

# HP Database and Middleware Automation

For Linux, Solaris, and AIX

Software Version: 10.22

## Advanced Oracle Database Patching User Guide

Workflows for Oracle CRS, Grid, and RAC

Document Release Date: December 2014

Software Release Date: December 2014



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The following table indicates changes made to this document since the last released major edition.

#### Document Changes

Chapter	Version	Changes
<a href="#">Title Page</a> <a href="#">Legal Notices</a>	10.10	Updated version number, software release date, document release date, and copyright date range.
<a href="#">Workflow Details</a>	10.10	Removed Patch Oracle Standalone Grid workflow since its functionality is contained in Apply Oracle Grid Standalone Patch and Apply Database Patch workflow.
<a href="#">About HP DMA Solution Packs</a>	10.10	Added overview topic About HP DMA Solution Packs.
<a href="#">Title Page</a> <a href="#">Legal Notices</a>	10.20	Updated version number, software release date, document release date, and copyright date range.
<a href="#">Compliance Quick Start</a> <a href="#">Workflow Details</a>	10.20	Removed the Quick Start chapter. In the "How to Run this Workflow" sections, pointed to the <i>HP DMA Quick Start Tutorial</i> .
<a href="#">The Advanced Database Patching Solution</a> <a href="#">Workflow Details</a>	10.20	Added table of deprecated workflows. Added new workflows: Oracle - Patch CRS Home <a href="#">Oracle - Patch Grid Infrastructure and Databases</a> Oracle - Rollback Patch from CRS Home <a href="#">Oracle - Rollback Patch from Grid Infrastructure and Database</a>
<a href="#">Title Page</a> <a href="#">Legal Notices</a> Entire guide	10.21	Updated version number, software release date, document release date, and copyright date range. Updated to new documentation template.
<a href="#">Title Page</a> <a href="#">Legal Notices</a>	10.22	Updated version number, software release date, document release date, and copyright date range.

**Document Changes, continued**

Chapter	Version	Changes
<a href="#">Oracle - Patch Grid Infrastructure and Databases</a> <a href="#">Oracle - Rollback Patch from Grid Infrastructure and Database</a>	10.22	HP DMA now uses the <code>trustAllCertificates</code> parameter in the <code>dma.xml</code> file rather than the Trust SSL Certificates workflow parameter.
<a href="#">Oracle - Patch Grid Infrastructure and Databases</a> <a href="#">Oracle - Rollback Patch from Grid Infrastructure and Database</a>	10.22	Added new advanced parameters and functionality.
<a href="#">Deprecated Advanced Oracle Patching Workflows</a> <a href="#">Workflow Details</a>	10.22	Deprecated workflows: Oracle - Patch CRS Home Oracle - Rollback Patch from CRS Home

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# About HP DMA Solution Packs

HP Database and Middleware Automation (HP DMA) software automates administrative tasks like provisioning and configuration, compliance, patching, and release management for databases and application servers. When performed manually, these day-to-day operations are error-prone, time consuming, and difficult to scale.

HP DMA automates these daily, mundane, and repetitive administration tasks that take up 60-70% of a database or application server administrator's day. Automating these tasks enables greater efficiency and faster change delivery with higher quality and better predictability.

HP DMA provides role-based access to automation content. This enables you to better utilize resources at every level:

- End-users can deliver routine, yet complex, DBA and middleware tasks.
- Operators can execute expert level tasks across multiple servers including provisioning, patching, configuration, and compliance checking.
- Subject matter experts can define, enforce, and audit full stack automation across network, storage, server, database, and middleware.

An HP DMA workflow performs a specific automated task—such as provisioning database or application servers, patching database or application servers, or checking a database or application server for compliance with a specific standard. You specify environment-specific information that the workflow requires by configuring its parameters.

Related HP DMA workflows are grouped together in solution packs. When you purchase or upgrade HP DMA content, you are granted access to download specific solution packs.

# Audience

This document is designed for IT architects and engineers who are responsible for planning, implementing, and maintaining Oracle® Database environments. It is also useful to engineers who are implementing—or planning to implement—HP Database and Middleware Automation (HP DMA).

To use this solution effectively, you should be familiar with the following Oracle Database features and their requirements:

- Oracle Cluster Ready Services (CRS)
- Oracle Grid Infrastructure
- Oracle Real Application Clusters (RAC)

For additional information, see the [Oracle Product Documentation](#) on page 68.

# Document Map

The following table shows you how to navigate this guide:

Topic	Description
<a href="#">The Advanced Database Patching Solution</a>	General information about this solution, including what it contains and what it does.
<a href="#">Workflow Details</a>	Information about each of the workflows included in this solution, including: prerequisites, how it works, how to run it, sample scenarios, and a list of input parameters.
<a href="#">Reference Information</a>	Links to pertinent Oracle product documentation and more information about HP DMA.
<a href="#">Tips and Best Practices</a>	Simple procedures that you can use to accomplish a variety of common HP DMA tasks.
<a href="#">Troubleshooting</a>	Tips for solving common problems.



# Important Terms

Here are a few basic HP DMA terms that you will need to know:

- In HP DMA, a **workflow** executes a process —such as installing a software product or checking a database instance for compliance with a specific security benchmark.
- A workflow consists of a sequence of **steps**. Each step performs a very specific task. Steps can be shared among workflows.
- Steps can have input and output **parameters**, whose values will be unique to your environment.

If you provide correct values for the input parameters that each scenario requires, the workflow will be able to accomplish its objective. Output parameters from one step often serve as input parameters to another step.

- A **solution pack** contains a collection of related workflows and the steps, functions, and policies that implement each workflow.

More precisely, solution packs contain **workflow templates**. These are read-only versions of the workflows that cannot be deployed. To run a workflow included in a solution pack, you must first create a deployable copy of the workflow template and then customize that copy for your environment.

- A **deployment** associates a workflow with the targets (servers, instances, or databases) where the workflow will run. To run a workflow, you execute a specific deployment. A deployment is associated with one workflow; a workflow can have many deployments, each with its own targets and parameter settings.
- The umbrella term **automation items** is used to refer to those items to which role-based permissions can be assigned. Automation items include workflows, deployments, steps, and policies.

Organizations also have role-based permissions. Servers, instances, and databases inherit their role-based permissions from the organization in which the server resides.

- The **software repository** contains any files that a workflow might need to carry out its purpose (for example, software binaries or patch archives). If the files that a workflow requires are not in the software repository, they must be stored locally on each target server.

When you are using HP DMA with HP Server Automation (HP SA), the software repository is the HP SA Software Library.

- An **organization** is a logical grouping of servers. You can use organizations to separate development, staging, and production resources—or to separate logical business units. Because user security for running workflows is defined at the organization level, organizations should be composed with user security in mind.

Additional terms are defined in the [Glossary](#) on page 82.

# Chapter 1: The Advanced Database Patching Solution

The HP Database and Middleware Automation (HP DMA) Advanced Database Patching solution provides tools that you can use to patch specialized Oracle Database configurations including Oracle Cluster Ready Services (CRS), Oracle Grid Infrastructure, and Oracle Real Application Clusters (RAC) in an efficient and automated way.

The benefits of using this HP DMA solution instead of patching your databases manually are:

- You can patch databases across multiple targets in either a development or production environment.
- You can use a variety of Oracle-supplied patches.
- You can easily roll back your system to a previous patch level.
- You can reduce database down time.
- You can reduce patching errors thanks to safeguards that HP DMA provides.

By consistently using the tools provided in this solution, you can apply database patches more accurately and consistently—and save time in the process.

**Note:** The workflows included in this HP DMA solution pack support Oracle Quarterly patches. They do not support Oracle one-off patches.

## What this Solution Includes

This solution includes the following workflows:

Workflow Name	Description
<a href="#">Apply Critical Patch Update to RAC Home</a>	<p>This workflow applies an Oracle supplied Critical Patch Update/Security Patch Update (CPU/SPU) or Patch Set Update (PSU) to one or more Real Application Cluster (RAC) Oracle Homes (RDBMS or ASM only).</p> <p>This workflow is delivered to support 10.2 and 11.1 environments. Its functionality has been replaced by the <a href="#">Oracle - Patch Grid Infrastructure and Databases</a> workflow.</p>
<a href="#">Apply Oracle CRS Patchset</a>	<p>This workflow applies an Oracle patchset to a CRS Oracle Home.</p>
<a href="#">Oracle - Patch Grid Infrastructure and Databases</a>	<p>This workflow patches Oracle Grid Infrastructure on 11.2 and 12.1 environments. It patches both Grid Standalone and Grid Cluster environments. In addition to the Grid Home, it patches all of the Database Homes and databases managed with the Grid.</p>
<a href="#">Oracle - Rollback Patch from Grid Infrastructure and Database</a>	<p>This workflow rolls back a patch from Oracle Grid Infrastructure on 11.2 and 12.1 environments. It works for both Grid Standalone and Grid Cluster environments. In addition to the Grid Home, it rolls back the patch from all of the Database Homes and databases managed with the Grid.</p>

You can run these workflows on demand or create a schedule to apply patches in a fully automated "lights out" manner.

## Deprecated Advanced Oracle Patching Workflows

The following workflows have been deprecated from the solution pack and removed from the product:

### Workflows Deprecated in HP DMA 10.22

Workflow Name	Description
Oracle - Patch CRS Home	<p>This workflow enables you to apply an Oracle-supplied Patch Bundle to an Oracle Cluster Ready Services (CRS) Home.</p> <p>This workflow has been replaced by the <a href="#">Oracle - Patch Grid Infrastructure and Databases</a> workflow for Oracle 11.2 (and later).</p>
Oracle - Rollback Patch from CRS Home	<p>This workflow enables you to rollback a Patch Bundle from an Oracle Cluster Ready Services (CRS) Home. The specified patch is rolled back from the CRS Home.</p> <p>This workflow has been replaced by the <a href="#">Oracle - Rollback Patch from Grid Infrastructure and Database</a> workflow for Oracle 11.2 (and later).</p>

**Tip:** Documentation for these deprecated workflows is available in the *HP DMA Advanced Oracle Database Patching User Guide* for HP DMA version 10.21. This document is available on the HP Software Support web site: <https://softwaresupport.hp.com/>

### Workflows Deprecated in HP DMA 10.20

Workflow Name	Description
Apply Critical Patch Update to CRS or Grid Home	<p>This workflow applies an Oracle-supplied Patch Bundle to an Oracle Cluster Ready Services (CRS) Home.</p> <p>This workflow has been replaced by the <a href="#">Oracle - Patch Grid Infrastructure and Databases</a> workflow for Oracle 11.2 (and later).</p>
Apply Oracle Grid Standalone Patch and Apply Database Patch	<p>This workflow applies an Oracle patch to a Grid Standalone Oracle Home and applies a patch to the databases on the target.</p> <p>This workflow has been replaced by the <a href="#">Oracle - Patch Grid Infrastructure and Databases</a> workflow.</p>
Rollback Critical Patch Update from CRS Home	<p>This workflow rolls back a Patch Bundle from a CRS Home.</p> <p>This workflow has been replaced by the <a href="#">Oracle - Rollback Patch from Grid Infrastructure and Database</a> workflow for Oracle 11.2 (and later).</p>

**Tip:** Documentation for these deprecated workflows is available in the *HP DMA Advanced Oracle Database Patching User Guide* for HP DMA version 10.10. This document is available

on the HP Software Support web site: <https://softwaresupport.hp.com/>

## What this Solution Does

The workflows in this solution do the following:

- Download an Oracle CPU/SPU or PSU archive, decompress and execute against the Oracle CRS or Grid Home. Perform version and patch-specific configuration updates as required by those versions. Allow you to apply the Patch Bundle to the Grid infrastructure only or to the database Oracle Homes as well.
- Download an Oracle CPU/SPU or PSU archive, decompress and execute against the Oracle RAC Home. Perform version and patch-specific configuration updates as required by those versions.
- Switch RAC Oracle Homes to a previously patched version by rolling back the PSUs from the old Oracle Home and applying those in the new Oracle Home.
- Download an Oracle Patchset archive, decompress and execute against the Oracle CRS Home.
- Download an Oracle Grid Standalone Grid Patch and Database Patch, decompress and execute it against a Grid Standalone Oracle Home and database. Perform version and patch-specific configuration updates as required by those versions.
- Rollback any CPU/SPU or PSU that has been applied to an Oracle CRS Home.

# Supported Products and Platforms

## Operating Systems

The HP DMA Advanced Database Patching workflows are supported on the following operating systems:

- Red Hat Enterprise Linux, SUSE Linux Enterprise Server, and Oracle Linux
- Solaris
- AIX

For specific operating system versions supported by each workflow, see the *HP Database and Middleware Automation version 10.22 Support Matrix* available at the HP Software Product Manuals web site:

<http://h20230.www2.hp.com/selfsolve/manuals>

## Hardware Requirements

For HP DMA server hardware requirements, see the *HP DMA Installation Guide* and the *HP DMA Release Notes*.

## Software Requirements

The latest HP DMA solution packs require the latest HP DMA platform. To use the latest solution packs, update the HP DMA platform. HP DMA 10.22 solution packs are supported on HP DMA 10.22 (and later).

## Chapter 2: Workflow Details

This solution pack contains the following workflows:

Workflow Name	Description
<a href="#">Apply Critical Patch Update to RAC Home</a>	<p>This workflow applies an Oracle supplied Critical Patch Update/Security Patch Update (CPU/SPU) or Patch Set Update (PSU) to one or more Real Application Cluster (RAC) Oracle Homes (RDBMS or ASM only).</p> <p>This workflow is delivered to support 10.2 and 11.1 environments. Its functionality has been replaced by the <a href="#">Oracle - Patch Grid Infrastructure and Databases</a> workflow.</p>
<a href="#">Apply Oracle CRS Patchset</a>	<p>This workflow applies an Oracle patchset to a CRS Oracle Home.</p>
<a href="#">Oracle - Patch Grid Infrastructure and Databases</a>	<p>This workflow patches Oracle Grid Infrastructure on 11.2 and 12.1 environments. It patches both Grid Standalone and Grid Cluster environments. In addition to the Grid Home, it patches all of the Database Homes and databases managed with the Grid.</p>
<a href="#">Oracle - Rollback Patch from Grid Infrastructure and Database</a>	<p>This workflow rolls back a patch from Oracle Grid Infrastructure on 11.2 and 12.1 environments. It works for both Grid Standalone and Grid Cluster environments. In addition to the Grid Home, it rolls back the patch from all of the Database Homes and databases managed with the Grid.</p>

Each workflow included in this solution pack has a set of input parameters whose values will be unique to your environment. If you provide correct values for the parameters that each scenario requires, the workflow will be able to accomplish its objective.

There are two steps required to customize this solution:

1. Ensure that all required parameters are visible. You do this by using the workflow editor.

For simple advanced database patching scenarios, you can use the default values for most parameters. To use this solution's more advanced features, you will need to expose additional parameters.

2. Specify the values for those parameters. You do this when you create a deployment.

**Tip:** Detailed instructions are provided in the "How to Run this Workflow" topic for each workflow.

The information presented here assumes the following:



- HP DMA is installed and operational.
- At least one suitable target server is available (see [Supported Products and Platforms](#) on page 15).
- You are logged in to the HP DMA web interface.
- You have permission to create, edit, and deploy copies of the workflows included in this solution pack.

**Tip:** All parameters used by the workflows in this solution are provided in the "Parameters" topic associated with each workflow.

## Apply Critical Patch Update to RAC Home

This workflow enables you to apply an Oracle-supplied Critical Patch Update/Security Patch Update (CPU/SPU) or Patch Set Update (PSU) to a list of Real Application Cluster (RAC) Oracle Homes supporting Automatic Storage Management (ASM) or Relational Database Management System (RDBMS). It does not apply to Cluster Ready Services (CRS).

If specified, the Oracle Homes will be cloned and subsequently patched. The OPatch version will also be updated, if needed. The workflow performs a rolling update of an active RAC Home. If the Clone Oracle Home parameter is specified, no RAC processes are stopped during this process as the specified Oracle Homes are copied and this copy is subsequently patched. If the specified Oracle Homes only service an Instance, this Instance is stopped during the patching. It is assumed that the Listener is running from the ASM Home. This workflow is not designed to update the CRS Home or a single database Instance.

To use this workflow in your environment, see the following information:

Topic	Information Included
<a href="#">Prerequisites for this Workflow</a>	List of prerequisites that must be satisfied before you can run this workflow
<a href="#">How this Workflow Works</a>	Information about what the workflow does, including validation checks performed, and steps executed
<a href="#">How to Run this Workflow</a>	Instructions for running this workflow in your environment
<a href="#">Sample Scenarios</a>	Examples of typical parameter values for this workflow
<a href="#">Parameters</a>	List of input parameters for this workflow

## Prerequisites for this Workflow

Be sure that the following prerequisites are satisfied before you run the [Apply Critical Patch Update to RAC Home](#) workflow:

1. You have installed the HP DMA Advanced Database Patching solution pack.
2. You have read access to all specified inventory pointers (Linux/UNIX).
3. You have a valid Oracle support contract.
4. You have imported the pertinent Oracle CPU/SPU into the HP DMA software repository (see [How to Import a File into the Software Repository](#) on page 78).
5. If you do not specify the OPatch option, you must have the current OPatch already available on your system.
6. Your targets are running one of the supported operating systems (see the *HP DMA Support Matrix*).
7. You must have a working RAC environment.

For more information about prerequisites for Oracle Database, refer to the [Oracle Product Documentation](#) on page 68.

## How this Workflow Works

The [Apply Critical Patch Update to RAC Home](#) workflow performs the following actions:

- The initial steps of the workflow prepare it to patch the RAC nodes. The workflow performs the validation checks described in the [Validation Checks Performed](#) section below.
- If an OPatch archive file has been provided, the workflow uses the correct OPatch version to patch the Oracle OPatch utility before applying the Critical Patch Update/Security Patch Update (CPU/SPU) to each Oracle RAC node.
- The workflow extracts and applies the patch to the Oracle RAC nodes. The workflow runs an SQL script to update the CPU/SPU Database Catalog for RAC against every RAC instance in the supplied list.
- The final steps of the workflow allow the workflow to end cleanly and confirm that the patch has been successfully applied.

### Validation Checks Performed

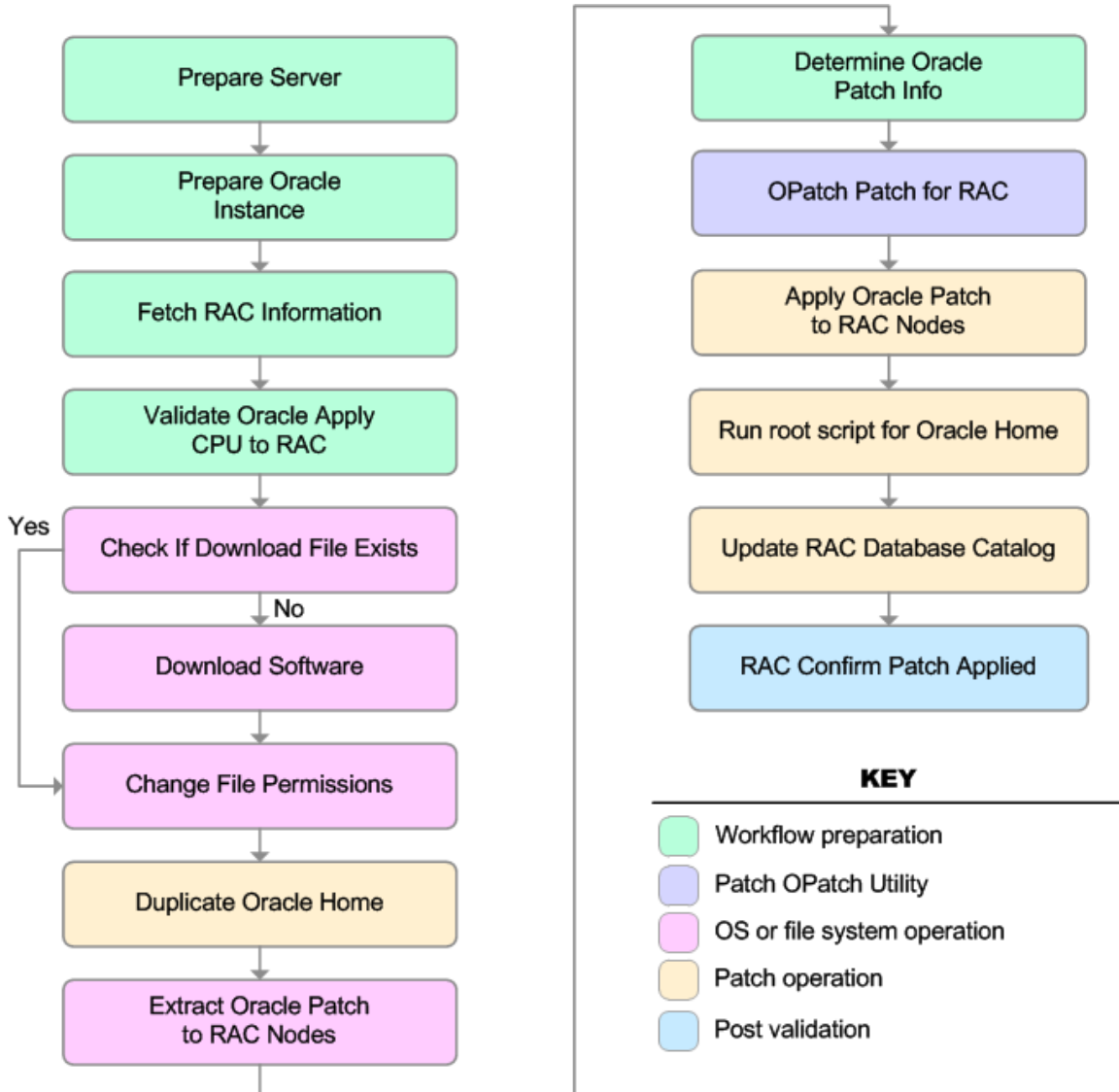
This workflow validates the following conditions:

1. The input parameters have the proper syntax (no special characters or spaces).
2. Files exist or have valid specifications.
3. The current Oracle Database and OPatch versions match the required versions.
4. The supplied CPU/SPU applies to the current Oracle Database version.

After the patching operation is completed, the workflow verifies that the CPU/SPU has been successfully applied to the target.

### Steps Executed

The [Apply Critical Patch Update to RAC Home](#) workflow includes the following steps. Each step must complete successfully before the next step can start. If a step fails, the workflow reports a failure and all subsequent steps are skipped.



### Steps Used in Apply Critical Patch Update to RAC Home

Workflow Step	Description
Prepare Server	This step prepares the target server enabling subsequent steps to be executed by the OS administrator user or the owner of the database software.
Prepare Oracle Instance	This step prepares instance level Oracle access.

#### Steps Used in Apply Critical Patch Update to RAC Home, continued

Workflow Step	Description
Fetch RAC Information	This step uses <code>srvctl</code> to fetch the RAC information.
Validate Oracle Apply CPU to RAC	This step validates the parameters for Apply Critical Patch Update to RAC Home.
Check if Download File Exists	This step determines whether one or more specified files already exist on the target server.
Download Software	This step downloads a list of files to a specified location on the target server.
Change File Permissions	This step changes the ownership to the provided user and group of each file specified. A warning is issued for files that are not found.
Duplicate Oracle Home	This step duplicates Oracle Home.
Extract Oracle Patch to RAC Nodes	This step extracts the CPU/SPU and PSU Archive to the different RAC nodes.
Determine Oracle Patch Info	This step determines all the patch information that the workflow requires to apply the pertinent patch.
OPatch Patch for RAC	This step determines if an OPatch archive file has been provided and updates OPatch as needed. This OPatch update is done for each RAC Oracle Home, such as, the Listener, ASM, Instance, and so on.
Apply Oracle Patch to RAC Nodes	This step applies the patch to the RAC nodes.
Run root script for Oracle Home	This step runs the Oracle provided <code>cpu_root.sh</code> or <code>psu_root.sh</code> script as part of an Oracle patch on RAC.
Update RAC Database Catalog	This step runs the <code>catcpu.sql</code> or <code>catpsu.sql</code> script against every RAC instance in the supplied list.
RAC Confirm Patch Applied	This step confirms that the patch has been properly applied.

**Note:** For input parameter descriptions and defaults, see [Parameters for Apply Critical Patch Update to RAC Home](#) on page 29.

## How to Run this Workflow

The following instructions show you how to customize and run the [Apply Critical Patch Update to RAC Home](#) workflow in your environment.

**Tip:** For detailed instructions to run HP DMA workflows—using the Run Oracle Compliance Audit workflow as an example—see *HP DMA Quick Start Tutorial*.

The workflow provides default values for some parameters. These default values are usually sufficient for a "typical" installation. You can override the defaults by specifying parameter values in the deployment. You can also expose additional parameters in the workflow, if necessary, to accomplish more advanced scenarios. Any parameters not explicitly specified in the deployment will have the default values listed in [Parameters for Apply Critical Patch Update to RAC Home](#) on page 29.

**Note:** Before following this procedure, review the [Prerequisites for this Workflow](#) on page 19, and ensure that all requirements are satisfied.

To run this workflow, you need to set your parameters differently depending on the location and status of your Oracle Patch Bundle. Use the following table to choose the method that matches your situation.

For information about uploading files to the HP DMA software repository, see [How to Import a File into the Software Repository](#) on page 78.

**To specify the parameters for the Oracle Patch Bundle, choose one of the following methods:**

Method 1: The Oracle ZIP file is in the software repository:

**Note:** The ZIP file name must have the following form: pPatchNum\_DBVersion\_OSVersion.zip. Example: p6880880\_102000\_Linux-x86-64.zip

1. In the CPU Archive parameter, specify the name (or names) of the ZIP file (or files) that was downloaded from Oracle.
2. In the Patch Download Location parameter, specify the directory where the ZIP file (or files) specified in the CPU Archives parameter should be downloaded.
3. In the Patch Archive Location parameter, specify the directory where the ZIP file (or files) specified in the CPU Archives parameter should be extracted (unzipped).

All downloaded files are removed upon successful completion of the workflow.

Method 2: The Oracle ZIP file is stored on each target machine:

**Note:** The ZIP file name must have the following form: pPatchNum\_DBVersion\_OSVersion.zip. Example: p6880880\_102000\_Linux-x86-64.zip

1. In the CPU Archive parameter, specify the fully qualified name (or names) of the ZIP file (or files) that was downloaded from Oracle.
2. Do not specify a value for the Patch Archive Location parameter. You must specify the Patch Download Location if either OCM Response File or Patch Information File need to be downloaded; otherwise, do not specify a value for Patch Download Location.

All downloaded files are removed upon successful completion of the workflow.



**To use the Apply Critical Patch Update to RAC Home workflow:**

1. Create a deployable copy of the workflow (see "Create a Deployable Workflow" in *HP DMA Quick Start Tutorial*).
2. Determine the values that you will specify for the following parameters:

**Input Parameters Defined in this Step: Validate Oracle Apply CPU to RAC**

Parameter Name	Default Value	Required	Description
CPU Archive	no default	required	Relative or fully-qualified path name of the Critical Patch Update archive file. If a fully-qualified path name points to a file, that file is expected to be on the target. If a relative path name points to a file, that file will be downloaded from the software repository on the HP DMA server. If a fully-qualified path name is a directory, the patch is expected to be unzipped and ready to be applied (this directory must be the patch number).
Oracle Homes	see description	required	Comma-separated list of fully-qualified Oracle Home directories to patch. This CPU/SPU/PSU will be applied to these Oracle Homes.

**Note:** This is the minimum set of parameters required to run this workflow. You may need to expose additional parameters depending on your objectives. See [How to Expose Additional Workflow Parameters](#) on page 74

See [Parameters for Apply Critical Patch Update to RAC Home](#) on page 29 for detailed descriptions of all input parameters for this workflow, including default values.

3. In the workflow editor, expose any additional parameters that you need. You will specify values for those parameters when you create the deployment.
4. Save the changes to the workflow (click **Save** in the lower right corner).
5. Create a new deployment (see "Create a Deployment" in *HP DMA Quick Start Tutorial* for instructions).
6. On the Parameters tab, specify values for the required parameters listed in step 2 and any additional parameters that you have exposed. You do not need to specify values for those parameters whose default values are appropriate for your environment.
7. On the Targets tab, specify one or more targets for this deployment.
8. Save the deployment (click **Save** in the lower right corner).
9. Run the workflow using this deployment (see "Run Your Workflow" in *HP DMA Quick Start Tutorial* for instructions).

**To verify the results:**

The workflow will complete and report SUCCESS on the Console if it has run successfully. If an error occurs during workflow execution, the error is logged, and the workflow terminates in the FAILURE state.

## Sample Scenarios

This topic shows you how to use various parameters to achieve the following advanced patching scenarios in your environment using the [Apply Critical Patch Update to RAC Home](#) workflow.

### Scenario 1: Apply the CPU/SPU and/or PSU to RAC Homes

In this scenario, the workflow applies the CPU/SPU and/or PSU to all specified RAC Homes. This includes the Listener, ASM, and RDBMS Homes. This is the default behavior for this workflow. If this is how you want to apply the patch, you must set the parameter Oracle Homes to the list of Homes where the patch is to be applied. Also, you must *not* specify values for the Clone Names and Clone Oracle Homes parameters as shown in the following parameter table:

Parameter Name	Description
CPU Archive	Relative or fully-qualified path name of the Critical Patch Update archive file. If a fully-qualified path name points to a file, that file is expected to be on the target. If a relative path name points to a file, that file will be downloaded from the software repository on the HP DMA server. If a fully-qualified path name is a directory, the patch is expected to be unzipped and ready to be applied (this directory must be the patch number).  Example: /u02/p14038787_112030_Linux-x86-64.zip
Oracle Homes	Comma-separated list of fully-qualified Oracle Home directories to patch. This CPU/SPU/PSU will be applied to these Oracle Homes.  Example: /u01/app/oracle/product/11.2.0/db1, /u01/app/oracle/product/11.2.0/db2

**Note:** Some of these parameters are not exposed by default in the deployment. See [How to Expose Additional Workflow Parameters](#) on page 74.

Be sure that the default values for all remaining input parameters are appropriate for your environment (see [Parameters for Apply Critical Patch Update to RAC Home](#) on page 29).

### Scenario 2: Clone RAC Homes and apply patch

In this scenario, the workflow duplicates (clones) the specified Oracle Homes to the specified Clone Oracle Homes. The patch is subsequently applied to the cloned Homes. No RAC processes are stopped during this process. All RAC resources remain available during this workflow. If this is how you want to apply the patch, you must specify a comma-separated list of Homes in the Oracle Homes and the Clone Oracle Homes parameter. Also, for each Oracle Home specified, you must specify a Clone Oracle Home and Clone Name as shown in the following parameter table:

Parameter Name	Description
CPU Archive	Relative or fully-qualified path name of the Critical Patch Update archive file. If a fully-qualified path name points to a file, that file is expected to be on the target. If a relative path name points to a file, that file will be downloaded from the software repository on the HP DMA server. If a fully-qualified path name is a directory, the patch is expected to be unzipped and ready to be applied (this directory must be the patch number).  Example: /u02/p14038787_112030_Linux-x86-64.zip
Clone Oracle Homes	Comma-separated list of fully-qualified path names of Oracle Homes to create using the Oracle Home Cloning process. The number of specified Clone Oracle Homes must match the number of specified Oracle Homes.  Example: /u01/app/oracle/product/11.2.0/db1_clone, /u01/app/oracle/product/11.2.0/db2_clone
Clone Names	Names to use for each of the specified Clone Oracle Homes. Required if the Clone Oracle Homes parameter is specified. The number of specified Clone Names must match the number of specified Clone Oracle Homes.  Example: Clone1,Clone2
Oracle Homes	Comma-separated list of fully-qualified Oracle Home directories to patch. This CPU/SPU/PSU will be applied to these Oracle Homes.  Example: /u01/app/oracle/product/11.2.0/db1, /u01/app/oracle/product/11.2.0/db2

**Note:** Some of these parameters are not exposed by default in the deployment. See [How to Expose Additional Workflow Parameters](#) on page 74.

Be sure that the default values for all remaining input parameters are appropriate for your environment (see [Parameters for Apply Critical Patch Update to RAC Home](#) on the next page).

## Parameters for Apply Critical Patch Update to RAC Home

The following tables describe the required and optional input parameters for this workflow. Some of these parameters are not initially visible in a deployment (see [How to Expose Additional Workflow Parameters](#) on page 74). For most parameters, if you do not specify a value for a parameter, a default value is assigned.

**Note:** Only those parameters that are configurable in a standard deployment are listed here. Input parameters that must be mapped to output parameters of previous steps are not listed.

### Input Parameters Defined in this Step: Prepare Oracle Instance

Parameter Name	Default Value	Required	Description
Inventory Files	see description	optional	Comma-separated list of Oracle inventory file names (with absolute paths). If not specified, set to the appropriate default value for the target server operating system. Defaults are:  Solaris or HP-UX: /var/opt/oracle/oraInst.loc  Linux: /etc/oraInst.loc

### Additional Input Parameters Defined in this Step: Validate Oracle Apply CPU to RAC

Parameter Name	Default Value	Required	Description
Clone Names	see description	optional	Names to use for each of the specified Clone Oracle Homes. Required if the Clone Oracle Homes parameter is specified. The number of specified Clone Names must match the number of specified Clone Oracle Homes.  Example: Clone1,Clone2
Clone Oracle Homes	see description	optional	Comma-separated list of fully-qualified path names of Oracle Homes to create using the Oracle Home Cloning process. The number of specified Clone Oracle Homes must match the number of specified Oracle Homes.
CPU Archive	no default	required	Relative or fully-qualified path name of the Critical Patch Update archive file. If a fully-qualified path name points to a file, that file is expected to be on the target. If a relative path name points to a file, that file will be downloaded from the software repository on the HP DMA server. If a fully-qualified path name is a directory, the patch is expected to be unzipped and ready to be applied (this directory must be the patch number).

**Additional Input Parameters Defined in this Step: Validate Oracle Apply CPU to RAC, continued**

Parameter Name	Default Value	Required	Description
Ignorable Oracle Errors	no default	optional	Comma-separated list of Oracle errors to be ignored when applying the patch to the database. This is in addition to the list of Oracle errors specified in the patch readme file. Values are of the form <code>ORA-nnnnn</code> .  Example: <code>ORA-04020,ORA-03113</code>
OCM Response File	no default	optional	Path name of the Oracle Configuration Manager (OCM) response file. If it is not found on the target, this file is downloaded from the software repository on the HP DMA server. If left blank, a default response file will be created.
OPatch Archive	no default	optional	Path name of the OPatch Archive file required for this Critical Patch Update. If the file is not present, it will be downloaded. If this parameter value is not specified, the current OPatch version will be used.
Oracle Homes	see description	required	Comma-separated list of fully-qualified Oracle Home directories to patch. This CPU/SPU/PSU will be applied to these Oracle Homes.
Patch Archive Location	<code>/var/tmp</code>	optional	Directory location where the CPU archives will be extracted.
Patch Download Location	<code>/var/tmp</code>	optional	Directory on the target server where the patch files are copied from the software repository on the HP DMA server—used only if the required files are not found on the target but are found in the HP DMA software repository.
Patch Information File	no default	optional	Supplementary patch information supplied by support. If this file is not found on the target, it is downloaded from the software repository on the HP DMA server.

**Additional Input Parameters Defined in this Step: Apply Oracle Patch to RAC Nodes**

Parameter Name	Default Value	Required	Description
Patch Name	no default	optional	Patch Name associated with the patch.

## Apply Oracle CRS Patchset

This workflow enables you to apply an Oracle-supplied CRS patchset to an Oracle Home. The Oracle patchset archive can be supplied from several sources as described in [How to Run this Workflow](#). Be aware that several items are not upgraded as part of this workflow. They include:

- Oracle Level Security is not upgraded.
- Oracle Data Vault is not upgraded.
- Oracle ASM is not upgraded.
- The `changePerm.sh` script is not run.
- OCM is not configured for a cloned Home.
- Database time zone definitions are not updated.

To use this workflow in your environment, see the following information:

Topic	Information Included
<a href="#">Prerequisites for this Workflow</a>	List of prerequisites that must be satisfied before you can run this workflow
<a href="#">How this Workflow Works</a>	Information about what the workflow does, including validation checks performed, and steps executed
<a href="#">How to Run this Workflow</a>	Instructions for running this workflow in your environment
<a href="#">Sample Scenarios</a>	Examples of typical parameter values for this workflow
<a href="#">Parameters</a>	List of input parameters for this workflow

## Prerequisites for this Workflow

Be sure that the following prerequisites are satisfied before you run the [Apply Oracle CRS Patchset](#) workflow:

1. You have installed the HP DMA Advanced Database Patching solution pack.
2. You have read access to all specified inventory pointers (Linux/UNIX).
3. You have a valid Oracle support contract.
4. You have imported the pertinent Oracle CPU/SPU into the HP DMA software repository (see [How to Import a File into the Software Repository](#) on page 78).
5. If you do not specify the OPatch option, you must have the current OPatch already available on your system.
6. Your targets are running one of the supported operating systems (see the *HP DMA Support Matrix*).

**Note:** The Oracle patchset archive must be located in one of the following places:

- On the target machine—specify the fully qualified path to the archive.
- In the HP DMA software repository—specify the name of the archive in the repository.

You must specify the location of the Oracle patchset archive in the Patchset Archive parameter.

For more information about prerequisites for Oracle Database, refer to the [Oracle Product Documentation](#) on page 68.



## How this Workflow Works

The [Apply Oracle CRS Patchset](#) workflow performs the following actions:

- The initial steps of the workflow perform the validation checks described in the [Validation Checks Performed](#) section below.
- The workflow stages the Oracle software distribution from an archived file, constructs commands used in subsequent steps, downloads any required files, and fetches the list Oracle Home Instances.
- The workflow shuts down all Oracle processes in preparation to clean the kernel and library memory and run the installer.
- The final steps of the workflow restart the Oracle processes and apply the CRS patchset to Oracle Home. After the patchset is applied to Oracle Home, all instances using this Oracle Home are upgraded using the Database Upgrade Assistant (DBUA).

### Validation Checks Performed

This workflow validates the following conditions:

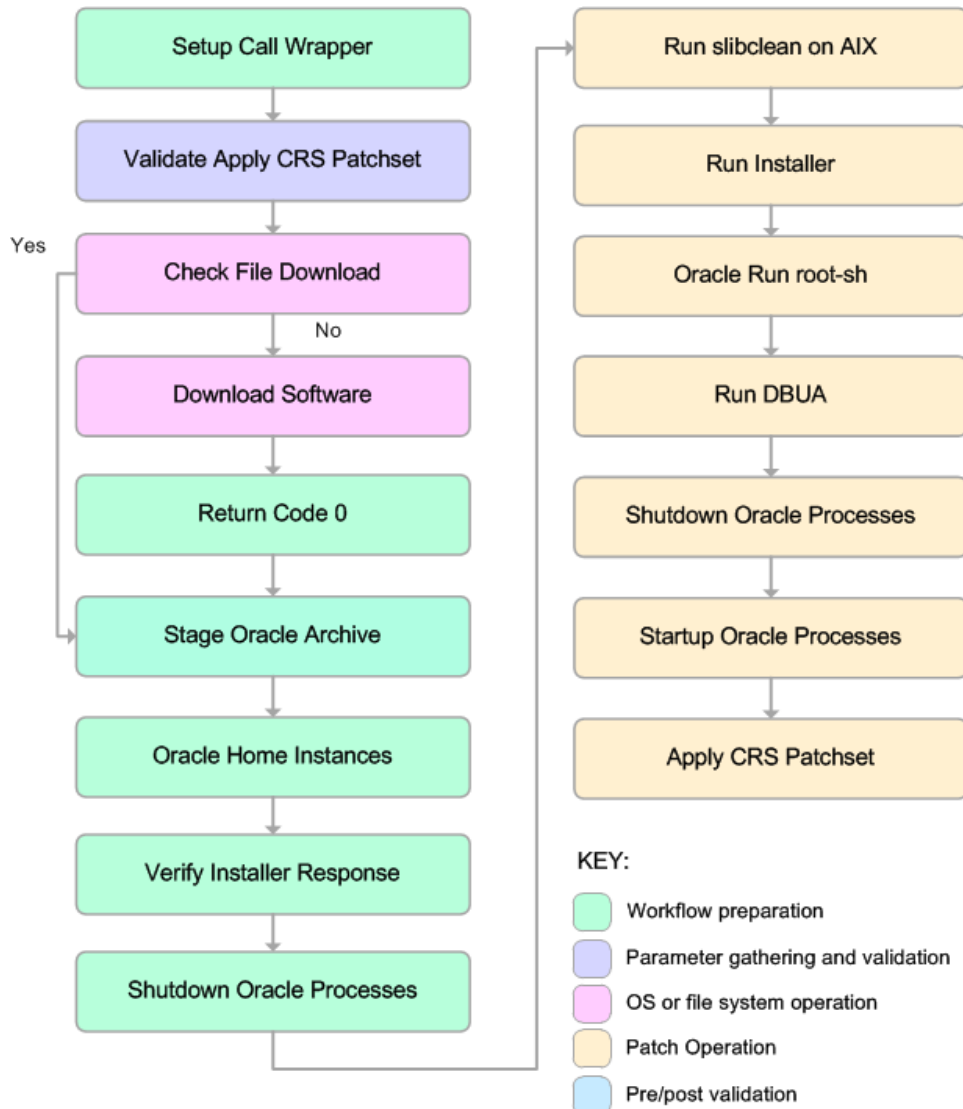
1. The input parameters have the proper syntax (no special characters or spaces).
2. Files exist or have valid specifications.
3. The supplied patchset applies to the current Oracle Database version.

After the patching operation is completed, the workflow verifies that the patchset has been successfully applied to the target.

**Caution:** If the metadata variable `Server.Unzip` is specified, the specified program is used instead of `gunzip`, `unzip`, and/or `cpio`. This is a required parameter for Windows (for example: `C:\Temp\unzip.exe`).

## Steps Executed

The [Apply Oracle CRS Patchset](#) workflow includes the following steps. Each step must complete successfully before the next step can start. If a step fails, the workflow reports a failure and all subsequent steps are skipped.



## Steps Used in Apply Oracle CRS Patchset

Workflow Step	Description
Setup Call Wrapper	This step verifies that the setup to become another user is in place.
Validate Apply CRS Patchset	This step validates the specified values of the input parameters for the <a href="#">Apply Oracle CRS Patchset</a> workflow.

### Steps Used in Apply Oracle CRS Patchset, continued

Workflow Step	Description
Check File Download	This step determines whether one or more specified files already exist on the target server.
Download Software	This step downloads a list of files to a specified location on the target server.
Return Code 0	This step ensures that the return code is set to zero.
Stage Oracle Archive	This step stages the Oracle software distribution from a *.zip, *.cpio, or *.cpio.gz file. It unwinds and uncompresses files as necessary depending on the type of archive file.
Oracle Home Instances	This step fetches the list of database instances using the supplied ORACLE_HOME input parameter.
Verify Installer Response	This step creates or verifies an installer response file. If the response file does not exist, it is created from the default standard response file provided by Oracle.
Shutdown Oracle Processes	This step shuts down the Oracle processes. This includes the Oracle Agent and all Oracle Instances and Listeners provided in the input list.
Run sibclean on AIX	This step runs the <code>sibclean</code> command on AIX targets. The <code>sibclean</code> utility removes any currently unused modules in kernel and library memory.
Run Installer	This step runs the Oracle Universal Installer (OUI) or the Installer (setup.exe) with the supplied response file.
Oracle Run root-sh	This step runs the Oracle provided <code>root.sh</code> script in silent mode.
Run DBUA	This step runs the Oracle Database Upgrade Assistant (DBUA) with the specified response file. It must be run as the Oracle software owner (typically oracle).
Shutdown Oracle Processes	This step shuts down the Oracle processes. This includes the Oracle Agent and all Oracle Instances and Listeners provided in the input list.
Startup Oracle Processes	This step starts up the Oracle processes. This includes the Oracle Agent and all Oracle Instances and Listeners provided in the input list.
Apply CRS Patchset	This step applies the CRS patchset to Oracle Home.

**Note:** For input parameter descriptions and defaults, see [Parameters for Apply Oracle CRS Patchset](#) on page 40.

## How to Run this Workflow

The following instructions show you how to customize and run the [Apply Oracle CRS Patchset](#) workflow in your environment.

**Tip:** For detailed instructions to run HP DMA workflows—using the Run Oracle Compliance Audit workflow as an example—see *HP DMA Quick Start Tutorial*.

The workflow provides default values for some parameters. These default values are usually sufficient for a "typical" installation. You can override the defaults by specifying parameter values in the deployment. You can also expose additional parameters in the workflow, if necessary, to accomplish more advanced scenarios. Any parameters not explicitly specified in the deployment will have the default values listed in [Parameters for Apply Oracle CRS Patchset](#) on page 40.

**Note:** Before following this procedure, review the [Parameters for Apply Oracle CRS Patchset](#) on page 40, and ensure that all requirements are satisfied.

**To use the Apply Oracle CRS Patchset workflow:**

1. Create a deployable copy of the workflow (see "Create a Deployable Workflow" in *HP DMA Quick Start Tutorial*).
2. Determine the values that you will specify for the following parameters:

### Input Parameters Defined in this Step: Setup Call Wrapper

Parameter Name	Default Value	Required	Description
Oracle Account	oracle	required	Oracle user that will own Oracle Home. It is left blank for Windows.

### Input Parameters Defined in this Step: Oracle Run root-sh

Parameter Name	Default Value	Required	Description
Cluster Nodes	no default	required	Comma-separated list of all Real Application Cluster (RAC) nodes where the Oracle Home is deployed. If RAC is not implemented, leave this parameter blank.

**Note:** This is the minimum set of parameters required to run this workflow. You may need to expose additional parameters depending on your objectives. See [How to Expose Additional Workflow Parameters](#) on page 74

See [Parameters for Apply Oracle CRS Patchset](#) on page 40 for detailed descriptions of all input parameters for this workflow, including default values.

3. In the workflow editor, expose any additional parameters that you need. You will specify values for those parameters when you create the deployment.
4. Save the changes to the workflow (click **Save** in the lower right corner).
5. Create a new deployment (see "Create a Deployment" in *HP DMA Quick Start Tutorial* for instructions).
6. On the Parameters tab, specify values for the required parameters listed in step 2 and any additional parameters that you have exposed. You do not need to specify values for those parameters whose default values are appropriate for your environment.
7. On the Targets tab, specify one or more targets for this deployment.
8. Save the deployment (click **Save** in the lower right corner).
9. Run the workflow using this deployment (see "Run Your Workflow" in *HP DMA Quick Start Tutorial* for instructions).

**To verify the results:**

The workflow will complete and report SUCCESS on the Console if it has run successfully. If an error occurs during workflow execution, the error is logged, and the workflow terminates in the FAILURE state.

## Sample Scenarios

This topic shows you how to use various parameters to achieve the following advanced patching scenarios in your environment using the [Apply Oracle CRS Patchset](#) workflow.

### Scenario 1: Apply the Oracle CRS Patchset to the default Oracle Home

In the scenario, the workflow applies the CRS Patchset to the default Oracle Home. This is the minimal use case requiring only those parameters shown in the following table:

Parameter Name	Description
Oracle Account	Oracle user that will own Oracle Home. It is left blank for Windows. Example: oracle
Cluster Nodes	Comma-separated list of all Real Application Cluster (RAC) nodes where the Oracle Home is deployed. If RAC is not implemented, leave this parameter blank. Example: RACNode1, RACNode2

**Note:** Some of these parameters are not exposed by default in the deployment. See [How to Expose Additional Workflow Parameters](#) on page 74.

Be sure that the default values for all remaining input parameters are appropriate for your environment (see [Parameters for Apply Oracle CRS Patchset](#) on page 40).

### Scenario 2: Apply the Oracle CRS Patchset and shutdown a list of listeners before applying the patch

In the scenario, the workflow applies the Oracle CRS Patchset to the default Oracle Home after shutting down a comma-separated list of listeners.

Parameter Name	Description
Oracle Account	Oracle user that will own Oracle Home. It is left blank for Windows. Example: oracle
Listeners	Comma-separated list of listeners running from this Oracle Home. Example: Listener1, Listener2, Listener3
Cluster Nodes	Comma-separated list of all Real Application Cluster (RAC) nodes where the Oracle Home is deployed. If RAC is not implemented, leave this parameter blank. Example: RACNode1, RACNode2

**Note:** Some of these parameters are not exposed by default in the deployment. See [How to Expose Additional Workflow Parameters](#) on page 74.

Be sure that the default values for all remaining input parameters are appropriate for your environment (see [Parameters for Apply Oracle CRS Patchset](#) on the next page).

## Parameters for Apply Oracle CRS Patchset

The following tables describe the required and optional input parameters for this workflow. Some of these parameters are not initially visible in a deployment (see [How to Expose Additional Workflow Parameters](#) on page 74). For most parameters, if you do not specify a value for a parameter, a default value is assigned.

**Note:** Only those parameters that are configurable in a standard deployment are listed here. Input parameters that must be mapped to output parameters of previous steps are not listed.

### Input Parameters Defined in this Step: Setup Call Wrapper

Parameter Name	Default Value	Required	Description
Oracle Account	oracle	required	Oracle user that will own Oracle Home. It is left blank for Windows.

### Additional Input Parameters Defined in this Step: Validate Apply CRS Patchset

Parameter Name	Default Value	Required	Description
Cluster Nodes	no default	optional	Comma-separated list of all Real Application Cluster (RAC) nodes where the Oracle Home is deployed. If RAC is not implemented, leave this parameter blank.
Ignore SIDs	no default	optional	Comma-separated list of Oracle Instances (SIDs) to ignore for patch post-processing.
Listeners	no default	optional	Comma-separated list of listeners running from this Oracle Home.
Oracle Binary Stage	/tmp	optional	Staging directory of the Oracle patchset installation binaries (runInstaller or setup.exe).
Oracle Home	see description	optional	The Oracle Home to which to apply the patchset. Example: /u01/app/oracle/product/11.2.0.0/DB2
Oracle Home Name	Ora1020	optional	Name of the Oracle Home as recorded in the inventory.
Oracle Inventory	no default	optional	Fully-qualified name for the Oracle inventory. It is ignored for Windows.



**Additional Input Parameters Defined in this Step: Validate Apply CRS Patchset, continued**

Parameter Name	Default Value	Required	Description
Patchset Archive	see description	optional	Comma-separated list of fully-qualified path names of the patchset archive files.  Default value: /tmp/p5337014_10203_SOLARIS64.zip
Skip root-sh	N	optional	Skip running the rootpre.sh and/or the root.sh script. Possible values are <b>Y</b> and <b>N</b> . Set this value to <b>Y</b> if the existing Oracle Home on the target machine has a version that is equal to or newer than the one being installed.

**Additional Input Parameters Defined in this Step: Oracle Run root-sh**

Parameter Name	Default Value	Required	Description
Cluster Nodes	no default	required	Comma-separated list of all Real Application Cluster (RAC) nodes where the Oracle Home is deployed. If RAC is not implemented, leave this parameter blank.

## Oracle - Patch Grid Infrastructure and Databases

This workflow enables you to patch Oracle Grid Infrastructure on 11.2 and 12.1 environments. The workflow patches both Grid Standalone and Grid Cluster environments. In addition to the Grid Home, it patches all of the Database Homes and databases managed with Grid.

In order to run on a clustered environment, you must specify a list of all nodes that are part of the Oracle Cluster in the Grid Nodes parameter. If there are specific Oracle Database Homes that you want included or excluded from the patching process, you can expose the Oracle Database Homes parameter in the Gather Advanced Parameters for Patch Grid Infrastructure and Databases step and specify the homes.

To use this workflow in your environment, see the following information:

Topic	Information Included
<a href="#">Prerequisites for this Workflow</a>	List of prerequisites that must be satisfied before you can run this workflow
<a href="#">How this Workflow Works</a>	Information about what the workflow does, including validation checks performed, and steps executed
<a href="#">How to Run this Workflow</a>	Instructions for running this workflow in your environment
<a href="#">Sample Scenarios</a>	Examples of typical parameter values for this workflow
<a href="#">Parameters</a>	List of input parameters for this workflow

**Note:** The documentation for this workflow refers to the workflow and its steps by their base names. The names in the HP DMA user interface may have a version appended, for example, v2.

## Prerequisites for this Workflow

Be sure that the following prerequisites are satisfied before you run the [Oracle - Patch Grid Infrastructure and Databases](#) workflow:

1. You have installed the HP DMA Advanced Database Patching solution pack.
2. You have read access to all specified inventory pointers (Linux/UNIX).
3. You have a valid Oracle support contract.
4. You have imported the pertinent Oracle CPU/SPU into the HP DMA software repository (see [How to Import a File into the Software Repository](#) on page 78).
5. If you do not specify the OPatch option, you must have the current OPatch already available on your system.
6. Your targets are running one of the supported operating systems (see the *HP DMA Support Matrix*).

### Other Dependencies

- Oracle Grid Home must be version 11.2.0.1 or later.
- The Oracle OPatch utility must be the latest version, or you must provide the newest OPatch archive using the appropriate workflow parameter.
- You must have enough free space available, which varies depending on the Oracle patch.

For more information about prerequisites for Oracle Database, refer to the [Oracle Product Documentation](#) on page 68.

## How this Workflow Works

The [Oracle - Patch Grid Infrastructure and Databases](#) workflow performs the following actions:

- The initial steps of the workflow prepare it to patch the Grid Home and all of the Database Homes and databases managed with Grid. The workflow performs the validation checks described in the [Validation Checks Performed](#) section below.
- If an OPatch archive file has been provided, the workflow uses the correct OPatch version to patch the Oracle OPatch utility before applying the patch to the Grid Infrastructure Home and the target databases.
- The workflow performs various staging operations before applying the patch such as checking to see if Oracle Home is to be patched. If so, it will perform various validation checks. Otherwise, it will perform just those staging operations relevant to patching the Grid Infrastructure Home.
- The workflow applies the patch to the Grid Home and to all of the Database Homes and databases managed with the Grid.
- The final steps of the workflow allow the workflow to end cleanly. The workflow verifies that the patch has been applied. Then it cleans up the downloaded files and runs Discovery to update the metadata.

### Validation Checks Performed

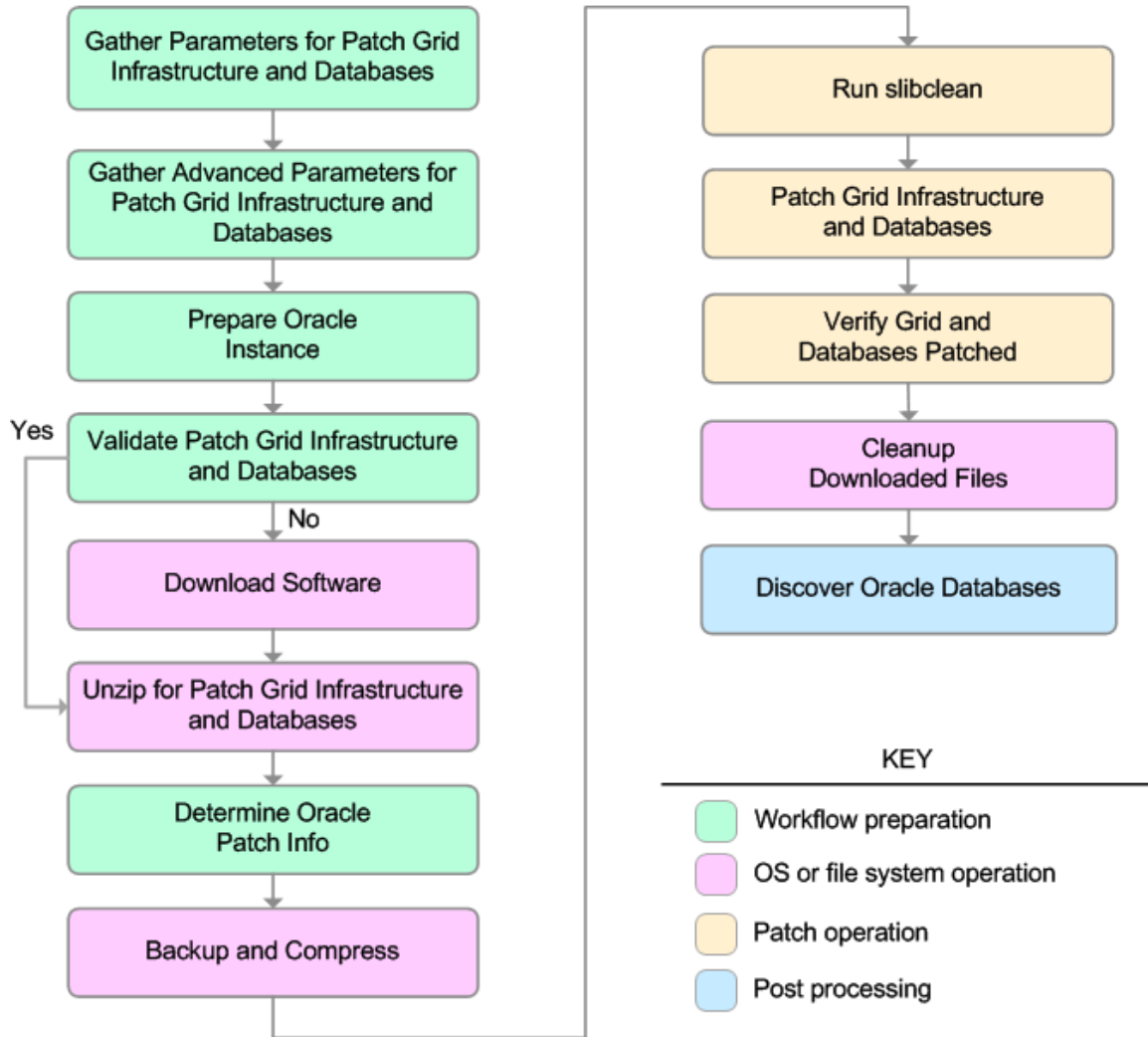
This workflow validate the following conditions:

1. The input parameters have the proper syntax (no special characters or spaces).
2. Files exist or have valid specifications.
3. The current Oracle Database and OPatch versions match the required versions.
4. The supplied patch applies to Oracle Home.
5. Recompiled database views are accurate.
6. The download location has enough space.

After the patching operation is completed, the workflow verifies that the patch has been successfully applied to the Grid Infrastructure Home, Database Homes, and the target databases.

### Steps Executed

The [Oracle - Patch Grid Infrastructure and Databases](#) workflow includes the following steps. Each step must complete successfully before the next step can start. If a step fails, the workflow reports a failure and all subsequent steps are skipped.



### Steps Used in Oracle - Patch Grid Infrastructure and Databases

Workflow Step	Description
Gather Parameters for Patch Grid Infrastructure and Databases	This step gathers the required parameters for Oracle - Patch Grid Infrastructure and Databases.
Gather Advanced Parameters for Patch Grid Infrastructure and Databases	This step gathers the optional advanced parameters for Oracle - Patch Grid Infrastructure and Databases.
Prepare Oracle Instance	This step prepares instance level Oracle access.
Validate Patch Grid Infrastructure and Databases	This step validates the values specified for the input parameters used by Oracle - Patch Grid Infrastructure and Databases. It also sets the values of various output parameters that will be consumed by subsequent steps.
Download Software	This step downloads a list of files to a specified location on the target server.
Unzip for Patch Grid Infrastructure and Databases	This step unzips on all nodes: <ul style="list-style-type: none"> <li>• The OPatch on the Grid and the Database Homes</li> <li>• The Patch Archive</li> </ul>
Determine Oracle Patch Info	This step determines all patch information that the workflow requires to apply the pertinent patch.
Backup and Compress	By default this step backs up all of the Grid and Database Homes and then compresses them into an archive. In addition, you can specify other directories and files that you want backed up—these parameters can be found in Gather Advanced Parameters for Patch Grid Infrastructure and Databases
Run slibclean	This step runs the <code>slibclean</code> command on AIX targets. The <code>slibclean</code> utility removes any currently unused modules in kernel and library memory.
Patch Grid Infrastructure and Databases	This step runs the preparatory SQL script and then patches the Grid infrastructure, the Database Homes, and all databases managed with the Grid.
Verify Grid and Databases Patched	This step confirms that the patch has been properly applied to the Grid Infrastructure, Database Homes, and databases managed with the Grid. In a clustered environment, the workflow verifies across all nodes.

#### Steps Used in Oracle - Patch Grid Infrastructure and Databases, continued

Workflow Step	Description
Cleanup Downloaded Files	This step removes files and archives that were downloaded to the target system during previous workflow steps.
Discover Oracle Databases	<p>This step audits the server's physical environment looking for Oracle instances and databases.</p> <p><b>Note:</b> Discovery is only additive. It will not remove instances or databases currently in your environment. It is the end user's responsibility to delete content this is no longer in use.</p> <p>In cluster situations where one node is active and other nodes are inactive, Discovery will only find instances and databases on the active node. Nothing will be added to inactive nodes.</p>

**Note:** For input parameter descriptions and defaults, see [Parameters for Oracle - Patch Grid Infrastructure and Databases](#) on page 54.

## How to Run this Workflow

The following instructions show you how to customize and run the [Oracle - Patch Grid Infrastructure and Databases](#) workflow in your environment.

**Tip:** For detailed instructions to run HP DMA workflows—using the Run Oracle Compliance Audit workflow as an example—see *HP DMA Quick Start Tutorial*.

The workflow provides default values for some parameters. These default values are usually sufficient for a "typical" installation. You can override the defaults by specifying parameter values in the deployment. You can also expose additional parameters in the workflow, if necessary, to accomplish more advanced scenarios. Any parameters not explicitly specified in the deployment will have the default values listed in [Parameters for Oracle - Patch Grid Infrastructure and Databases](#) on page 54.

**Note:** Before following this procedure, review the [Prerequisites for this Workflow](#) on page 43, and ensure that all requirements are satisfied.

**To use the Oracle - Patch Grid Infrastructure and Databases workflow:**

1. Create a deployable copy of the workflow (see "Create a Deployable Workflow" in *HP DMA Quick Start Tutorial*).
2. Determine the values that you will specify for the following parameters:

**Input Parameters Defined in this Step: Gather Parameters for Patch Grid Infrastructure and Databases**

Parameter Name	Default Value	Required	Description
Patch Archive	no default	required	Comma-separated list of patch file names (not fully-qualified).

**Note:** This is the minimum set of parameters required to run this workflow. You may specify values for the optional advanced parameters and you may need to expose additional parameters depending on your objectives. See [How to Expose Additional Workflow Parameters](#) on page 74

See [Oracle - Patch Grid Infrastructure and Databases](#) for detailed descriptions of all input parameters for this workflow, including default values.

3. In the workflow editor, expose any additional parameters that you need. You will specify values for those parameters when you create the deployment.
4. Save the changes to the workflow (click **Save** in the lower right corner).



5. Create a new deployment (see "Create a Deployment" in *HP DMA Quick Start Tutorial* for instructions).
6. On the Parameters tab, specify values for the required parameters listed in step 2 and any additional parameters that you have exposed. You do not need to specify values for those parameters whose default values are appropriate for your environment.
7. On the Targets tab, specify one or more targets for this deployment.
8. Save the deployment (click **Save** in the lower right corner).
9. Run the workflow using this deployment (see "Run Your Workflow" in *HP DMA Quick Start Tutorial* for instructions).

**To verify the results:**

The workflow will complete and report SUCCESS on the Console if it has run successfully. If an error occurs during workflow execution, the error is logged, and the workflow terminates in the FAILURE state.

*Optional:* To further verify that the Grid patch was successfully applied:

1. Log in to the target server.
2. Set the ORACLE\_HOME to your Grid Home.
3. Run the command: `$ORACLE_HOME/OPatch/opatch lsinventory`
4. Verify that the patch number from the archive that you specified is listed in the output.

*Optional:* To further verify that the patch was successfully applied on the Database Homes:

1. Log in to the target server.
2. Set the ORACLE\_HOME to your Database Home.
3. Run the command: `$ORACLE_HOME/OPatch/opatch lsinventory`
4. Verify that the patch number from the archive that you specified is listed in the output.

*Optional:* To further verify that the patch was successfully applied to the Oracle Database Instances associated with the Oracle Home:

1. Log in as an SQLPlus privileged user.
2. Set the environment variable, for example:  

```
. oraenv
```
3. Give the name of the Oracle Database, for example:  

```
orca
```
4. Search results for comments and actions, for example:  

```
select comments,action from sys.registry$history;
```
5. Check that the desired patch was applied. For example, look for:  

```
CPUOct2013 or PSUOct2013
```

## Sample Scenarios

This topic shows you how to use various parameters to achieve the following advanced patching scenarios in your environment using the [Oracle - Patch Grid Infrastructure and Databases](#) workflow.

**Note:** Use the ASM instance in your environment as the deployment's target.

### Scenario 1: Apply patch to a Grid clustered environment

In this scenario, the workflow patches Grid clustered environments. It applies the patch to the Grid Infrastructure, the Oracle Database Homes, and all associated databases. Under most cases you will specify the OPatch Archive and the Patch Information File. You only need to set the required parameters as shown in the following parameter table:

Parameter Name	Description
Patch Archive	Comma-separated list of patch file names (not fully-qualified). Example: p17272829_121010_Linux-x86-64.zip
Grid Nodes	Comma separated list of nodes that are part of a Grid Infrastructure environment. By default, the nodes are discovered by <code>olsnodes</code> and then all nodes are rolled back. Example: dma-rac1.usa.hp.com,dma-rac2.usa.hp.com
OPatch Archive	The OPatch Archive file required for this patch (not fully-qualified). If this parameter value is not specified, the current OPatch version will be used. Example: p6880880_121010_Linux-x86-64.zip
Oracle Database Homes	Oracle Database Homes to patch along with the Oracle Grid. Valid values are ALL, NONE, INCLUDE: followed by a comma separated list of Oracle Homes to patch with the Oracle Grid, and EXCLUDE: followed by a comma separated list of Oracle Homes to exclude from the patching process. Example: ALL
Patch Information File	Supplementary patch information supplied by support. If this file is not found on the target, it is downloaded from the software repository on the HP DMA server. Example: 201310_PatchInfo.xml

Be sure that the default values for all remaining input parameters are appropriate for your environment (see [Parameters for Oracle - Patch Grid Infrastructure and Databases](#) on page 54).

### Scenario 2: Apply patch to a Grid Standalone environment

In this scenario, the workflow patches a Grid Standalone environment. It applies the patch to both the Grid Standalone Home, the Oracle Database Homes, and all associated databases. You only need to leave Grid Nodes blank.

Parameter Name	Description
Patch Archive	Comma-separated list of patch file names (not fully-qualified). Example: p17272829_121010_Linux-x86-64.zip
Grid Nodes	Comma separated list of nodes that are part of a Grid Infrastructure environment. By default, the nodes are discovered by <code>olsnodes</code> and then all nodes are rolled back. Example:
OPatch Archive	The OPatch Archive file required for this patch (not fully-qualified). If this parameter value is not specified, the current OPatch version will be used. Example: p6880880_121010_Linux-x86-64.zip
Oracle Database Homes	Oracle Database Homes to patch along with the Oracle Grid. Valid values are ALL, NONE, INCLUDE: followed by a comma separated list of Oracle Homes to patch with the Oracle Grid, and EXCLUDE: followed by a comma separated list of Oracle Homes to exclude from the patching process. Example: ALL
Patch Information File	Supplementary patch information supplied by support. If this file is not found on the target, it is downloaded from the software repository on the HP DMA server. Example: 201310_PatchInfo.xml

Be sure that the default values for all remaining input parameters are appropriate for your environment (see [Parameters for Oracle - Patch Grid Infrastructure and Databases](#) on page 54).

### Scenario 3: Only patch specific Oracle Database Homes

In this scenario, the workflow patches Grid clustered environments. It applies the patch to the Grid Infrastructure, only the specified Oracle Database Homes, and all associated databases. You only need to set Oracle Database Homes to the desired Oracle Database Homes.

Parameter Name	Description
Patch Archive	Comma-separated list of patch file names (not fully-qualified). Example: p17272829_121010_Linux-x86-64.zip
Grid Nodes	Comma separated list of nodes that are part of a Grid Infrastructure environment. By default, the nodes are discovered by <code>olsnodes</code> and then all nodes are rolled back. Example: dma-rac1.usa.hp.com,dma-rac2.usa.hp.com
OPatch Archive	The OPatch Archive file required for this patch (not fully-qualified). If this parameter value is not specified, the current OPatch version will be used. Example: p6880880_121010_Linux-x86-64.zip
Oracle Database Homes	Oracle Database Homes to patch along with the Oracle Grid. Valid values are ALL, NONE, INCLUDE: followed by a comma separated list of Oracle Homes to patch with the Oracle Grid, and EXCLUDE: followed by a comma separated list of Oracle Homes to exclude from the patching process. Example: INCLUDE: /u01/app/oracle/product/12.1.0/dbhome_1
Patch Information File	Supplementary patch information supplied by support. If this file is not found on the target, it is downloaded from the software repository on the HP DMA server. Example: 201310_PatchInfo.xml

Be sure that the default values for all remaining input parameters are appropriate for your environment (see [Parameters for Oracle - Patch Grid Infrastructure and Databases](#) on the next page).

## Parameters for Oracle - Patch Grid Infrastructure and Databases

The following tables describe the required and optional input parameters for this workflow. Some of these parameters are not initially visible in a deployment (see [How to Expose Additional Workflow Parameters](#) on page 74). For most parameters, if you do not specify a value for a parameter, a default value is assigned

**Note:** Only those parameters that are configurable in a standard deployment are listed here. Input parameters that must be mapped to output parameters of previous steps are not listed.

### Input Parameters Defined in this Step: Gather Parameters for Patch Grid Infrastructure and Databases

Parameter Name	Default Value	Required	Description
Patch Archive	no default	required	Comma-separated list of patch file names (not fully-qualified).

### Additional Input Parameters Defined in this Step: Gather Advanced Parameters for Patch Grid Infrastructure and Databases

Parameter Name	Default Value	Required	Description
Backup File List	see description	optional	List of additional files and folders that you would like backed up. By default, the backup already includes Grid Home, Database Homes, and Inventory Location.
Backup File Name	dma_backup	optional	Name of the backup file.
Backup Location	no default	optional	Location where the backup file will be located.
Cleanup	True	optional	If true, the workflow will cleanup downloaded and extracted files upon completion. Valid values are True and False.
DB Version	no default	optional	The current Oracle Database version. For example: 11.2.0.3
Download Location	/tmp	optional	Location where all files where files will be downloaded or they already exist.
Extract Location	/tmp	optional	Directory location where the ZIP archives will be extracted.

**Additional Input Parameters Defined in this Step: Gather Advanced Parameters for Patch Grid Infrastructure and Databases, continued**

Parameter Name	Default Value	Required	Description
Grid Nodes	no default	optional	Comma separated list of nodes that are part of a Grid Infrastructure environment. By default, the nodes are discovered by <code>olsnodes</code> and then all nodes are rolled back.
Ignorable Oracle Errors	no default	optional	A comma-separated list of Oracle errors to be ignored when applying the patch to the database. This is in addition to the list of Oracle errors specified in the patch readme file. Values are of the form ORA-nnnnn. For example: ORA-04020,ORA-03113
OCM Response File	no default	optional	Path name of the Oracle Configuration Manager (OCM) response file. If not found on the target, this file is downloaded from the software repository. If left blank, a default response file will be created.
OPatch Archive	no default	optional	The OPatch Archive file required for this patch (not fully-qualified). If this parameter value is not specified, the current OPatch version will be used.
OPatch Version	no default	optional	The new OPatch version of the patch being applied. If you specify a value for this parameter, you MUST also specify values for Patch Number and Patch Name.
Oneoff Archives	no default	optional	Comma separated list of One-off patch archive(s).
Oracle Database Homes	ALL	optional	Oracle Database Homes to patch along with the Oracle Grid. Valid values are ALL, NONE, INCLUDE: followed by a comma separated list of Oracle Homes to patch with the Oracle Grid, and EXCLUDE: followed by a comma separated list of Oracle Homes to exclude from the patching process.
Oracle Group	no default	optional	The group that owns the Grid Oracle Home.
Patch Information File	no default	optional	Supplementary patch information supplied by support. If this file is not found on the target, it is downloaded from the software repository on the HP DMA server.
Patch Name	no default	optional	Name of the patch that is being applied. If you specify a value for this parameter, you MUST also expose and specify OPatch Version and Patch Number.

**Additional Input Parameters Defined in this Step: Gather Advanced Parameters for Patch Grid Infrastructure and Databases, continued**

Parameter Name	Default Value	Required	Description
Patch Number	no default	optional	Patch number of the patch being applied. If you specify a value for this parameter, you MUST also expose and specify OPatch Version and Patch Name.
Preparatory SQL	no default	optional	File name that contains SQL statements that must be run before the database catalog update. This file is passed directly to SQLPlus and must be formatted as such. If not found on the target, it is downloaded from the software repository.
Required Disk Space	no default	optional	Amount of disk space required (checked for) before installing the patch. Size is in Gigabytes.
Run Database View Recompile	False	deprecated	If set to true, the Database View Recompile step will be run. Valid values are True and False.
Startup Instance	Y	deprecated	If set to Y, the workflow will attempt to start the database instance if it is offline. Valid values are Y and N.
Trust SSL Certificates	no default	deprecated	<p>HP DMA no longer uses this workflow parameter to determine whether the workflow will trust any Secure Sockets Layer (SSL) certificate used to connect to the HP DMA web service. HP DMA uses the following parameter in the <code>dma.xml</code> file:</p> <pre>&lt;Parameter name="com.hp.dma.conn.trustAllCertificates" values="VALUE" /&gt;</pre> <p>Here, VALUE is true or false.</p>
Web Service Password	no default	optional	Password for the HP DMA Discovery web service API.
Web Service URL	no default	optional	URL for the HP DMA Discovery web service API.
Web Service User	no default	optional	User who is capable of modifying the managed environment by using the HP DMA Discovery web service API.



## Oracle - Rollback Patch from Grid Infrastructure and Database

This workflow rolls back a patch from Oracle Grid Infrastructure on 11.2 and 12.1 environments. It works for both Grid Standalone and Grid Cluster environments. In addition to the Grid Home, it rolls back the patch from all of the Database Homes and databases managed with the Grid.

In order to run on a clustered environment, in the Grid Nodes parameter you specify a list all nodes that are part of the Oracle Cluster.

To use this workflow in your environment, see the following information:

Topic	Information Included
<a href="#">Prerequisites for this Workflow</a>	List of prerequisites that must be satisfied before you can run this workflow
<a href="#">How this Workflow Works</a>	Information about what the workflow does, including validation checks performed, and steps executed
<a href="#">How to Run this Workflow</a>	Instructions for running this workflow in your environment
<a href="#">Sample Scenarios</a>	Examples of typical parameter values for this workflow
<a href="#">Parameters</a>	List of input parameters for this workflow

**Note:** The documentation for this workflow refers to the workflow and its steps by their base names. The names in the HP DMA user interface may have a version appended, for example, v2.

## Prerequisites for this Workflow

Be sure that the following prerequisites are satisfied before you run the [Oracle - Rollback Patch from Grid Infrastructure and Database](#) workflow:

1. You have installed the HP DMA Advanced Database Patching solution pack.
2. You have Read access to all specified inventory pointers (Linux/UNIX).
3. Your targets are running one of the supported operating systems (see the *HP DMA Support Matrix*).

### Other Dependencies

- The workflow must have unchallenged ability to become the Oracle database user (typically oracle) on all nodes of the RAC. This is generally done using `sudo` or `ssh oracle@localhost`.
- The workflow must have unchallenged ability to become the Oracle CRS user (example oracrs) on all nodes of the RAC. This is generally done using `sudo` or `ssh oracle@localhost`.
- The workflow must have unchallenged ability to become the superuser user (typically root) on all nodes of the RAC. This is generally done using `sudo` or `ssh oracle@localhost`.
- The workflow and the CRS/ASM/Instance/Listener users (typically oracle) must have unchallenged ability to `ssh` to all the RAC nodes.

For more information about prerequisites for Oracle Database, refer to the [Oracle Product Documentation](#) on page 68.

## How this Workflow Works

The [Oracle - Rollback Patch from Grid Infrastructure and Database](#) workflow performs the following actions:

- The initial steps of the workflow prepare it to roll back the patch from the Grid Home, and all of the Database Homes and databases managed with Grid. The workflow performs the validation checks described in the [Validation Checks Performed](#) section below.
- The workflow verifies the archive to roll back, the download location, and the Homes to roll back.
- The workflow rolls back the patch from the Grid Home and from all of the Database Homes and databases managed with the Grid.
- The final steps of the workflow allow the workflow to end cleanly. The workflow verifies that the patch has been rolled back. Then it runs Discovery to update the metadata and cleans up the downloaded files.

### Validation Checks Performed

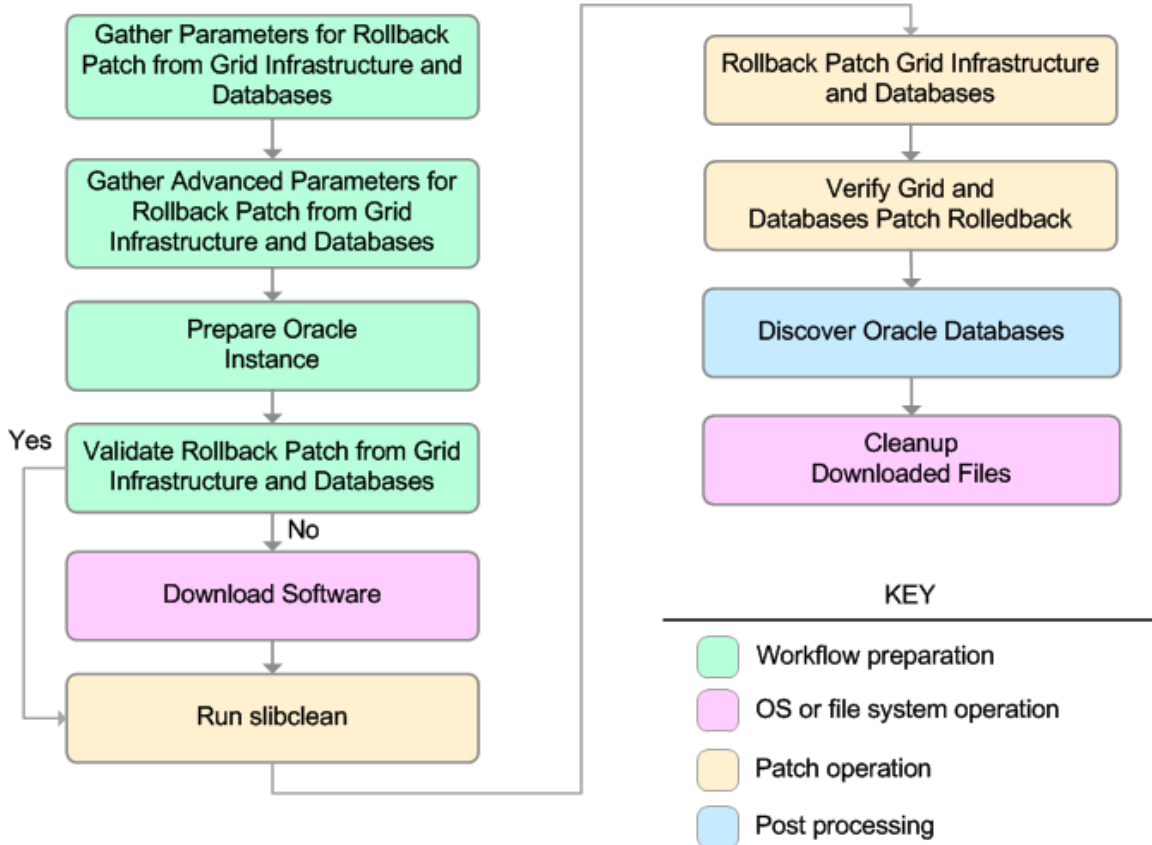
This workflow validates the following conditions:

1. The input parameters have the proper syntax (no special characters or spaces).
2. Files exist or have valid specifications.
3. The supplied patch applies to Oracle Home.
4. The download location has enough space.

After the patching operation is completed, the workflow verifies that the patch has been successfully rolled back from the Grid Infrastructure Home, Database Homes, and the target databases.

### Steps Executed

The [Oracle - Rollback Patch from Grid Infrastructure and Database](#) workflow includes the following steps. Each step must complete successfully before the next step can start. If a step fails, the workflow reports a failure and all subsequent steps are skipped.



### Steps Used in Oracle - Rollback Patch from Grid Infrastructure and Databases

Workflow Step	Description
Gather Parameters for Rollback Patch from Grid Infrastructure and Databases	This step gathers the required parameters for Oracle - Rollback Patch from Grid Infrastructure and Databases.
Gather Advanced Parameters for Rollback Patch from Grid Infrastructure and Databases	This step gathers the optional advanced parameters for Oracle - Rollback Patch from Grid Infrastructure and Databases.
Prepare Oracle Instance	This step prepares instance level Oracle access.
Validate Rollback Patch from Grid Infrastructure and Databases	This step validates the parameters for Oracle - Rollback Patch from Grid Infrastructure and Databases.

### Steps Used in Oracle - Rollback Patch from Grid Infrastructure and Databases, continued

Workflow Step	Description
Download Software	This step downloads a list of files to a specified location on the target server.
Run slibclean	This step runs the <code>slibclean</code> command on AIX targets. The <code>slibclean</code> utility removes any currently unused modules in kernel and library memory.
Rollback Patch Grid Infrastructure and Databases	This step rolls back the patches from the Grid infrastructure, the Database Homes, and all databases managed with the Grid.
Verify Grid and Databases Patch Rollback	This step confirms that the patch has been properly rolled back from the Grid Infrastructure, Database Homes, and databases managed with the Grid. In a clustered environment, the workflow verifies across all nodes.
Discover Oracle Databases	<p>This step audits the server's physical environment looking for Oracle instances and databases.</p> <div> <p><b>Note:</b> Discovery is only additive. It will not remove instances or databases currently in your environment. It is the end user's responsibility to delete content this is no longer in use.</p> <p>In cluster situations where on node is active and other nodes are inactive, Discovery will only find instances and databases on the active node. Nothing will be added to inactive nodes.</p> </div>
Cleanup Downloaded Files	This step removes files and archives that were downloaded to the target system during previous workflow steps.

**Note:** For input parameter descriptions and defaults, see [Parameters for Oracle - Rollback Patch from Grid Infrastructure and Database](#) on page 66.

## How to Run this Workflow

The following instructions show you how to customize and run the [Oracle - Rollback Patch from Grid Infrastructure and Database](#) workflow in your environment.

**Tip:** For detailed instructions to run HP DMA workflows—using the Run Oracle Compliance Audit workflow as an example—see *HP DMA Quick Start Tutorial*.

The workflow provides default values for some parameters. These default values are usually sufficient for a "typical" installation. You can override the defaults by specifying parameter values in the deployment. You can also expose additional parameters in the workflow, if necessary, to accomplish more advanced scenarios. Any parameters not explicitly specified in the deployment will have the default values listed in [Parameters for Oracle - Rollback Patch from Grid Infrastructure and Database](#) on page 66.

**Note:** Before following this procedure, review the [Prerequisites for this Workflow](#) on page 58, and ensure that all requirements are satisfied.

**To use the Oracle - Rollback Patch from Grid Infrastructure and Databases workflow:**

1. Create a deployable copy of the workflow (see "Create a Deployable Workflow" in *HP DMA Quick Start Tutorial*).
2. Determine the values that you will specify for the following parameters:

**Input Parameters Defined in this Step: Gather Parameters for Rollback Patch from Grid Infrastructure and Databases**

Parameter Name	Default Value	Required	Description
Patch Archive	no default	required	Patch archive file of the applied patch to roll back from the Oracle Grid and databases.

**Note:** This is the minimum set of parameters required to run this workflow. You may specify values for the optional advanced parameters and you may need to expose additional parameters depending on your objectives. See [How to Expose Additional Workflow Parameters](#) on page 74

See [Parameters for Oracle - Rollback Patch from Grid Infrastructure and Database](#) for detailed descriptions of all input parameters for this workflow, including default values.

3. In the workflow editor, expose any additional parameters that you need. You will specify values for those parameters when you create the deployment.
4. Save the changes to the workflow (click **Save** in the lower right corner).

5. Create a new deployment (see "Create a Deployment" in *HP DMA Quick Start Tutorial* for instructions).
6. On the Parameters tab, specify values for the required parameters listed in step 2 and any additional parameters that you have exposed. You do not need to specify values for those parameters whose default values are appropriate for your environment.
7. On the Targets tab, specify one or more targets for this deployment.
8. Save the deployment (click **Save** in the lower right corner).
9. Run the workflow using this deployment (see "Run Your Workflow" in *HP DMA Quick Start Tutorial* for instructions).

**To verify the results:**

The workflow will complete and report SUCCESS on the Console if it has run successfully. If an error occurs during workflow execution, the error is logged, and the workflow terminates in the FAILURE state.

*Optional:* To further verify that the Grid patch was successfully rolled back:

1. Log in to the target server.
2. Set the ORACLE\_HOME to your Grid Home.
3. Run the command: `$ORACLE_HOME/OPatch/opatch lsinventory`
4. Verify that the patch number that you rolled back is NOT listed in the output.

*Optional:* To further verify that the patch was successfully rolled back from the Database Homes:

1. Log in to the target server.
2. Set the ORACLE\_HOME to your Database Home.
3. Run the command: `$ORACLE_HOME/OPatch/opatch lsinventory`
4. Verify that the patch number that you rolled back is NOT listed in the output.

*Optional:* To further verify that the patch was successfully rolled back from the Oracle Database Instances associated with the Oracle Home:

1. Log in as an SQLPlus privileged user.
2. Set the environment variable, for example:  
  
`. oraenv`
3. Give the name of the Oracle Database, for example:

`orca`

4. Search results for comments and actions, for example:

`select comments,action from sys.registry$history;`

5. Verify that the patch number that you rolled back is NOT listed in the output, for example:

`CPUOct2013 or PSUOct2013`



## Sample Scenarios

This topic shows you how to use various parameters to achieve the following advanced patching scenarios in your environment using the [Oracle - Rollback Patch from Grid Infrastructure and Database](#) workflow.

**Note:** Use the ASM instance in your environment as the deployment's target.

### Scenario: Roll back patch in a Grid cluster or Grid Standalone environment

In this scenario, the workflow rolls back the patch from the Grid Infrastructure (cluster or Standalone), the Database Homes, and all associated databases.

Parameter Name	Description
Patch Archive	<p>Patch archive file of the applied patch to roll back from the Oracle Grid and databases.</p> <p>Example: p17272829_121010_Linux-x86-64.zip</p>

Be sure that the default values for all remaining input parameters are appropriate for your environment (see [Parameters for Oracle - Rollback Patch from Grid Infrastructure and Database](#) on the next page).

## Parameters for Oracle - Rollback Patch from Grid Infrastructure and Database

The following tables describe the required and optional input parameters for this workflow. Some of these parameters are not initially visible in a deployment (see [How to Expose Additional Workflow Parameters](#) on page 74). For most parameters, if you do not specify a value for a parameter, a default value is assigned

**Note:** Only those parameters that are configurable in a standard deployment are listed here. Input parameters that must be mapped to output parameters of previous steps are not listed.

### Input Parameters Defined in this Step: Gather Parameters for Rollback Patch from Grid Infrastructure and Databases

Parameter Name	Default Value	Required	Description
Patch Archive	no default	required	Patch archive file of the applied patch to roll back from the Oracle Grid and databases.

### Additional Input Parameters Defined in this Step: Gather Advanced Parameters for Rollback Patch from Grid Infrastructure and Databases

Parameter Name	Default Value	Required	Description
Cleanup	True	optional	If true, the workflow will cleanup downloaded and extracted files upon completion. Valid values are True and False.
Download Location	/tmp	optional	Location where all files where files will be downloaded or they already exist.
Extract Location	/tmp	optional	Directory location where the ZIP archives will be extracted.
Grid Nodes	no default	optional	Comma separated list of nodes that are part of a Grid Infrastructure environment. By default, the nodes are discovered by <code>olsnodes</code> and then all nodes are rolled back.
Ignorable Oracle Errors	no default	optional	A comma-separated list of Oracle errors to be ignored when applying the patch to the database. This is in addition to the list of Oracle errors specified in the patch readme file. Values are of the form ORA-nnnnn. For example: ORA-04020,ORA-03113
OCM Response File	no default	optional	Path name of the Oracle Configuration Manager (OCM) response file. If not found on the target, this file is downloaded from the software repository. If left blank, a default response file will be created.

**Additional Input Parameters Defined in this Step: Gather Advanced Parameters for Roll-back Patch from Grid Infrastructure and Databases, continued**

Parameter Name	Default Value	Required	Description
Oracle Database Homes	ALL	optional	Oracle Database Homes to roll back along with the Oracle Grid. Valid values are ALL, NONE, INCLUDE: followed by a comma separated list of Oracle Homes to roll back with the Oracle Grid, and EXCLUDE: followed by a comma separated list of Oracle Homes to exclude from the rollback process.
Preparatory SQL	no default	optional	File name that contains SQL statements that must be run before the database catalog update. This file is passed directly to SQLPlus and must be formatted as such. If not found on the target, it is downloaded from the software repository.
Run Database View Recompile	False	deprecated	If set to true, the Database View Recompile step will be run. Valid values are True and False.
Trust SSL Certificates	no default	deprecated	<p>HP DMA no longer uses this workflow parameter to determine whether the workflow will trust any Secure Sockets Layer (SSL) certificate used to connect to the HP DMA web service. HP DMA uses the following parameter in the dma.xml file:</p> <pre>&lt;Parameter name="com.hp.dma.conn.trustAllCertificates" values="VALUE" /&gt;</pre> <p>Here, VALUE is true or false.</p>
Web Service Password	no default	optional	Password for the HP DMA Discovery web service API.
Web Service URL	no default	optional	URL for the HP DMA Discovery web service API.
Web Service User	no default	optional	User who is capable of modifying the managed environment by using the HP DMA Discovery web service API.

## Chapter 3: Reference Information

This contains the following information:

Topic	Description
<a href="#">Oracle Product Documentation</a> below	Links to current product documentation for Oracle Database
<a href="#">Additional Resources</a> below	Links to additional HP DMA documentation

### Oracle Product Documentation

For the current list of hardware and software requirements, as well as supported platforms for Oracle Database, see:

<http://docs.oracle.com/>

For Oracle support using your support contract, see:

<https://support.oracle.com.>

To obtain patches from the Oracle Support Services Web site, OracleMetaLink, see:

<https://metalink.oracle.com>

### Additional Resources

For information about using the HP DMA web interface, see the *HP DMA User Guide*, the *HP DMA Administrator Guide*, and the *HP DMA Quick Start Tutorial*.

These documents are part of the HP DMA documentation library, which is available on the HP Software Support web site:

<https://softwaresupport.hp.com/>

## Chapter 4: Tips and Best Practices

This portion of the document contains a collection of tips and best practices that will enable you to use HP DMA more effectively. It contains the following topics:

- [How a Solution Pack is Organized](#) on the next page
- [How to Expose Additional Workflow Parameters](#) on page 74
- [How to Use a Policy to Specify Parameter Values](#) on page 75
- [How to Import a File into the Software Repository](#) on page 78

## How a Solution Pack is Organized

**Note:** This topic uses the Run Oracle Compliance Audit workflow in the Database Compliance solution pack as an example. The information provided here, however, pertains to any solution pack.

In HP DMA, a **workflow** executes a process —such as installing a software product or checking a database instance for compliance with a specific security benchmark.

A **solution pack** contains one or more related **workflow templates**.

Each workflow template has a Documentation tab that provides detailed information about that workflow.

The screenshot displays the HP Database & Middleware Automation console. The top navigation bar includes links for Home, Automation, Reports, Environment, Solutions, and Setup. Below this, a secondary navigation bar lists Workflows, Steps, Functions, Policies, Deployments, Run, Console, and History. The main content area is titled 'My Copy of Run Oracle Compliance Audit' and features several tabs: Documentation (selected), Workflow, History, Deployments, and Roles. Under the Documentation tab, there are fields for Name (My Copy of Run Oracle Compliance Audit), Tags, Type (Oracle), and Target level (Instance). The Documentation section is divided into three parts: Purpose, Description, and Parameters. The Purpose section states the audit's goal is to check compliance with CIS benchmarks and PCI/SOX requirements. The Description section explains the workflow uses CIS Level 1 and 2 auditing and compares results to PCI and SOX requirements. The Parameters section is currently empty. At the bottom of the console, there is a toolbar with buttons for DELETE, EXPORT, EXTRACT POLICY, and DEPLOY, along with a 'Copy' button and a 'Save or CANCEL' prompt.

HP Database & Middleware Automation

Home Automation Reports Environment Solutions Setup

Workflows Steps Functions Policies Deployments Run Console History

### My Copy of Run Oracle Compliance Audit

Documentation Workflow History Deployments Roles

Name: My Copy of Run Oracle Compliance Audit

Tags:

Type: Oracle

Target level: Instance

Documentation:

#### Purpose

Audit an Oracle Database instance for compliance with the following Center for Internet Security (CIS) benchmarks and, optionally, compare the audit results to the related PCI and SOX requirements:

- CIS Security Configuration Benchmark for Oracle Database Server 11g, version 1.1.0, December 2011
- CIS Security Benchmark for Oracle 9i/10g, version 2.01, April 2005
- Payment Card Industry (PCI) Data Security Standard Version 2.0, October 2010
- Sarbanes-Oxley (SOX) Sarbanes-Oxley Act of 2002 Section 302

#### Description

This workflow will audit an Oracle Database instance using CIS Level 1 and Level 2 auditing. It will then compare the results to the pertinent PCI and SOX requirements, where applicable. This audit, which runs in conjunction with the HP DMA reporting tool, can identify more than 175 compliance related problems with an Oracle database. You can view information about the audit on the Console while the audit is running. After the audit has finished, the workflow sends a summary report to each specified email address. You can also view a compliance report on the Reports page.

#### Parameters

HELP PDF EDIT

DELETE EXPORT EXTRACT POLICY DEPLOY Copy Save or CANCEL

A workflow consists of a sequence of **steps**. Each step performs a very specific task. Each step includes a documentation panel that briefly describes its function.

The screenshot displays the HP Database & Middleware Automation web interface. The top navigation bar includes links for Home, Automation, Reports, Environment, Solutions, and Setup. Below this, a secondary navigation bar shows Workflows, Steps, Functions, Policies, Deployments, Run, Console, and History. The main content area is titled 'Get Oracle Home' and features several tabs: General, Action, Parameters, History, Workflows, Solutions, and Roles. The 'General' tab is active, showing the 'Properties' section on the left and the 'Documentation' section on the right. The 'Properties' section lists the following details for the 'Get Oracle Home' step: Name: Get Oracle Home, Tags: (empty), Type: Oracle, Category: Script, and Targetable: ☐. The 'Documentation' section provides a detailed description: 'Description: Get the value of ORACLE\_HOME from the appropriate source:'. It then lists two sources: '- The /etc/oratab or /var/opt/oracle/oratab file on UNIX' and '- The registry on Windows'. Below this, it states 'Dependencies: None', 'Input Parameters: None', and 'Output Parameters:'. The output parameters are listed as: '- Oracle Home = The fully qualified name of the ORACLE\_HOME' and '- Oracle SID = The Oracle server (instance) ID'. Finally, it shows the 'Return Code: 0 = Step was successful'. At the bottom of the interface, there is a 'Copy' button and a lock icon with the text 'THIS STEP IS READ ONLY'.

HP Database & Middleware Automation

Home Automation Reports Environment Solutions Setup

Workflows Steps Functions Policies Deployments Run Console History

### Get Oracle Home

General Action Parameters History Workflows Solutions Roles

**Properties**

Name: Get Oracle Home

Tags:

Type: Oracle

Category: Script

Targetable: ☐

**Documentation**

Description:

Get the value of ORACLE\_HOME from the appropriate source:

- The /etc/oratab or /var/opt/oracle/oratab file on UNIX
- The registry on Windows

Dependencies: None

Input Parameters: None

Output Parameters:

- Oracle Home = The fully qualified name of the ORACLE\_HOME
- Oracle SID = The Oracle server (instance) ID

Return Code:

0 = Step was successful

Copy

THIS STEP IS READ ONLY

Steps can have input and output **parameters**. Output parameters from one step often serve as input parameters to another step. Steps can be shared among workflows.

Parameter descriptions are displayed on the Parameters tab for each step in the workflow.

The screenshot shows the 'Database & Middleware Automation' console with the 'Automation' tab selected. Under 'Automation', the 'Steps' sub-tab is active, showing a workflow named 'Parse Oracle Inventory'. The 'Parameters' sub-tab is selected, displaying a list of parameters. The parameters are divided into 'INPUT PARAMETERS' and 'OUTPUT PARAMETERS'. Input parameters include 'Inventory Files', 'Oracle Account', 'Oracle Home', and 'Server Wrapper'. Output parameters include 'CRS Account', 'CRS Active Version', 'CRS Group', 'CRS Home', 'CRS Home Name', 'CRS Nodes', 'Cluster Nodes', 'Inventory Groups', and 'Inventory Locations'. A note at the bottom states: 'X Parameter is in use and cannot be removed.'

Parameter descriptions are also displayed on the Workflow tab for each workflow.

The screenshot shows the 'Get Listener Names / Oracle SIDs' workflow step. On the left, a description box states: 'Optional: Comma delimited list of ORACLE\_SIDs, at least one of which a resulting listener must service. If blank, listeners are not limited to those servicing any specific ORACLE\_SID.' A red arrow points to this description with the text 'To see the parameter description here'. On the right, the workflow steps are listed. Step 8, 'Get Listener Names', is expanded, showing 'Listener Homes: Prepare Oracle Instance.Oracle Home' and 'Oracle SIDs: Get Oracle Home.Oracle SID'. A red arrow points to the 'Oracle SIDs' parameter with the text 'Click here'.



Parameter descriptions are also displayed on the Parameters tab in the **deployment** (organized by step).

hp Database & Middleware Automation

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Run Oracle Compliance CIS

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Gather Parameters for Oracle Compliance

Compliance Type: CIS

Fixed Value

Compliance type that will be audited by the workflow. Compliance types supported: CIS, PCI, SOX. Will be defaulted to CIS.

Excluded Compliance Checks:

Fixed Value

Optional: Checks to exclude from of Compliance Checks

Inventory Files: /etc/orainst.loc

Fixed Value

Optional: Comma separated list of fully qualified Oracle inventory files. If not specified, default to /etc/orainst.loc, /var/opt/oracle/orainst.loc, or %ProgramFiles%\Oracle\Inventory.

Gather Advanced Parameters for Oracle Compliance

Email Addresses to Receive Report: CISComplianceAuditor@mycompany.com

Fixed Value

\*Optional. Provided an email address or multiple email addresses separated by commas without spaces that you would like to receive an email of the results of the compliance tests run against the target specified.

✖ DELETE

▶ RUN

Restore defaults

Copy

Save

or

CANCEL

**Note:** The workflow templates included in this solution pack are read-only and cannot be deployed. To use a workflow template, you must first create a copy of the template and then customize that copy for your environment.

## How to Expose Additional Workflow Parameters

Each workflow in this solution pack has a set of input parameters. Some are required and some are optional. To run a workflow in your environment, you must specify values for a subset of these parameters when you create a deployment.

By default, only a few of the input parameters for each workflow are visible on the Deployment page, and the rest are hidden. In order to specify a value for a parameter that is currently hidden, you must first expose that parameter by changing its mapping in the workflow editor.

### To expose a hidden workflow parameter:

1. In the HP DMA web interface, go to Automation > Workflows.
2. From the list of workflows, select a deployable workflow.
3. Go to the Workflow tab.
4. In the list of steps below the workflow diagram, click the ► (blue arrow) to the immediate left of the pertinent step name. This expands the list of input parameters for this step.
5. For the parameter that you want to expose, select - User Selected - from the drop-down list.  
For example:

Step	Name	Required Result	Next
▼ 1	<a href="#">Gather Parameters for Oracle Compliance</a>		2
	Compliance Type: - User selected -		
	Excluded Compliance Checks: - User selected -		
	Inventory Files: - User selected -		

6. Repeat steps 4 and 5 for all the parameters that you would like to specify in the deployment.
7. Click **Save** in the lower right corner.

## How to Use a Policy to Specify Parameter Values

It is sometimes advantageous to provide parameter values by using a policy rather than explicitly specifying the values in a deployment. This approach has the following advantages:

- The policy can be used in any deployment.
- It is faster and less error-prone than specifying parameter values manually.
- For parameter values that change frequently—for example, passwords that must be changed regularly—you only need to update them in one place.

To establish a policy, you can either [Create a Policy](#) or [Extract a Policy](#) from a workflow.

After you establish the policy, you must [Reference the Policy in the Deployment](#).

For more information, see the *HP DMA User Guide*. This document is available on the HP Software Support web site: <https://softwaresupport.hp.com/>

## Create a Policy

The first step in this approach is to create a policy that provides parameter values. There are two ways to do this: (1) create a new policy, and define all attributes manually (as shown here) or (2) extract a policy from a workflow (see [Extract a Policy](#) on the next page).

**To create a policy that provides parameter values:**

1. In the HP DMA web UI, go to Automation > Policies.
2. Click **New Policy**.
3. In the **Name** box, specify the name of the policy
4. For each parameter value that you want to provide using this policy, perform the following actions on the Attributes tab:
  - a. From the drop-down list, select the type of attribute:
    - A Text attribute contains simple text that users can view while deploying and running workflows.
    - A List attribute contains a comma-separated list of values (or a large amount of text not suitable for a Text attribute).
    - A Password attribute contains simple text, but the characters are masked so that users cannot see the text.

- b. In the text box to the left of the Add button, specify the name of the attribute.

For your convenience, this name should be similar to the parameter name used in the pertinent workflow (or workflows).

- c. Click **Add**.

- d. In the new text box to the right of the attribute's name, enter a value for this attribute.

To remove an attribute, click the **Remove** button.

5. On the Roles tab, grant Read and Write permission to any additional users and groups who will be using this policy. By default, any groups to which you belong have Read and Write permission.
6. Click the **Save** button (lower right corner).

## Extract a Policy

An alternative to creating your own policy one attribute at a time is to extract the policy. This automatically creates a reusable policy that provides values for all input parameters associated with a workflow. This is a convenient way to create a policy.

### To extract a policy:

1. Go to Automation > Workflows.
2. Select the Workflow that you want to work with.
3. Click the Extract Policy link at the bottom of the screen.
4. Specify values for each attribute listed.
5. *Optional:* Remove any attributes that you do not want to use.
6. *Optional:* Add any new attributes that you want to use.
7. *Optional:* On the Roles tab, select the Read box for any users or user groups that you want to be able to use this policy to provide parameter values in a Deployment. Select the Write box for any users or groups that you want to be able to modify this Policy (add or remove attributes).
8. Click **Save**.

## Reference the Policy in the Deployment

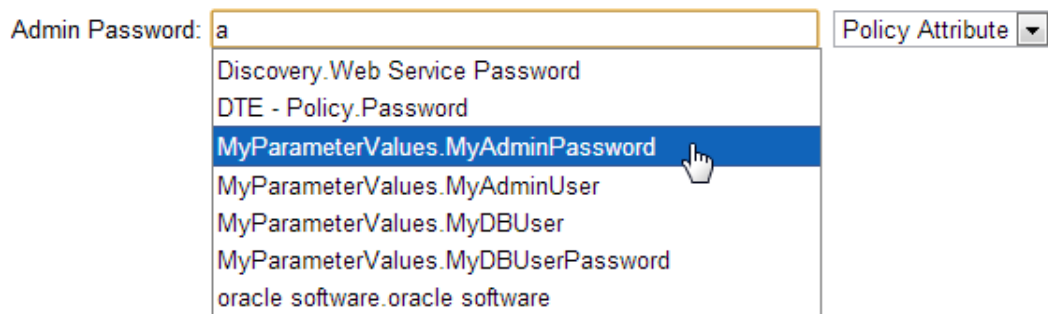
After you create a policy, you can reference its attributes in a deployment.

**To reference policy attributes in a deployment:**

1. Create or access the deployment.

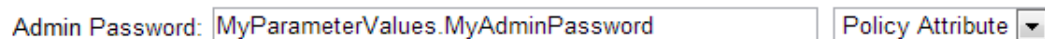
See “Deployments” in the *HP DMA User Guide* for details.

2. On the Parameters tab, perform the following steps for each parameter whose value you want to provide by referencing a policy attribute:
  - a. In the drop-down menu for that parameter, select **Policy Attribute**.
  - b. In the text box for that parameter, type any character. A drop-down list of policy attributes appears. For example:



The screenshot shows a form with a label 'Admin Password:' followed by a text input field containing the letter 'a'. To the right of the text field is a dropdown menu with the text 'Policy Attribute' and a downward arrow. The dropdown menu is open, displaying a list of policy attributes. The first three items are 'Discovery.Web Service Password', 'DTE - Policy.Password', and 'MyParameterValues.MyAdminPassword', which is highlighted with a blue background and a mouse cursor. Below these are 'MyParameterValues.MyAdminUser', 'MyParameterValues.MyDBUser', 'MyParameterValues.MyDBUserPassword', and 'oracle software.oracle software'.

- c. From the drop-down list, select the attribute that you want to reference. For example:



The screenshot shows the same form as before, but the text input field now contains 'MyParameterValues.MyAdminPassword' and the dropdown menu is closed.

3. Click **Save** to save your changes to the deployment.

## How to Import a File into the Software Repository

Many HP DMA workflows are capable of downloading files from the software repository on the HP DMA server to the target server (or servers) where the workflow is running. The following procedure shows you how to import a file into the software repository so that it can be downloaded and deployed by a workflow.

HP DMA uses the HP Server Automation (HP SA) Software Library as its software repository.

**Tip:** Be sure to use unique file names for all files that you import into the software repository.

### To import a file into the HP SA Software Library:

1. Launch the HP SA Client from the Windows Start Menu.

By default, the HP SA Client is located in Start → All Programs → HP Business Service Automation → HP Server Automation Client

If the HP SA Client is not installed locally, follow the instructions under “Installing the SA Client Launcher” in the *User Guide: Server Automation*, available on the HP Software Support web site: <https://softwaresupport.hp.com/>

2. In the navigation pane in the HP SA Client, select Library → By Folder.
3. Select (or create) the folder where you want to store the file.
4. From the Actions menu, select **Import Software**.
5. In the Import Software dialog, click the **Browse** button to the right of the File(s) box.
6. In the Open dialog:
  - a. Select the file (or files) to import.
  - b. Specify the character encoding to be used from the Encoding drop-down list. The default encoding is English ASCII.
  - c. Click **Open**. The Import Software dialog reappears.
7. From the Type drop-down list, select **Unknown**.
8. If the folder where you want to store the files does not appear in the Folder box, follow these steps:
  - a. Click the **Browse** button to the right of the Folder box.
  - b. In the Select Folder window, select the import destination location, and click **Select**. The Import Software dialog reappears.

9. From the Platform drop-down list, select all the operating systems listed.

10. Click **Import**.

If one of the files that you are importing already exists in the folder that you specified, you will be prompted regarding how to handle the duplicate file. Press F1 to view online help that explains the options.

11. Click **Close** after the import is completed.

## Chapter 5: Troubleshooting

These topics can help you address problems that might occur when you install and run the workflows in this solution pack:

- [Target Type](#) below
- [User Permissions and Related Requirements](#) below
- [Discovery in HP DMA](#) on the next page

### Target Type

In your deployment, make sure that you have specified the correct type of target. The workflow type and the target type must match. A workflow designed to run against an instance target, for example, cannot run against a server target.

### User Permissions and Related Requirements

Roles define access permissions for organizations, workflows, steps, policies, and deployments. Users are assigned to roles, and they gain access to these automation items according to the permissions and capabilities defined for their roles.

Roles are assigned by the HP Server Automation administrator. They are then registered in HP DMA by your HP DMA administrator.

Your HP DMA administrator will ensure that the users in your environment are assigned roles that grant them the permissions and capabilities they need to accomplish their tasks. For example:

- To create a workflow, your role must have Workflow Creator capability.
- To view a workflow, your role must have Read permission for that workflow.
- To edit a workflow, your role must have Write permission for that workflow.
- To view a deployment, your role must have Read permission for that deployment.
- To modify a deployment, your role must have Write permission for that deployment.
- To run a deployment, your role must have Execute permission for that deployment and Deploy permission for the organization where it will run.

Capabilities determine what features and functions are available and active in the HP DMA UI for each user role.

For more information, see the *HP DMA Administrator Guide*. This document is available on the HP Software Support web site: <https://softwaresupport.hp.com/>



## Discovery in HP DMA

HP DMA uses a process called “discovery” to find information about the servers, networks, and database instances on target machines in your managed environment.

You must explicitly initiate the process of discovery—it is not automatic. See the *HP DMA User Guide* for instructions. This document is available on the HP Software Support web site:  
<https://softwaresupport.hp.com/>

# Glossary

## A

### **automation items**

The umbrella term automation items is used to refer to those items to which role-based permissions can be assigned. Automation items include workflows, deployments, steps, and policies.

## B

### **bridged execution**

A bridged execution workflow includes some steps that run on certain targets and other steps that run on different targets. An example of a bridged execution workflow is Extract and Refresh Oracle Database via RMAN (in the Database Refresh solution pack). This workflow extracts the contents of a database on one target (the Source) and creates a new database with the same contents on another target (the Destination). This workflow is useful when you want to clone a database - for example, to move it from a traditional IT infrastructure location into a private cloud. Bridged execution workflows are supported on HP DMA version 9.11 (and later).

## C

### **capability**

Capabilities are collections of related privileges. There are three capabilities defined in HP DMA. Login Access capability enables a user to log in to the web interface. This capability does not guarantee that this user can view any organizations or automation items—permissions are required to access those items. Workflow Creator capability

enables a user to create new workflows and make copies of other workflows. Administrator capability enables a user to perform any action and view all organizations. If you have Administrator capability, you do not need Workflow Creator capability. The Administrator can assign any of these capabilities to one or more roles registered roles.

### **connector**

HP DMA includes a Connector component that enables it to communicate with HP Server Automation. You must configure the Connector before you can run an workflow against a target.

### **cross-platform**

Cross-platform database refresh involves converting the data from one type of byte ordering to another. This is necessary, for example, if you want to load a database dump file on a little-endian Linux target that was created on a big-endian Solaris server.

### **custom field**

Custom Fields are used to customize workflows or show information about the environment. Custom Fields can be used in workflow steps to automatically supply information that is specific to an organization, server, instance, or database.

## D

### **deployment**

Deployments associate a workflow with a target environment in which a workflow runs. You can customize a deployment by specifying values for any workflow parameters that are designated - User Selected - in the workflow. You must save a deployment before you can run the workflow. You can re-use a saved deployment as many times as you like.

## F

### function

Functions are reusable pieces of code that can be included in automation steps. Any common routine or operation that multiple steps perform is a good candidate for a function. Functions can be tagged with keywords indicating the language in which they are written and the operating system with which they work. Functions are "injected" into the step code just prior to step execution.

## I

### input parameters

A workflow has a set of required parameters for which you must specify a value. The required parameters are a subset of all the parameters associated with that workflow. The remaining parameters are considered optional. You can specify a value for an optional parameter by first exposing it using the workflow editor and then specifying the value when you create a deployment.

## M

### mapping

An input parameter is said to be "mapped" when its value is linked to an output parameter from a previous step in the workflow or to a metadata field. Mapped parameters are not visible on the Deployment page. You can "unmap" a parameter by specifying - User Selected - in the workflow editor. This parameter will then become visible on the Deployment page.

## O

### organization

An organization is a logical grouping of servers. You can use organizations to separate development, staging, and production resources - or to separate logical business units.

## P

### parameters

Parameters are pieces of information - such as a file system path or a user name - that a step requires to carry out its action. Values for parameters that are designated User Selected in the workflow can be specified in the deployment. Parameters that are marked Enter at Runtime in the deployment must be specified on the target system when the workflow runs.

### policy

Policies are reusable sets of attributes that can be used as parameter values in deployments. Deployments can reference policy attributes to change the automation behavior. Policies provide values for input parameters. They can contain fixed values or reference Custom Fields. Policies enable HP DMA to manage groups of hundreds or thousands of servers at a time without the need to configure each individual server.

## R

### raw devices

In Sybase ASE version 15, you can create and mount database devices on raw bound devices. This enables Sybase ASE to use direct memory access from your address space to the physical sectors on the disk. This can improve performance by reducing memory copy

operations from the user address space to the operating system kernel buffers.

### **role**

Each HP DMA user has one or more roles. Roles are used to grant users permission to log in to and to access specific automation items and organizations. Roles are defined in HP Server Automation. Before you can associate a role with an automation item or organization, however, you must register that role in HP DMA.

## **S**

### **smart group**

Smart Groups are dynamic groups of servers, instances, or databases defined by some criteria. They are used to specify targets for deployments. As information about an environment object changes, its membership in the groups is re-evaluated.

### **software repository**

The software repository is where the workflow will look for any required files that are not found on the target server. If you are using HP DMA with HP Server Automation (SA), this repository is the SA Software Library.

### **solution pack**

A solution pack contains one or more related workflow templates. These templates are read-only and cannot be deployed. To run one of the workflows included in a solution pack, you must first create a deployable copy of that template and then customize that copy for your environment. Solution packs are organized by function - for example: database patching or application server provisioning.

### **steps**

Steps contains the actual code used to perform a unit of work detailed in a workflow.

## **T**

### **target instance**

In the context of MS SQL database refresh, the term "target instance" refers to the SQL Server instance where the database that will be restored resides.

## **W**

### **workflow**

A workflow automates the process followed for an operational procedure. Workflows contain steps, which are linked together to form business logic for a common task. Workflows connect existing tasks in order to perform a new business process by building on existing best practices and processes.

### **workflow editor**

The workflow editor is the tool that you use to assemble steps into workflows. You can map each input parameter to output parameters of previous steps or built-in metadata (such as the server name, instance name, or database name). You can also specify User Selected to expose a parameter in the deployment; this enables the person who creates the deployment to specify a value for that parameter.

### **workflow templates**

A workflow template is a read-only workflow that cannot be deployed. To run one of the workflows included in a solution pack, you must first create a deployable copy of the workflow template and then customize that copy for your environment.