ORACLE

Oracle Fleet Patching and Provisioning (FPP)

Oracle Database 23ai Technical Brief

Purpose statement

This document provides an overview of features and enhancements included in Fleet Patching and Provisioning release 23ai. It is intended solely to help you assess the business benefits of upgrading to 23ai and planning for the implementation and upgrade of the product features described.

Disclaimer

This document in any form, software or printed matter, contains proprietary information that is the exclusive property of Oracle. Your access to and use of this confidential material is subject to the terms and conditions of your Oracle software license and service agreement, which has been executed and with which you agree to comply. This document and information contained herein may not be disclosed, copied, reproduced or distributed to anyone outside Oracle without prior written consent of Oracle. This document is not part of your license agreement nor can it be incorporated into any contractual agreement with Oracle or its subsidiaries or affiliates.

This document is for informational purposes only and is intended solely to assist you in planning for the implementation and upgrade of the product features described. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, timing, and pricing of any features or functionality described in this document remains at the sole discretion of Oracle. Due to the nature of the product architecture, it may not be possible to safely include all features described in this document without risking significant destabilization of the code.

ORACLE

Table of contents

ORACLE

Introduction

Patching Oracle Database is an essential task that customers should regularly accomplish to avoid functional and security bugs. However, coping with a release update per quarter is not easy.

Customers with a considerable number of databases need to dedicate precious DBA resources to patching activities. Customers in specific industries must abide by strict regulations that force them to apply the security patches within a short delay. Small customers struggle as well, often lacking knowledge or resources, which sometimes leads to infrequent patching leaving databases unprotected.

Oracle Fleet Patching and Provisioning, or FPP, helps to keep your database fleet lifecycle under control by using automation, standardization, and **out-of-place patching**. The FPP drift detection capabilities can verify the compliance of the environments. FPP can be used in local mode with limited functionality and constraint to the local cluster and central mode with full fleet and full functionality, making it possible to use the same syntax no matter how many targets the customer has.

Routine operations like provisioning new clusters and databases, installing patched Oracle binaries, patching clusters and databases, or upgrading them, are completely automated by Oracle Fleet Patching and Provisioning. All FPP operations have been tested and validated according to the Maximum Availability Architecture blueprints. These blueprints guarantee that all planned maintenance operations are executed in the correct order, with the least impact on the business.

Customers implementing Fleet Patching and Provisioning can effortlessly patch hundreds or thousands of databases per maintenance window with the minimum human interaction, enabling consistent time and money savings.

What's new in Oracle Fleet Patching and Provisioning 23ai

The new 23ai release extends the capabilities of FPP in several areas: improving availability, flexibility and versatility, and usability, lifecycle operations are really "Patch Simple" with Oracle Fleet Patching and Provisioning 23ai.

Support for the latest 23ai HA features
Oracle RAC 23ai introduces several new features improving and enhancing availability such as Local Rolling Database Maintenance and Oracle Two Stage Rolling Updates.

The Local Rolling Database Maintenance feature both for Single Instance Databases as for Real Application Clusters start another instance on the same node and relocates sessions to the new instance while at the same time respecting configured drain timeouts, FPP automates all the necessary steps.

The Oracle Two Stage Rolling Updates feature makes it possible to apply rare non-rolling patches by splitting the apply process into two stages; first, binary changes are applied node by node, but these changes remain inactive. Then, in a second stage, SQL changes are applied, and the changes become active.

Oracle Fleet Patching and Provisioning 23ai supports both new features improving the availability of applications.

Online Database patching support

Online patches are special patches, regular patches require shutting down the Oracle Database instance, relinking the Oracle binary and starting up the Oracle Database instance again, online patches don't require relinking and can thus be installed without shutting the database instance. FPP allows these patches to be installed on existing workingcopies.

Oracle Exadata Full Stack Patching

Oracle Fleet Patching and Provisioning 18c made it possible to patch Exadata infrastructure. Subsequent releases, 19c and 21c, enhanced and improved this functionality further, allowing for vertical combined Grid Infrastructure and Compute node (BareMetal or Virtualized), Hypervisor, InfiniBand, and RoCE switches and storage server patching; in short, the full Exadata stack can be patched with FPP. In the latest version of Fleet Patching and Provisioning, this functionality has been enhanced to make it more versatile and flexible, it is possible to use the FPP server as external driving node, it is not necessary anymore to use one of the FPP clients to perform patching.

Scheduler Improvements

The ability to schedule provisioning and patching operations has been an often-used feature in Oracle Fleet Patching and Provisioning. This feature was enhanced significantly in 23ai, it is now possible to schedule jobs in a paused state, customize the behavior when working with batches, and to add tags to jobs for easier tracking.

Usability Improvements

Previous versions of Oracle Fleet Patching and Provisioning required to have a basic GNS without zone delegation in place on the FPP server. In Oracle Fleet Patching and Provisioning 23ai only an Application VIP is needed, simplifying network and firewall flows. The FPP repository is no longer stored in the GIMR but in either a SEHA database or External Oracle Database.

Gold Image and working copy improvements

Gold images can be stored in a compressed (zip) format, saving space on the FPP server and reducing network transfer time.

Gold images that have no working copies tied to them can be archived in external storage, freeing space on the centralized repository and, at the same time, making it possible to keep the old gold images for compliance reasons. Upon demand, they can be re-imported again into the FPP server repository.

Existing Oracle Grid Infrastructure or Database homes can be registered as working copies, this makes cleanup and fallback easier.

Local mode enhancements

The Oracle Fleet Patching and Provisioning local mode introduced in 18c provides local automation for move operations. In Oracle Fleet Patching and Provisioning 23ai this has been simplified.

Previously local mode required to have a GIMR installed on the to-be-patched cluster, this requirement has been lifted, and makes using FPP Local Mode really easy. FPP Local ModeF is the perfect introduction to Fleet Patching and Provisioning and makes it possible to easily transition toward the full centralized FPP server when the Fleet expands.

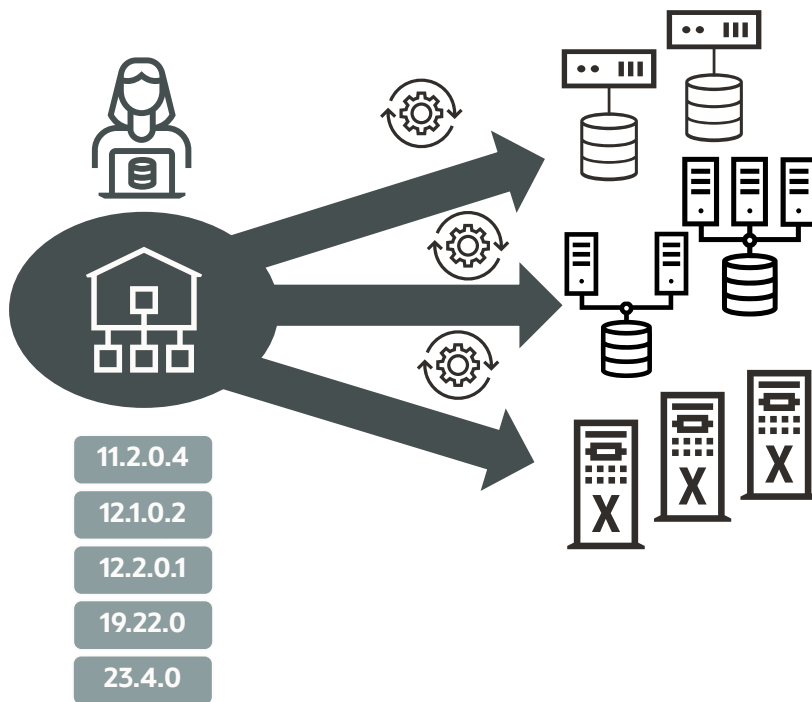# How Does Fleet Patching and Provisioning Work?

Figure 1 Highlevel overview graphic

An Oracle Fleet Patching and Provisioning installation in a data center consists of a central FPP server and any number of targets.

Oracle Fleet Patching and Provisioning supports a wide range of operations and target types on different platforms.

Oracle Fleet Patching and Provisioning out-of-the-box supports:

- Oracle Grid Infrastructure
- Oracle Real Application Clusters
- Oracle Single Instance
- Oracle Restart
- Oracle Exadata Infrastructure

In terms of hardware requirements, since Oracle Fleet Patching and Provisioning is a feature of the Grid Infrastructure, the minimum hardware recommended for a Fleet Patching and Provisioning Service is the same as for any Grid Infrastructure deployment.

More details can be found in the Oracle Support Document 2126710.1 (FPP: Fleet Patching & Provisioning Server - Minimum Requirement). For detailed steps on creating an FPP Service (and Client too), please refer to the Fleet Patching and Provisioning documentation.

Oracle recommends hosting the FPP Server on a multi-node cluster for high availability, but it can be hosted on a single-node Grid Infrastructure deployment.

Architecture

Oracle Fleet Patching and Provisioning comes in two configurations:

- Central mode FPP for environments with multiple targets and full functionality
- FPP Local Mode for local automation and limited functionality

Central mode FPP

Central mode FPP requires a central server Grid Infrastructure installed and ACFS storage for repository storage. The FPP software runs as a Java cluster resource. Previous versions of FPP required a GIMR database and GNS, in 23ai the GIMR has been de-supported and either a Single Instance Oracle Enterprise Edition Database (Special license right) or a RAC or RAC One Node using your own license can be used. Instead of GNS an Application VIP can be used for the FPP Server.
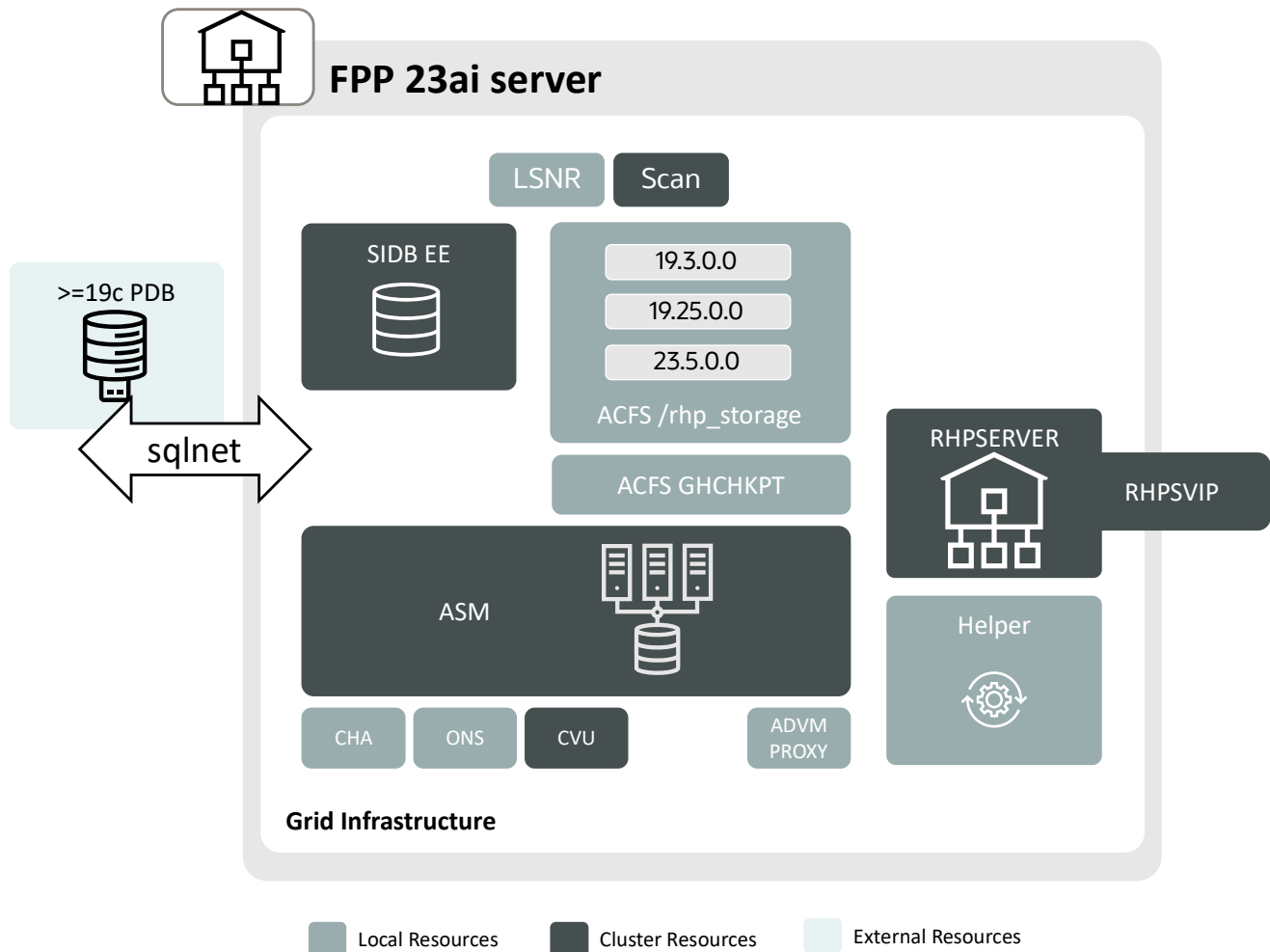

Figure 2 : FPP 23ai Architectural overview

FPP Local Mode can only do local move operations, in 23ai this setup has been simplified a lot not requiring a GIMR anymore or Java container. It is a trimmed down version of the full Fleet Patching and Provisioning server, as the Oracle footprint increases you can easily move to central mode and use FPP to its fullest.
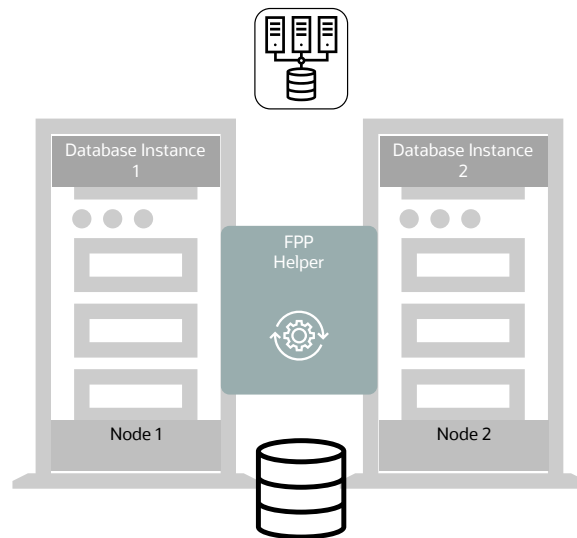

Figure 3 Graphic explaining FPP Local Mode

FPP Targets

There are two type of FPP targets :

FPP Clients or *rhpclients* and FPP *rhpclient-less targets.*

FPP Clients or rhpclients

This type has a *rhpclient* running and communicates with the FPP server over JMX and RMI, operations can be initiated from the FPP server or from the client. It provides extra functionality compared to FPP rhpclient-less targets. Each Oracle Clusterware installation starting with 12.2 has a *rhpclient*.

FPP rhpclient-less targets

In this case the FPP server initiates operations and connection happens through `ssh`, either key based or password based. Oracle Restart or single instance database or Oracle Clusterware older than 12.2 are examples of *rhpclient-less targets.*

Network and data center topology

The network topology is one of the critical aspects when deploying FPP. There are two main aspects to consider: the first one is the latency introduced by the distance with the targets. The image transfer requires a decent bandwidth and low latency to complete in a reasonable time. Therefore, any tentative to deploy working copies to remote data centers might lead to delays and timeouts.

The other consideration is the security concern of opening firewall ports between different networks, subnets, or VLANs. Targets with Grid Infrastructure as from version 12.2 use the *rhpclient* adapter that uses the JMX protocol on port 8896, while other targets referred *to rhpclient-less targets* use the SSH protocol on port 22. FPP requires a few more open ports to transfer the images. Opening these ports between segregated segments is sometimes impossible or forbidden by the security department.

For this reason, we recommend putting one FPP Server for each data center or network segment. These FPP Servers can be managed independently or coupled using the **FPP Server peering feature**.
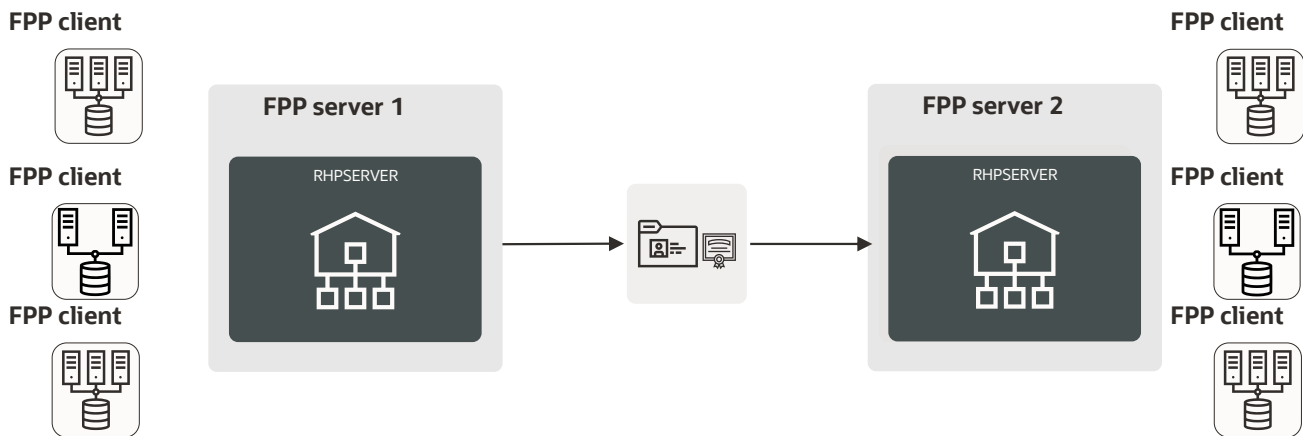
Gold Image Management

Each gold image represents an installed home, either Oracle Database home, Grid Infrastructure home, or any other software home. Applications do not run directly on gold images. Instead, copies can be created from gold images, and these are the deployed executables, those copies are called working copies.

Gold images can be imported from an installed home on the FPP Server, an FPP Client, or any node in the data center. Gold images can also be shared among FPP Servers by setting up FPP peering.

Since its release in version 12.1.0.2 Fleet Patching and Provisioning has been patching out-of-place. To make it easier for customers Oracle provides a procedure to download Release Updates (RU) as full versions as well as custom images from My Oracle Support, these images can be imported into FPP.

More details about the process can be found in Oracle Support Document **Gold Image How To (Doc ID 2965269.1)**

There are several ways to import gold images in FPP:

- from an existing ORACLE_HOME
- from a zipfile
    - o uncompressed

- o compressed
- o as zip-copy

Importing gold images from an existing ORACLE_HOME

```
rhpctl import image -image db234000 \
-path /u01/app/oracle/23.0.0.0/dbhome_1
```
The image will be stored in uncompressed form in the FPP gold image repository.

Importing from a zip file

Uncompressed :

```
rhpctl import image -image db234000 \
-zip /software/oracle/db_234000.zip
```

This will import the contents of the zipfile and store in uncompressed form in the FPP gold image repository.

Compressed :

```
rhpctl import image -image db234000 \
-zip /software/oracle/db_234000.zip -store_as_zip
```

This new 23ai feature will store the zip file in its binary form on the FPP server gold image repository and workingcopies can be transferred as one zip file instead of file by file.

As zip-copy :

Sometimes it might not be possible use FPP peering, to improve the user experiences in these cases the zip-copy feature was introduced in previous versions Fleet Patching and Provisioning.

This feature makes it possible to import an image as a zipped copy and then transfer it to the target either on a shared or local filesystem, the responsibility of the local copy availability on the target is the customers responsibility.

To make use of the zip-copy feature the image firstly needs to be imported with `-location` parameter, note that the image needs to be zipped

```
rhpctl import image -image db234000 \
-zip /u01/app/oracle/images/db_234000.zip \
-location /u01/app/oracle/images/db_234000.zip
```

Secondly the image needs to be transferred to a location that can be accessed by the FPP target or client, once this is done the following `add workingcopy` command can be used.

```
rhpctl add workingcopy -image db234000 -workingcopy WC_db234000_FPPC \
-user oracle -oraclebase /u01/app/oracle  -targetnode fppc \
-path /u01/app/oracle/product/23.0.0.0/dbhome_1 \
-localmount -location /software/oracle/db_234000.zip
```

By specifying the `-localmount` and `-location` options, the FPP server know that it doesn't need to transfer the image.

State and Access

Fleet Patching and Provisioning allows you to define the state of an image – published, testable, or restricted. This enables life cycle management. Furthermore, access to a given image can be controlled at both the role and specific user levels.

Series

Using an image series is a convenient way to group different gold images into a logical sequence. An image can belong to zero, one or more series. A series could represent a sequence of patch levels, with different series tailored to specific use cases.

Notifications

Users may subscribe to series events. Anyone subscribed will be notified by email when an image is added to or deleted from the series they are subscribed to.

Provisioning

Fleet Patching and Provisioning can provision and configure Oracle Grid Infrastructure, Oracle Database homes (and later create Databases) & Generic Software.

Workingcopies

As seen in the previous section, importing gold images is the first step, but before a gold image can be used it needs to be provisioned as a workingcopy, once that is done Oracle Grid Infrastructure or Oracle Database provisioning can happen as well as patching or upgrade operations.

```
rhpctl add workingcopy -image db234000 \
-user oracle -oraclebase /u01/app/oracle –client <name_of_the_cluster> \
-workingcopy WC_DB_234000_FPPC1 -path /u01/app/oracle/product/23.0.0.0/dbhome_1
-transfer_as_zip
```

The new to 23ai option `-transfer_as_zip`, will zip the gold image on the fly if the gold image was not compressed while importing and uncompress on the FPP target.

Oracle Grid Infrastructure

Oracle FPP can provision Oracle Grid Infrastructure on one or more nodes that have only the OS installed, and then configure Oracle Grid Infrastructure to form a single-node or multi-node Oracle Grid Infrastructure installation.

Oracle Database

Fleet Patching and Provisioning can provision Oracle Database homes for Oracle Database 11.2 and later. Once the software is provisioned, a single FPP command will create a database with choices including:

- Oracle Real Application Clusters (Oracle RAC)
- Oracle Real Application Clusters One Node (Oracle RAC One Node)
- Single Instance (with or without Grid Infrastructure or Oracle Restart on the target)
- Templates
- Creating Oracle Multitenant Container Databases (CDBs)

Patching Operations

Out-of-place patching is the best practice for applying updates. The patched environment is created in a new directory path, and then the home is switched to the new path. This approach allows non-disruptive software distribution since the existing home can be active while the new home is provisioned. Also, rollback is facilitated since the old home is available if any problems are encountered after the switch.

Key Features for Patching:
- Out-of-place, non-disruptive distribution of new homes
- Rolling by default
- Dry-run evaluation
- Resumable in case of errors during operation
- Simple rollback
- Control over service draining and relocation to maximize availability

Oracle Database patching

The patched Oracle Home is installed in a new directory path, and then each Database is moved from the current to the new Oracle Home. FPP copies the configuration files. This approach works whether the database home is shared with other databases or not and significantly reduces the impact and risk of maintenance. After the one-time activity of preparing the new (patched) gold image, each target in the data center can be patched with two commands:

1. `rhpctl add workingcopy` to install the new Oracle Home
2. `rhpctl move database`

Because FPP implements out-of-place patching and understands the configuration details of the Database, undoing a patching operation by rolling back to the original home is the same single command that rolled to the patched version. This capability reduces the risk of maintenance. Also, the process can be restarted. If a failure occurs during the patch procedure, the operator corrects the problem then re-issues the patch command. FPP will resume where it left off.

Grid Infrastructure patching

Patching Grid Infrastructure homes is just as simple as for Database homes. When a gold image representing the patched home is ready for distribution, a single command provisions the home to the target. That target (FPP Client or otherwise) is not disrupted by this out-of-place provisioning – the Clusterware will continue operating without any impact.

When the maintenance window arrives, a single command switches to the patched home. By default, FPP performs a rolling update. And as for database patching, the operation can be safely and efficiently reversed with a fall back to the prior (managed) home.

GI patching can leverage the Zero Downtime Oracle Grid Infrastructure Patching feature (or ZDOGIP). Just by adding the switch "-tgip" to the command line, the instances running Oracle Database 19.8 or later can stay up and running. At the same time, the underlying Grid Infrastructure stack is restarted for patching. Please note that there are limitations when the running stack makes use of ACFS or AFD kernel drivers.

Combined Grid Infrastructure and Database Patching

When you patch an Oracle Grid Infrastructure deployment, Fleet Patching and Provisioning enables you to patch the Oracle Database homes on the cluster simultaneously so that you can patch both types of software homes in a single maintenance operation.

As as an example, to simultaneously move:

- Oracle Grid Infrastructure from WC_gi234000_cl1 to WC_gi234000_cl1
- Oracle Databases from WC_db234000_cl1 to WC_db234000_cl1
- Oracle Databases from WC_db1919000_cl1 to WC_db1920000_cl1

Issue the following command in Oracle Fleet Patching and Provisioning:

```
rhpctl move gihome  \
    -sourcewc WC_gi234000_cl1 \
    -destwc WC_gi234000_cl1 –auto \
    -dbhomes WC_db230000_cl1=WC_db234000_cl1,WC_db1919000_cl1=WC_db1920000_cl1
```

Upgrade Operations

Grid Infrastructure upgrades

Upgrade operations can be similar to or more complex than patching, depending on the target type.

For Grid Infrastructure stacks, the command is very similar. For instance, after the "Software Only" installation of the new Grid Home, the single command is similar to this one:

```
rhpctl upgrade gihome \
  -sourcewc WC_gi191900_cl1 \
  -destwc WC_gi23300_cl1
```

Oracle Database upgrades

Database upgrades are one of the most complex activities that DBAs have to face. FPP provides a single command to go through all the upgrade steps:

```
rhpctl upgrade database \
  -sourcewc WC_db1919000_cl1 \
  -destwc WC_db234000_cl1 \
  -upgtimezone YES | NO \
  -runutlrp YES | NO
```

In Fleet Patching and Provisioning 23ai, autoupgrade is the default mechanism to perform database upgrades, when creating gold images it is recommended to put the latest `autoupgrade.jar` file in the ORACLE_HOME.

Exadata Software Updates

Fleet Patching and Provisioning is the preferred tool also for updating your fleet of Exadata machines. Fleet Patching and Provisioning can provision software images to the servers and initiate the patching operations by executing "`patchmgr`" underneath.

In release 23ai the FPP server or another system can be the driving node for Exadata patch operations.

It is also possible to patch operating system of the Baremetal or Virtualized Exadata and the Grid Infrastructure in one single flow, this reduces the potential number of brownouts if Application Continuity wouldn't be used.

Combined Grid Infrastructure and Exadata DB Node Patching

Similar to Combined Grid Infrastructure and Database Patching, it is possible to patch the Exadata infrastructure software on database nodes along with Grid Infrastructure.

```
rhpctl move gihome -destwc GI_234000_exadata42 \
 -sourcewc GI_234000_exadata42 -image exa_231100 \
 -iso_repo p35167747_231000_Linux-x86-64.zip \
 -patchmgrloc /u01/staging/ dbserver_patch_230418
```

Conclusion

Release after release, Fleet Patching and provisioning brings new features that enhance the patching experience. With enhancements for upgrades and reduced downtime, Fleet Patching and Provisioning 23ai is no exception.

Customers can replace dozens or hundreds of manual tasks with a single command line or a single RESTful API call.

Forget about tedious and time-consuming patching campaigns: Fleet Patching and Provisioning gives you the automation, standardization, and protection level that your auditors are looking for.

ORACLE

Connect with us

Call +**1.800.ORACLE1** or visit **oracle.com**. Outside North America, find your local office at: **oracle.com/contact**.

B blogs.oracle.com   f facebook.com/oracle   🐦 twitter.com/oracle