HP Database and Middleware Automation

For Linux, Solaris, and AIX

Software Version: 10.10

Advanced Database Patching User Guide

Workflows for Oracle CRS, Grid, and RAC

Document Release Date: June 2013

Software Release Date: June 2013

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

Document Changes

Chapter	Version	Changes
Title Page Legal Notices	10.10	Updated version number, software release date, document release date, and copyright date range.
Workflow Details	10.10	Removed Patch Oracle Standalone Grid workflow since its functionality is contained in Apply Oracle Grid Standalone Patch and Apply Database Patch workflow.
About HP DMA Solution Packs	10.10	Added overview topic About HP DMA Solution Packs.

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http://h20230.www2.hp.com/new_access_levels.jsp

Contents

Contents 5

About HP DMA Solution Packs 8

Audience 9

Document Map 10

Important Terms 11

The Advanced Database Patching Solution 12

- What this Solution Includes 13
- What this Solution Does 14
- Supported Products and Platforms 15

Advanced Database Patching Quick Start 16

- Import the Solution Pack 17
- Create a Deployable Workflow 20
- Create a Deployment 21
- Run Your Workflow 25
- View the Results 27

Workflow Details 30

- Apply Critical Patch Update to CRS or Grid Home 32
  - Prerequisites for this Workflow 33
  - How this Workflow Works 34
  - How to Run this Workflow 38
  - Sample Scenarios 42
  - Parameters for Apply Critical Patch Update to CRS or Grid Home 47
- Apply Critical Patch Update to RAC Home 50
  - Prerequisites for this Workflow 51
  - How this Workflow Works 52
  - How to Run this Workflow 56
  - Sample Scenarios 59

Parameters for Apply Critical Patch Update to RAC Home 61
Apply Oracle CRS Patchset 63
Prerequisites for this Workflow 64
How this Workflow Works 65
How to Run this Workflow 69
Sample Scenarios 71
Parameters for Apply Oracle CRS Patchset 73
Apply Oracle Grid Standalone Patch and Apply Database Patch 75
Prerequisites for this Workflow 76
How this Workflow Works 77
How to Run this Workflow 89
Sample Scenarios 91
Parameters for Apply Oracle Grid Standalone Patch and Apply Database Patch 95
Rollback Critical Patch Update from CRS Home 98
Prerequisites for this Workflow 99
How this Workflow Works 100
How to Run this Workflow 103
Sample Scenarios 105
Parameters for Rollback Critical Patch Update from CRS Home 108
Reference Information 110
Oracle Product Documentation 110
Additional Resources 111
Tips and Best Practices 112
How a Solution Pack is Organized 113
How to Expose Additional Workflow Parameters 117
How to Use a Policy to Specify Parameter Values 118
Create a Policy 118
Extract a Policy 119
Reference the Policy in the Deployment 119
How to Import a File into the Software Repository 121
Troubleshooting 122
Target Type 122

User Permissions and Related Requirements 122
Discovery in HP DMA 123
Glossary 124

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, & 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 Databasefeatures 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 110.

Document Map

The following table shows you how to navigate this guide:

Topic	Description
The Advanced Database Patching Solution	General information about this solution, including what it contains and what it does.
Advanced Database Patching Quick Start	A step-by-step tutorial that shows you how to run a compliance audit and view the results.
Workflow Details	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.
Reference Information	Links to pertinent Oracle product documentation and more information about HP DMA.
Tips and Best Practices	Simple procedures that you can use to accomplish a variety of common HP DMA tasks.
Troubleshooting	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 consist 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.
- 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 124.

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 Custers (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
Apply Critical Patch Update to CRS or Grid Home	This workflow applies an Oracle-supplied Patch Bundle to an Oracle Cluster Ready Services (CRS) Home.
Apply Critical Patch Update to RAC Home	This workflow applies an Oracle supplied Critical Patch Update (CPU) or Patch Setup Update (PSU) to one or more Real Application Cluster (RAC) Oracle Homes (RDBMS or ASM only).
Apply Oracle CRS Patchset	This workflow applies an Oracle patchset to a CRS Oracle Home.
Apply Oracle Grid Standalone Patch and Apply Database Patch	This workflow applies an Oracle patch to a Grid Standalone Oracle Home and applies a patch to the databases on the target.
Rollback Critical Patch Update from CRS Home	This workflow rolls back a Patch Bundle from a CRS Home.

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

What this Solution Does

The workflows in this solution do the following:

- Download an Oracle CPU 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 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 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 10.10 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

This solution requires HP DMA version 10.10 (or later).

Chapter 2

Advanced Database Patching Quick Start

This tutorial shows you how to run one of the workflows in this solution pack, namely Apply Critical Patch Update to CRS or Grid Home. You can use this tutorial as an example for running the other patching workflows.

The tutorial will guide you through the following steps:

1. Import the Solution Pack on the next page
2. Create a Deployable Workflow on page 20
3. Create a Deployment on page 21
4. Run Your Workflow on page 25
5. View the Results on page 27

Note: In this tutorial, default values will be used for most input parameters. Before executing these steps, make sure that these default values are suitable for your environment.

See Parameters for Apply Critical Patch Update to CRS or Grid Home on page 47 for descriptions of available input parameters, including default values.

The information presented in this tutorial assumes the following:

- HP DMA is installed and operational.
- At least one valid target is available.

Note: This tutorial uses a very simple scenario to help you get started quickly. For detailed information about how the workflows in this solution pack work and how you can customize them for your environment, see the Workflow Details on page 30.

Import the Solution Pack

The following instructions assume that you have purchased a license for the HP DMA solution pack that you want to import.

The HP DMA 10.10 solution packs are included on the HP DMA 10.10 installation media. They are located in the following folders:

- The `DMA_10.10_Server_and_Client` folder contains the Discovery solution pack.

  The Discovery solution pack is not automatically installed with HP DMA. You must import it if you want to use the discovery workflows.

- The `DMA_10.10_Database_Solution_Packs` folder contains all of the database solution packs (provisioning, advanced provisioning, patching, advanced patching, compliance, refresh, and release management).

- The `DMA_10.10_Middleware_Solution_Packs` folder contains all of the application server solution packs (provisioning, patching, configuration management, and release management).

Note: Always check to see if there are more recent versions of the HP DMA solution packs available online. Due to frequent releases, it is likely that the solution packs provided on the installation media have since been updated.

To get the most recent version of a solution pack:

1. Go to the following web site: HP Software Support Online
2. Go to the Self-Solve tab, and sign in using your HP Passport credentials (see Support on page 4 for more information).
3. On the Advanced Search page, specify the following search criteria:

Product:	Database and Middleware Automation
Version:	All Versions
Operating System:	All Operating Systems
Document Type:	Patches

4. Click **Search**.
5. If there is a more recent version of the Database Compliance solution pack that you want to import, do the following:
   a. Click the link for the solution pack that you want to import (for example: dbmasp db adv patch 10.x).
   b. Click the **DOWNLOAD PATCH** link, and download the ZIP file that contains the patch.
   c. From the patch ZIP file, extract the ZIP file that contains the solution pack (for example: DBCompliance.zip).

      Note: This ZIP file may be included in a larger ZIP file that contains multiple solution packs.

To import the solution pack:

1. On the system where you downloaded the solution pack, open a web browser, and go to the following address:

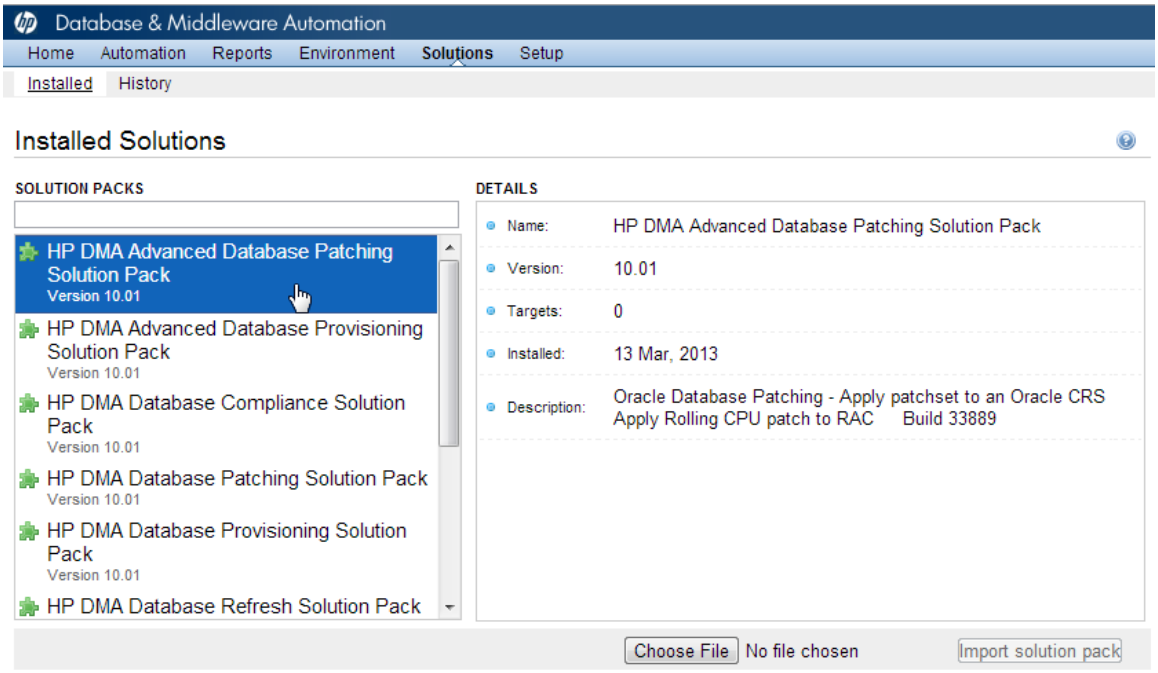
   `https://<HP_DMAserver>:8443/dma/login`

2. Log in to the HP DMA server using an account with Administrator capability.
3. On the Solutions > Installed tab, click the **Browse** button in the lower right corner. The Choose File dialog opens.

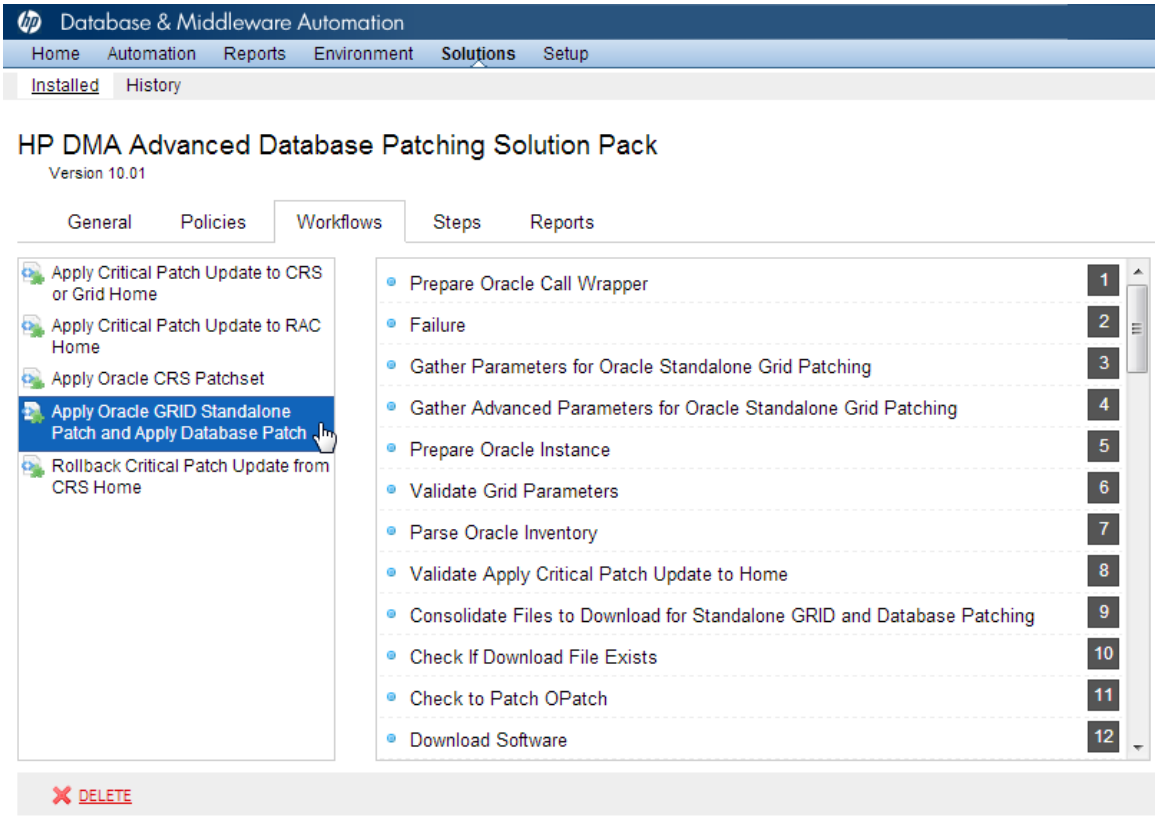
   Note: This button and the dialog that subsequently opens may have different names depending on the browser that you are using.

4. Locate and select the solution pack ZIP file that you extracted earlier, and click **Open**.
5. Click **Import solution pack**.

To view basic information about the solution pack, hover your mouse over its name in the left pane:



To view detailed information about the solution pack, click its name in the left pane. To view a list of the workflows that the solution pack contains, go to the Workflows tab.



Create a Deployable Workflow

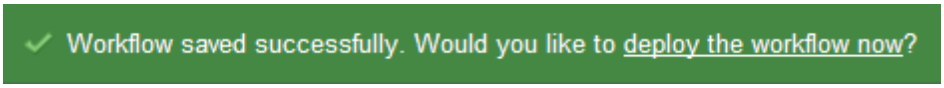
The workflow templates provided by HP in your solution pack are read-only and cannot be deployed. When you are viewing a read-only item in the DMA web UI, you will see the lock icon in the lower right corner:

Read-only workflows are not deployable. You can create a deployable workflow by making a copy of a workflow template.[1]

To create a deployable copy of the workflow template:

1. In the DMA web interface, go to Solutions > Installed.
2. In the left pane, click the Advanced Database Patching Solution Pack.
3. Go to the Workflows tab.
4. From the list of workflows, select the Apply Critical Patch Update to CRS or Grid Home workflow template.
5. Click the **Copy** button in the lower left corner.
6. On the Documentation tab, specify the following:
   - Name – Name that will appear in the list of available workflows
   - Tags – Keywords that you can use later to search for this workflow (optional)
   - Type – OS (this will be selected as a result of the copy)
   - Target level – Instance (this will be selected as a result of the copy)
7. On the Roles tab, grant Read access to at least one user or group and Write access to at least one user or group.
8. Click **Save**.

   Your new workflow now appears in the list of available workflows, and the following message is displayed:

9. Click the **deploy the workflow now** link in the green message bar.

[1] For more information about creating and working with workflows, see "Workflows" in the *User Guide: Database and Middleware Automation*. This document is available on the HP Software Product Manuals web site: http://h20230.www2.hp.com/selfsolve/manuals

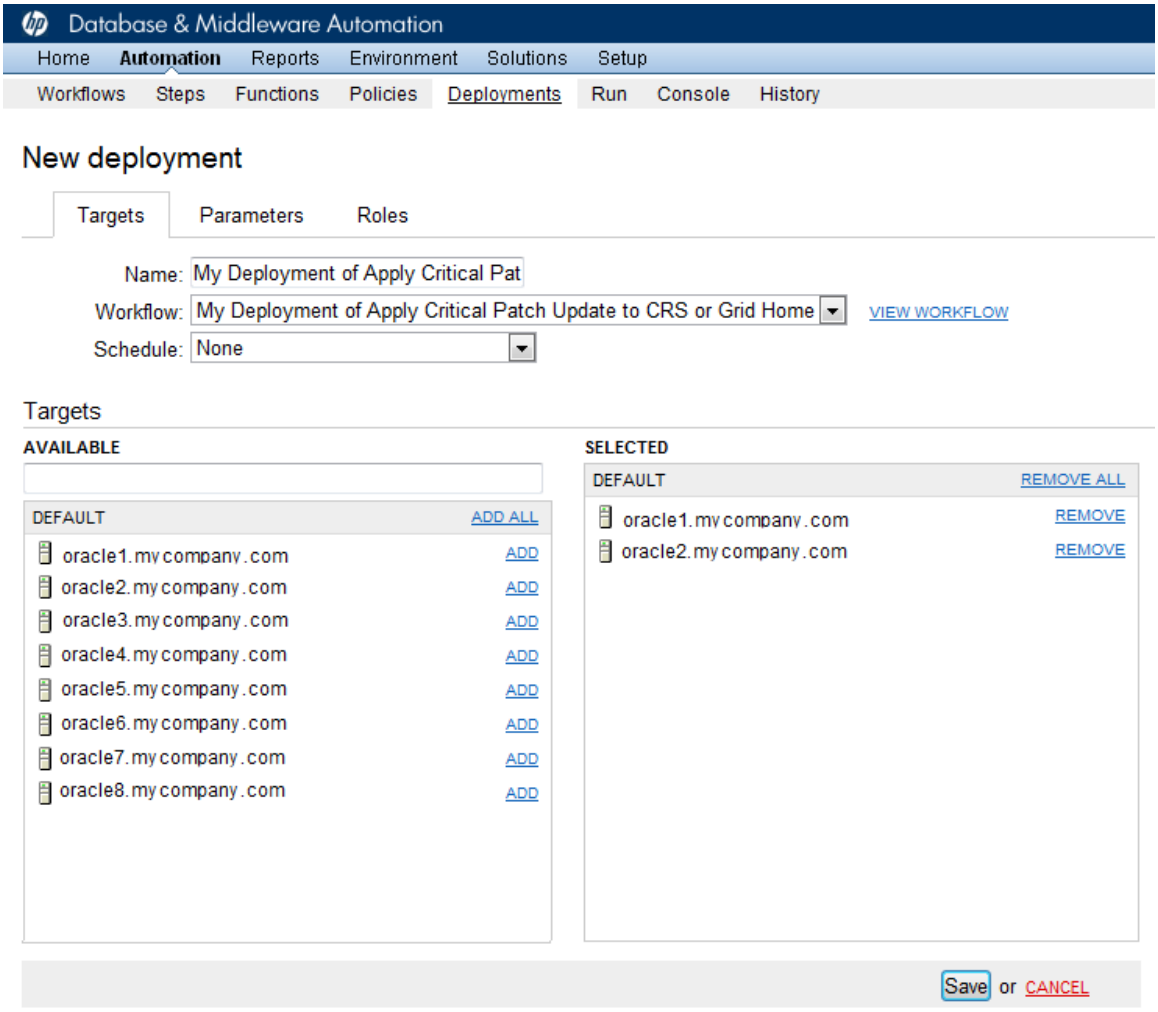
Create a Deployment

Before you can run your new workflow, you must create a deployment. A deployment associates a workflow with one or more specific targets (servers, instances, or databases).

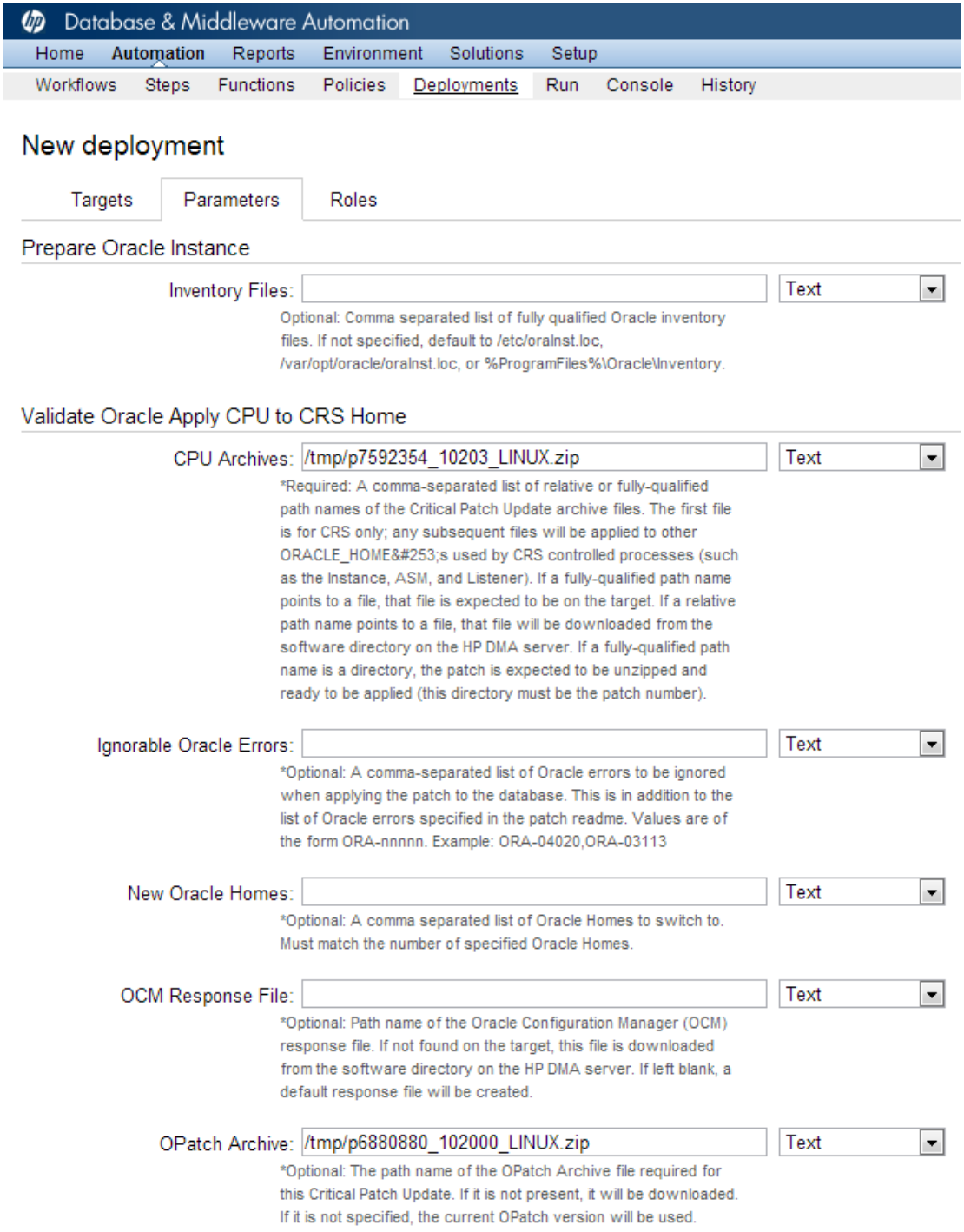
To create a deployment:

1. If you do not see the green message bar—for example, if you navigated to another page after you created your copy of the workflow template—follow these steps:
   a. Go to the Automation > Deployments page.
   b. In the lower right corner, click **New deployment**.
2. Specify the following:
   - Name – Name that will appear in the list of available deployments.
   - Workflow – From the drop-down list, select the deployable workflow (the copy) that you just created.
   - Schedule – Frequency or date when the workflow will run. Select None so that the workflow will run once when you explicitly tell it to run.

3. From the list of AVAILABLE targets on the left side of the Targets area, click the **ADD** link for the instance where the workflow will run.



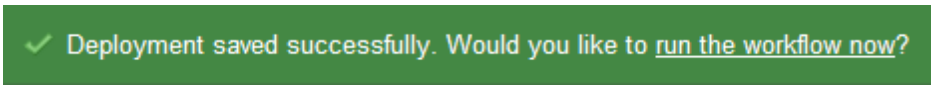
4. On the Parameters tab, specify values for the following input parameters:



Note: These are a subset of the required parameters for this workflow. Parameters that are not visible in the deployment will have default values. See the Parameters for Apply Critical Patch Update to CRS or Grid Home on page 47 for descriptions of all available input parameters for this workflow, including default values.

5. Click **Save**.

   Your new deployment now appears in the list of available workflows, and the following message is displayed:

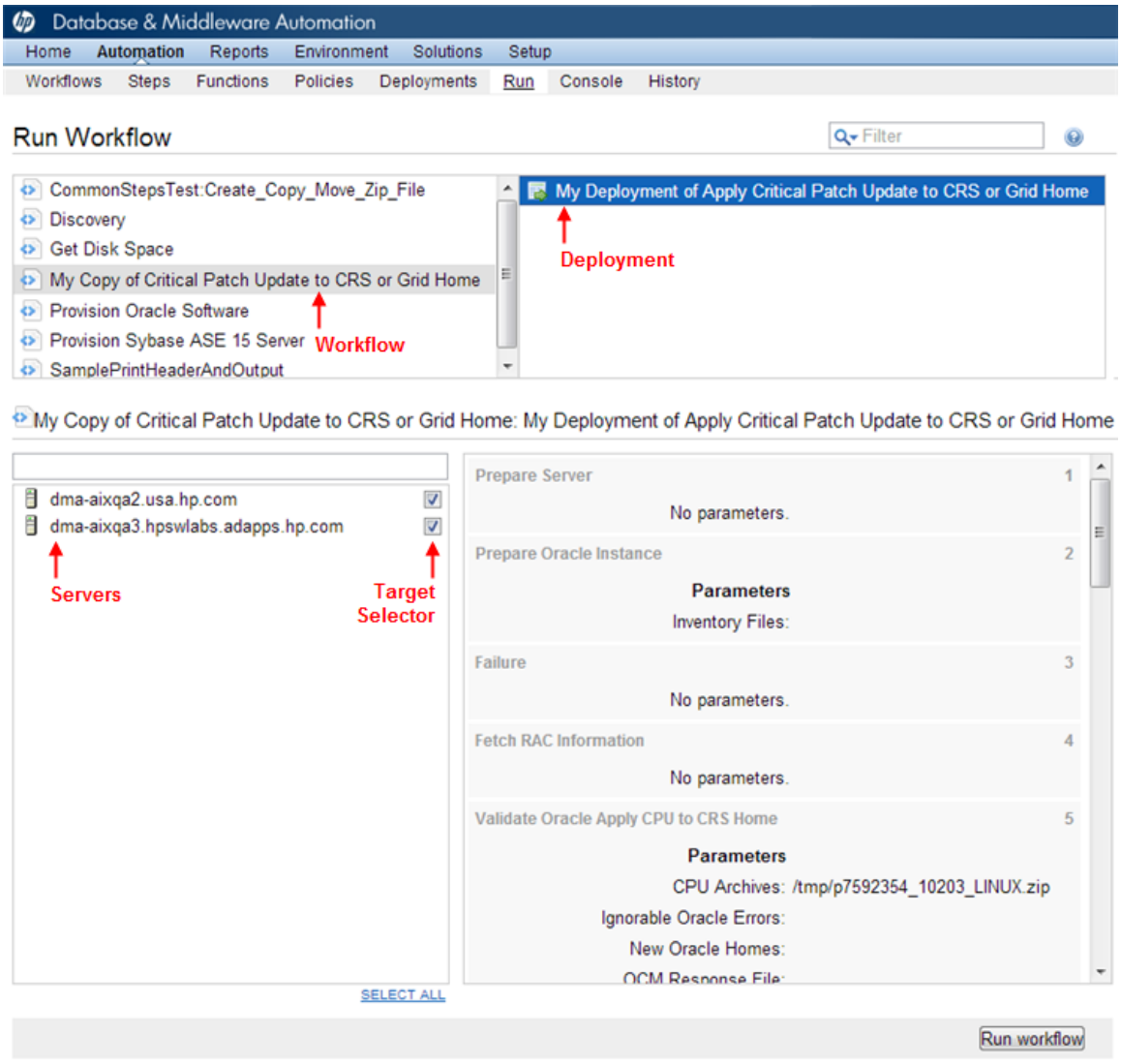
6. Click the **run the workflow now** link in the green message bar.

Run Your Workflow

Now you are ready to run your workflow against the target that you selected.

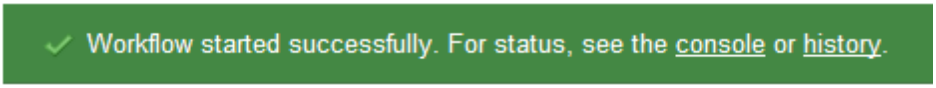
To run the workflow:

1. If you do not see the green message bar—for example, if you navigated to another page after you created your deployment—follow these steps: show
   a. Go to the Automation > Run area.
   b. In the list of WORKFLOWS on the left side, select the workflow that you created.
   c. In the list of DEPLOYMENTS in the center, double-click the deployment that you just created.
2. Select the target selector check box for the instance where you want to run the workflow.



3. Click the **Run workflow** button.

4. The following message is displayed:

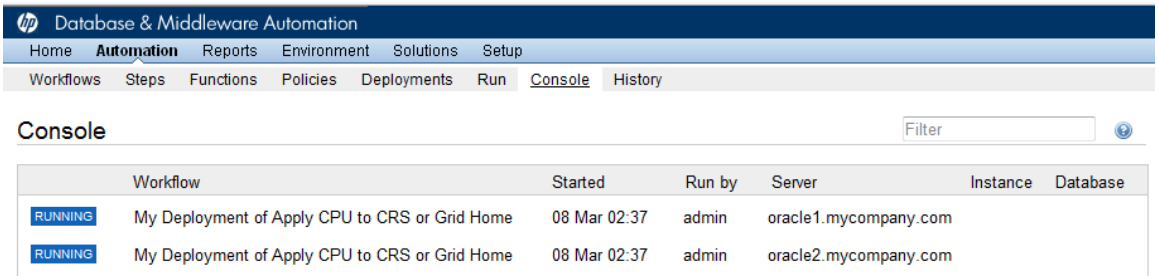


5. To view the progress of your deployment, click the **console** link in the green message bar.

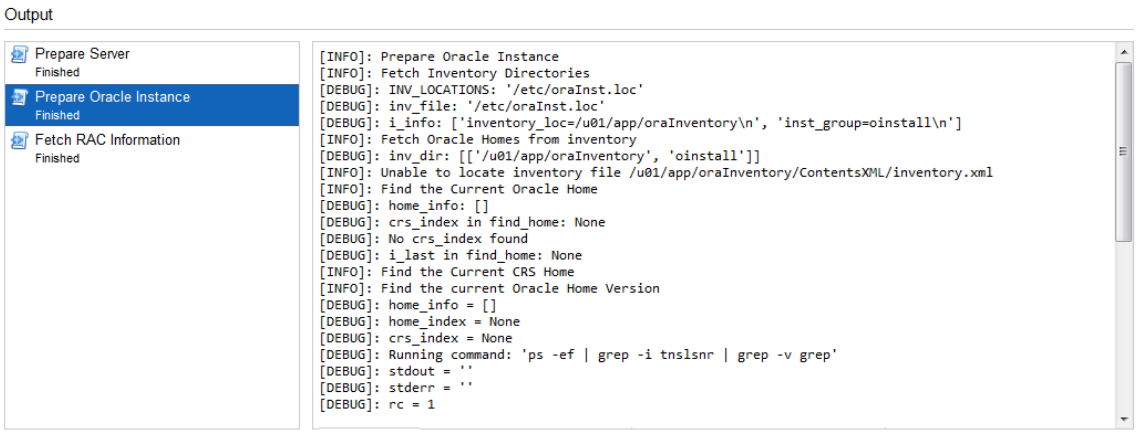
View the Results

While your workflow is running, you can watch its progress on the Automation > Console page.

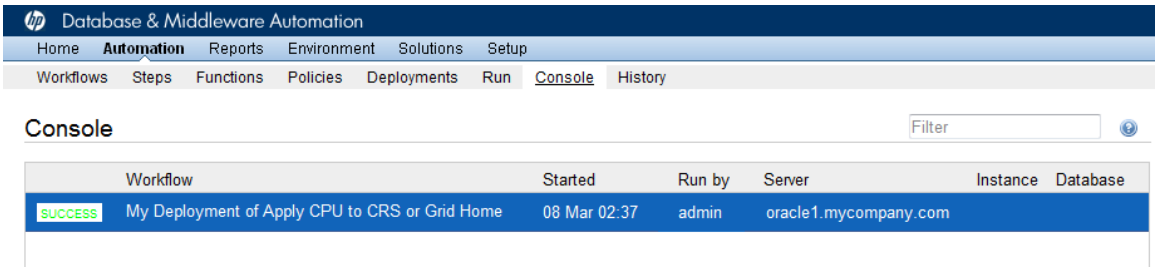
To view the progress of the workflow as the deployment proceeds, click the workflow name in the upper box on the Console page.



To view the outcome of a specific step, select that step in the left box in the Output area. Informational messages are displayed in the right box, and the values of any output parameters are listed.



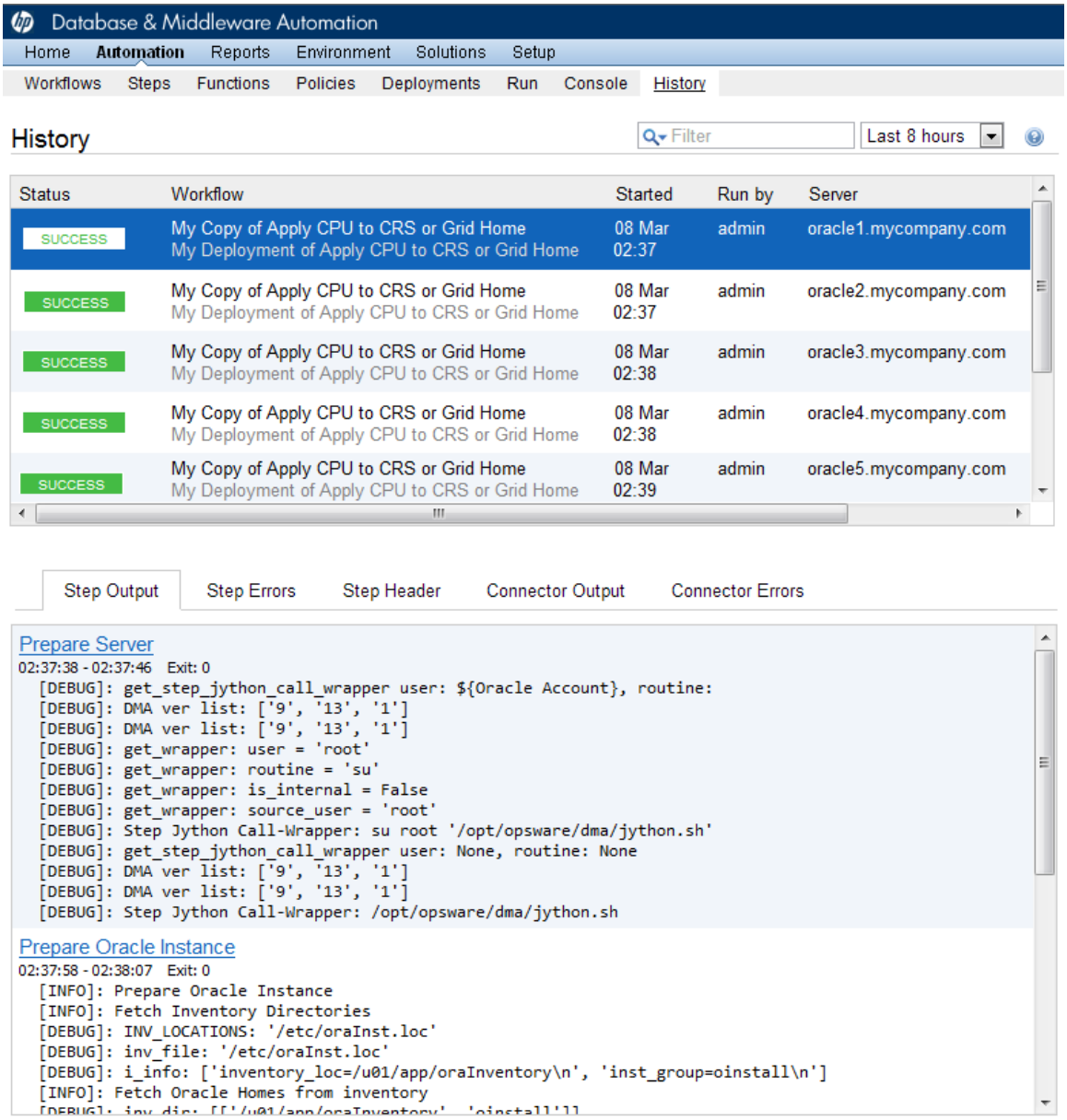
While the workflow is running, its status indicator on the Console says RUNNING. After the workflow finishes, its status indicator changes to SUCCESS, FAILURE, or FINISHED depending on the outcome of the workflow.



After the workflow has finished running, you can view a summary of your deployment on the History page. This page lists all the deployments that have run on this DMA server during the time period specified in the Filter box.

While the workflow is running, the History page shows nothing in the status column. A workflow that results in the FINISHED state also shows nothing in the status column on this page.

To view step-by-step results, select the row in the table that corresponds to your deployment.



The tabs below the table show you information about each step in the workflow. This includes the start and end time for each step, the exit code, and the following information:

- Step Output – any informational messages that were produced
- Step Errors – any errors that were reported

- Step Header – values assigned to any output parameters
- Connector Output – any informational messages related to the connection to your server management tool
- Connector Errors – any errors that were reported by the connector to your server management tool—if any errors were reported a red asterisk (*) appears on the tab

Chapter 3

Workflow Details

This solution pack contains the following workflows:

Workflow Name	Description
Apply Critical Patch Update to CRS or Grid Home	This workflow applies an Oracle-supplied Patch Bundle to an Oracle Cluster Ready Services (CRS) Home.
Apply Critical Patch Update to RAC Home	This workflow applies an Oracle supplied Critical Patch Update (CPU) or Patch Setup Update (PSU) to one or more Real Application Cluster (RAC) Oracle Homes (RDBMS or ASM only).
Apply Oracle CRS Patchset	This workflow applies an Oracle patchset to a CRS Oracle Home.
Apply Oracle Grid Standalone Patch and Apply Database Patch	This workflow applies an Oracle patch to a Grid Standalone Oracle Home and applies a patch to the databases on the target.
Rollback Critical Patch Update from CRS Home	This workflow rolls back a Patch Bundle from a CRS Home.

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 Use 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 CRS or Grid Home

This workflow enables you to apply an Oracle-supplied Patch Bundle to an Oracle Cluster Ready Services (CRS) Home. It also allows you to perform the following optional tasks:

- Update the Relational Database Management System (RDBMS) Home and/or the Automatic Storage Management (ASM) Home with an additional patch
- Switch RDBMS and/or ASM Homes to previously patched Homes

By default, the associated RDMS and/or ASM Homes are also updated with the Patch Bundle. If more than one patch archive is specified, the first is applied to the CRS Home, and the balance is applied to the Instance, the ASM Home, and/or the Listener Home. This enables you to apply both the CRS Bundle and an ASM or Instance Critical Patch Update (CPU) or Patch Set Update (PSU) during a single outage.

Note: This workflow updates the OPatch version, if needed, for all affected homes.

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

Topic	Information Included
Prerequisites for this Workflow	List of prerequisites that must be satisfied before you can run this workflow
How this Workflow Works	Information about what the workflow does, including validation checks performed, and steps executed
How to Run this Workflow	Instructions for running this workflow in your environment
Sample Scenarios	Examples of typical parameter values for this workflow
Parameters	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 CRS or Grid 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 into the HP DMA software repository (see How to Import a File into the Software Repository on page 121).
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 Solution Pack 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 and the CRS/ASM/Instance/Listener users (typically oracle) must have unchallenged ability to `ssh` to all the RAC nodes.
- The ASM (in versions 10.2 and 11.1), Instance, and Listener Homes must have the same owner. The CRS (CRS/ASM in version 11.2) Home can have a different owner. A maximum of two separate owners is permitted.

For more information about prerequisites for Oracle Database, refer to the Oracle Product Documentation on page 110.

How this Workflow Works

This workflow performs the following actions:

- The initial steps of the workflow prepare it to patch the CRS or Grid Home. 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 (CPU) to each Oracle RAC Home.
- The workflow extracts and applies the CPU to the CRS Homes on the Oracle RAC nodes. The workflow stops all Clusterware processes. It also removes any currently unused modules in kernel and library memory. Then the workflow runs an SQL script to update the CPU 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

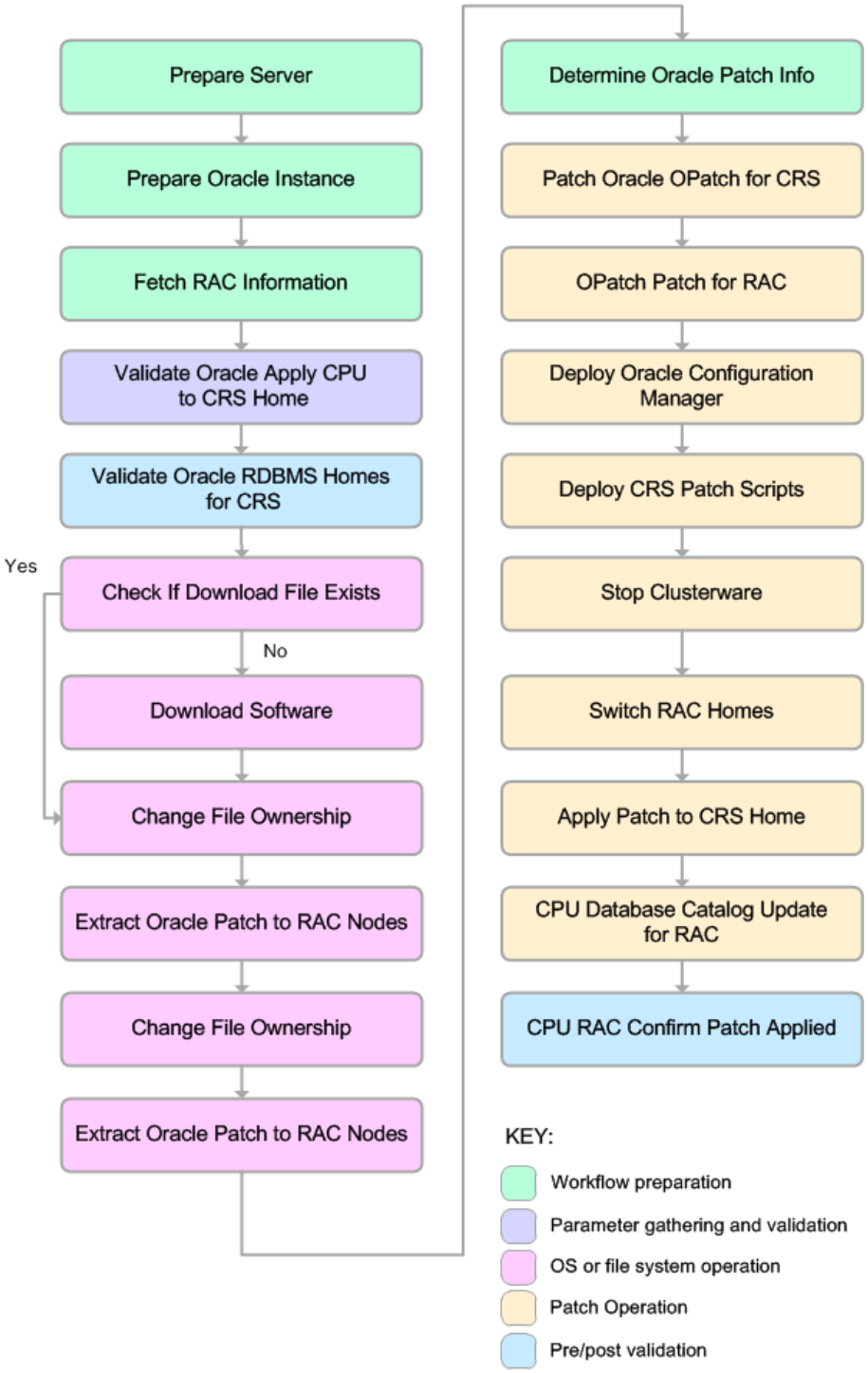
This workflow validates the following conditions:

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 Oracle RDBMS home information is accurate when Oracle Homes are being patched during a CRS patch update.
5. The supplied CPU applies to the current Oracle Database version.

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

Steps Executed

The Apply Critical Patch Update to CRS or Grid 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 CRS or Grid 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.
Fetch Oracle information	This step uses `srvctl` to fetch the RAC information.
Validate Oracle Apply CPU to CRS Home	This step validates the parameters for Apply Critical Patch Update to CRS or Grid Home.
Validate RDBMS Homes for CRS	This step validates the Oracle RDBMS home information when Oracle Homes are also being patched during a CRS patch update. This step should only be executed if the Oracle RDBMS Homes are being patched as part of the CRS patch update.
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 Ownership	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.
Extract Oracle Patch to RAC Nodes	This step extracts the CPU and PSU Archive to the different RAC nodes.
Change File Ownership	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.
Extract Oracle Patch to RAC Nodes	This step extracts the CPU and PSU Archive to the different nodes.
Determine Oracle Patch Info	This step determines all the patch information that the workflow requires to apply the pertinent patch.
Patch Oracle OPatch for CRS	This step determines if an OPatch archive file has been provided and updates OPatch as needed for a CRS Home. It verifies the correct version of OPatch for all the patch archive files.
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 (for example: the Listener, ASM, the Instance, etc.).

Steps Used in Apply Critical Patch Update to CRS or Grid Home (continued)

Workflow Step	Description
Deploy Oracle Configuration Manager	This step deploys the Oracle Configuration Manager response file. It creates a default file if none is specified.
Deploy CRS Patch Scripts	This step deploys the scripts needed to apply the CPU and PSU patches to a CRS Home.
Stop Clusterware	This step stops all Clusterware processes.
Switch RAC Homes	This step switches Oracle Homes for Clusterware services. This step must be run as root to verify the Listener changes.
Apply Patch to CRS Home	This step applies the patch to Oracle CRS Homes as follows: For each node, the first patch is applied to the CRS Oracle Home and then is applied to all other Homes (ASM, Instance, Listener). Any additional patches are applied to the other Homes (not the CRS Home). After the last node is patched, the RAC services are started on each node.
CPU Database Catalog Update for RAC	This step runs the `catcpu.sql` or `catpsu.sql` script against every RAC instance in the supplied list.
CPU 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 CRS or Grid Home on page 47.

How to Run this Workflow

The following instructions show you how to customize and run the Apply Critical Patch Update to CRS or Grid Home workflow in your environment.

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 CRS or Grid Home on page 47.

Note: Before following this procedure, review the Prerequisites for this Workflow on page 33, 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 121.

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 Archives 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 Archives 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.

Method 3: The unzipped Oracle patch is stored on each target machine:

1. In the CPU Archives parameter, specify the fully qualified directory name where the unzipped files are located. The directory name must be the patch number.
2. Do not specify a value for the Patch Archive Location parameter.
3. 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.

To use the Apply Critical Patch Update to CRS or Grid Home workflow:

1. Create a deployable copy of the workflow (see Create a Deployable Workflow on page 20).
2. Determine the values that you will specify for the following parameters:

Input Parameters Defined in this Step: Validate Oracle Apply CPU to CRS Home

Parameter Name	Default Value	Required	Description
CPU Archives	see description	required	Comma-separated list of relative or fully-qualified path names of the Critical Patch Update archive files. The first file is for CRS only. Any subsequent files will be applied to other Oracle Homes used by CRS controlled processes (such as the Instance, ASM, and Listener). 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). Default value: `/tmp/p7592354_10203_LINUX.zip`
Oracle Homes	no default	optional	Comma-separated list of fully-qualified path names of Oracle Homes where the patch will be applied.
Patch Download Location	no default	required	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 Oracle Homes	Y	required	Indicates whether the patch should be applied to the non-CRS homes registered by Clusterware or specified by the New Oracle Homes parameter. Valid values are Y (yes) or N (no).

Input Parameters Defined in this Step: Deploy CRS Patch Scripts

Parameter Name	Default Value	Required	Description
CRS Version	no default	required	Database version that is a match for the patch being applied.

> **Note:** This is the minimum set of parameters required to run this workflow. You may need to expose additional parameters depending on your provisioning objectives. See How to Expose Additional Workflow Parameters on page 117
>
> See Parameters for Apply Critical Patch Update to CRS or Grid Home on page 47 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 on page 21 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 on page 25 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 CRS or Grid Home workflow.

Scenario 1: Apply CPU and/or PSU to the CRS or Grid Home only

In this scenario, the workflow applies the CPU and/or PSU to the CRS or Grid Home only. It does not apply the Patch Bundle to the Oracle Database Homes. If you have one or more nodes running on a RAC cluster but want to apply the Patch Bundle to the underlying Grid infrastructure only, be sure to set the Patch Oracle Homes parameter to **N** as shown in the following parameter table:

Parameter Name	Description
CPU Archives	Comma-separated list of relative or fully-qualified path names of the Critical Patch Update archive files. The first file is for CRS only. Any subsequent files will be applied to other Oracle Homes used by CRS controlled processes (such as the Instance, ASM, and Listener). 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). Default value: `/tmp/p7592354_10203_LINUX.zip` Example: `/u02/p13923374_112030_Linux-x86-64.zip`
CRS Version	Database version that is a match for the patch being applied. Example: 1102
Patch Download Location	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. Example: `/u02`
Patch Oracle Homes	Indicates whether the patch should be applied to the non-CRS homes registered by Clusterware or specified by the New Oracle Homes parameter. Valid values are Y (yes) or N (no). Example: N

Note: Some of these parameters are not exposed by default in the deployment. See How to Expose Additional Workflow Parameters on page 117.

Be sure that the default values for all remaining input parameters are appropriate for your environment (see Parameters for Apply Critical Patch Update to CRS or Grid Home on page 47).

Scenario 2: Apply CPU and/or PSU to the CRS or Grid Home and to the Oracle Database Homes

In this scenario, the workflow applies the CPU and/or PSU to both the CRS or Grid Home and to the Oracle Database Homes as well. If you have one or more nodes running on a RAC cluster and want to apply the Patch Bundle to both the Grid infrastructure and the database instances that it manages, be sure to set the Patch Oracle Homes variable to **Y** and supply a comma-separated list of Oracle Homes to which you want the Patch Bundle applied as shown in the following parameter table:

Parameter Name	Description
CPU Archives	Comma-separated list of relative or fully-qualified path names of the Critical Patch Update archive files. The first file is for CRS only. Any subsequent files will be applied to other Oracle Homes used by CRS controlled processes (such as the Instance, ASM, and Listener). 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). Default value: `/tmp/p7592354_10203_LINUX.zip` Example: `/u02/p13923374_112030_Linux-x86-64.zip`
CRS Version	Database version that is a match for the patch being applied. Example: 1102
Oracle Homes	Comma-separated list of fully-qualified path names of Oracle Homes where the patch will be applied. Example: `/u01/app/oracle/product/11.2.0/db1,/u01/app/oracle/product/11.2.0/db2`
Patch Download Location	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. Example: `/u02`
Patch Oracle Homes	Indicates whether the patch should be applied to the non-CRS homes registered by Clusterware or specified by the New Oracle Homes parameter. Valid values are Y (yes) or N (no). Example: Y

Note: Some of these parameters are not exposed by default in the deployment. See How to Expose Additional Workflow Parameters on page 117.

Be sure that the default values for all remaining input parameters are appropriate for your environment (see Parameters for Apply Critical Patch Update to CRS or Grid Home on page 47).

Note: If the ASM user is different from the RDBMS user, this workflow will fail.

Scenario 3: Apply the CPU and/or PSU to the CRS Home and switch other Homes

In this scenario, you have already provisioned and patched the New Oracle Home. The workflow switches other Homes that are currently in use to previously cloned Homes where the patch has already been applied. Specify a comma-separated list of Homes in the Oracle Homes and the New Oracle Homes parameters. The workflow will switch the Oracle Homes to the respective New Oracle Homes. Set the Patch Oracle Homes to **N** to prevent patching of the specified New Oracle Homes:

Parameter Name	Description
CPU Archives	Comma-separated list of relative or fully-qualified path names of the Critical Patch Update archive files. The first file is for CRS only. Any subsequent files will be applied to other Oracle Homes used by CRS controlled processes (such as the Instance, ASM, and Listener). 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). Default value: `/tmp/p7592354_10203_LINUX.zip` Example: `/u02/p13923374_112030_Linux-x86-64.zip`
CRS Version	Database version that is a match for the patch being applied. Example: 1102
New Oracle Homes	Comma-separated list of the Oracle Homes (fully-qualified paths) that will be cloned (copied) from the Oracle Homes list. There must be one New Oracle Home for each Clone Oracle Home. Example: `/u02/app/oracle/product/11.2.0/db1_patched`
Oracle Homes	Comma-separated list of fully-qualified path names of Oracle Homes where the patch will be applied. Example: `/u02/app/oracle/product/11.2.0/db1`
Patch Download Location	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. Example: `/u02`
Patch Oracle Homes	Indicates whether the patch should be applied to the non-CRS homes registered by Clusterware or specified by the New Oracle Homes parameter. Valid values are Y (yes) or N (no). Example: N

Note: Some of these parameters are not exposed by default in the deployment. See How to Expose Additional Workflow Parameters on page 117.

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

Parameters for Apply Critical Patch Update to CRS or Grid Home

The following tables describe the required and optional input parameters for this workflow. Some of these parameters may not be initially visible in a deployment (see How to Expose Additional Workflow Parameters on page 117). 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 CRS Home

Parameter Name	Default Value	Required	Description
CPU Archives	see description	required	Comma-separated list of relative or fully-qualified path names of the Critical Patch Update archive files. The first file is for CRS only. Any subsequent files will be applied to other Oracle Homes used by CRS controlled processes (such as the Instance, ASM, and Listener). 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). Default value: `/tmp/p7592354_10203_LINUX.zip`
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 `ORA-nnnnn`. Example: `ORA-04020,ORA-03113`.

Additional Input Parameters Defined in this Step: Validate Oracle Apply CPU to CRS Home (continued)

Parameter Name	Default Value	Required	Description
New Oracle Homes	no default	optional	Comma-separated list of the Oracle Homes (fully-qualified paths) that will be cloned (copied) from the Oracle Homes list. There must be one New Oracle Home for each Clone Oracle Home.
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	see description	optional	The fully-qualified path name of the OPatch Archive file required for this Critical Patch Update. If this file is not present, it will be downloaded. If this parameter value is not specified, the current OPatch version will be used. Default value: `/tmp/p6880880_102000_LINUX.zip`
Oracle Homes	no default	optional	Comma-separated list of fully-qualified path names of Oracle Homes where the patch will be applied.
Patch Archive Location	`/var/tmp`	optional	Directory location where the zip archives will be extracted. .
Patch Download Location	no default	required	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.
Patch Oracle Homes	Y	required	Indicates whether the patch should be applied to the non-CRS homes registered by Clusterware or specified by the New Oracle Homes parameter. Valid values are Y (yes) or N (no).
Patch Rollback	no default	optional	Comma-separated list of patch numbers to roll back before applying the Critical Patch Update and/or Patch Set Update.

Additional Input Parameters Defined in this Step: Deploy CRS Patch Scripts

Parameter Name	Default Value	Required	Description
CRS Version	no default	required	Database version that is a match for the patch being applied.

Apply Critical Patch Update to RAC Home

This workflow enables you to apply an Oracle-supplied Critical Patch Update (CPU) 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
Prerequisites for this Workflow	List of prerequisites that must be satisfied before you can run this workflow
How this Workflow Works	Information about what the workflow does, including validation checks performed, and steps executed
How to Run this Workflow	Instructions for running this workflow in your environment
Sample Scenarios	Examples of typical parameter values for this workflow
Parameters	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 into the HP DMA software repository (see How to Import a File into the Software Repository on page 121).
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 Solution Pack Support Matrix*).

For more information about prerequisites for Oracle Database, refer to the Oracle Product Documentation on page 110.

How this Workflow Works

This 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 (CPU) to each Oracle RAC node.
- The workflow extracts and applies the CPU to the Oracle RAC nodes.The workflow runs an SQL script to update the CPU 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

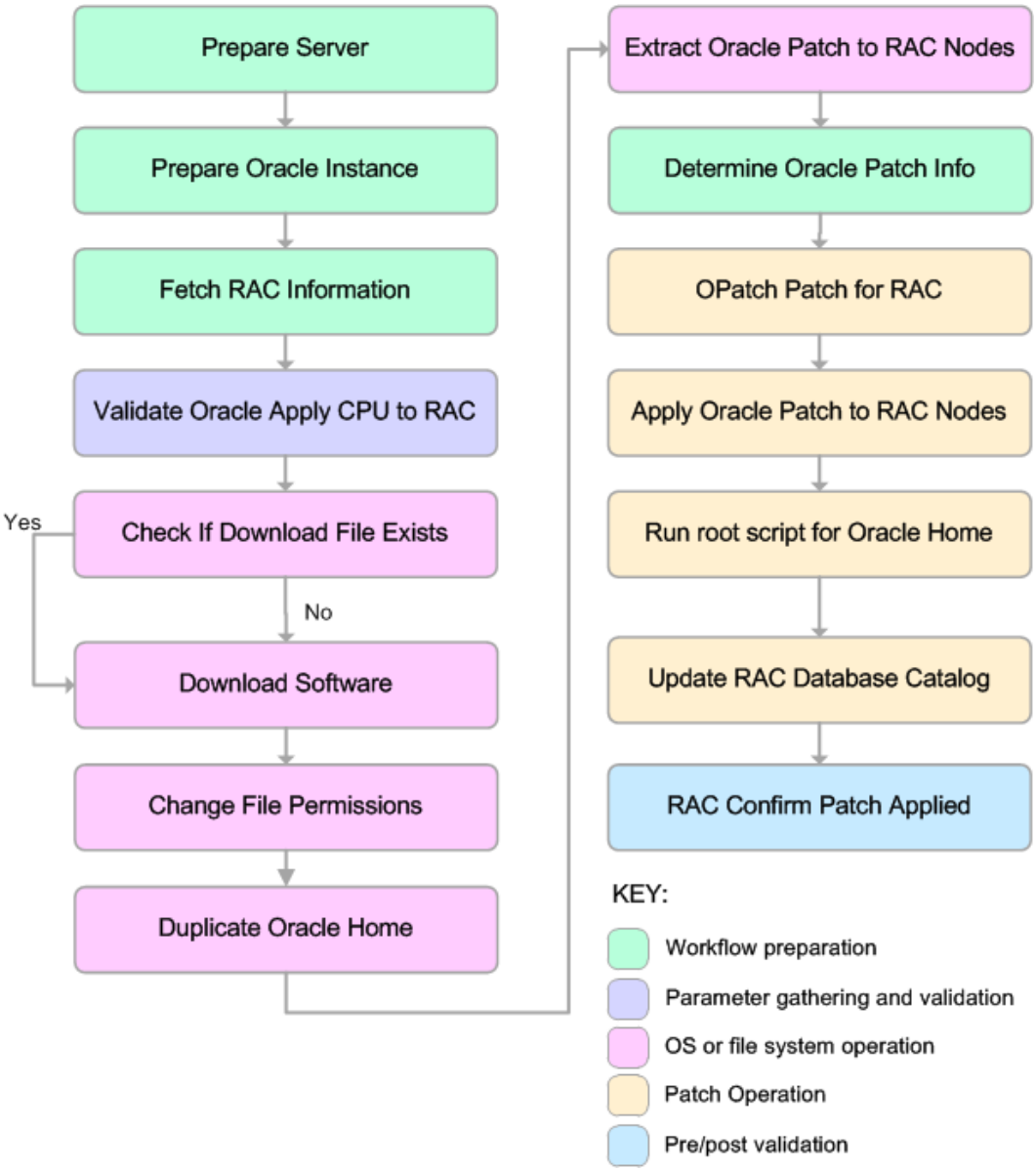
This workflow validates the following conditions:

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 applies to the current Oracle Database version.

After the patching operation is completed, the workflow verifies that the CPU 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

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.
Fetch RAC Information	This step uses `srvctl` to fetch the RAC information.
Validate Oracle Apply CPU to RAC	This step validates the parameters for Apply Critical Patch Update to RAC.
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 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 `cpu_root.sh` or `psu_root.sh` script as part of an Oracle patch on RAC.
Update RAC Database Catalog	This step runs the `catcpu.sql` or `catpsu.sql` 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 61.

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.

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 61.

Note: Before following this procedure, review the Prerequisites for this Workflow on page 51, 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 121.

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 Archives 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 Archives 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.

Method 3: The unzipped Oracle patch is stored on each target machine:

1. In the CPU Archives parameter, specify the fully qualified directory name where the unzipped files are located. The directory name must be the patch number.
2. Do not specify a value for the Patch Archive Location parameter.
3. 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.

To use the Apply Critical Patch Update to RAC workflow:

1. Create a deployable copy of the workflow (see Create a Deployable Workflow on page 20).
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/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 provisioning objectives. See How to Expose Additional Workflow Parameters on page 117

   See Parameters for Apply Critical Patch Update to RAC Home on page 61 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 on page 21 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 on page 25 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 and/or PSU to RAC Homes

In this scenario, the workflow applies the CPU 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/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 117.

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 61).

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/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 117.

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 117). 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 `ORA-nnnnn`. Example: `ORA-04020,ORA-03113`
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/PSU will be applied to these Oracle Homes.
Patch Archive Location	`/var/tmp`	optional	Directory location where the CPU archives will be extracted.
Patch Download Location	/var/tmp	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.

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
Prerequisites for this Workflow	List of prerequisites that must be satisfied before you can run this workflow
How this Workflow Works	Information about what the workflow does, including validation checks performed, and steps executed
How to Run this Workflow	Instructions for running this workflow in your environment
Sample Scenarios	Examples of typical parameter values for this workflow
Parameters	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 into the HP DMA software repository (see How to Import a File into the Software Repository on page 121).
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 Solution Pack Support Matrix*).

Note: The Oracle patchset archive must 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 110.

How this Workflow Works

This 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:

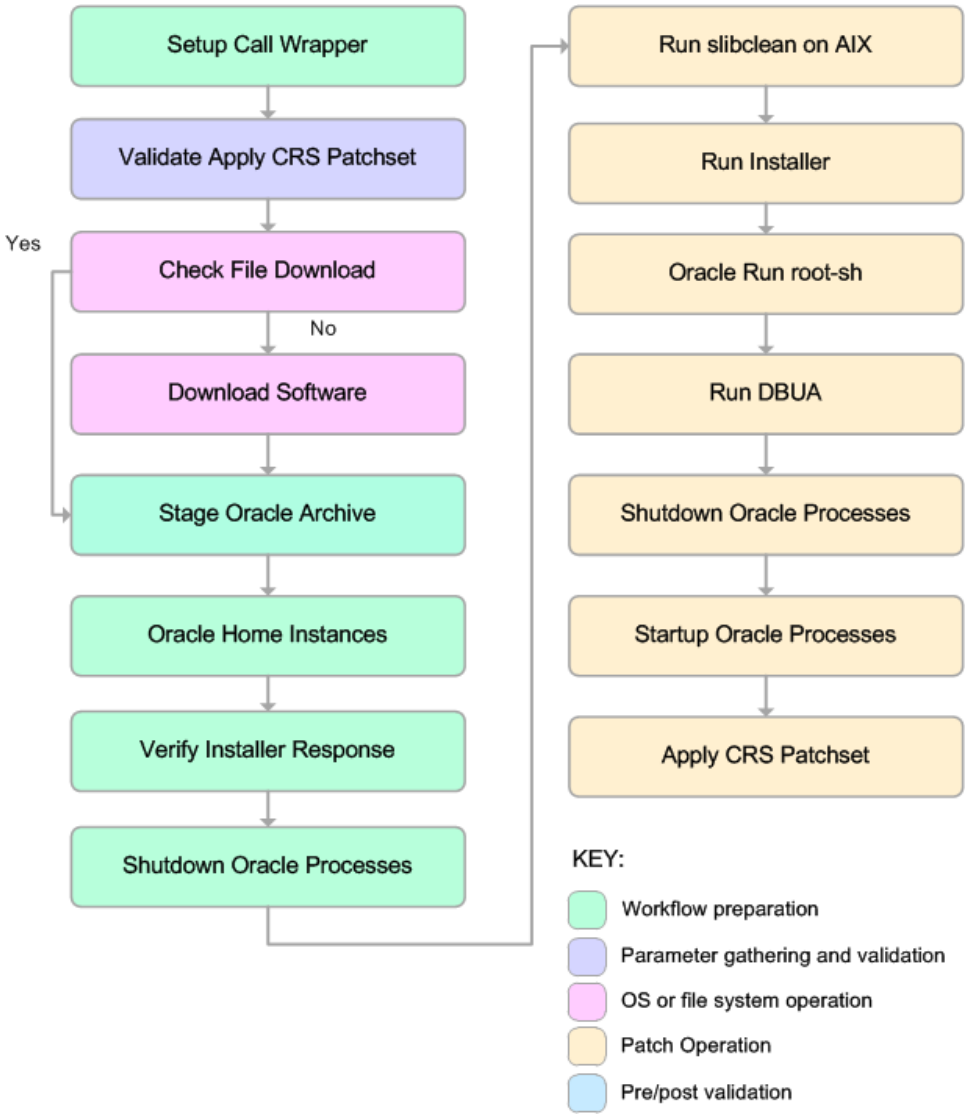
1. The input parameters have the proper syntax (no special characters or spaces).
2. Files exist or have valid specifications.
3. The supplied patchset applies to the current Oracle Database version.

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 Apply Oracle CRS Patchset workflow.
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.
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 `slibclean` command on AIX targets. The `slibclean` 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 `root.sh` 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 73.

How to Run this Workflow

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

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 73.

Note: Before following this procedure, review the Parameters for Apply Oracle CRS Patchset on page 73, 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 on page 20).
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 provisioning objectives. See How to Expose Additional Workflow Parameters on page 117

   See Parameters for Apply Oracle CRS Patchset on page 73 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 on page 21 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 on page 25 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 117.

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 73).

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 117.

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 117). 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. Defaut 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 **Y** and **N**. Set this value to **Y** 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.

Apply Oracle Grid Standalone Patch and Apply Database Patch

This workflow enables you to apply an Oracle Grid Standalone patch and apply a Database patch to your enterprise databases.

You can install an Oracle-supplied patch to a Grid Oracle Home. If the OPatch archive is specified, the workflow will upgrade OPatch before the patch is applied. Otherwise, it will attempt to use the current version of OPatch.

This workflow is designed to work with version 11.2.0.1 or later of the Oracle Grid Infrastructure for the Standalone Server or Oracle Restart Home.

There are advanced parameters that can be specified to back up the Grid installed binaries to another location. If specified, the installed binaries will be backed up before the patch is applied. Advanced parameters can also be used to check for the amount of free disk space available before the patch is applied. This is an important feature in cases where Oracle requires 25 GB of free space for a patch. The CPU Archive advanced parameter can be used to apply a Critical Patch Update (CPU) to the databases on the target as well.

Note: This workflow replaces the Patch Grid Standalone workflow in the Database Patching solution pack.

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

Topic	Information Included
Prerequisites for this Workflow	List of prerequisites that must be satisfied before you can run this workflow
How this Workflow Works	Information about what the workflow does, including validation checks performed, and steps executed
How to Run this Workflow	Instructions for running this workflow in your environment
Sample Scenarios	Examples of typical parameter values for this workflow
Parameters	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 Grid Standalone Patch and Apply Database Patch 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 into the HP DMA software repository (see How to Import a File into the Software Repository on page 121).
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 Solution Pack Support Matrix*).

Other Dependencies

- Oracle Standalone 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 110.

How this Workflow Works

This workflow performs the following actions:

- The initial steps of the workflow prepare it to patch the Grid Standalone Home and Oracle Database. 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 Standalone 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 Standalone Home.
- The workflow applies the patch to the Grid Standalone Home. In doing so, it checks whether Oracle Home is to be patched. It verifies that the patch has been applied, restores the Database Home configuration, and restarts the Grid.
- The workflow applies the patch to the target databases. In doing so, it checks whether Oracle Home is to be patched. It starts the Database Home, cleans up downloaded files, and verifies that the patch has been applied.

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 CPU applies to Oracle Home.
5. Recompiled database views are accurate.

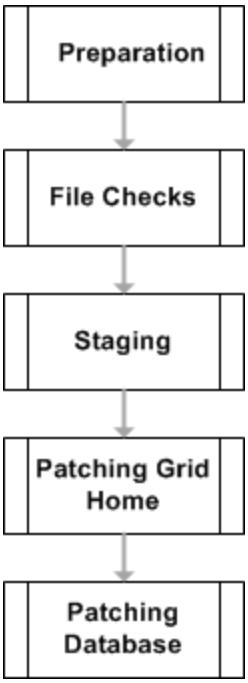
After the patching operation is completed, the workflow verifies that the CPU has been successfully applied to the Grid Standalone Home and to the target databases.

Steps Executed

The Apply Oracle Grid Standalone Patch and Apply Database Patch 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.

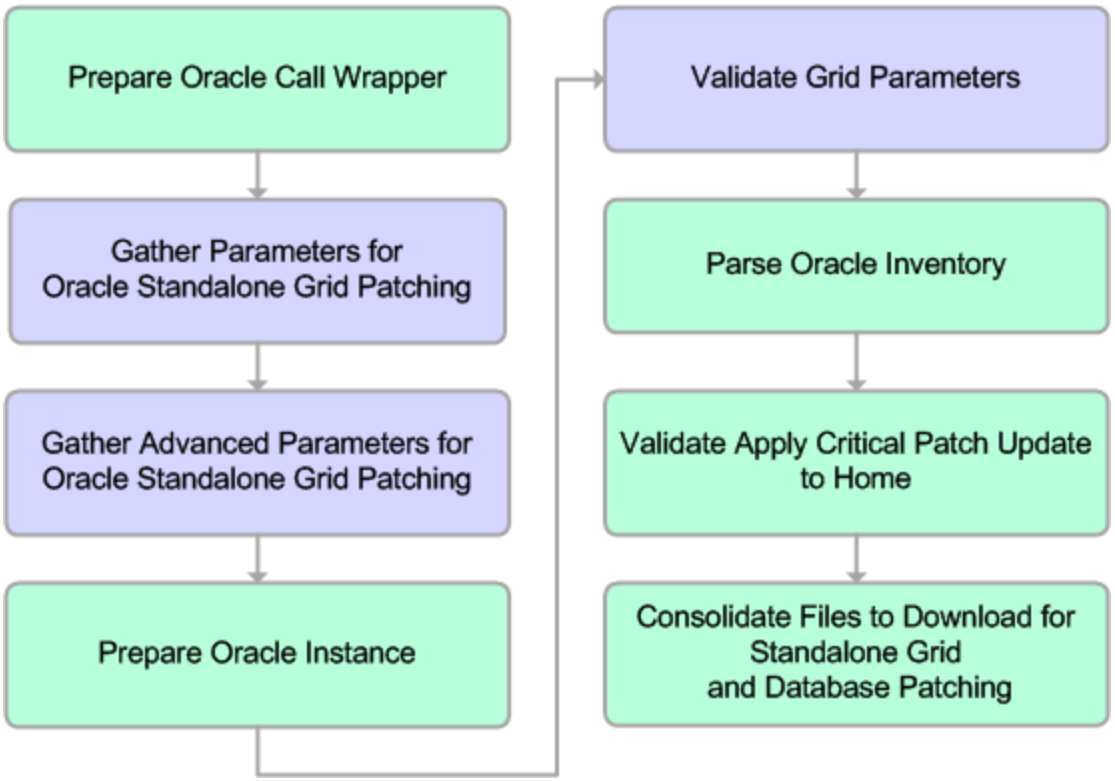
Since this workflow has several steps, the following presents an overview of the steps grouped by the general task the steps are performing:

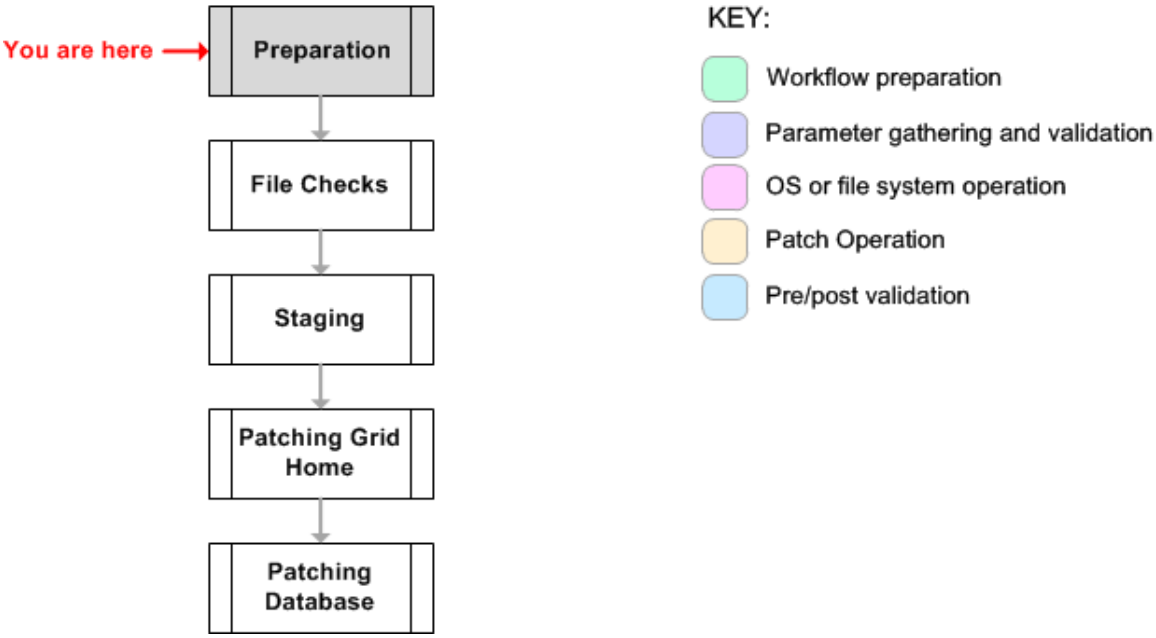
Overview of Workflow



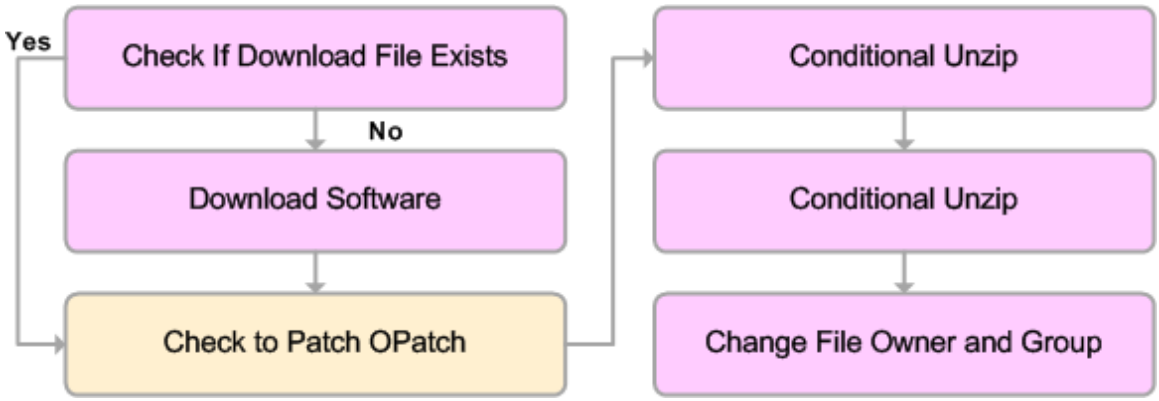
The workflow diagrams on the following pages break out the steps that are performed for each general task.

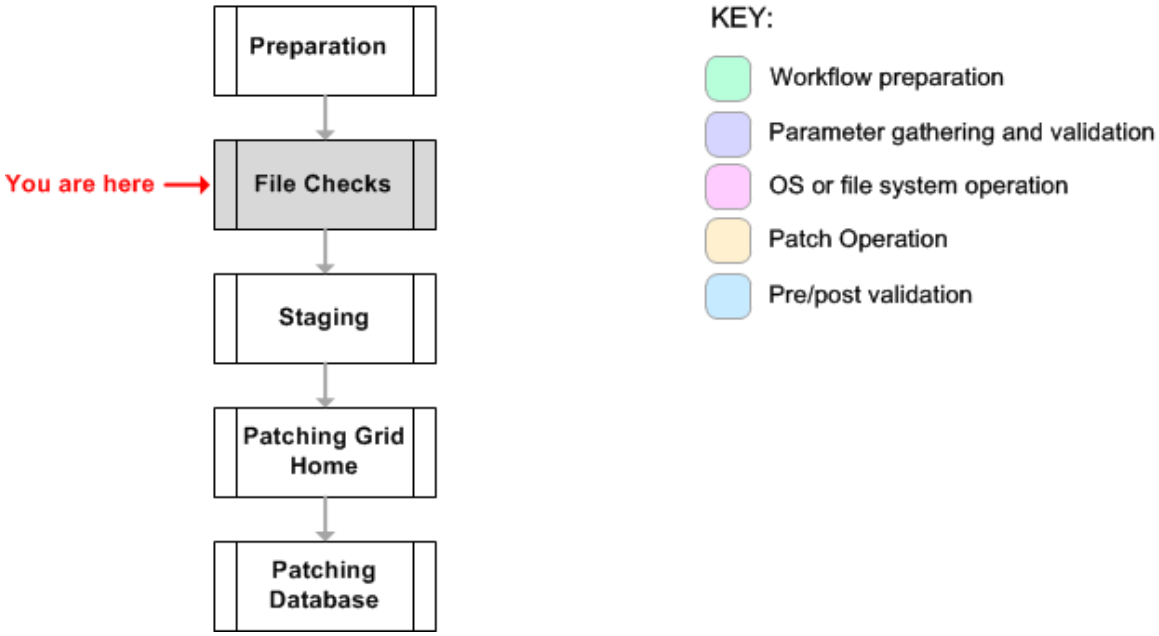
Preparation



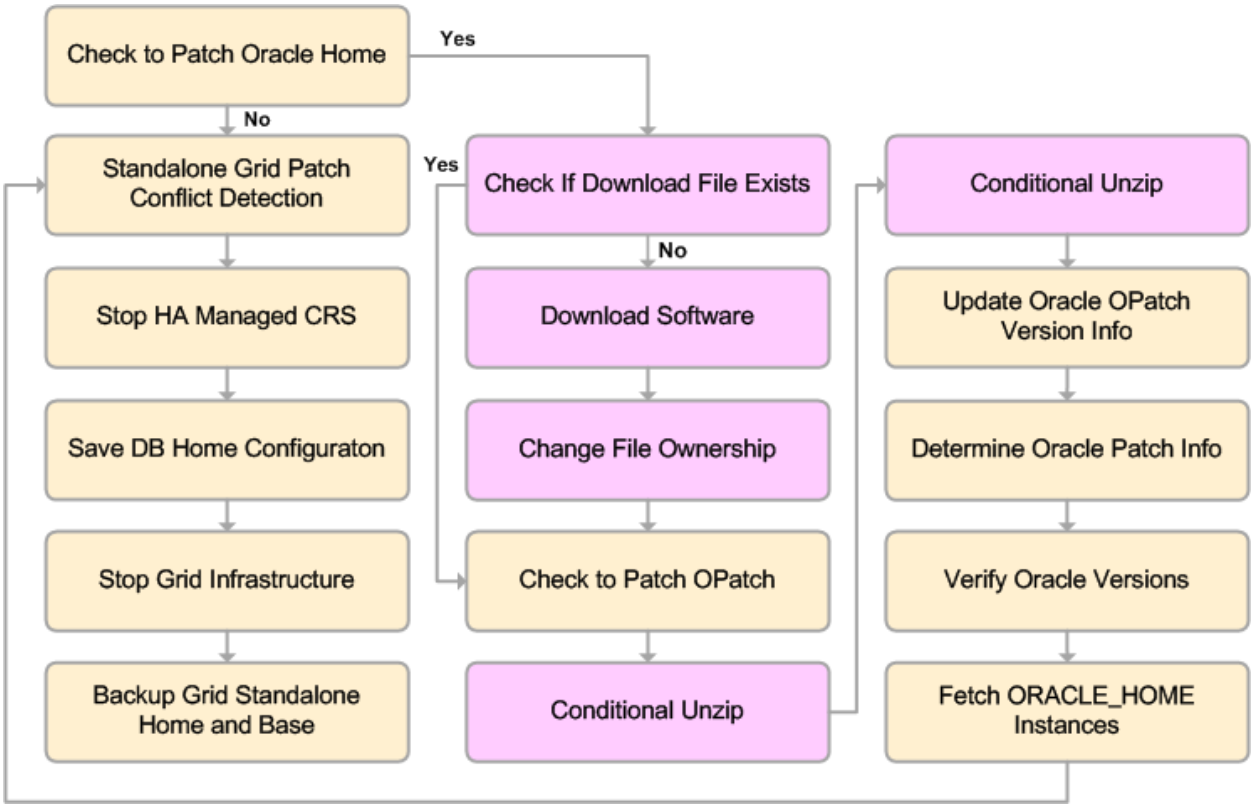


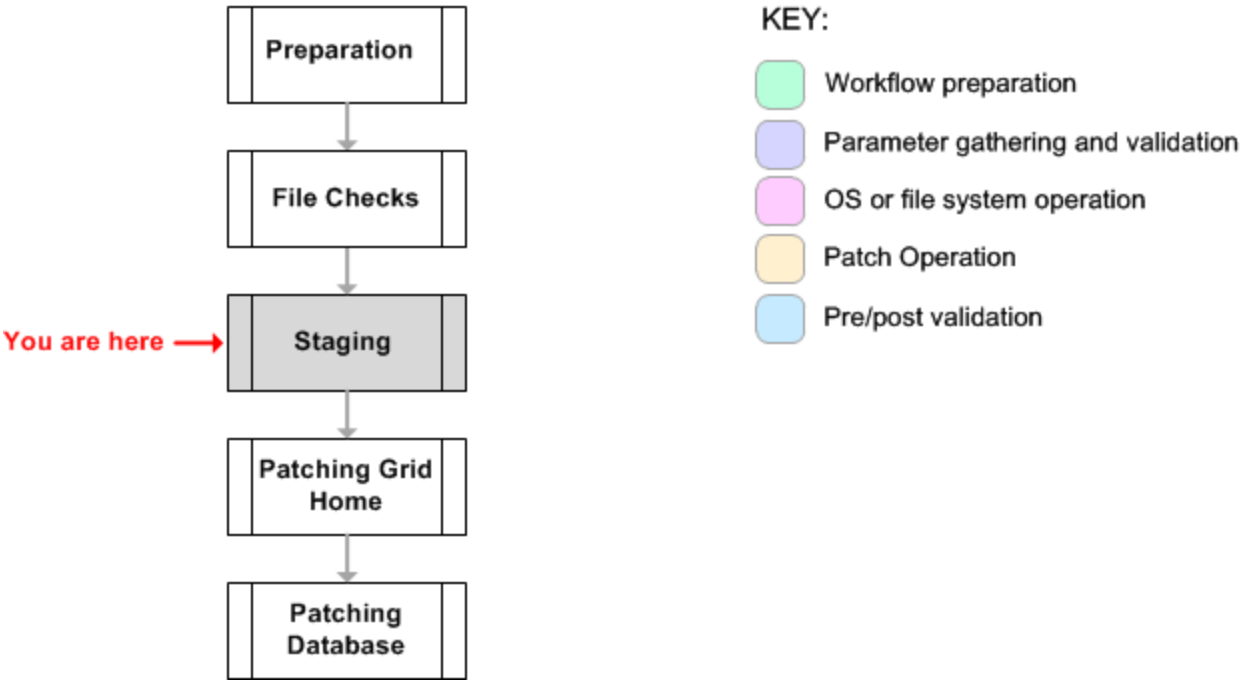
File Checks


Yes
Check If Download File Exists
No
Download Software
Check to Patch OPatch
Conditional Unzip
Conditional Unzip
Change File Owner and Group

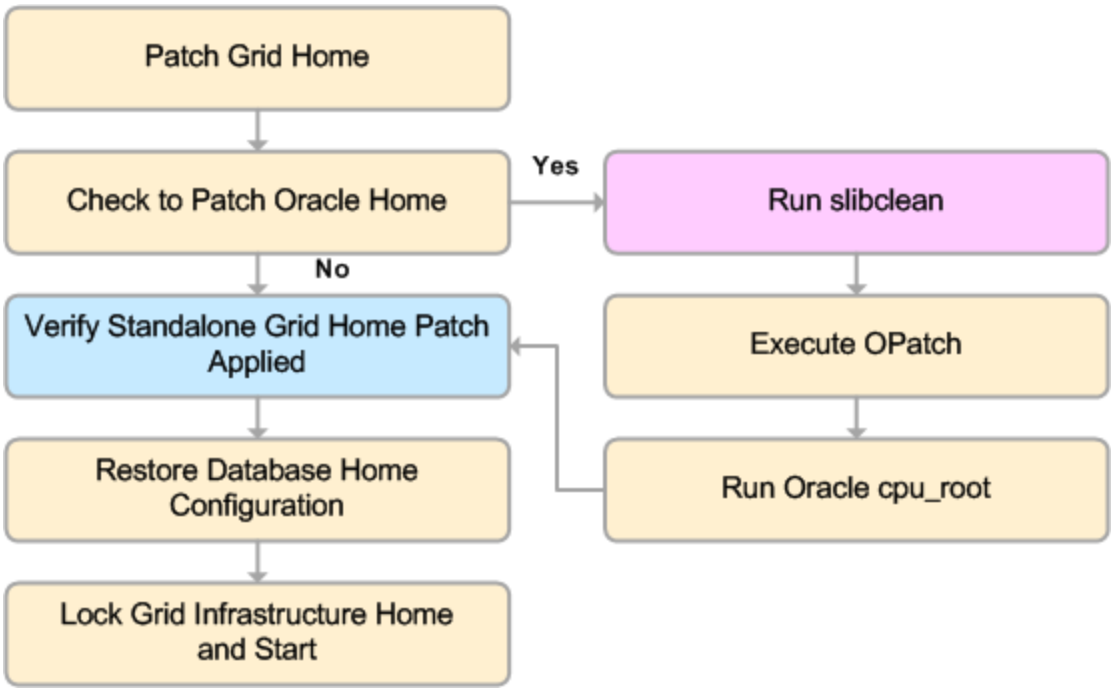

Preparation
You are here
File Checks
Staging
Patching Grid Home
Patching Database
KEY:
Workflow preparation
Parameter gathering and validation
OS or file system operation
Patch Operation
Pre/post validation

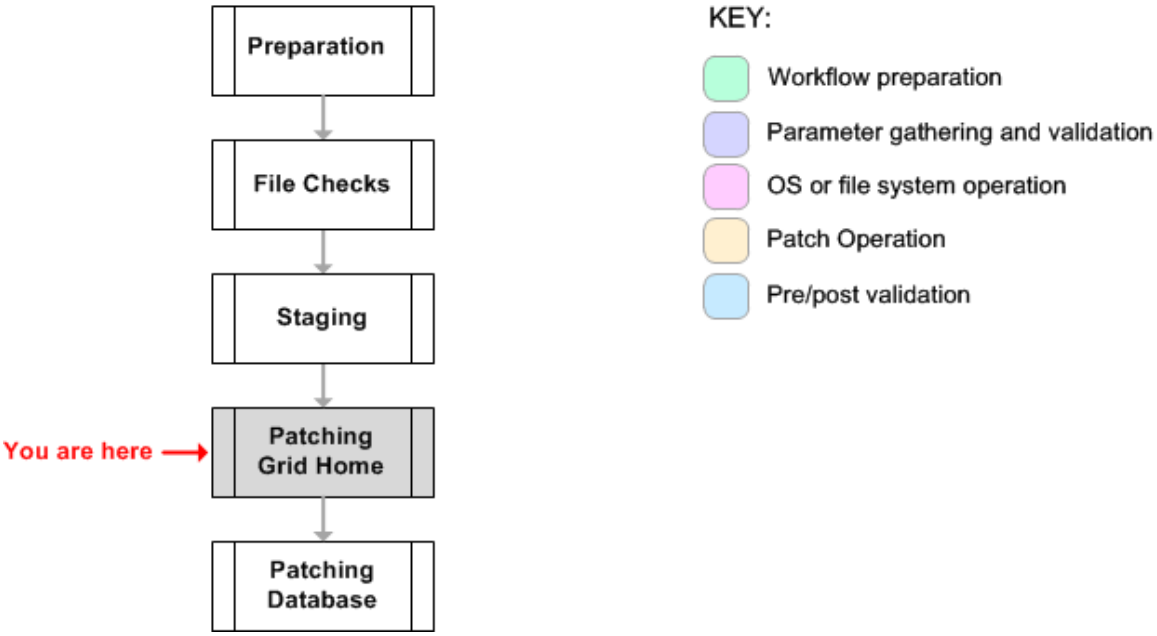
Staging


Check to Patch Oracle Home
Yes
No
Standalone Grid Patch Conflict Detection
Yes
Check If Download File Exists
Conditional Unzip
No
Stop HA Managed CRS
Download Software
Update Oracle OPatch Version Info
Save DB Home Configuraton
Change File Ownership
Determine Oracle Patch Info
Stop Grid Infrastructure
Check to Patch OPatch
Verify Oracle Versions
Backup Grid Standalone Home and Base
Conditional Unzip
Fetch ORACLE_HOME Instances

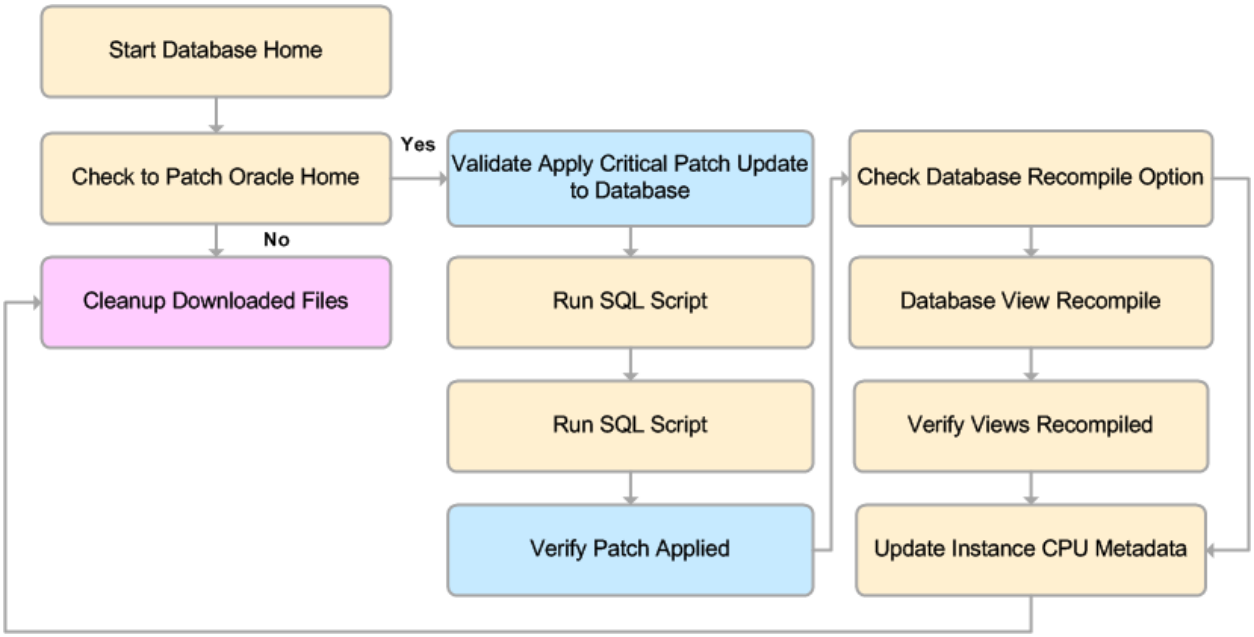

Preparation
File Checks
You are here
Staging
Patching Grid Home
Patching Database
KEY:
Workflow preparation
Parameter gathering and validation
OS or file system operation
Patch Operation
Pre/post validation

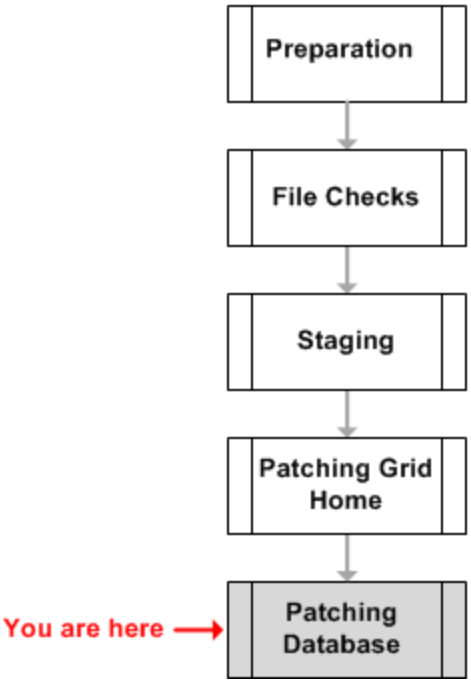
Patching Grid Home

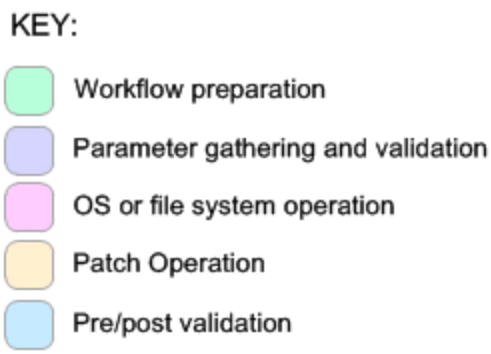




Patching Database







Steps Used in Apply Oracle Grid Standalone Patch and Apply Database Patch

Workflow Step	Description
Prepare Oracle Call Wrapper	This step constructs the commands needed to execute subsequent steps in the workflow as either the OS administrative user or the user who owns the pertinent ORACLE_HOME. The step also creates utility parameters that will be used by subsequent steps.
Gather Parameters for Oracle Standalone Grid Patching	This step gathers the parameters for Oracle Standalone Grid patching.
Gather Advanced Parameters for Oracle Standalone Grid Patching	This step gathers the advanced parameters for Oracle Standalone Grid patching.
Prepare Oracle Instance	This step prepares instance level Oracle access.
Validate Grid Parameters	This step validates the Grid parameters.
Parse Oracle Inventory	This step parses the specified Oracle inventory files (if they exist) and passes the inventory information to subsequent steps. • If one or more Inventory Files are specified and they exist, the step parses these files and extracts their contents. • If no Inventory Files are specified, the step assigns the appropriate default and attempts to parse that file. • If one or more Inventory Files are specified and they do not exist, the step creates an inventory based on the specified Oracle Account and Oracle Home.
Validate Apply Critical Patch Update to Home	This step validates the values specified for the input parameters used by the Apply Critical Patch Update to Grid Standalone Home. It also sets the values of various output parameters that will be consumed by subsequent steps.
Consolidate Files to Download for Standalone Grid and Database Patching	This step consolidates the files to download for the Standalone Grid and database patching.

Steps Used in Apply Oracle Grid Standalone Patch and Apply Database Patch (continued)

Workflow Step	Description
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.
Check to Patch OPatch	This step determines whether an OPatch archive file has been provided. If this file has been provided, the workflow will use the file to patch the Oracle OPatch utility before applying the Critical Patch Update (CPU).
Conditional Unzip	This step unzips the specified Archive File into the specified destination directory—for the Critical Patch Update download.
Conditional Unzip	This step unzips the specified Archive File into the specified destination directory—for the OPatch download.
Change File Owner and Group	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.
Check to Patch Oracle Home	This step determines if an OPatch archive file has been provided and branches appropriately.
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 Ownership	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.
Check to Patch OPatch	This step determines whether an OPatch archive file has been provided. If this file has been provided, the workflow will use the file to patch the Oracle OPatch utility before applying the Critical Patch Update (CPU).
Conditional Unzip	This step unzips the specified Archive File into the specified destination directory—for the Critical Patch Update download.
Conditional Unzip	This step unzips the specified Archive File into the specified destination directory—for the Critical Patch Update download.
Update Oracle OPatch Version Info	This step determines which version of OPatch will be used to apply the Critical Patch Update (CPU). If OPatch will be updated before the CPU is applied, and the OPatch archive file is available, the updated version is retrieved from the archive file. If OPatch will not be updated before the CPU is applied, the current version is used.

Steps Used in Apply Oracle Grid Standalone Patch and Apply Database Patch (continued)

Workflow Step	Description
Determine Oracle Patch Info	This step determines all the patch information that the workflow requires to apply the pertinent patch.
Verify Oracle Versions	This step ensures that the current Oracle Database and OPatch versions match the versions required to apply the patch.
Fetch ORACLE_HOME Instances	This step fetches the list of instances that share the specified ORACLE_HOME.
Standalone Grid Patch Conflict Detection	This step detects if there is any Standalone Grid Patch conflict.
Stop HA Managed CRS	This step stops HA-managed Cluster Ready Service.
Save DB Home Configuration	This step saves the Database Home configuration.
Stop Grid Infrastructure	This step stops the Grid Infrastructure.
Backup Grid Standalone Home and Base	This step backs up the Grid Standalone Home and the Grid Base to the specified backup location.
Patch Grid Home	This step applies the CPU to the Grid Standalone Home.
Check to Patch Oracle Home	This step determines if an OPatch archive file has been provided and branches appropriately.
Run slibclean	This step runs the `slibclean` command on AIX targets. The slibclean utility removes any currently unused modules in kernel and library memory.
Execute OPatch	This step runs the Oracle OPatch utility to deploy an Oracle supplied patch.
Run Oracle cpu_root	This step runs the Oracle provided `cpu_root.sh` script as part of an Oracle CPU patch.
Verify Standalone Grid Home Patch Applied	This step verifies that the patch has been properly applied to the Standalone Grid Home.

Steps Used in Apply Oracle Grid Standalone Patch and Apply Database Patch (continued)

Workflow Step	Description
Restore Database Home Configuration	This step restores the Database Home configuration from the Patch Archive location.
Lock Grid Infrastructure Home and Start	This step locks the Grid Infrastructure Home and Start.
Start Database Home	This step starts the Database Home services.
Check to Patch Oracle Home	This step determines if an OPatch archive file has been provided and branches appropriately.
Validate Apply Critical Patch Update to Database	This step verifies the values for step variables used in the Apply Critical Patch Update workflow.
Run SQL Script	This step runs the specified SQL Script against each SID in the specified Oracle SIDs list. It skips all instances in the Ignore SIDs list (these are typically standby databases). The first Run SQL Script step runs the optional user-defined Preparatory SQL Script file.
Run SQL Script	This step runs the specified SQL Script against each SID in the specified Oracle SIDs list. It skips all instances in the Ignore SIDs list (these are typically standby databases). The second Run SQL Script step runs the Patch Information File.
Verify Patch Applied	This step confirms that the patch has been properly applied to the Oracle Database.
Check Database Recompile Option	This step checks to see if the database recompile option is set.
Database View Recompile	This step recompiles the database views as required by the Critical Patch Update (CPU) or Patch Set Update (PSU) patching process.
Verify Views Recompiled	This step confirms that any views that were required to be recompiled where successfully recompiled.
Update Instance CPU Metadata	This step updates the Patch Level metadata field associated with the pertinent instance.

Steps Used in Apply Oracle Grid Standalone Patch and Apply Database Patch (continued)

Workflow Step	Description
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 Apply Oracle Grid Standalone Patch and Apply Database Patch on page 95.

How to Run this Workflow

The following instructions show you how to customize and run the Apply Oracle Grid Standalone Patch and Apply Database Patch workflow in your environment.

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 Grid Standalone Patch and Apply Database Patch on page 95.

Note: Before following this procedure, review the Prerequisites for this Workflow on page 76, and ensure that all requirements are satisfied.

To use the Apply Oracle Grid Standalone Patch and Apply Database Patch workflow:

1. Create a deployable copy of the workflow (see Create a Deployable Workflow on page 20).
2. Determine the values that you will specify for the following parameters:

Input Parameters Defined in this Step: Prepare Oracle Call Wrapper

Parameter Name	Default Value	Required	Description
Oracle Account	oracle	required	Oracle user who will own the ORACLE_HOME. Leave this parameter blank for Windows.

Additional Parameters Defined in this Step: Gather Parameters for Oracle Standalone Grid Patching

Parameter Name	Default Value	Required	Description
CRS Base	no default	required	Location where you have or want your Cluster Ready Services (CRS) base setup.
CRS Home	no default	required	Fully-qualified path name of the Oracle Clusterware Home.
Patch Archive	no default	required	Comma-separated list of patch file names. They are not fully-qualified.
Patch Download Directory	no default	required	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.

Note: This is the minimum set of parameters required to run this workflow. You may need to expose additional parameters depending on your provisioning objectives. See How to Expose Additional Workflow Parameters on page 117

> See Parameters for Apply Oracle Grid Standalone Patch and Apply Database Patch on page 95 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 on page 21 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 on page 25 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 Grid Standalone Patch and Apply Database Patch workflow.

Scenario 1: Apply patch to the Grid Standalone Home only

In this scenario, the workflow applies the patch to the Grid Standalone Home only. It does not apply the patch to the Oracle Database Homes. If you patch your Grid infrastructure on a different schedule from your database, you may want to use this scenario. This is the minimal case. You only need to set the required parameters as shown in the following parameter table:

Parameter Name	Description
Oracle Account	Oracle user who will own the ORACLE_HOME. Leave this parameter blank for Windows. Example: oracle
CRS Base	Location where you have or want your Cluster Ready Services (CRS) base setup. Example: `/u01/app/grid`
CRS Home	Fully-qualified path name of the Oracle Clusterware Home. Example: `/u01/app/11.2.0/grid`
Patch Archive	Comma-separated list of patch file names. They are not fully-qualified. Example: `p14192201_112020_Linux-x86-64.zip`
Patch Download Directory	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. Example: `/tmp`

Be sure that the default values for all remaining input parameters are appropriate for your environment (see Parameters for Apply Oracle Grid Standalone Patch and Apply Database Patch on page 95).

Scenario 2: Apply patch to the Grid Standalone Home and to the Oracle Database Homes

In this scenario, the workflow applies the patch to both the Grid Standalone Home and to the Oracle Database Homes as well. This scenario is useful if you have one or more databases running on your Grid infrastructure and you want to apply the patch to both to have a single down-time period while patching. In this use case, you must specify the CPU Archive parameter as shown in the following parameter table:

Parameter Name	Description
Oracle Account	Oracle user who will own the ORACLE_HOME. Leave this parameter blank for Windows. Example: oracle
CRS Base	Location where you have or want your Cluster Ready Services (CRS) base setup. Example: `/u01/app/grid`
CRS Home	Fully-qualified path name of the Oracle Clusterware Home. Example: `/u01/app/11.2.0/grid`
Patch Archive	Comma-separated list of patch file names. They are not fully-qualified. Example: `p14192201_112020_Linux-x86-64.zip`
Patch Download Directory	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. Example: `/tmp`
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: `p14038791_112020_Linux-x86-64.zip`

Be sure that the default values for all remaining input parameters are appropriate for your environment (see Parameters for Apply Oracle Grid Standalone Patch and Apply Database Patch on page 95).

Scenario 3: Back up Grid Standalone Home and Base

In this scenario, the workflow backs up the Grid Standalone Home and Base before applying the patch. You may want to exercise this precaution before applying the patch as a safeguard against any kind of system failure. In this use case, you must specify the GRID Backup File Name and the GRID Backup Location as shown in the following parameter table:

Parameter Name	Description
Oracle Account	Oracle user who will own the ORACLE_HOME. Leave this parameter blank for Windows. Example: oracle
CRS Base	Location where you have or want your Cluster Ready Services (CRS) base setup. Example: `/u01/app/grid`
CRS Home	Fully-qualified path name of the Oracle Clusterware Home. Example: `/u01/app/11.2.0/grid`
Patch Archive	Comma-separated list of patch file names. They are not fully-qualified. Example: `p14192201_112020_Linux-x86-64.zip`
Patch Download Directory	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. Example: `/tmp`
GRID Backup File Name	Name of the backup file that will be created. Do not include the extension `.tar.gz` since it will be automatically appended to the name. The default name is `dma_grid_backup.tar.gz` if one is not specified. Example: `dma_grid_backup`
GRID Backup Location	This is the location to which you want to back up your GRID Base and HOME. Example: `/tmp/backups`

Be sure that the default values for all remaining input parameters are appropriate for your environment (see Parameters for Apply Oracle Grid Standalone Patch and Apply Database Patch on page 95).

Scenario 4: Do not clean up specified files

In this scenario, the workflow does not clean up any files that you specify that you want to keep on the system. You may want to retain downloaded patch files for reference purposes. In this use case, you must specify the Do Not Remove List and the Temporary File Location as shown in the following parameter table:

Parameter Name	Description
Oracle Account	Oracle user who will own the ORACLE_HOME. Leave this parameter blank for Windows. Example: oracle
CRS Base	Location where you have or want your Cluster Ready Services (CRS) base setup. Example: `/u01/app/grid`
CRS Home	Fully-qualified path name of the Oracle Clusterware Home. Example: `/u01/app/11.2.0/grid`
Patch Archive	Comma-separated list of patch file names. They are not fully-qualified. Example: `p14192201_112020_Linux-x86-64.zip`
Patch Download Directory	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. Example: `/tmp`
Do Not Remove List	List of directories that should not be removed. Example: `/tmp/2012_JulyCPU.zip`
Temporary File Location	The location where all temporary output files will be placed. Example: `/tmp/output`

Note: Some of these parameters are not exposed by default in the deployment. See How to Expose Additional Workflow Parameters on page 117.

Be sure that the default values for all remaining input parameters are appropriate for your environment (see Parameters for Apply Oracle Grid Standalone Patch and Apply Database Patch on the next page).

Parameters for Apply Oracle Grid Standalone Patch and Apply Database Patch

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 117). 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 Call Wrapper

Parameter Name	Default Value	Required	Description
Oracle Account	oracle	required	Oracle user who will own the ORACLE_HOME. Leave this parameter blank for Windows.

Additional Parameters Defined in this Step: Gather Parameters for Oracle Standalone Grid Patching

Parameter Name	Default Value	Required	Description
CRS Base	no default	required	Location where you have or want your Cluster Ready Services (CRS) base setup.
CRS Home	no default	required	Fully-qualified path name of the Oracle Clusterware Home.
Patch Archive	no default	required	Comma-separated list of patch file names. They are not fully-qualified.
Patch Download Directory	no default	required	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.

Additional Parameters Defined in this Step: Gather Advanced Parameters for Oracle Standalone Grid Patching

Parameter Name	Default Value	Required	Description
CPU Archive	no default	optional	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).
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.
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.
Preparatory SQL	no default	optional	File name containing 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, this file is downloaded from the software repository on the HP DMA server.

Additional Parameters Defined in this Step: Validate Grid Parameters

Parameter Name	Default Value	Required	Description
Oracle Group	oinstall	optional	The Oracle group used for the ORACLE_HOME installation.

Additional Parameters Defined in this Step: Backup Standalone Grid Home and Base

Parameter Name	Default Value	Required	Description
GRID Backup File Name	see description	optional	Name of the backup file that will be created. Do not include the extension `.tar.gz` since it will be automatically appended to the name. The default name is `dma_grid_backup.tar.gz` if one is not specified.
GRID Backup Location	no default	optional	This is the location to which you want to back up your GRID Base and HOME.

Additional Parameters Defined in this Step: Cleanup Downloaded Files

Parameter Name	Default Value	Required	Description
Do Not Remove List	no default	optional	List of directories that should not be removed.
Temporary File Location	no default	optional	The location where all temporary output files will be placed.

Rollback Critical Patch Update from CRS Home

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. If needed, the Relational Database Management System (RDBMS) Home and/or the Automatic Storage Management (ASM) Home can be switched to unpatched versions.

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

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

Prerequisites for this Workflow

Be sure that the following prerequisites are satisfied before you run the Rollback Critical Patch Update from CRS 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. Your targets are running one of the supported operating systems (see the *HP DMA Solution Pack 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 and the CRS/ASM/Instance/Listener users (typically oracle) must have unchallenged ability to `ssh` to all the RAC nodes.
- The ASM (in versions 10.2 and 11.1), Instance, and Listener Homes must have the same owner. The CRS (CRS/ASM in version 11.2) Home can have a different owner. A maximum of two separate owners is permitted.

For more information about prerequisites for Oracle Database, refer to the Oracle Product Documentation on page 110.

How this Workflow Works

This workflow performs the following actions:

- The initial steps of the workflow prepare to roll back the patch. It prepares the server, determines the Oracle Home, prepares the Oracle Instance, and validates the input parameters. It determines all the pertinent patch information.
- The workflow stops the Clusterware services.
- The workflow determines if the other Database Homes are to be switched.
- The workflow determines if the rollback should be applied to the CRS Home only or all Database Homes and applies the rollback by running the specified SQL Script.
- The workflow rolls back the Critical Patch Update database catalog for RAC.
- The workflow then confirms that the patch was properly rolled back from the Grid Home.

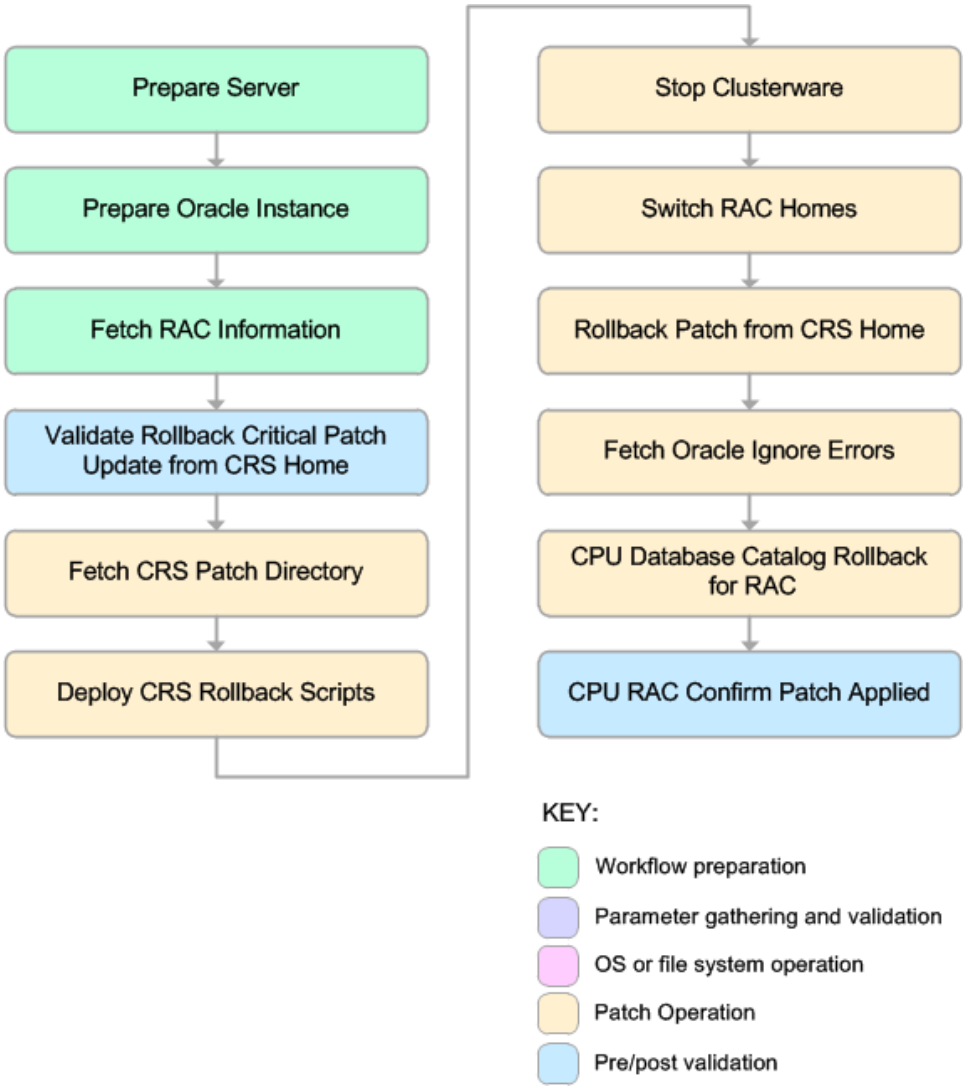
Validation Checks Performed

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.

Steps Executed

The Rollback Critical Patch Update from CRS 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 Rollback Critical Patch Update from CRS 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 or middleware software.
Prepare Oracle Instance	This step prepares instance level Oracle access.
Fetch RAC Information	This step uses `srvctl` to fetch the RAC information.
Validate Rollback Critical Patch Update from CRS Home	This step validates the parameters for Rollback Critical Patch Update from CRS Home.
Fetch CRS Patch Directory	This step fetches the CRS patch directory.
Deploy CRS Rollback Scripts	This step deploys the scripts needed to rollback the CPU and PSU patches from a CRS Home.
Stop Clusterware	This step stops all Clusterware processes.
Switch RAC Homes	This step switches Oracle Homes for Clusterware services. This step must be run as root to verify the listener changes. Otherwise, this check is skipped.
Rollback Patch from CRS Home	This step rolls back the patch from CRS Home.
Fetch Oracle Ignore Errors	This step fetches the lists of acceptable Oracle errors when patching the database.
CPU Database Catalog Rollback for RAC	This step runs the `rollback_catcpu.sql` or `rollback_catpsu.sql` script against every RAC instance in the supplied list.
CPU RAC Confirm Patch Applied	This step confirms that the patch has been properly applied.

Note: For input parameter descriptions and defaults, see Parameters for Rollback Critical Patch Update from CRS Home on page 108.

How to Run this Workflow

The following instructions show you how to customize and run the Rollback Critical Patch Update from CRS Home workflow in your environment.

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 Rollback Critical Patch Update from CRS Home on page 108.

Note: Before following this procedure, review the Prerequisites for this Workflow on page 99, and ensure that all requirements are satisfied.

To use the Apply Critical Patch Update to CRS or Grid Home workflow:

1. Create a deployable copy of the workflow (see Create a Deployable Workflow on page 20).
2. Determine the values that you will specify for the following parameters:

   Additional Parameters Defined in this Step: Stop Clusterware

Parameter Name	Default Value	Required	Description
Cluster Version	1101	required	The active version of Oracle Clusterware as reported by the `crsctl query crs activeversion` command.

   Note: This is the minimum set of parameters required to run this workflow. You may need to expose additional parameters depending on your provisioning objectives. See How to Expose Additional Workflow Parameters on page 117

   See Prerequisites for this Workflow on page 99 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 on page 21 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 on page 25 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 Rollback Critical Patch Update from CRS Home workflow.

Scenario 1: Roll back Patch Bundle from the CRS Home only

In this scenario, the workflow rolls back the patch from the CRS Home only. It does not roll back any other Database Homes such as the Listener, ASM, and RDBMS Homes. If you have one or more nodes running on a RAC cluster but want to roll back the Patch Bundle from the underlying Grid infrastructure only, be sure to set the Rollback Oracle Homes parameter to N as shown here:

Parameter Name	Description
Rollback Oracle Homes	Indicates whether the patch should be removed from the non-CRS Homes registered by Clusterware or specified by the New Oracle Homes parameter. Valid values are Y (yes) or N (no). Example: N
Cluster Version	The active version of Oracle Clusterware as reported by the `crsctl query crs activeversion` command. Example: 1101

Note: Parameters New Oracle Homes, and Oracle Homes should not be specified in this scenario.

Note: If the ASM user is different from the RDBMS user, this workflow will fail.

Be sure that the default values for all remaining input parameters are appropriate for your environment (see Parameters for Rollback Critical Patch Update from CRS Home on page 108).

Scenario 2: Roll back Patch Bundle form the CRS Home and all Database Homes

In this scenario, the workflow rolls back the patch from the CRS Home and all other Homes used by Clusterware registered processes. This includes the Listener, ASM, and RDBMS Homes. This is the default behavior for this workflow.

Parameter Name	E
Rollback Oracle Homes	Indicates whether the patch should be removed from the non-CRS Homes registered by Clusterware or specified by the New Oracle Homes parameter. Valid values are Y (yes) or N (no). Example: Y
Cluster Version	The active version of Oracle Clusterware as reported by the `crsctl query crs activeversion` command. Example: 1101

Note: Parameters Rollback Oracle Homes, New Oracle Homes, and Oracle Homes should not be specified in this scenario.

Be sure that the default values for all remaining input parameters are appropriate for your environment (see Parameters for Rollback Critical Patch Update from CRS Home on page 108).

Scenario 3: Roll back patch from the CRS Home and switch other Homes

In this scenario, the workflow rolls back the patch from the CRS Home and switches the other Homes in use to previously cloned Homes where the patch is already rolled back. The New Oracle Homes and Oracle Homes parameters are populated with a comma-separated list of Homes. The workflow will switch from the Oracle Homes to New Oracle Homes. The `catcpu_rollback.sql` or `catpsu_rollback.sql` script is run on all databases using the New Oracle Homes parameter. The Rollback Oracle Homes parameter is set to **N** to prevent rollback of the specified New Oracle Homes.

Parameter Name	Description
New Oracle Homes	Comma-separated list of the Oracle Homes (fully-qualified paths) to which to switch. The number must match the number of specified Oracle Homes. Example: `/u02/app/oracle/product/11.2.0/db1_patched, /u02/app/oracle/product/11.2.0/db2_patched`
Oracle Homes	Comma-separated list of fully-qualified path names of Oracle Homes to process. Example: `/u01/app/oracle/product/11.2.0/db1, /u01/app/oracle/product/11.2.0/db2`
Rollback Oracle Homes	Indicates whether the patch should be removed from the non-CRS Homes registered by Clusterware or specified by the New Oracle Homes parameter. Valid values are Y (yes) or N (no). Example: N
Cluster Version	The active version of Oracle Clusterware as reported by the `crsctl query crs activeversion` command. Example: 1101

Be sure that the default values for all remaining input parameters are appropriate for your environment (see Parameters for Rollback Critical Patch Update from CRS Home on the next page).

Parameters for Rollback Critical Patch Update from CRS 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 117). 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 Parameters Defined in this Step: Validate Rollback Critical Patch Update from CRS Home

Parameter Name	Default Value	Required	Description
Ignorable Oracle Errors	no default	optional	Comma-separated list of Oracle errors to be ignored when removing the patch from the CRS Home. This is in addition to the list of Oracle errors specified in the patch readme file. Values are of the form `ORA-nnnnn`. Example: `ORA-04020,ORA-03113`
New Oracle Homes	no default	optional	Comma-separated list of the Oracle Homes (fully-qualified paths) to which to switch. The number must match the number of specified Oracle Homes.
Oracle Homes	no default	optional	Comma-separated list of fully-qualified path names of Oracle Homes to process.
Patch Rollback	no default	optional	Patch number to roll back from the CRS Home and optionally from the RDBMS, ASM, and Listener Homes.
Rollback Oracle Homes	Y	optional	Indicates whether the patch should be removed from the non-CRS Homes registered by Clusterware or specified by the New Oracle Homes parameter. Valid values are Y (yes) or N (no).

Additional Parameters Defined in this Step: Stop Clusterware

Parameter Name	Default Value	Required	Description
Cluster Version	1101	required	The active version of Oracle Clusterware as reported by the `crsctl query crs activeversion` command.

Additional Parameters Defined in this Step: CPU RAC Confirm Patch Applied

Parameter Name	Default Value	Required	Description
Database Version	no default	optional	Database version associated with the Patch.

Chapter 4

Reference Information

This chapter contains the following information:

Topic	Description
Oracle Product Documentation below	Links to current product documentation for Oracle Database
Additional Resources on the next page	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* and the *HP DMA Administrator Guide*.

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

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

Chapter 5

Tips and Best Practices

This portion of the document contains a collection of tips and best practices that will enable you to use 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 117

How to Use a Policy to Specify Parameter Values on page 118

How to Import a File into the Software Repository on page 121

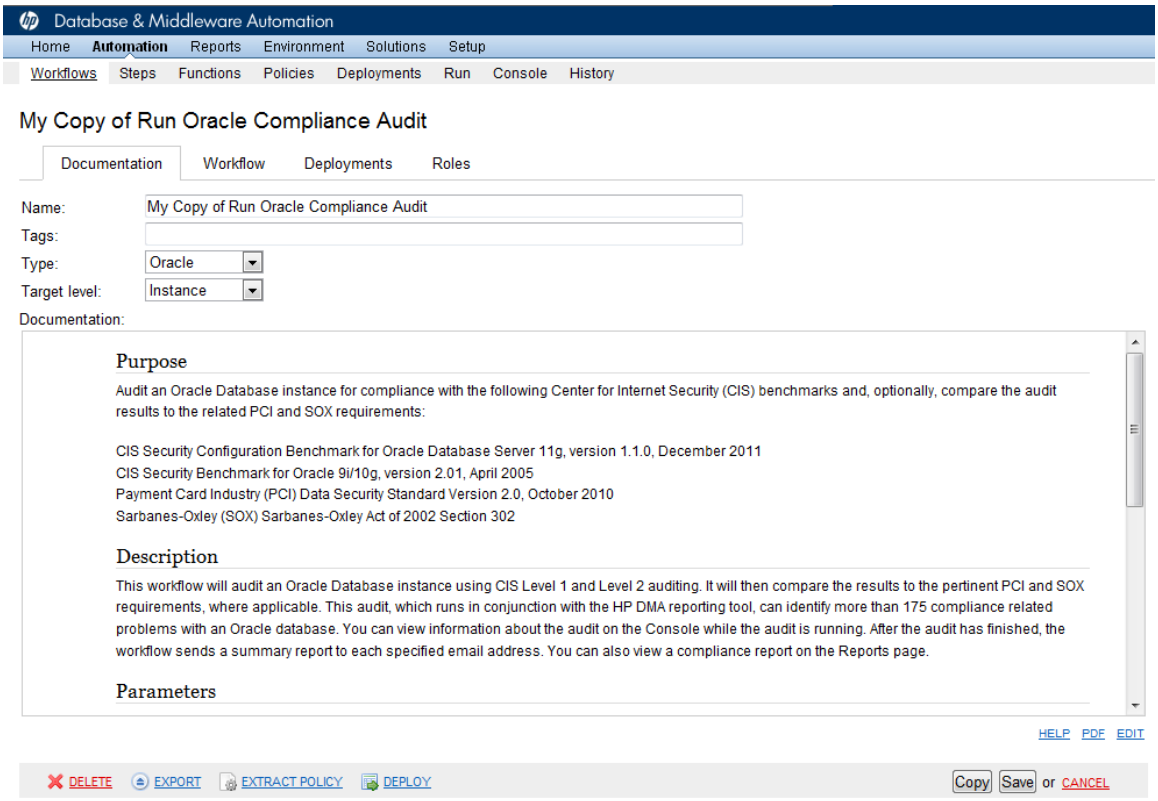
How a Solution Pack is Organized

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.

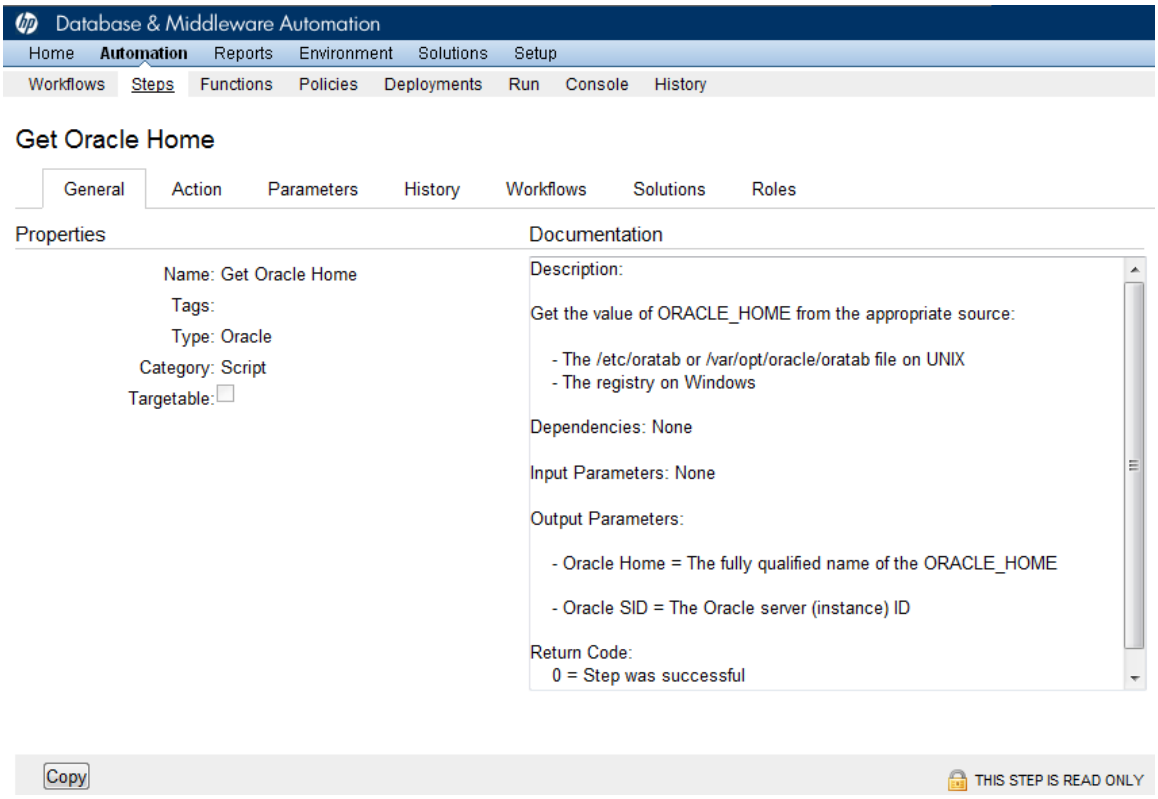
In HP DMA, a **workflow** executes a process —such as installing a software product or checking a database instance for compliance with a specific security benchmark.

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

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

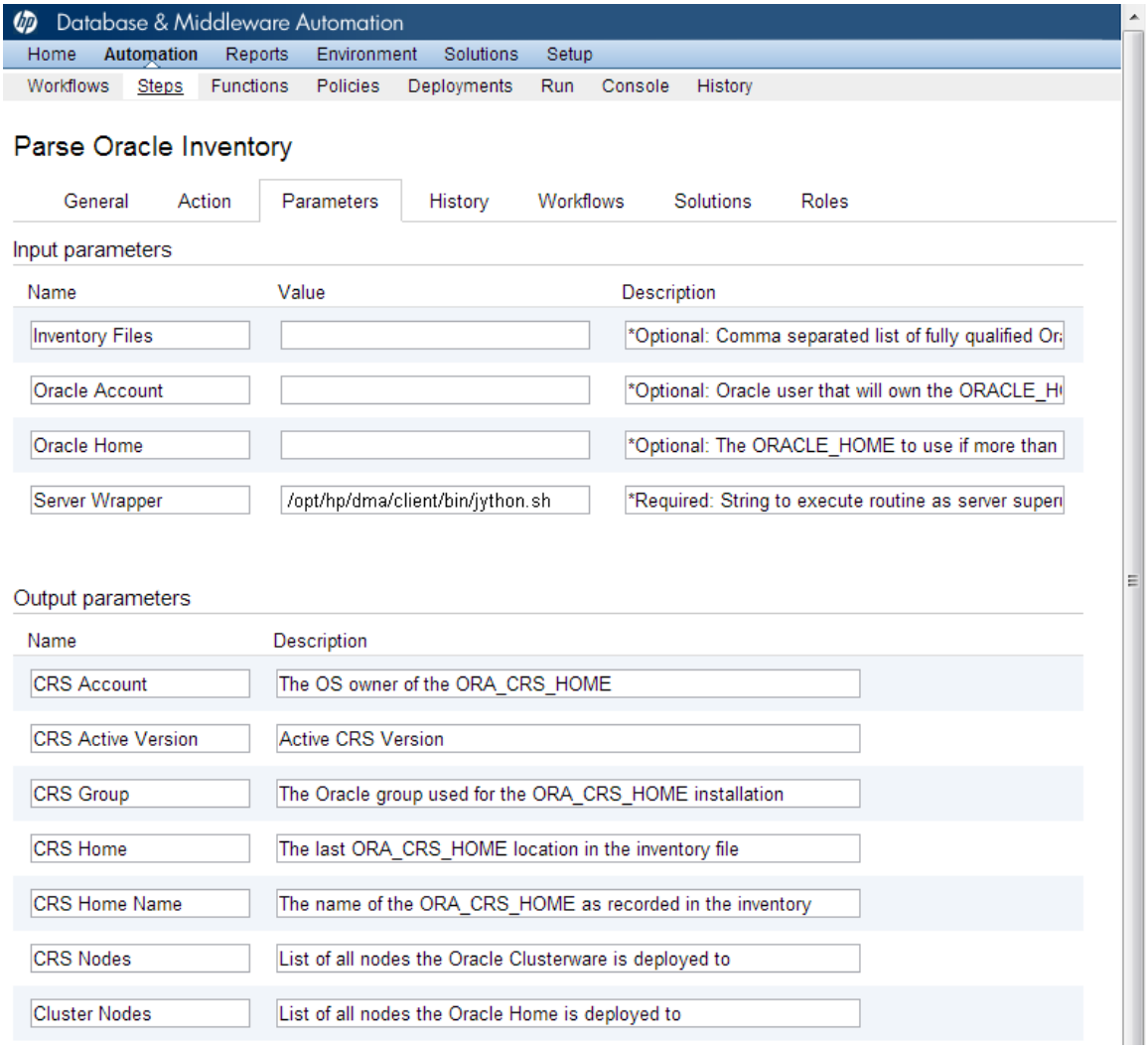


A workflow consists of a sequence of **steps**. Each step performs a very specific task. Each step includes a documentation panel that briefly describes its function.

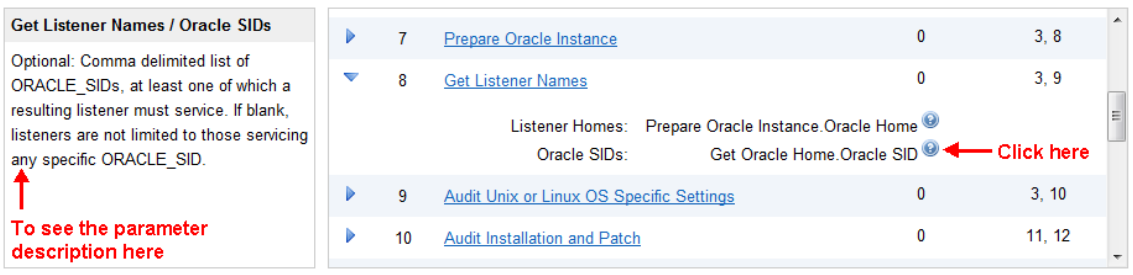


Steps can have input and output **parameters**. Output parameters from one step often serve as input parameters to another step. Steps can be shared among workflows.

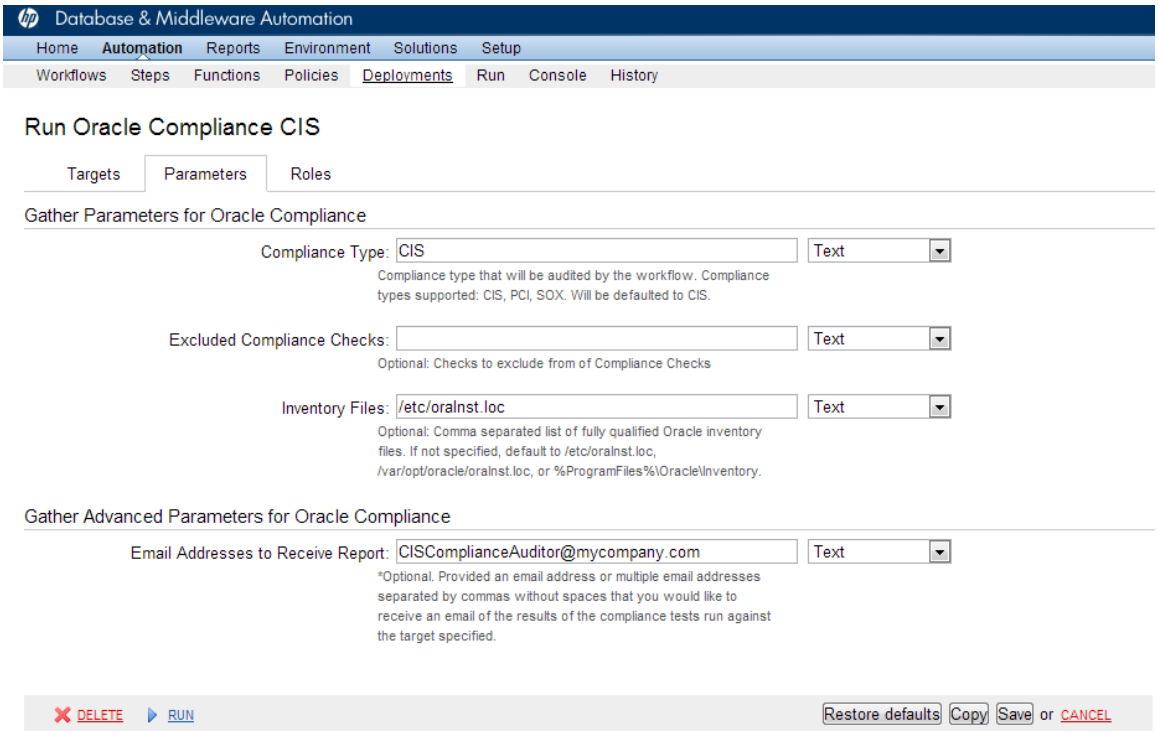
Parameter descriptions are displayed on the Parameters tab for each step in the workflow.



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



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



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.

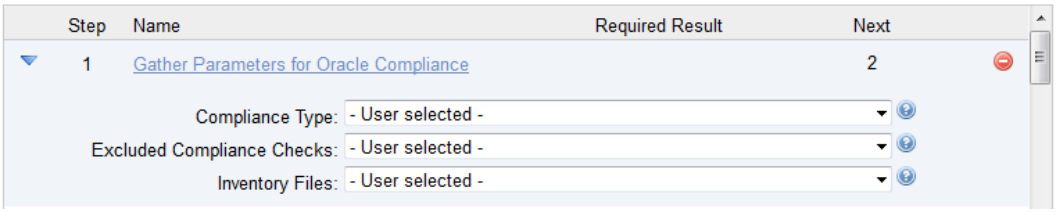
How to Expose Additional Workflow Parameters

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 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:



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 Product Manuals web site: http://h20230.www2.hp.com/selfsolve/manuals

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 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:

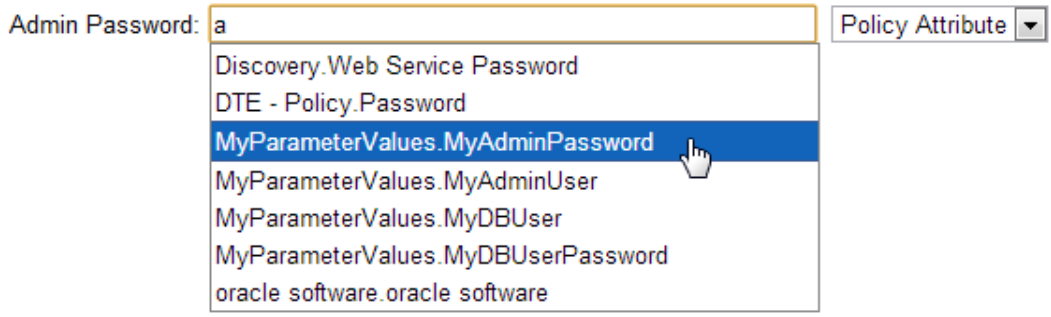
1. Create or access the deployment.

   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:



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

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 Software → HP Server Automation Client

   If the HP SA Client is not installed locally, follow the instructions under "Download and Install the HP SA Client Launcher" in the *HP Server Automation Single-Host Installation Guide*.
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 6

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 your server management tool 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 Product Manuals web site: http://h20230.www2.hp.com/selfsolve/manuals

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 Product Manuals web site: http://h20230.www2.hp.com/selfsolve/manuals

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 your server management tool. 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 it's 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 your server management tool. 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.