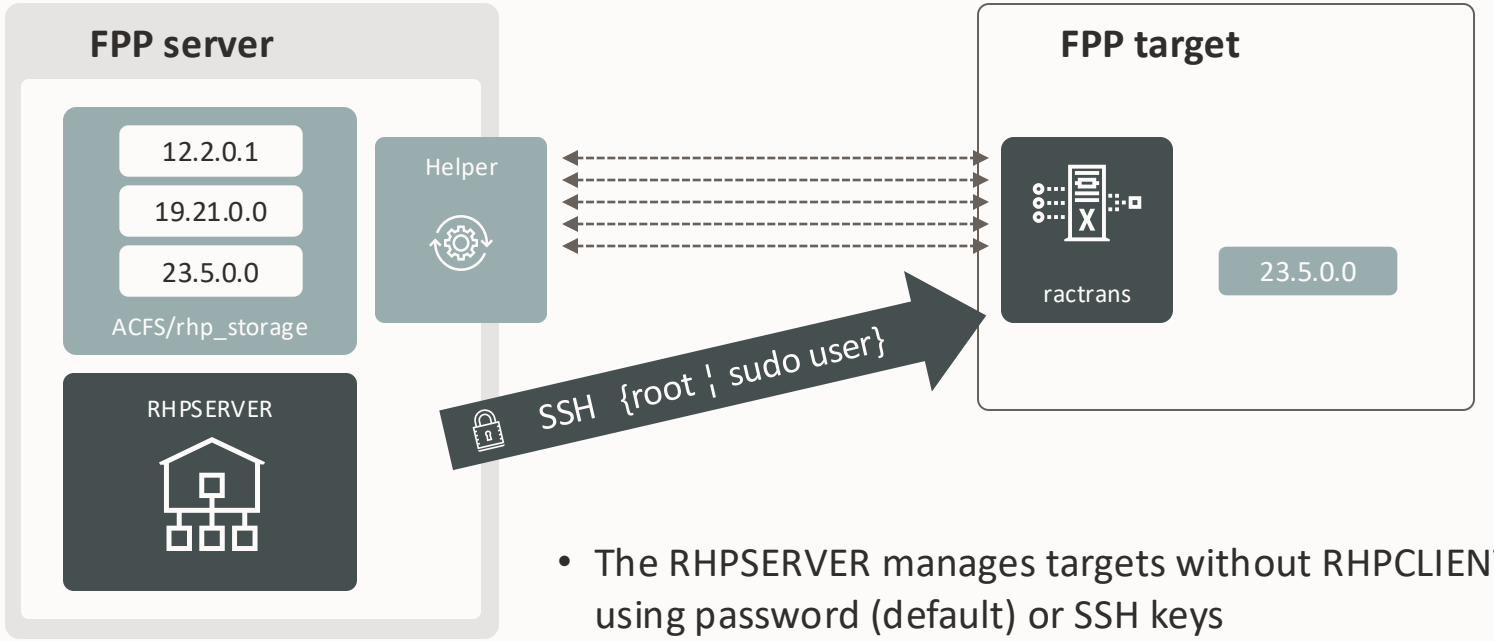


- **GI 12.1 or non-GI target deployments**
- Operations initiated from FPP server only
- Connection via remote SSH commands

- **Grid Infrastructure Clusters release 12.2+**
- Operations initiated from FPP server or client
- Connection via JMX and local processes
- Supports some additional capabilities compared to non-RHPC targets

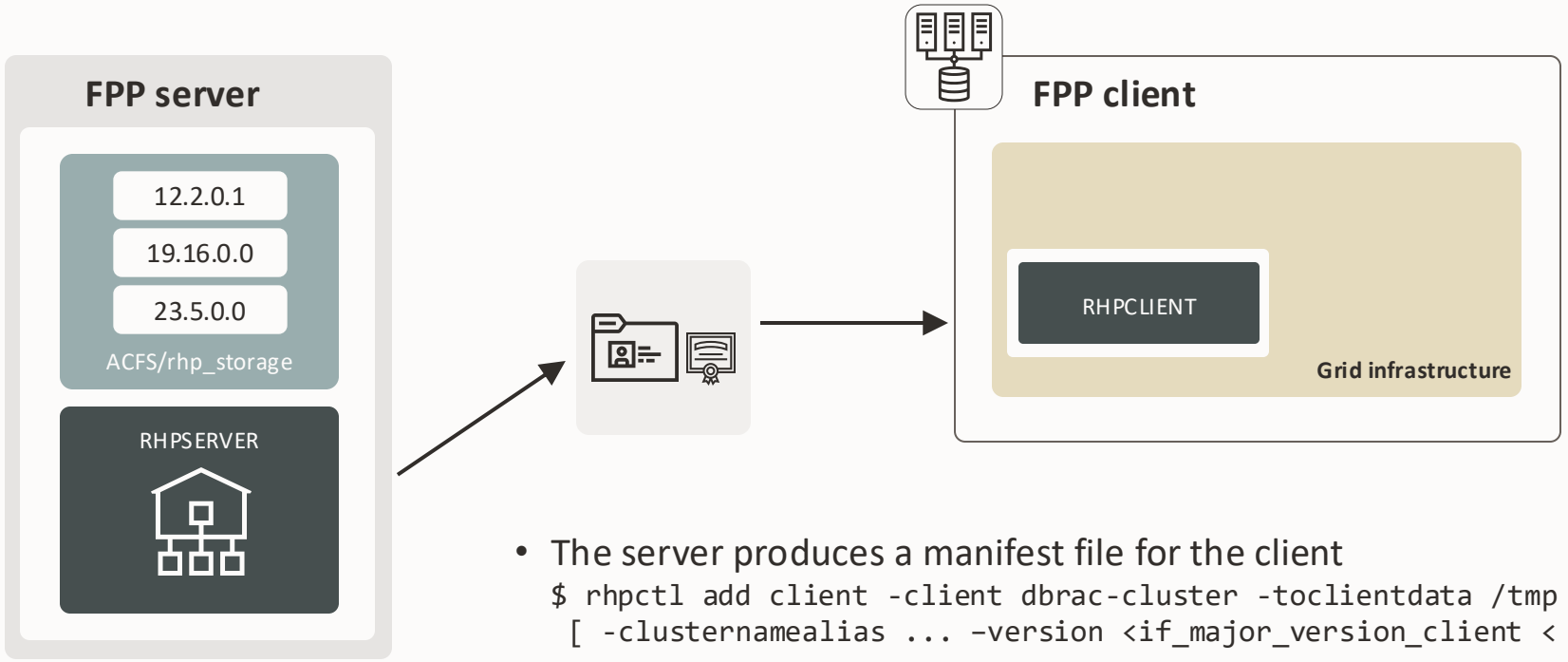
Getting started

FPP targets without RHPCLIENT



- The RHPSERVER manages targets without RHPCLIENT through SSH using password (default) or SSH keys
- Named credentials are stored in the FPP Server OCR
- Working copies are transferred to the target using «ractrans»
  `$ rhpctl add workingcopy -image … -path … -workingcopy … -targetnode … -root`
- The progress is tracked thanks to a listener on the FPP Server.

Adding FPP clients



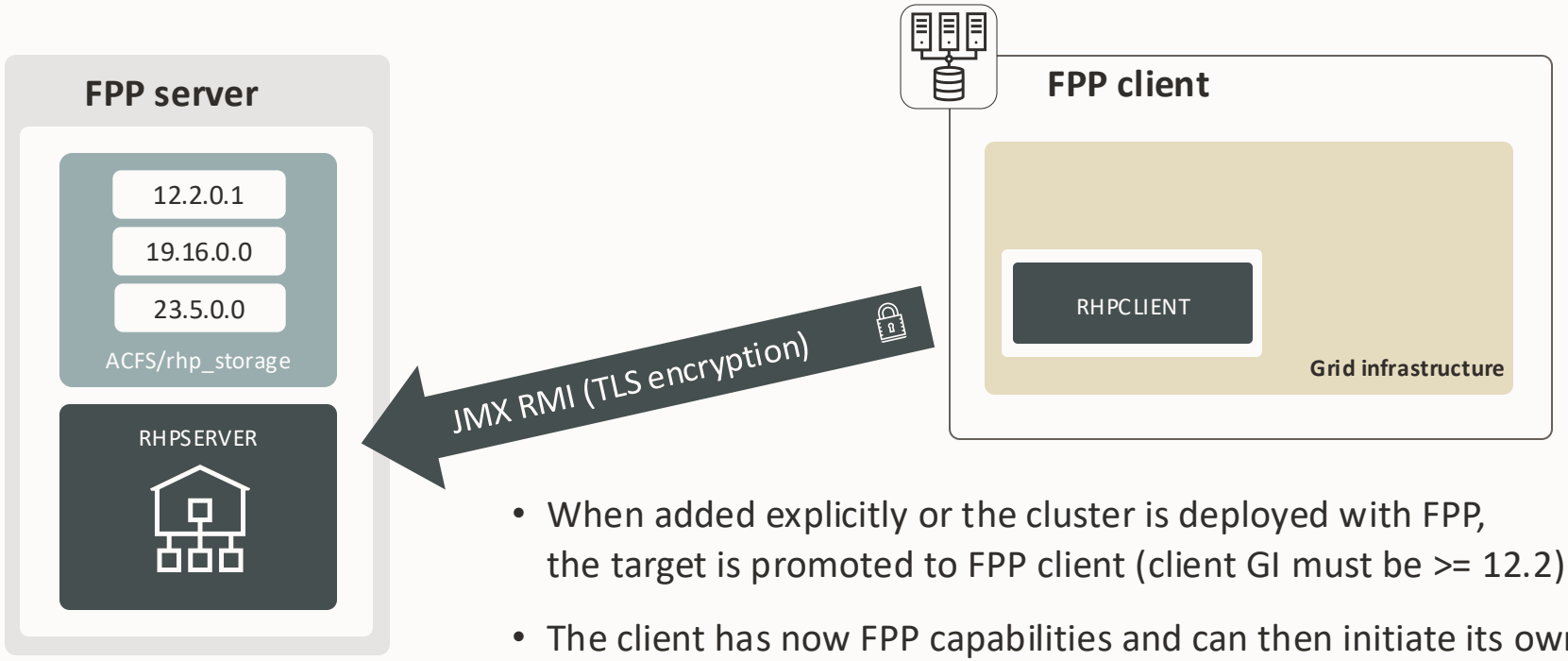
- The server produces a manifest file for the client

```
$ rhpctl add client -client dbrac-cluster -toclientdata /tmp
 [ -clusternamealias ... –version <if_major_version_client < major_version server>]
```

- It must be copied on the client, which uses it to connect to the server (as root)

```
# srvctl add rhpclient -clientdata /tmp/dbrac-cluster-cluster.xml
$ srvctl start rhpclient
$ rhpctl query server
    Rapid Home Provisioning Server (RHPS): fpps01
    Storage base path: /rhp_storage
    Disk Groups: DATA
    Port number: 8896
```

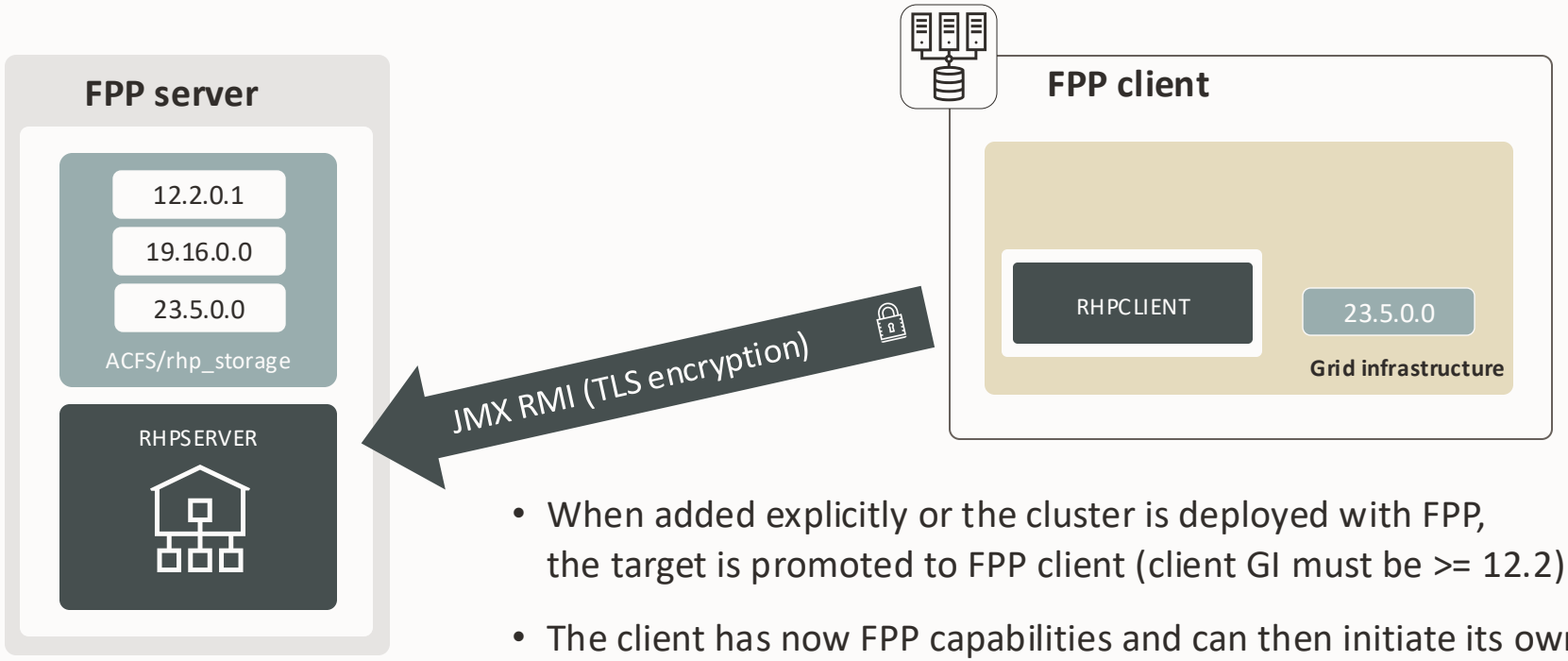
FPP clients



- When added explicitly or the cluster is deployed with FPP, the target is promoted to FPP client (client GI must be >= 12.2)
- The client has now FPP capabilities and can then initiate its own operations
- FPP client and server can communicate through TLS encrypted JMX:RMI. SSH is not needed anymore, root credentials or sudo also not needed.
- file transfer via “ractrans".

```
rhpctl add workingcopy -image … -path … -workingcopy … -client …
```

FPP clients



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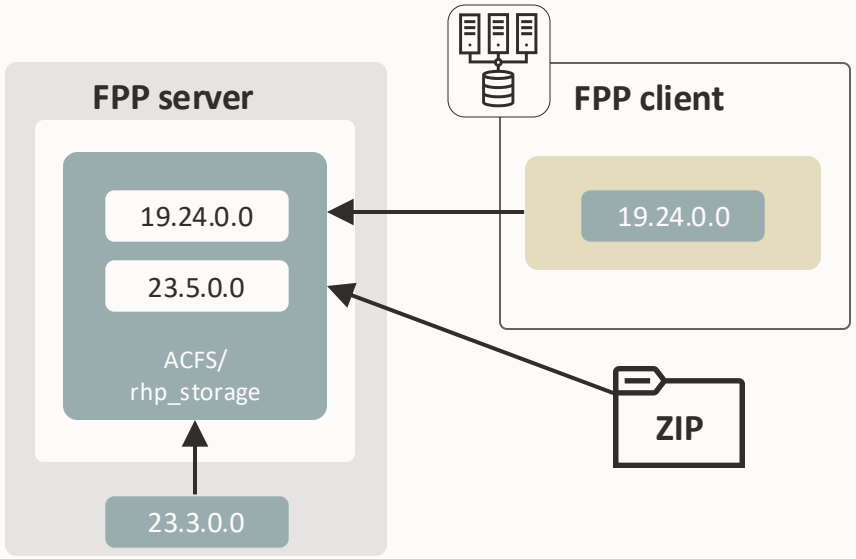
```
rhpctl add workingcopy -image … -path … -workingcopy … -client …
```

Importing images

rhpctl import image



- From zip file
- From existing unmanaged home (local or remote)

- Recommended to :
  1) Import on the FPP server itself, using local home or zip
  2) Start from base release 19.3 (for 19c) then apply RU's and one offs

Check https://blogs.oracle.com/maa/post/fpp-by-example-part-3-creating-gold-images

In 23ai RUs are always full versions
Custom images with one-offs on a specific RU can be asked via MOS

Creating Gold Image for Oracle Database and Grid Infrastructure Installations (Doc ID 2915366.2)

Fleet Patching & Provisioning by Example

Import Image

Importing images - Example

```
rhpctl import image -image gi_19_24_0 -path /u01/app/19.0.0.0/grid -imagetype ORACLEGISOFTWARE
fpps01.pub.fpplivelab.oraclevcn.com: Audit ID: 4
fpps01.pub.fpplivelab.oraclevcn.com: Creating a new ACFS file system for image " gi_19_24_0" ...
fpps01.pub.fpplivelab.oraclevcn.com: Copying files...
fpps01.pub.fpplivelab.oraclevcn.com: Copying home contents...
fpps01.pub.fpplivelab.oraclevcn.com: Changing the home ownership to user grid...
fpps01.pub.fpplivelab.oraclevcn.com: Changing the home ownership to user grid...


rhpctl import image -image db_19_24_0 -path /u01/app/oracle/product/19.0.0.0/dbhome_1
fpps01.pub.fpplivelab.oraclevcn.com: Audit ID: 5
fpps01.pub.fpplivelab.oraclevcn.com: Creating a new ACFS file system for image " db_19_24_0" ...
fpps01.pub.fpplivelab.oraclevcn.com: Copying files...
fpps01.pub.fpplivelab.oraclevcn.com: Copying home contents...
fpps01.pub.fpplivelab.oraclevcn.com: Changing the home ownership to user oracle...
fpps01.pub.fpplivelab.oraclevcn.com: Changing the home ownership to user grid...
```


Querying images - Example

```
rhpctl query image -image gi_19_24_0
fpp19c-c11.sub01171652351.lab.oraclevcn.com: Audit ID: 1775
Image name: GI_1924_0
Owner: grid@dbSysmzylwmqq
Site: dbSysmzylwmqq
Access control: USER:grid@dbSysmzylwmqq
Access control: ROLE:OTHER
Access control: ROLE:GH_IMG_PUBLISH
Access control: ROLE:GH_IMG_ADMIN
Access control: ROLE:GH_IMG_VISIBILITY
Parent Image:
Software home path: /rhp/images/iGI_1924_0612605/.ACFS/snaps/iGI_1924_0/swhome
Image state: PUBLISHED
Image size: 11248 Megabytes
Image Type: ORACLEGISOFTWARE
Image Version: 19.0.0.0.0:19.24.0.0.0
Groups configured in the image:
OSDBA=oinstall,OSASM=oinstall,OSBACKUP=oinstall,OSDG=oinstall,OSKM=oinstall,OSRAC=oinstall
Image platform: Linux_AMD64
Interim patches installed: 34697081,36414915,36538667,36758186,36648174,36590554,36587798,36582781
Contains a non-rolling patch: FALSE
Complete: TRUE
```

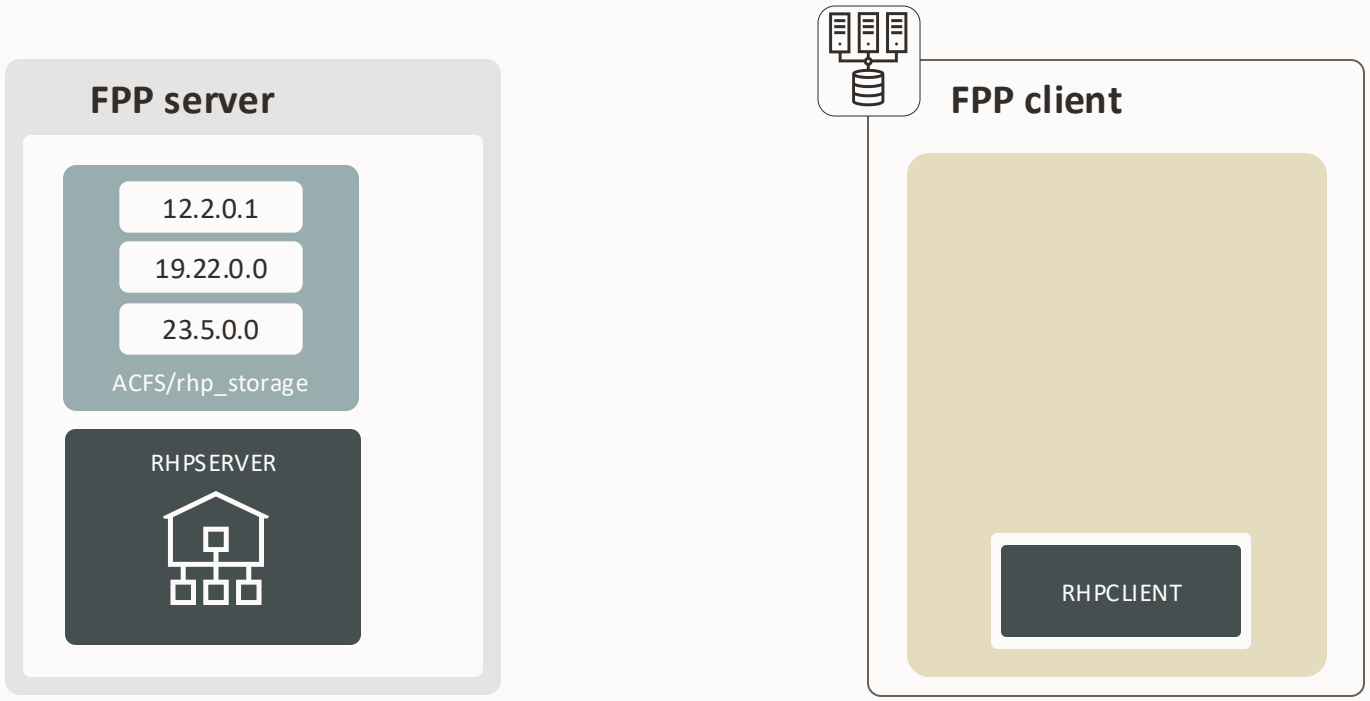
Gold image storage on the FPP server

```
df -h /rhp/images/iGI_1924_0612605/.ACFS/snaps/iGI_1924_0/swhome
Filesystem              Size  Used Avail Use% Mounted on
/dev/asm/ghvol277286-41   24G   14G   11G  57% /rhp/images/iGI_1924_0612605

acfsutil snap info /rhp/images/iGI_1924_0612605
snapshot name:               iGI_1924_0
snapshot location:           /rhp/images/iGI_1924_0612605/.ACFS/snaps/iGI_1924_0
RO snapshot or RW snapshot:  RO
parent name:                 /rhp/images/iGI_1924_0612605
snapshot creation time:      Mon Aug 12 12:03:18 2024
file entry table allocation: 168165376   ( 160.38 MB )
storage added to snapshot:   168165376   ( 160.38 MB )
```

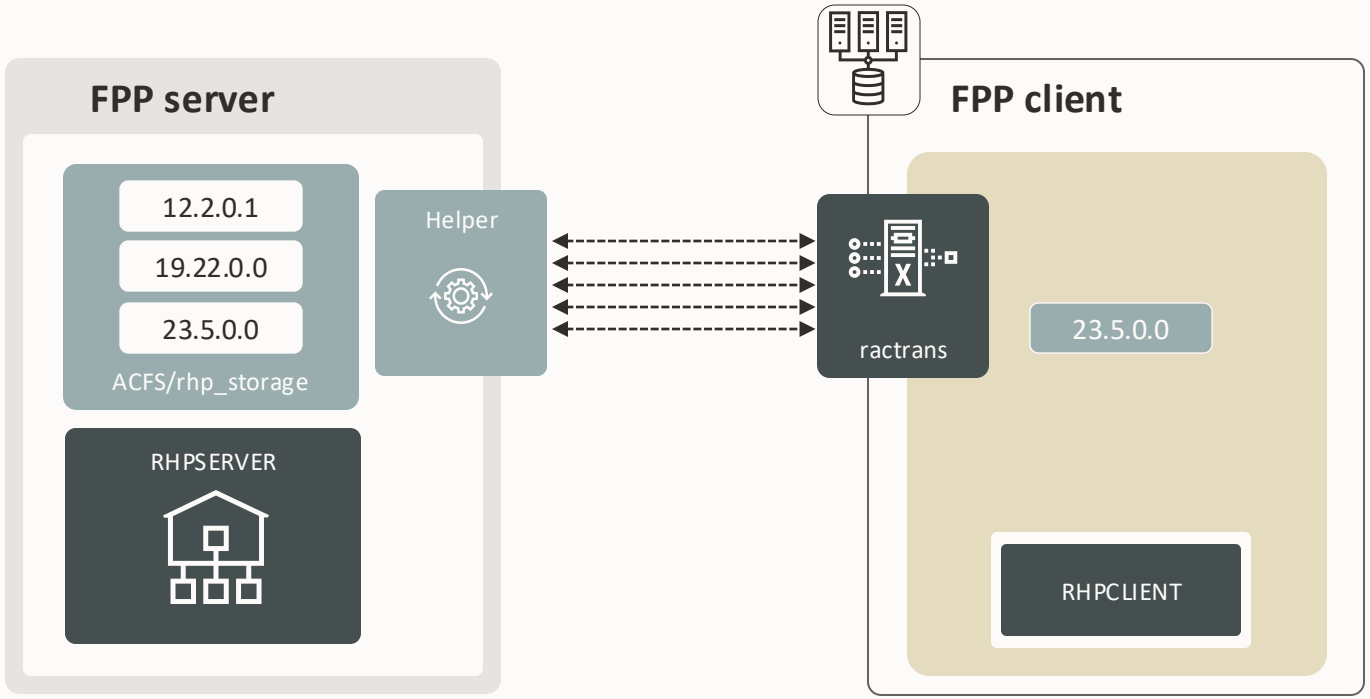
Patching and Provisioning

Adding workingcopies with LOCAL storagetype



- Filesystem existence and size are not managed by FPP
- The Oracle Home will be on a local filesystem (must provision on all cluster nodes)
- Whether client (JMX) or not (SSH), the transfer is done via ractrans.
- Minimum 6 ports needed, configurable with:
  `srvctl modify rhpserver -port_range <range>`

Adding workingcopies with LOCAL storagetype



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Adding workingcopies FPP Client vs rhpclient-less target

FPP Client

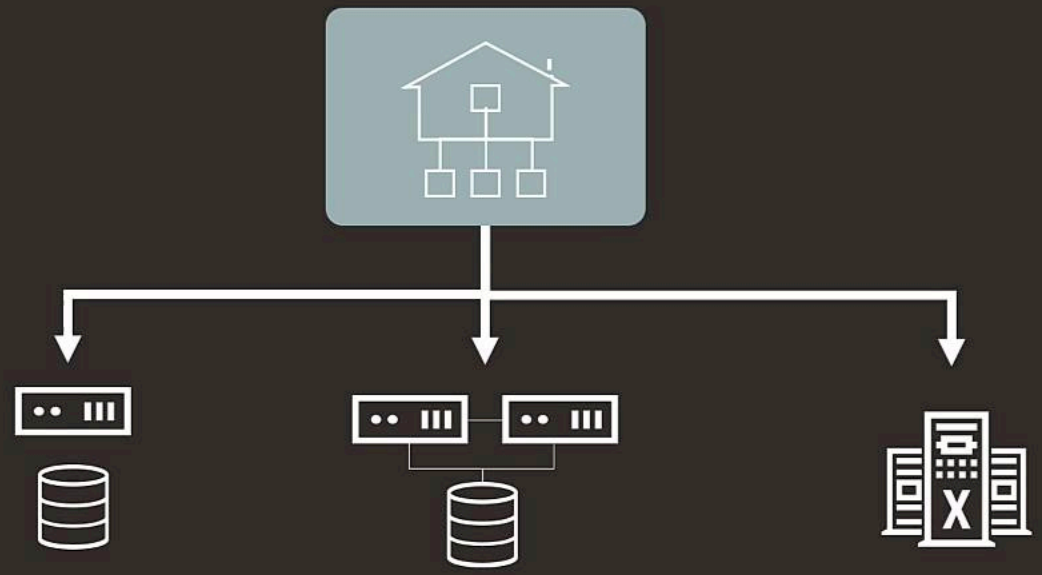
Rhpclient-less target

```
rhpctl add workingcopy –image <img_name> -workingcopy <wc_name>
-oraclebase <oracle_base> -path <oracle_home> -user <oracle_home_user>
-groups OSDBA=dba,…,OSKM=dba,OSRAC=dba
```

```
-client <client_name>
```

```
-targetnode target
-root | -cred cred_name | -sudouser sudo_username | -auth sshkey
-arg1 user:ssh_user
-arg2 identity_file:path_to_identity_file
-arg3 sudo_location:path_to_sudo_binary
```

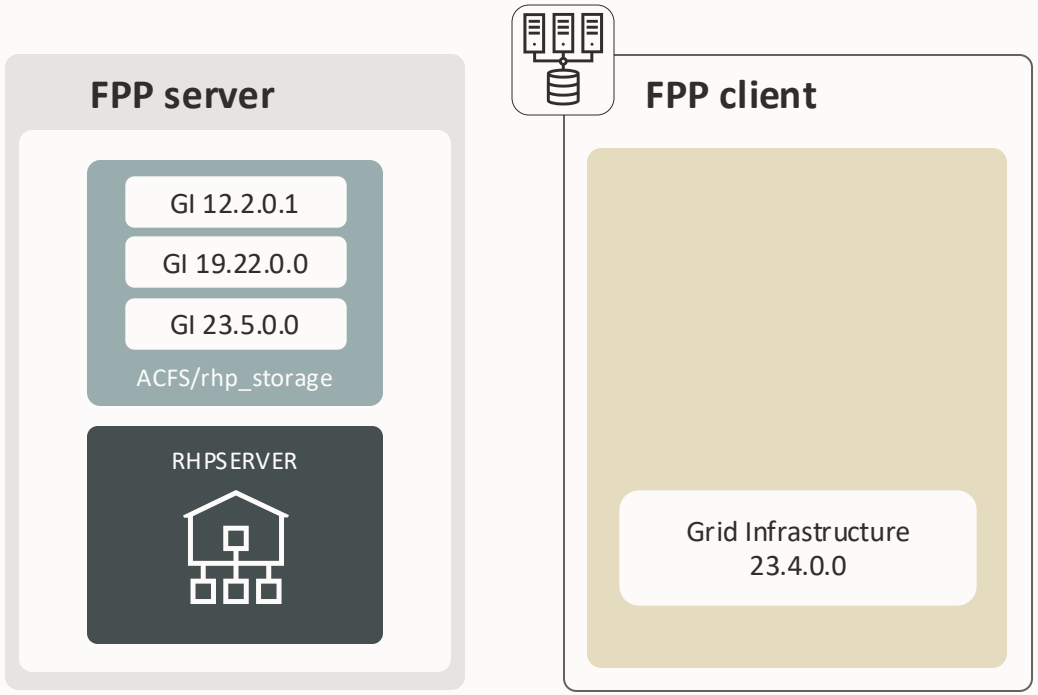
It is recommended to always specify the groups



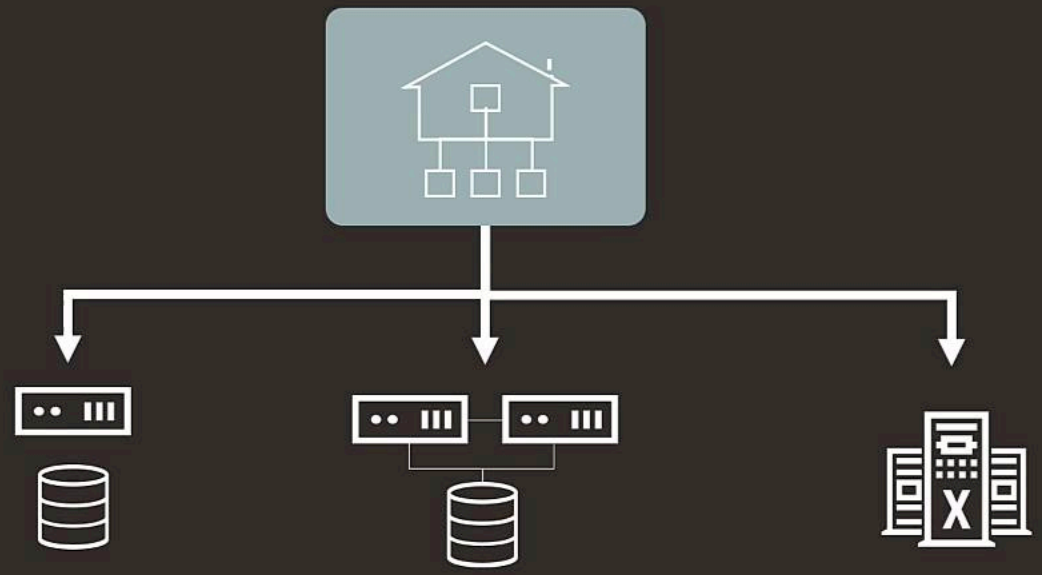
Fleet Patching & Provisioning by Example

Adding Database Working Copy

Adding grid infrastructure workingcopy to an existing server/cluster



- GI working copies can only be LOCAL
- GI Software copy works like database software copies
- FPP detects users and groups and assign correct ownership
- A GI stack already exists, the install is «software_only»



Fleet Patching & Provisioning by Example

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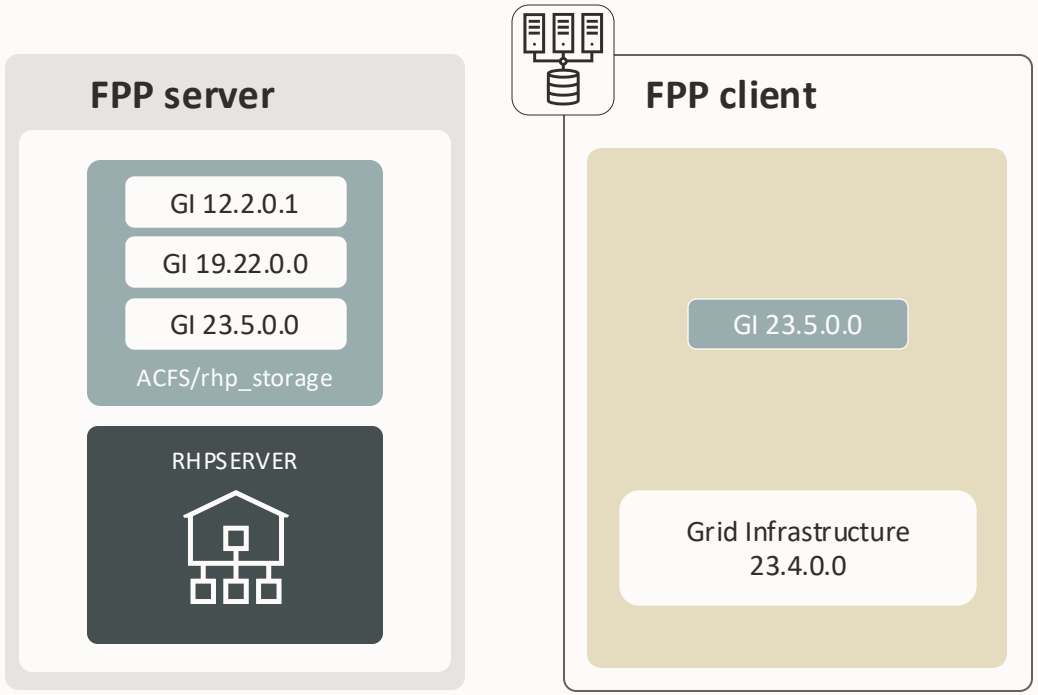

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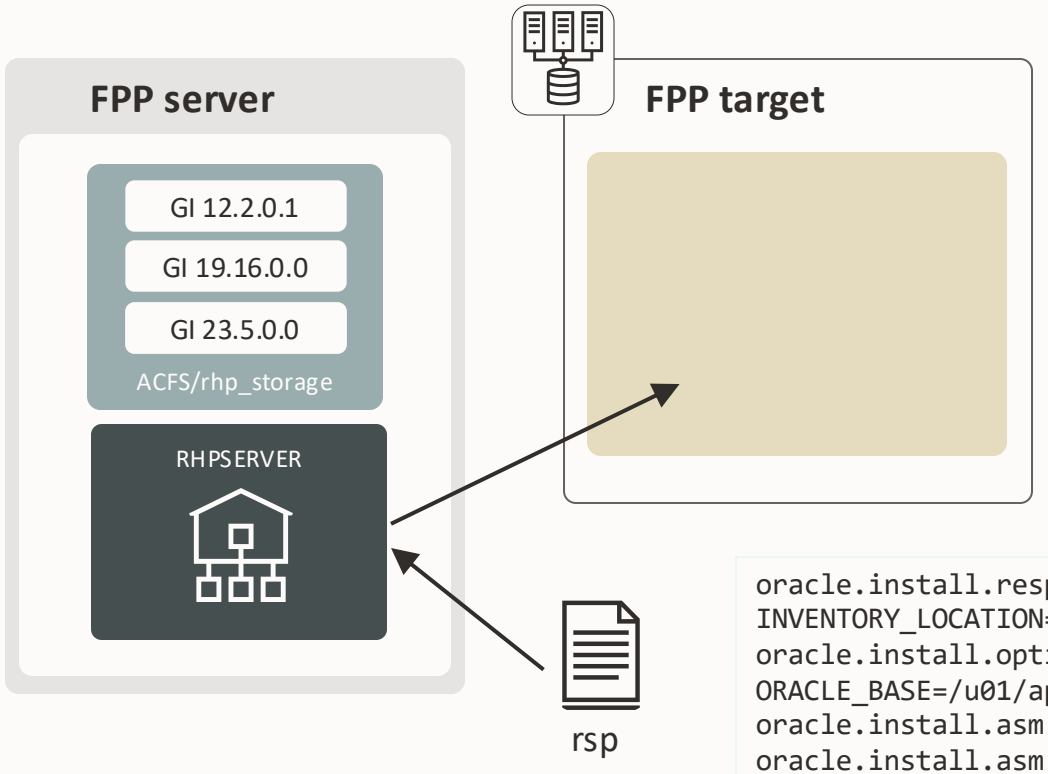
- FPP detects users and groups and assign correct ownership
- A GI stack already exists, the install is «software_only»

```
rhpctl add workingcopy –workingcopy <workingcopy_name>
  -image <image_name> \
  -oraclebase <..> -softwareonly \
  -path <..>
```

Adding grid infrastructure workingcopy to a new server/cluster



- A responsfile can be provided to configure the cluster
- GI Software is copied
- FPP takes care of installing and configuring the cluster

```
oracle.install.responseFileVersion=/oracle/install/rspfmt_crsinstall_response_schema_v19.0.0
INVENTORY_LOCATION=/u01/app/oraInventory
oracle.install.option=HA_CONFIG
ORACLE_BASE=/u01/app/grid
oracle.install.asm.OSDBA=dba
oracle.install.asm.OSOPER=oper
oracle.install.asm.OSASM=asmadmin
oracle.install.asm.SYSASMPassword=WelcomeWelcome##123
oracle.install.asm.diskGroup.name=DATA
oracle.install.asm.diskGroup.redundancy=EXTERNAL
oracle.install.asm.diskGroup.AUSize=4
oracle.install.asm.diskGroup.disks=/dev/oracleasm/asm-disk1
oracle.install.asm.diskGroup.diskDiscoveryString=/dev/oracleasm/*
oracle.install.asm.monitorPassword=WelcomeWelcome##123
```

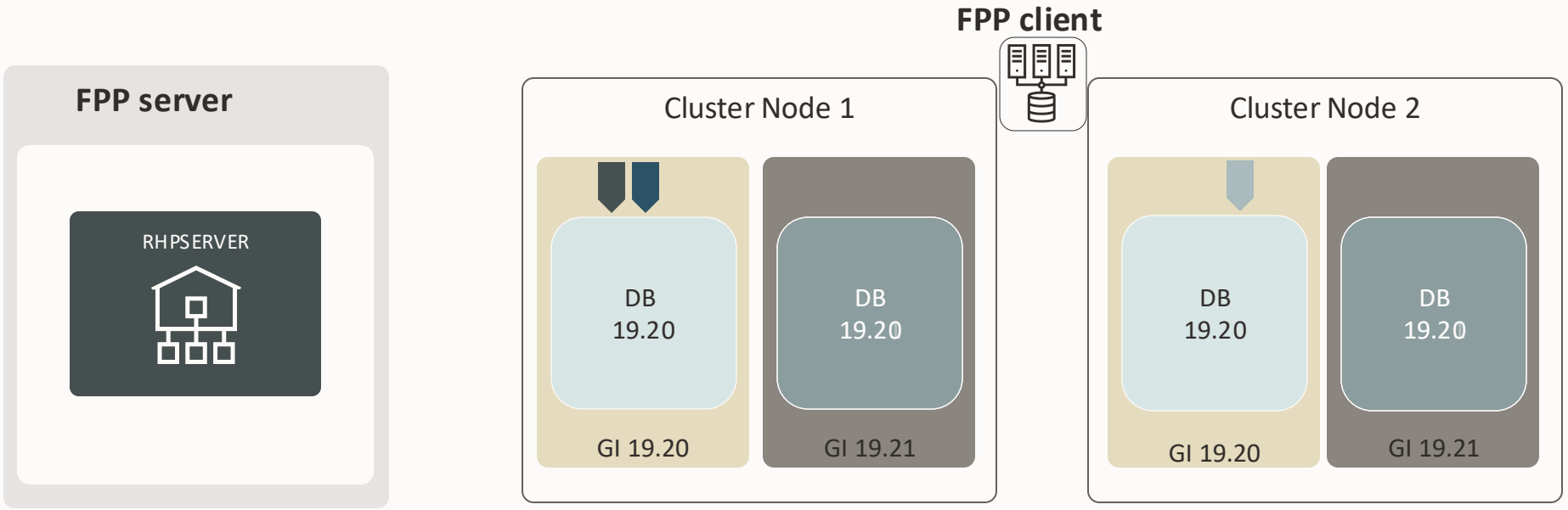
Example: Deployment of an Oracle Restart environment

```
[grid@fpps01 ~]$ rhpctl add workingcopy -workingcopy WC_gi_19_24_0_FPPC   -image gi_19_24_0 -responsefile ~/fppc.rsp \
  -path /u01/app/grid/WC_gi_19_24_0_FPPC -user oracle -oraclebase /u01/app/oracle \
  -targetnode fppc -sudouser opc -sudopath /bin/sudo -ignoreprereq

Enter user "opc" password: FPPll##123
fpps01.pub.fpplivelab.oraclevcn.com: Storing metadata in repository for working copy "WC_gi_19_24_0_FPPC" ...
fpps01.pub.fpplivelab.oraclevcn.com: Creating snapshot "tmpgi_19_24_0WC_gi_19_24_0_FPPC" ...
fpps01.pub.fpplivelab.oraclevcn.com: Changing the home ownership to user oracle...
fpps01.pub.fpplivelab.oraclevcn.com: Copying software contents to Local File System ...
fpps01.pub.fpplivelab.oraclevcn.com: Changing the home ownership to user oracle...
[ . . . ]
fppc: As a root user, execute the following script(s):
fppc:   1. /u01/app/oraInventory/orainstRoot.sh
fppc:   2. /u01/app/grid/WC_gi_19_24_0_FPPC/root.sh
fppc: ..................................................   100% Done.
fpps01.pub.fpplivelab.oraclevcn.com: Successfully executed clone operation.
fpps01.pub.fpplivelab.oraclevcn.com: Executing root script on nodes [fppc].
fppc: Changing permissions of /u01/app/oraInventory.
fppc: Adding read,write permissions for group.
fppc: Removing read,write,execute permissions for world.
fppc:
fppc: Changing groupname of /u01/app/oraInventory to oinstall.
fppc: The execution of the script is complete.
fpps01.pub.fpplivelab.oraclevcn.com: Successfully executed root script on nodes [fppc].
fpps01.pub.fpplivelab.oraclevcn.com: Executing configuration script on nodes [fppc]
fpps01.pub.fpplivelab.oraclevcn.com: Successfully executed configuration script on nodes [fppc]
fpps01.pub.fpplivelab.oraclevcn.com: Executing root script on nodes [fppc].
fppc: Check /u01/app/grid/WC_gi_19_24_0_FPPC/install/root_fppc_2021-03-31_13-24-06-546102180.log for the output of root script
fpps01.pub.fpplivelab.oraclevcn.com: Successfully executed root script on nodes [fppc].
fpps01.pub.fpplivelab.oraclevcn.com: Executing post configuration script on nodes [fppc]
fpps01.pub.fpplivelab.oraclevcn.com: Successfully executed post configuration script on nodes fppc]
fpps01.pub.fpplivelab.oraclevcn.com: Oracle home provisioned.
fpps01.pub.fpplivelab.oraclevcn.com: Working copy creation completed.
```

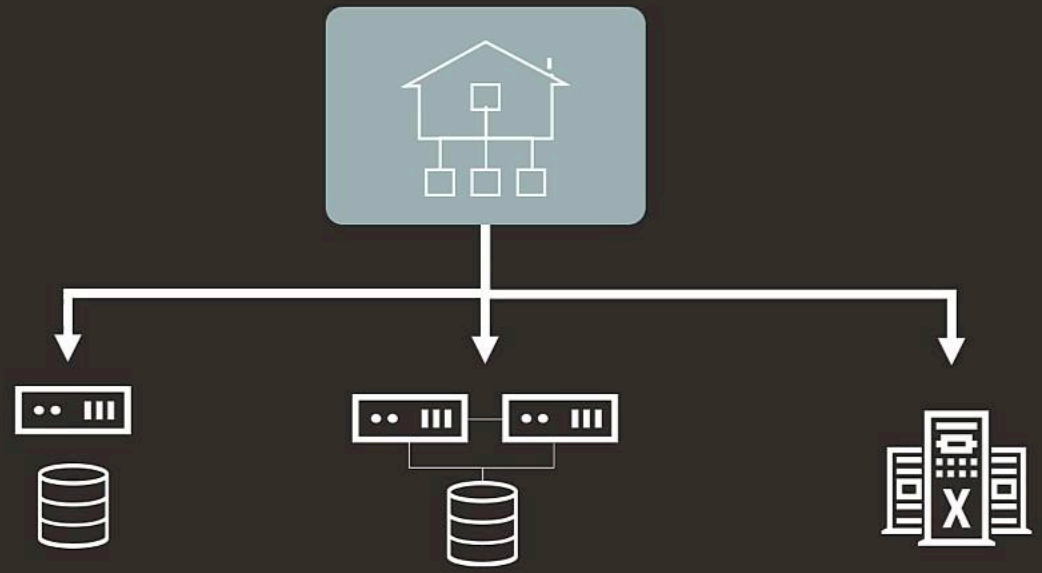
Grid patching

Rolling patching to new grid home




```
rhpctl move gihome \
  -destwc WC_gi192000_cl1 \
  -sourcewc WC_gi192100_cl1 \
  -drain_timeout 600
```

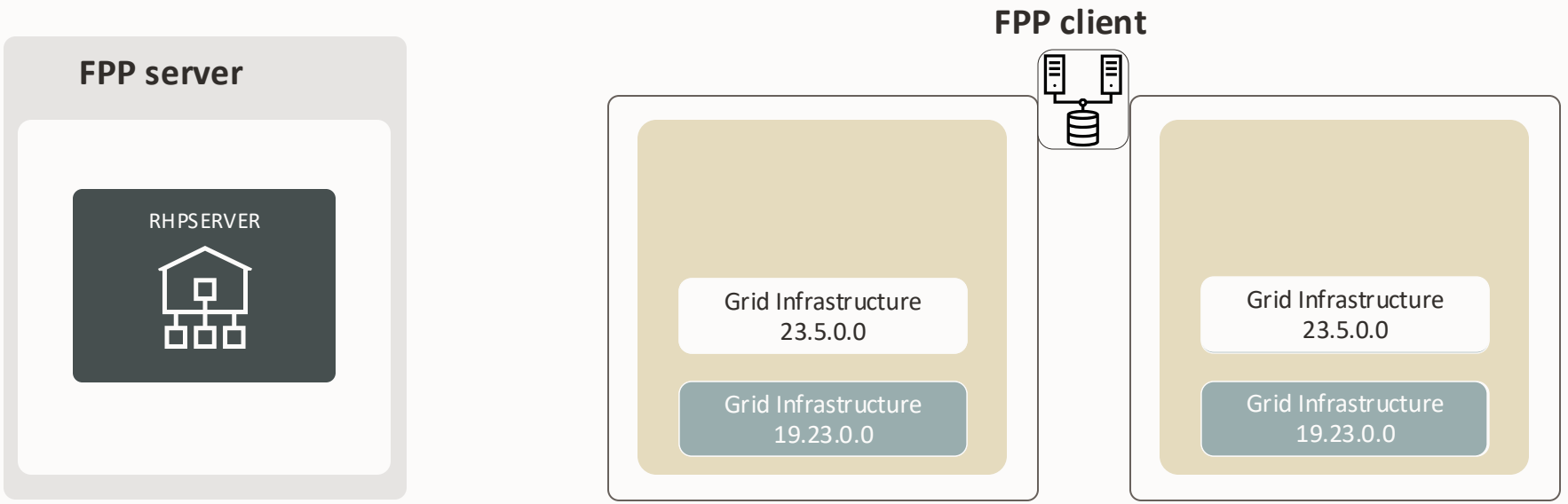
- Rolling by default
- Automated datapatch execution
- Service Drain Timeout honored
- Optionally possible to patch "Vertically" GI + DB in one flow



Fleet Patching & Provisioning by Exampe

Patching Grid Infrastructure (move)

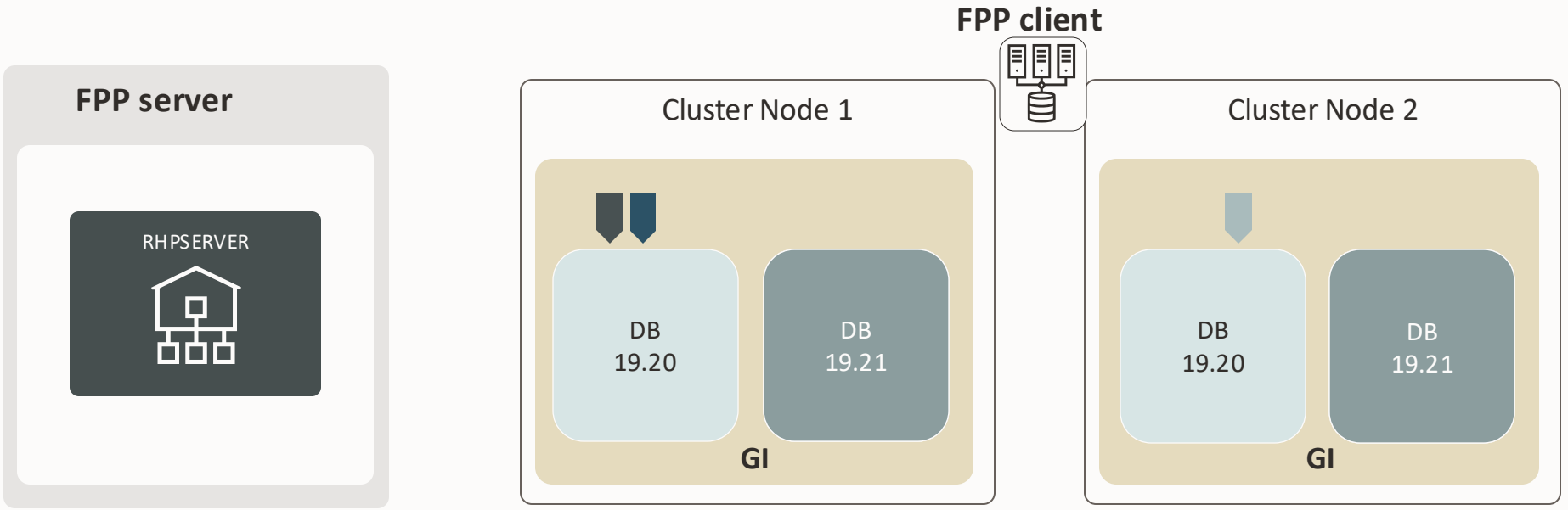
Grid infrastructure upgrade




```
rhpctl upgrade gihome \
  -sourcewc WC_gi19230_cl1 \
  -destwc WC_gi23400_cl1
```

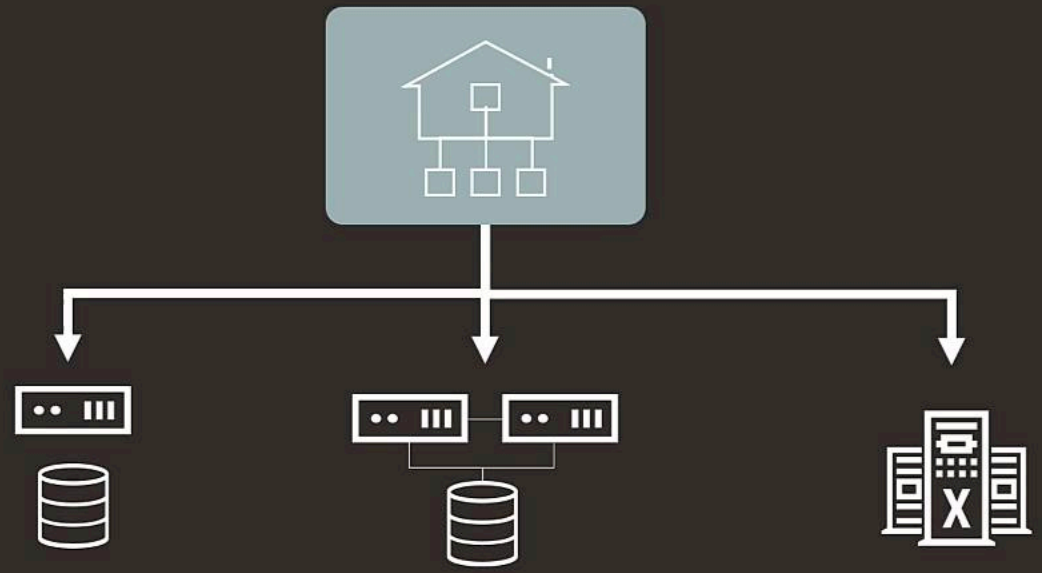
Database patching

Rolling patching to new database home




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

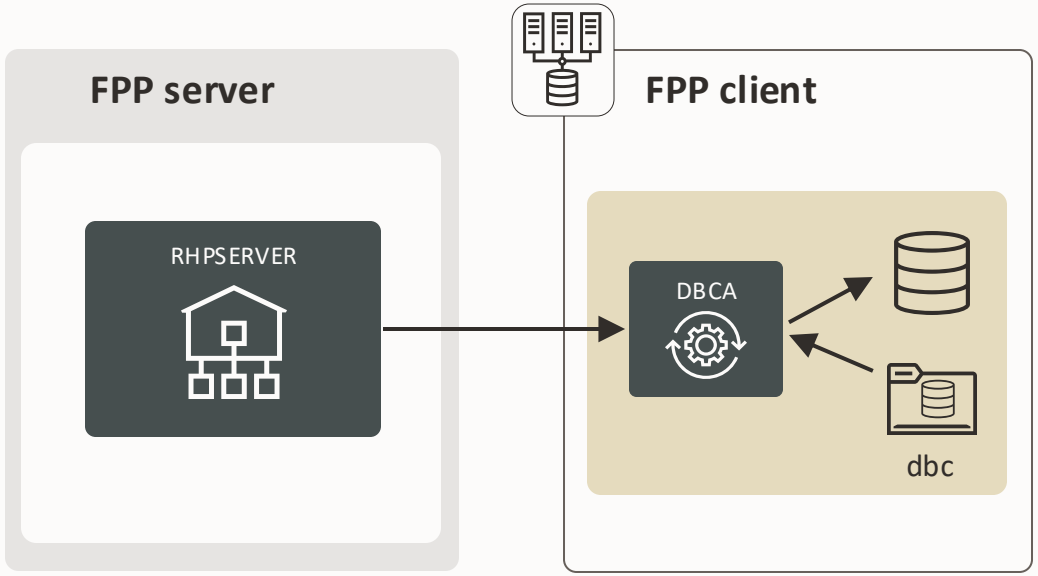
- Rolling by default
- Automated datapatch execution
- Service Drain Timeout honored
- Optionally possible to patch "Vertically" GI + DB in one flow



Fleet Patching & Provisioning by Example

Patch Database (move)

Provisioning databases



- FPP can provision SINGLE Instance, RAC, RACONENODE databases to FPP Clients
- It executes database creation assistant (DBCA)
- Template files must exist either in the Gold Image or locally on the FPP Client

```
rhpctl add database -workingcopy <workingcopy> \
  -dbname <dbuqname> ... \
  –dbtemplate <template_file>
```

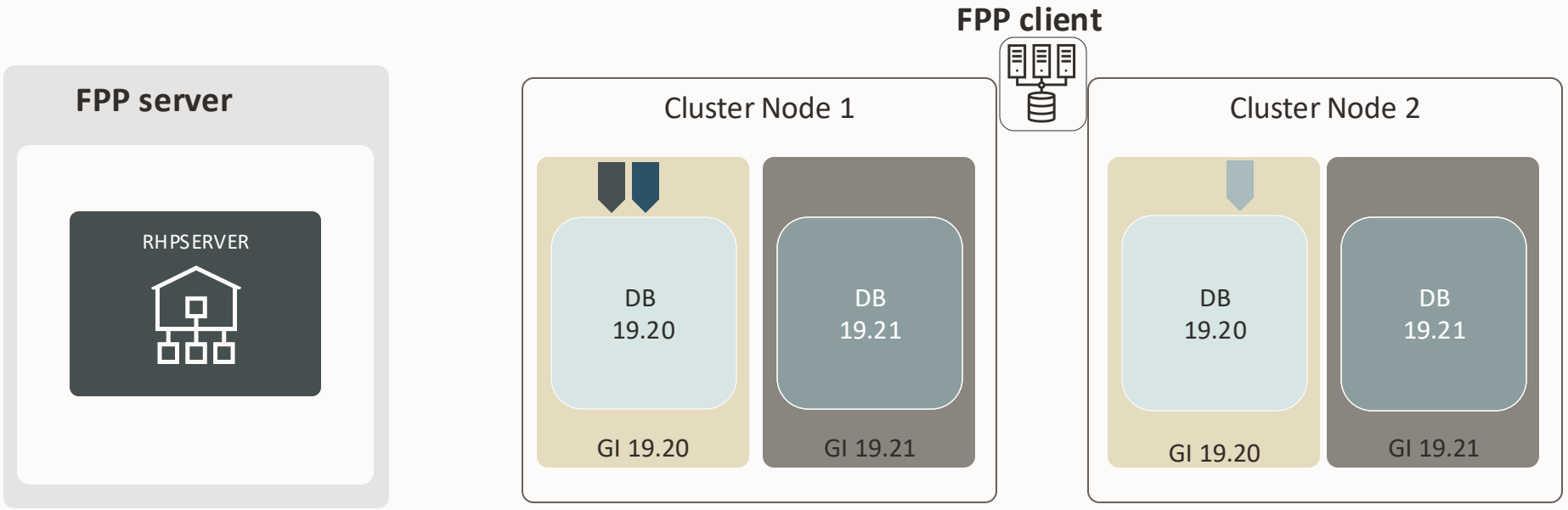
Provisioning databases

```
rhpctl add database \
  -workingcopy WC_db_19_12_0_oci_FPPC1_RHP \
  -dbname raccldb2_fra1nn \
  -datafileDestination DATA \
  -targetnode fppc1 \
  -dbtype RAC \
  -cdb \
  -dbtemplate db_19_12_0_oci:assistants/dbca/templates/seed_db.dbc
```

```
$ ls –tr /u01/app/oracle/cfgtoollogs/dbca/raccldb2_fra1nn
initraccldb2frTempOMF.ora.1115202092759  cloneDBCreation.log       catclust_catcon_77650.lst
raccldb2_fra1nn.log                      rmanUtil                 CreateClustDBViews.log
trace.log_2020-12-14_05-55-05PM          plugDatabase.log         lockAccount.log
initraccldb2frTempOMF.ora.1115202094834  ordlib0.log              utlrp0.log
rmanDeleteFiles.sql                      ordlib_catcon_75303.lst  utlrp_catcon_85815.lst
raccldb2_fra1nn0.log                     execemx0.log             postDBCreation.log
trace.log_2020-12-15_09-25-26AM          execemx_catcon_76689.lst raccldb2_fra1nn1.log
tempControl.ctl                          postScripts.log          trace.log_2020-12-15_09-45-48AM
CloneRmanRestore.log                     catclust0.log
```

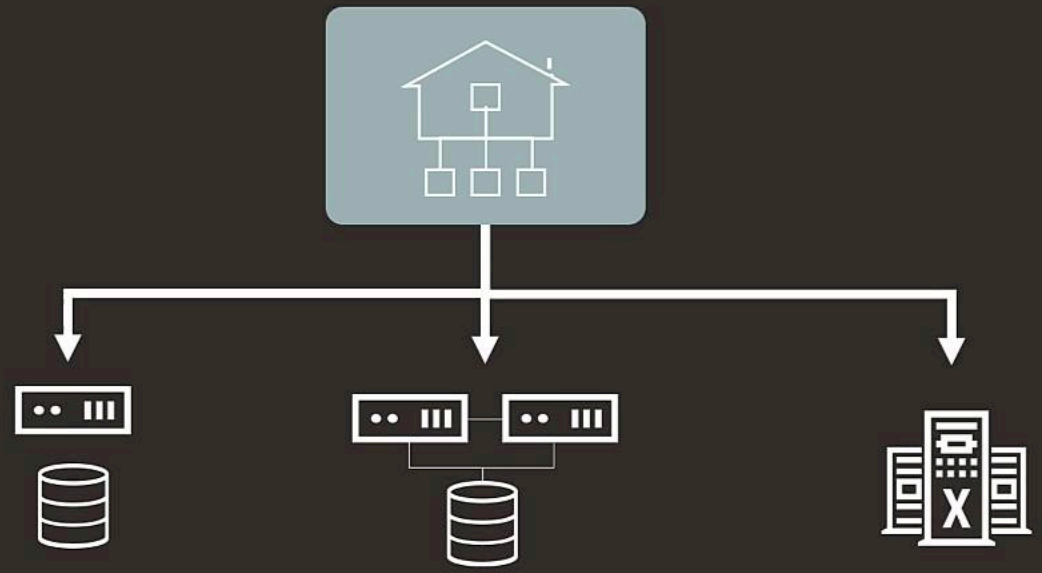
Vertical patching

Combined GI + DB patching




```
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
```

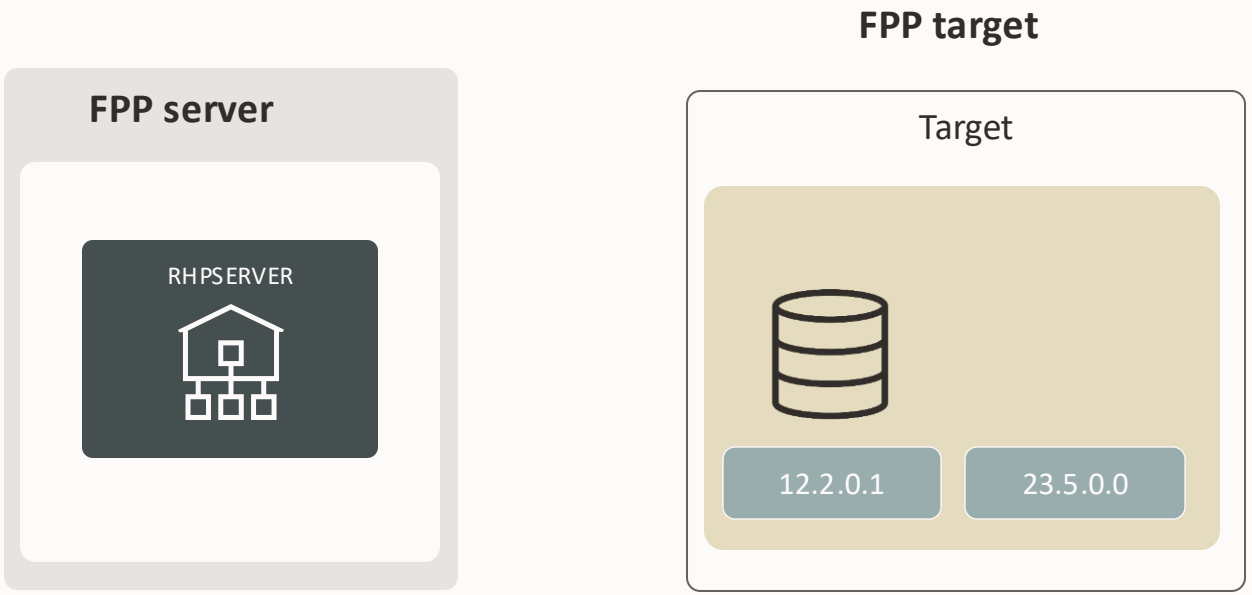
- Compute OS + GI patching possible on Exadata



Fleet Patching & Provisioning by Example

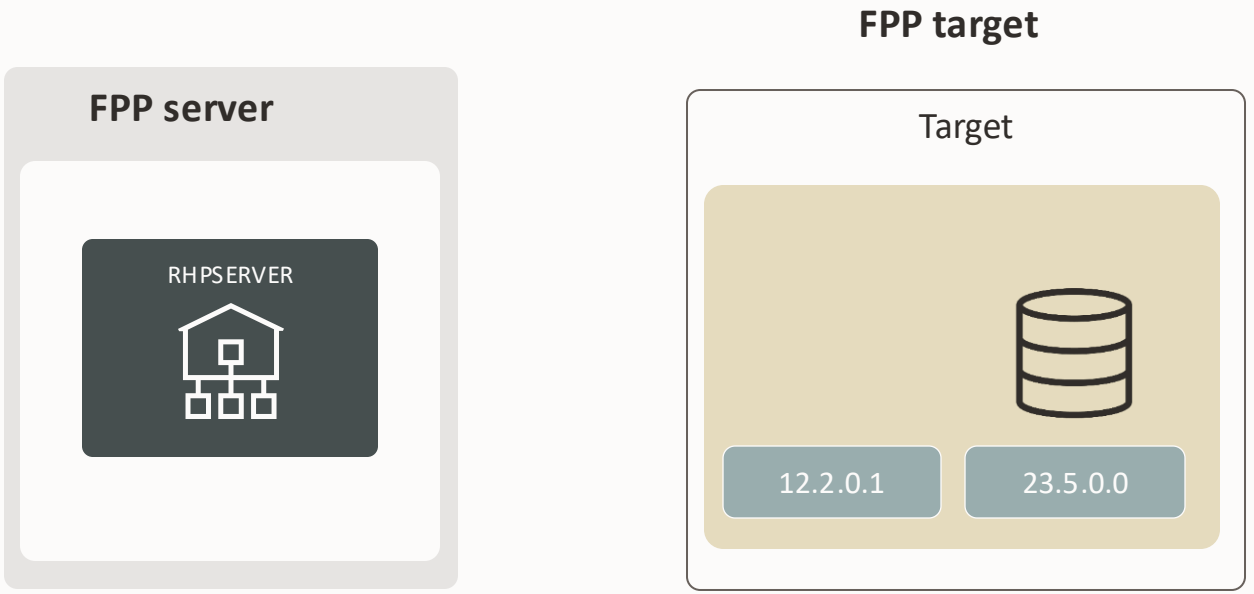
Vertical Patching Grid Infrastructure & Database

Database upgrades




```
rhpctl upgrade database \
  -dbname single_fra1nn \
  -sourcewc WC_db12201_cl1 \
  -destwc WC_db2300_cl1 \
  -autoupg
  -upgtimezone YES | NO
  -grp YES | NO
  -restart
```

Database upgrades




```
rhpctl upgrade database \
  -dbname single_fra1nn \
  -sourcewc WC_db12201_cl1 \
  -destwc WC_db23400_cl1 \
  -autoupg
  -upgtimezone YES | NO
  -grp YES | NO
  -restart
```

- Uses autoupgrade
  - Upgrade timezone as part of the process
  - Creates a guaranteed restore point
- Make sure to put the most recent `autoupgrade` version in the target image `?/rdbms/admin` check MOS note 2485457.1
- Multitenant conversion possible in 23ai
- Upgrade required downtime

Thank you

Make sure to fill in the evaluation form