HP Database and Middleware Automation

for the Red Hat Enterprise Linux and SUSE Enterprise Linux operating systems

Software Version: 10.20

User Guide

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Documentation Updates

The title page of this document contains the following identifying information:

- Software Version number, which indicates the software version.
- Document Release Date, which changes each time the document is updated.
- Software Release Date, which indicates the release date of this version of the software.

To check for recent updates or to verify that you are using the most recent edition of a document, go to:

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

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Or click the **New users - please register** link on the HP Passport login page.

You will also receive updated or new editions if you subscribe to the appropriate product support service. Contact your HP sales representative for details.

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

Document Changes

Chapter	Version	Changes
Chapter 1, Introduction	10.01	Added a statement about the new feature that lists your roles and capabilities when you click your user name in the HP DMA web interface (see Accessing HP DMA on page 10).
Chapter 2, Automation	10.01	Added information about Python style imports for functions (see Functions on page 33). Added a statement calling attention to the new Functions tab that lists the other functions that reference a particular function (see Viewing/ Opening a Function on page 33).
Chapter 3, Environment	10.01	Added an instruction to select the **Show empty values** box when viewing or assigning values to Custom Fields associated with a specific organization, server, instance, or database (see Assigning Values to Custom Fields on page 62). Added a statement calling attention to the new Deployments tab on the Smart Groups page that lists all the deployments that reference a particular Smart Group (see Smart Groups on page 54). Added a statement indicating that steps are now included on the Usage tab for Custom Field in addition to workflows, deployments, and Smart Groups (see Viewing Custom Fields on page 60). Added a statement indicating that the SA host name is displayed in the Add Servers to Organization dialog. Previously, the SA server name was displayed (see Adding a Server to an Organization on page 51).
Chapter 5, Roles, Capabilities, and Permissions	10.01	Added a screen image showing how to click your user name to view your roles and capabilities (see Access Control Mechanisms on page 70).
Chapter 2, Automation	10.20	Updated screen shots. Added History Tab.

Support

Visit the HP Software Support Online web site at:

www.hp.com/go/hpsoftwaresupport

This web site provides contact information and details about the products, services, and support that HP Software offers.

HP Software online support provides customer self-solve capabilities. It provides a fast and efficient way to access interactive technical support tools needed to manage your business. As a valued support customer, you can benefit by using the support web site to:

* Search for knowledge documents of interest

* Submit and track support cases and enhancement requests

* Download software patches

* Manage support contracts

* Look up HP support contacts

* Review information about available services

* Enter into discussions with other software customers

* Research and register for software training

Most of the support areas require that you register as an HP Passport user and sign in. Many also require a support contract. To register for an HP Passport ID, go to:

http://h20229.www2.hp.com/passport-registration.html

To find more information about access levels, go to:

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

Contents

1 Introduction

This introduction includes the following information:

Purpose of this Guide

This guide provides information about using Database and Middleware Automation (HP DMA). For information about a specific HP DMA Solution Pack, see the *User Guide* for that Solution Pack.

What is Database and Middleware Automation?

HP DMA automates frequently performed data center tasks and processes that tend to be complex, manually intensive, and error-prone. It enables operations teams to automate the repair and maintenance of business critical applications, regardless of platform, version, or vendor.

HP DMA provides the following benefits:

- Automates routine IT life cycle tasks and procedures
- Reduces operational expenditures associated with data center management

HP DMA groups components into solution packs to address a specific data center task or process—for example: database patching, middleware provisioning, or database compliance. Solution packs are customizable to your unique data center environment. For more information, see Chapter 4, Solutions, on page 65 of this guide.

Audience

This guide is primarily intended for the following IT professionals:

- **Database administrators**, who are responsible for installing and maintaining database software and assuring compliance with security standards.

- **Application administrators**, who are responsible for installing and maintaining application server software (middleware).

- **Data center engineers**, who are responsible for improving the effectiveness and efficiency of data center operations through increased use of automation.

- **Data center operators**, who are responsible for executing automated data center tasks.

The following stakeholders also benefit by understanding how HP DMA works:

- **Data center administrators**, who are responsible for ensuring the secure and seamless operation of the data center and all its components.

- **Operations specialists**, who are responsible for ensuring that all business critical operations are secure, compliant with pertinent standards, and efficient.

- **HP DMA administrators**, who are responsible for all HP DMA administration tasks. They control the privileges and permissions available to each user role, and they decide which servers are managed by HP DMA. They may also be responsible for installing and updating HP DMA.

- **Development team** members and managers, who design and implement applications that are eventually deployed in the data center.

Prerequisites

To perform the various operations described in this guide, you must have the proper capabilities and permissions. See Roles, Capabilities, and Permissions on page 69 for more information.

System Requirements

See the *HP Database and Middleware Automation Installation Guide* for information about hardware and software requirements for HP DMA.

Supported Target Platforms

For a list of the target server platforms supported by HP DMA, see the *Release Notes* for this HP DMA version.

For a comprehensive list of target server platforms supported by each workflow in each HP DMA solution pack, see the *HP DMA Support Matrix*.

Firewalls and Ports

The HP DMA web interface requires port 8443. You must configure any firewalls protecting your HP DMA server to allow this port to be open.

Browsers

For a list of the browsers supported by HP DMA, see the *Release Notes* for this HP DMA version.

Document Conventions

This guide uses several typographical conventions to help explain how to use HP DMA.

Table 1   Conventions

Convention	Definition
Bold	Words in bold show items to select or click, such as menu items or buttons.
Courier New	Files, paths, and commands in Courier New style show items that are file names, path names, or commands.
	This symbol means that the following information is read-only.
	This symbol appears within a green bar across the top of the page and means that you have successfully completed a task.
	This symbol appears within a red bar across the top of the page and means that you have not successfully completed a task.
	Click this red "remove" icon to delete information adjacent to this sign.
	Click this green "add" icon to add information adjacent to this sign.
	Click this red "x" icon to perform a component delete and confirm your action.
	Click this blue question mark icon to view a helpful description about the current page you are viewing.
Filter	Where you see a filter box, you can perform a real-time filter. Type what you are searching for in the Filter field, and see the filter results display as you type.

Accessing HP DMA

To access HP DMA, open a web browser and specify the following URL:

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

Here, `<HPDMAServer>` represents the host name or IP address of your HP DMA server.

To log in to HP DMA, enter your user name and password.

After you log in, you can view information about your roles and capabilities by clicking your user name in the upper right corner of the HP DMA window.

Summary of Chapters

Chapter	Description
Automation on page 11	How to use HP DMA to automate repetitive or complicated data center tasks.
Environment on page 49	How to manage Organizations, which contain Servers, Instances, and Databases—targets for automated Workflows.
Solutions on page 65	How to import and use Solution Packs, which group similar Workflows and Steps in a convenient package.
Roles, Capabilities, and Permissions on page 69	How to set role-based access for specific automation components and Organizations to precisely control who does what in HP DMA.
Bridged Execution Workflows on page 77	This appendix discusses bridged execution workflows, an advanced automation feature available in HP DMA.
How to Import a File into the Software Repository on page 85	How to import a file into the HP DMA software repository so that it can later be downloaded to target servers during workflow execution.

Related Documents

For more information, refer to the following HP DMA documents:

- *Installation Guide*
- *Administrator Guide*
- *API Reference Guide*
- *Release Notes*
- *Support Matrix*

2 Automation

This chapter includes the following topics:

About HP DMA Automation

Automation provides the following benefits:

- Drives standardization in asset management across a data center.
- Empowers data center administrators to define and share best practices.
- Simplifies and automates common administrative tasks.
- Reduces human error when performing data center administration tasks. When common tasks are automated, the risk of human error is reduced, and consistency is driven across an enterprise.

HP DMA workflows separate tasks into reusable steps that provide a simple, holistic view of how data center administration tasks are performed. Workflows have the unique ability to run in any environment without any modifications to the underlying automation code.

Workflows

A **workflow** is a set of steps used to accomplish a specific operational task or procedure—such as patching a database instance, installing middleware, or auditing all the instances in an organization for compliance with a security standard.

A workflow is deployed to specific **targets**. There are three types of targets:

- Servers
- Instances
- Databases

HP DMA targets must be—or, in the case of instance and database targets, reside on—HP Server Automation (SA) managed servers. In addition, these servers must have the DMA Client Files policy. See DMA Client Files Policy on page 63.

Workflow **steps** contains the actual code used to perform a unit of work detailed in a workflow. A step is typically an executable script, although it can take other forms. Steps are linked together to form the business logic for a task or procedure. You can use a workflow to perform a new business process by building on existing best practices and processes.

Workflow **documentation** should contain information required to understand not only how a procedure is executed, but also how that procedure has been qualified and tested. workflow documentation encapsulates best practices into a shareable document that can be exported for IT auditors, change control boards, or training manuals for new data center administrators.

The Workflow Execution Architecture

HP DMA controls the flow or progression of a workflow through its component steps. This limits the amount of memory that the HP DMA client running on the managed server requires.

This procedure explains how HP DMA runs a workflow:

1 HP DMA finds the first workflow step to execute.

2 HP DMA replaces all metadata, parameters, and header variables for this workflow step.

3 The HP DMA client executes that script and returns the output and errors as it executes.

4 When the script has completed, the HP DMA client sends the return code back to the HP DMA server.

5 Based on the value of the return code, HP DMA decides which workflow step to execute next.

6 HP DMA repeats step 2 through step 5 until the workflow is completed.

Search for a Workflow

You can use a real-time filter to search for any workflow by name, type, or tags. Type what you are searching for in the Workflows box, and see the filter results display as you type. The search string is not case-sensitive, as shown in Figure 1.

Figure 1   Real-Time Filter Feature
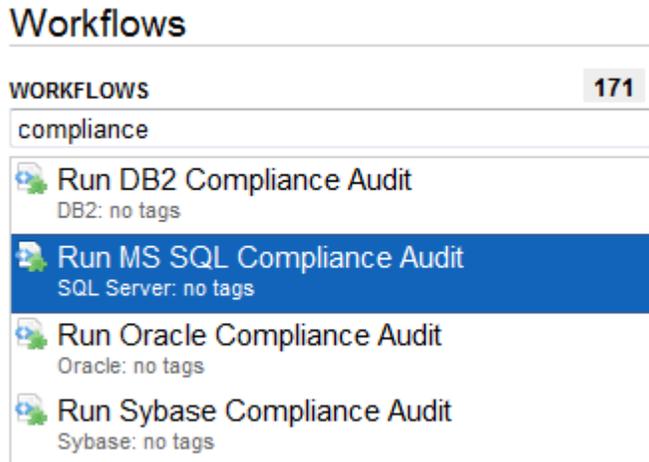
▶ The real-time filter feature is available throughout the HP DMA user interface (UI).

Viewing an Existing Workflow

From the Automation > Workflows page, you can view a list of existing workflows and preview the steps included in any workflow listed.

Steps List

In the Workflows pane, point to the workflow name. As you point to the workflow, you can view the associated steps in the Steps pane, as shown in Figure 2.

Figure 2   Example of Steps in a Workflow

Workflows

WORKFLOWS	171	STEPS	
compliance		Prepare Sybase Call Wrapper	1
Run DB2 Compliance Audit DB2: no tags		Gather Parameters for Sybase Compliance	2
Run MS SQL Compliance Audit SQL Server: no tags		Failure	3
Run Oracle Compliance Audit Oracle: no tags		Gather Advanced Parameters for Sybase Compliance	4
Run Sybase Compliance Audit Sybase: no tags		Validate Compliance Parameters	5
		Prepare Sybase Compliance Check	6
		Audit Sybase Authentication Mechanisms	7
		Audit Sybase Network Security Mechanisms	8
		Audit Sybase Database Resource Permissions	9
		Audit Sybase Auditing, Logging and Reporting	10
		Audit Sybase Extensibility Mechanisms	11
		Audit Sybase Host and Network Deployment	12
		Validate Post Compliance Checks	13
		Delete File	14
		Send Compliance Email	15
		Success	16
		Failure	17

:

Workflow Documentation

In the Workflows pane, click the workflow that you want to view. The Documentation tab opens, as shown in Figure 3.

Provided that the workflow is deployable (not locked), you can modify the workflow documentation to suit your environment. To open the documentation editor, click the **Edit** link in the lower right corner.

For formatting information, click the **Help** link in the lower right corner.

Figure 3   Example of Workflow Documentation

Workflow Details

From the Documentation tab, click the Workflow tab to view the following information:

- A graphical representation of the workflow logic
- A list of all available steps, grouped by tag
- A table listing the steps included in the workflow and the parameters associated with each step<WebrootGreen>"Chapter 2, Automation" on page 11

Figure 4   Example of Workflow Details

Creating a New Workflow

1. On the Automation > Workflows page, click **New Workflow**.

    The Documentation tab opens.

2. Specify the following information:

    - Name: A unique name for the workflow.

    - Tags: Use this field as a keyword field. Use existing tags or create new ones so that you and others can easily find or filter for this workflow in the future.

    - Type: Type of database or middleware software to which this workflow pertains.

    - Target Level: This determines which types of targets you can select when you create a deployment. Select Server, Instance, or Database.

    - Documentation: Use this field to document the function of this workflow. You will likely develop the workflow documentation in an iterative fashion as you refine the workflow.

3. Add at least one step to your workflow using one or both of the following methods:

    - Create a New Step (see page 17)

    - Add an Existing Step (see page 18)

    To delete a step from a workflow, click the "Remove" 🔴 button.

4. When you are finished adding and connecting steps, click **Save**.

    "Workflow Saved Successfully" displays in a green bar at the top of the Workflows page.

Create a New Step

You can use the New Step wizard to create a new step "on the fly" while you are editing a workflow. This is an alternative to creating a step from the Automation > Steps page (see Creating a New Step on page 24).

To create a new step by using the New Step wizard:

1. Click the **New Step** link just below the Steps panel. The New Step wizard opens.

2. Specify the information that the wizard prompts you to provide. This will vary depending on the type of step that you are creating (script, email, or variable timer).

3. Click **Next** to advance through the wizard pages.

    If you add parameters to your new step, you can specify Plain Text or Password for the parameter type. The value of a Password type parameter is always masked in the HP DMA user interface.

4. Click **Finish** when you have provided all required information.

    The New Step wizard creates the step and adds it to the workflow after any existing steps.

Add an Existing Step

To add an existing step to a workflow, you must first locate the step and then place it in the appropriate spot in the workflow. The following procedure assumes that the workflow has been created, and that you are viewing the workflow tab.

To add an existing step to a workflow:

1   In the steps panel, click one of the tags to show the list of steps that have that tag:

Alternatively, you can type text into the filter box above the Steps panel, and any steps whose names contain that text are listed:

New workflow

| Documentation | Workflow | History |

Download

- Check File Download
- Check If Download File Exists
- CS Download Software
- DB2 Archive Download Required?
- Determine File Download
- Download Software
- Susan's Copy of Download Software
- WebSphere 7 Check File Download

NEW STEP
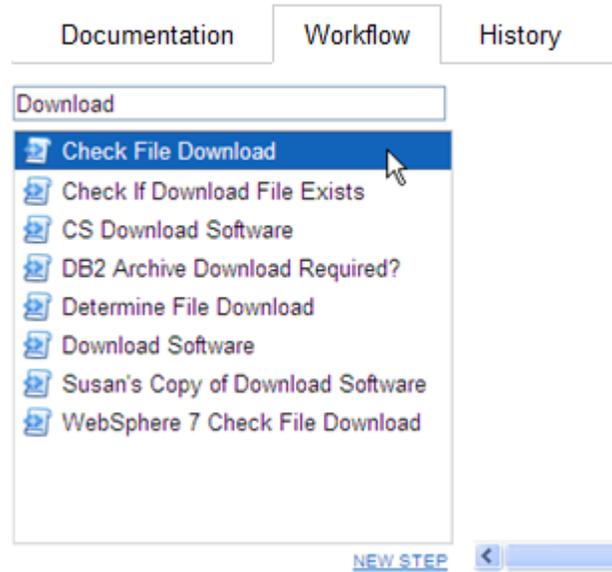
2   Double-click a step to add it to the workflow.

3   In the steps table below the diagram, modify the Required Result and Next values for this step and any pertinent existing steps so that the workflow logic is correct.

Click in the Required Result or Next column to edit the value.

➤ Be sure to always include the built-in SUCCESS and FAILURE steps in your workflows (see Built-In Steps on page 25). Make sure that the final step that the workflow executes is either SUCCESS or FAILURE, depending on the outcome of the previous steps.

➤ A Download Software step is built into your HP DMA software. This step enables you to download one or more files from the software repository to a specified location on the target server. To locate this step, on the workflow tab, type "download" in the filter box. See Download Software on page 26 for additional information.

Copying a Workflow

Copy is available from all the tabs in the Automation > Workflow area. Creating a copy of a workflow saves time by enabling you to reuse information in a workflow by renaming it without having to re-type the workflow's information.

To make a copy of a workflow:

1   Click **Copy**.

The Documentation tab opens, and the workflow name changes to "Copy of *<workflow name>*."

2   Make any changes to the copy.

3   Click **Save**.

Exporting a Workflow

You can export a workflow, and it is saved on the local file system as an SOP file.

When you export a workflow, you export the steps used in that workflow, but you do not export the functions.

To export a Workflow:

1   Go to Automation > Workflows.

2   Click the workflow that you want to export.

3   Click **Export**.

4   A page displays and allows you to select a location to which you want to save the workflow.

5   Click **OK**.

6   Click **Save**.

Importing a Workflow

You can import a workflow that was previously exported as an SOP file.

To import a workflow:

1   On the Automation > Workflows page, click **Browse** to find the workflow you want to import.

    Note: In some browsers, this button is labeled Choose File instead of Browse.

2   After you select a file to import, Click **Import workflow**.

Assigning Roles to a Workflow

Roles determine who can read or modify a workflow. You can modify the roles settings for any workflow that you have permission to Write. You can only assign permissions for roles that you have—unless you have a role with Administrator capability.

To assign roles to a workflow.

1   Go to Automation > Workflows.

2   In the Workflows pane, point to the workflow name.

3   Click the workflow you want to view.

    The Documentation tab displays.

4   Click the **Roles** tab.

    The Roles tab displays.

5   Select or clear the **Read** or **Write** check boxes, depending on the permission you want to grant.

6   Click **Save**.

Viewing the History of a Workflow

Every time that a workflow is saved, a new entry is added to the table on the History tab. The entry shows you when the workflow was saved and by whom it was saved.

Deleting a Workflow

You can delete a workflow unless its status is "Read Only." You must either have a role with Administrator capability, or you must have a role that has both Workflow Creator capability and permission to Write the workflow.

If you delete a workflow that has associated deployments, the associated deployments will be deleted automatically with the workflow.

To delete a workflow:

1   Go to Automation > Workflows.

2   Open the workflow you want to delete.

3   Click and confirm delete.

Steps

Steps are reusable automation components. They are assembled into workflows that automate a task or system healing action. steps can accept input parameters for customization and provide output for subsequent steps to use.

Searching for Steps

You can perform a real-time filter on any step by name, type, or tags. Type what you are searching for in the steps field, and the filter results will display as you type.

Viewing a Step

Steps provided by HP are Read Only. You must copy a step before you can modify it. See Copying a Step on page 25.

To view information about a specific step:

1   Go to Automation > Steps.

You can also access individual steps from the Steps tab on the Solutions page or the list of steps associated with a workflow.

2   In the Steps pane, point to the step name that you want to view.

As you point to a step, the workflows that use that particular step is shown in the Workflows pane.

3 Click the step you want to view.

There are seven tabs that you can use to view information about this step:

- General Tab (described on page 22)
- Action Tab (described on page 22)
- Parameters Tab (described on page 23)
- History Tab (described on page 24)
- Workflows Tab (described on page 24)
- Solutions Tab (described on page 24)
- Roles Tab (described on page 24)

The General tab opens first. The step name appears above the tabs.

➤ In order to modify the properties of a step, you must have Write permission for that step (see Roles Tab on page 24 and Roles, Capabilities, and Permissions on page 69).

General Tab

The General tab displays information about a step. In the Properties area, you can view and edit the following information:

- Name: Step's name (must be unique).
- Tags: Use this field as a keyword field to type descriptive words about a step's function, language, compliance, etc., so that you can easily find or filter for this step.
- Type: Determines where or at what level a step is executed.
- Category: Specifies the type of step. There are three step categories:
  — Script: Executes the code on the Action tab.
  — Email: Sends an email to the specified email address.
  — Variable Timer: Waits the number of minutes that you specify before the workflow proceeds to the next step. This is useful, for example, if you want to allow time for the system to reboot.

The Category setting determines which options are available on the Action tab.

You can only specify the Category field when you are creating a new step. You cannot edit the Category field after a step has been saved.

In the Documentation area, you can view or edit documentation that is related to the step.

Action Tab

The Action tab enables you to view and specify the action that a step takes when that step is used in a workflow. The options available on the Action tab reflect the Category type specified on the General tab.

Actions for Script Type Steps

For a Script type step, you must specify two things:

- Call wrapper – the location of the interpreter that executes the script.

Specify `jython` here to run the script using HP DMA's built-in python interpreter.

You can specify a different call wrapper if you prefer. For example:

```
/bin/ksh
```

```
/usr/bin/perl
```

```
powershell -ExecutionPolicy unrestricted -File, cscript /E VBS
```

⚠️ If you install Windows PowerShell on a managed server, and you want to use it as an HP DMA call wrapper, you must restart the SA agent on that server. To do this, restart the Opsware Agent service.

- Code – the script to run using the Call wrapper.

  You can type or paste the script into the Code box, or you can use the Import Script tool.

  The Import Script tool replaces any information in the Code field with the contents of a file that you specify. To import a script, follow these steps:

  a   Click the **Import Script** link.

  b   Click **Browse** to locate the script you want to import.

  c   Click **Open** to import the script (or click **X** to cancel).

Actions for Email Type Steps

For an Email type step, you must specify three things:

- To – email address to which the email message will be sent.
- Subject – subject of the email message.
- Message – content (body) of the email message.

Actions for Variable Timer Type Steps

For a Variable Timer type step, you must specify one option: the Delay. This is the number of minutes that you want the workflow to wait before executing the next step.

Parameters Tab

Parameters enable you to pass information into or out of a step. You set the input to a value, and the output parameter is set within the code (see Understanding Parameters on page 27). Script steps can have both input and output parameters. All other step types can only have input parameters.

- Input Parameters

  The Parameters tab defines the variables that a workflow sets when running a step so that the step can run against different objects and still be reusable. For example, in a database backup, the directory where the backup should be placed would be a good candidate for an input parameter so that both development and production database backups could use the step without modification.

- Output Parameters

Script type steps enable you to define output parameters as well as input parameters. Steps use output parameters to provide information to be used by downstream steps. For example, if a step determines the location of the Oracle Home directory on a target server, it can add that location to its set of output parameters for subsequent steps to use.

➤ If you want to remove a parameter from a step, you can click the **Remove** link for that parameter. If that parameter is associated with a workflow, however, you cannot remove it, and the Remove link is not available.

History Tab

Every time that a step is saved, a new entry is added to the table on the History tab. The entry shows you when the step was saved and by whom it was saved. If you click an entry in the table, the action information for that version of the step is displayed in the Details area.

Workflows Tab

The Workflows tab shows you a list of the workflows that use this step. If you have permission to Read a specific workflow, you can view or edit information pertaining to that workflow by clicking its name.

Solutions Tab

The Solution tab shows you a list of the Solution Packs that include this step. To view information about a particular Solution Pack, click the name of that Solution Pack. For more information, see Solutions on page 65

Roles Tab

The Roles tab shows you which user groups have Write permission for the step.

Permissions settings for baseline steps (steps that are shipped with HP DMA) cannot be changed, even by an HP DMA administrator. To change permissions for any other step, select or clear the check boxes to grant or revoke Write access.

If there is a "—" in the Write column, none of the roles have Write access to the step. For more information on changing permissions as an HP DMA administrator, see Permission Settings on page 75.

Creating a New Step

You do not need any special permissions to create new steps. To use your new step in a workflow, however, you must have Write permission for that workflow (see Roles, Capabilities, and Permissions on page 69).

To create a new step:

1 Go to Automation > Steps.

2 Click **New Step**.

3 Specify the following information on the General tab:
   • Name: Unique name of the step.

- Tags: Use this field as a keyword field, to type descriptive words about a step's function, language, compliance, etc. so that you can easily find or filter for this step.

- Type: Helps you decide where or at what level to run a step.

- Category: Specifies the type of step.

4 Specify the information required on the Action tab:

- For a Script type step, specify the Call wrapper and Code (see Actions for Script Type Steps on page 22).

- For an Email type step: specify the email address, subject, and content (see Actions for Email Type Steps on page 23).

- For a Variable Timer type step, specify the Delay (see Actions for Variable Timer Type Steps on page 23).

5 *Optional:* In the Documentation area, add documentation that describes the step that you are creating—for example: describe its purpose, dependencies, parameters, and return codes.

6 *Optional:* Specify any parameters that this step uses (see Parameters Tab on page 23).

7 *Optional:* Specify who is allowed to modify this step (see Roles Tab on page 24).

8 Click **Save**.

Copying a Step

Since steps provided by HP are read-only, you must first copy a step before you can modify it. You do not need any special permissions in order to copy a step. To use your copied step in a workflow, however, you must have Write permission for that workflow (see Roles, Capabilities, and Permissions on page 69).

To copy an existing step:

1 Go to Automation > Steps.

2 Click a step that you want to modify.

3 Click **Copy**.

4 Specify a unique name for the copy.

5 Modify the step to suit your objective.

6 Click **Save** in the lower right corner.

Built-In Steps

There are three utility steps that are provided with your HP DMA software:

- Success on page 26

- Failure on page 26

- Download Software on page 26

You can use these steps to build workflows.

It is good practice to always include a SUCCESS step and a FAILURE step in your workflows. The final step that a workflow executes should be either SUCCESS or FAILURE, depending on the return code of the previous step.

Success

This step is intended to be used as the terminal step in a workflow when the workflow has successfully executed the previous steps. A workflow may contain multiple Success steps depending on its branching logic. After the Success step executes, the Console and History pages indicate that the workflow execution status is SUCCESS.

Failure

This step is intended to be used as the terminal step in a workflow when a step in the workflow has failed. Typically, there will only be one Failure step in the Workflow—but you can have multiple Failure steps, depending on the workflow's branching logic. After the Failure step executes, the Console and History pages indicate that the workflow execution status is FAILURE.

Download Software

This step enables you to conveniently transfer a group of files from the software repository to a target server. This is useful, for example, when you are using an HP DMA workflow to install software on one or more target servers.

This step has the following parameters:

Table 2   Download Software Parameters

Parameter	Type	Required	Description
FileNames	input	yes	Comma delimited list of files to download.
TargetDir	input	yes	Directory on the target server where the files will be downloaded.
Downloaded Files	output	n/a	Comma delimited list of files that were downloaded

You must specify both input parameters. You can use the output parameter in downstream workflow steps.

This step has the following dependencies:

- You must first add any files that will be transferred to the software repository. See How to Import a File into the Software Repository on page 85 for instructions.

- File names must be unique. When referencing files in this step's FileNames input parameter, specify a comma-separated list of the uploaded file names.

  Note that it is important to specify the actual file names, not the SA package names.

This Step has the following return codes:

Table 3   Download Software Return Codes

Return Code	Meaning
0	All files were successfully downloaded.
1	A fatal error occurred while files were being downloaded.
9	One or more files were successfully downloaded.

Understanding Parameters

You create parameters at the step level, and then you assign values at either the workflow level or the deployment level. The following topics provide examples that illustrate how parameters are created and then used at various levels.

- Creating Parameters on page 27
- Assigning Values to Parameters on page 28
- Using Parameters on page 31

Figure 5 shows an example of a step whose purpose is to validate all the input parameters required for the workflow. This step provides output parameters that are consumed by the subsequent steps in the workflow.

➤ Note that Password type parameters are masked throughout the HP DMA user interface.

Creating Parameters

You can add, modify, and remove parameters for any step for which you have Write permission (see Roles, Capabilities, and Permissions on page 69).

To create a new parameter:

1 Go to Automation > Steps.

2 Select the step that you want to modify (or create a new step).

3 Go to the Parameters tab.

4 Use the **Add** link to add a new input or output parameter. Specify the following information:

- Type: Plain Text or Password.
- Name: A unique name (within this step) for the parameter.
- Value: The default value of this parameter.

  The default value is encrypted before it is stored in the HP DMA database.

  The value of Password type parameters are always masked in the HP DMA user interface.

- Description: Information that indicates the purpose of this parameter and how its value should be specified. For example:

  ```
  Required: Unique node name that cannot contain any of the following
  special characters / \ * , : ; = + ? | < > & % ' " [ ] > # $ ^ { }. If
  you plan to federate into an existing cell later, make sure that the
  node name is unique within that cell.
  ```

5 Click **Save**.

Figure 5   Automation > Steps > Parameters Tab
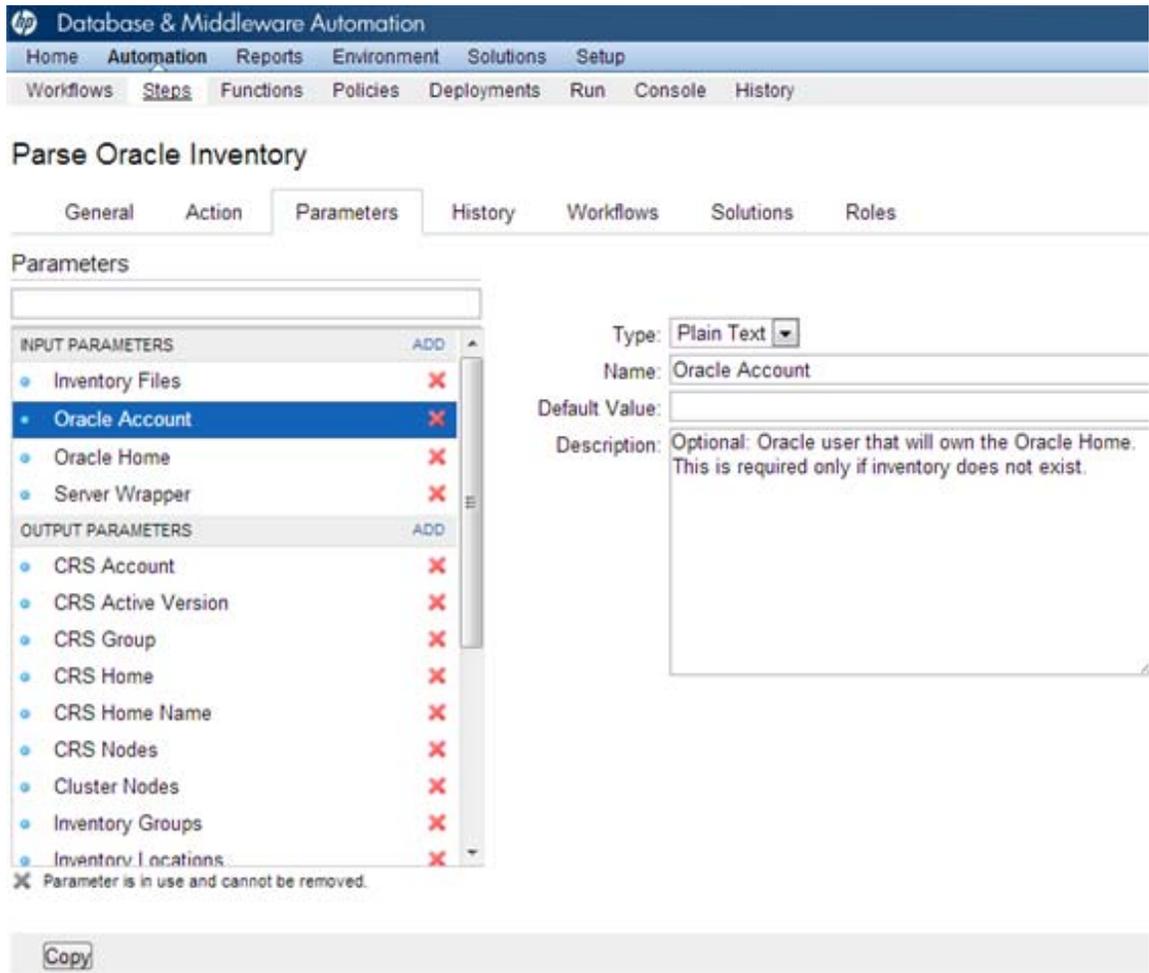
Assigning Values to Parameters

Parameters are defined in steps, but their values are assigned at the workflow level, the deployment level, or with a run action.

Parameters whose values are assigned at the workflow level typically either have constant values or values that are determined at execution time using custom fields. For example, a parameter's value may change based on the organization. In this case, the parameter remains consistent, but the value assigned to that parameter changes.

To assign parameter values at the workflow level, go to the Automation > Workflows > Workflow tab.

Once you go to the Workflow tab, view the workflow table located below the workflow diagram. If the step contains an input parameter, there is an arrow next to each step that, when clicked, displays the "values" that can be associated with that step's parameters (see Figure 6).

When you are working with parameters at the deployment level or with a run action the parameters are not as static as parameters that you would set at the workflow level. If you know that you have a value that changes often, do not assign it at the workflow level—assign it, instead, at the deployment level. For more information, see Using Parameters on page 31.

Figure 6   Workflow Tab with Step Parameters Displayed

The drop-down list associated with each input parameter contains built-in metadata and any user-defined Custom Fields.

If a prior step in the workflow contains an output parameter, that output parameter will be included in the drop-down list for that parameter.

In Figure 7, for example, the output parameters of the Gather Parameters for MS SQL Compliance step are available to provide values for the input parameters of the Validate Compliance Parameters step. The HP DMA, organization, and server metadata items are also available.

Figure 7   Automation > Workflow Tab: Parameter "Values" Drop-Down List
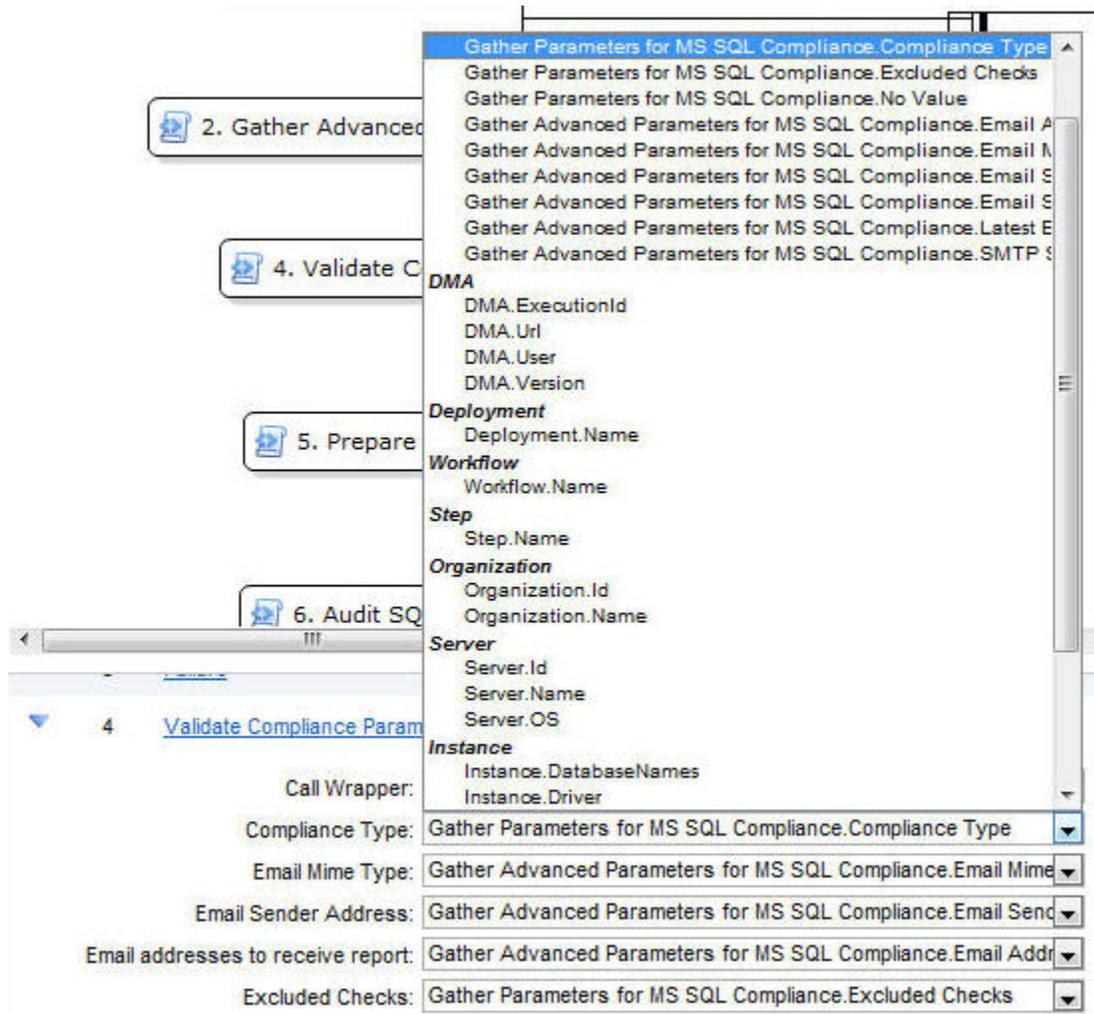
If you assign an output parameter from a previous step to an input parameter at the workflow level, that input parameter does not appear in the deployment parameters list. All parameters that are not either assigned to a Custom Field or mapped at the workflow level will be modifiable at the deployment level. Any parameter that is not set in the workflow or at the deployment level will use the default value assigned for that step.

To assign values to parameters at the workflow level:

1   Go to Automation > Workflows.

2   Perform one of the following tasks:

  • Click **New Workflow** to create a workflow.

  • Select an existing editable workflow.

3   Go to the Workflow tab.

The steps in the workflow display in the workflow table, below the workflow diagram. The arrows to the left of each step expand that step to display any parameters associated with the step, as shown in Figure 6. If a step has no input parameters, the arrow does not appear.

- A numeric value in the Required Result column is the return code that must be received from at least one parent node in order for that step to run.

- You can use the Next field to reorder your workflow's steps.

4   Click the arrow next to each step. The input or output parameter "values" display in a drop-down list. Assign a value from the "Values" list (as shown in Figure 7) to the desired parameter.

5   Click **Save**.

The Workflow page opens, and the message "Workflow saved successfully. Would you like to deploy the workflow now?" displays.

To proceed, see Deployments on page 37.

Using Parameters

There are three points at which you can assign parameter values: in the workflow, in the deployment, and at run time.

Parameter values should be assigned at the deployment level when the value is specific to the targets that are part of the deployment. For example, you may wish to use the same workflow with production and development servers, but you need to use a different parameter value for each environment. This can be accomplished by creating one deployment of that workflow for production servers, and a second deployment for development servers. This allows you to set the same parameter differently for the each set of targets.

➤   If you assign a value to a parameter at the workflow level, that parameter does not display at the deployment level, so it cannot be overridden.

In a deployment, you can specify parameter values using static text, built-in custom fields, user-defined custom fields, and policy attributes. You will not see any output parameters from other steps on the Deployment page, however; mapping output to input parameters is only possible in the Workflow editor.

If you create a Deployment and then add parameters to your Step, any newly-created parameters appear in the Deployment parameter list and contain the default value assigned in the Step editor.

To assign parameter values at the deployment level:

1   Perform one of the following actions:

- Click the **... Would you like to deploy the workflow now** link at the top of the page (this is available immediately after you save a workflow).

- Create new deployment (see Creating a New Deployment on page 38).

2   On the Targets tab, specify the following:

- Name: Type a unique deployment name.

- Workflow: If you clicked the link in step 1, the workflow name is pre-populated. If you are creating a new deployment, select a workflow from the list.

  Click **View Workflow** if you need to see the workflow for which you are creating a deployment.

- Schedule (optional): Select a deployment schedule from the drop-down list (see Scheduling a Deployment on page 40).

➤ On the Deployments > Parameters tab, if you select Runtime and try to save a deployment with a schedule, you cannot save until you clear the check box or unschedule the deployment.

3   Add the targets from the available pool.

4   Go to the Parameters tab.

5   For each parameter whose value you want to specify, follow these steps:

   a   Select the source of the parameter value from the drop-down list on the far right:
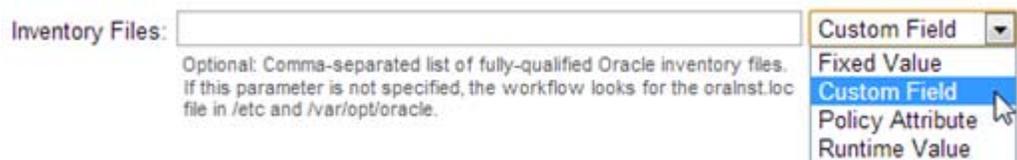
   b   If you selected Fixed Value, Custom Field, or Policy Attribute, specify the parameter value in the text box.

       — If you selected Custom Field or Policy Attribute, select a custom field or policy attribute from the drop-down list.

       — If you selected Fixed Value, simply type the value in the text box.

         If the parameter is of type Password, the characters are masked.

       If you selected Runtime, the text box is disabled. You will specify the parameter value at run time.

       To replace all parameter values with their default values assigned at the step level, click **Restore Defaults**.

6   Click **Save**.

   The Deployment page opens, and the message "Deployment saved successfully. Would you like to run the workflow now?" displays. For more information, see Run on page 42.

Using Metadata and Policies from a Workflow Step

You can use metadata from any workflow step type by using the **${Object.Attribute}** syntax.

For example, the ${Instance.Password} metadata variable would be replaced at run-time with the actual password for the instance on which this workflow step was executed.

For example, if the password for a given instance were `password`, the script

var password = "${Instance.Password}"

would be replaced with

    var password = "password"

at run-time.

You can also replace user-defined metadata using these conventions.

Using Parameters from a Workflow Step

You can reference a parameter from a workflow step using the **${ParameterName}** convention. Use a parameter to change the way that this workflow step runs prior to run-time.

For example, if you have a parameter called `InstallDirectory` with a default value of `/opt/app/oracle`, the script

var installDir = "${InstallDirectory}"

would be replaced with

```
var installDir = "/opt/app/oracle"
```

at run-time.

Functions

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.

HP DMA now supports Python-style imports for functions. If your function has the "python" or "jython" tag, and a step attempts to import it using standard Python syntax (for example: `import ostools`), HP DMA will now facilitate that import.

Previously, functions were "injected" into the step code just prior to step execution. This mechanism is still available so that existing automation content can be used. Python-style imports are now the preferred method for importing functions, however.

Note that HP DMA functions can import other functions.

Searching for a Function

You can use a real-time filter to locate a function by name or by tags. Type what you are searching for in the Functions field, and the filter results will display as you type.

Viewing/Opening a Function

From the Automation > Functions page, you can view all existing functions as well as preview a function's code.

To view or modify a particular function, select its name in the Functions list. Detailed information about that function is then displayed. The Code tab shows you the code that implements that function. The Steps and Functions tabs show you which steps and other functions, respectively, use that function.

▶ Some functions are Read Only.

Creating a Function

1   Go to Automation > Functions.

2   Click **New function**.

   The General tab opens.

3   Specify a unique Name for the function.

4   *Optional*: Specify any Tags or Documentation in the appropriate areas.

5   Click the **Code** tab.

6   Type or paste new code in the Code area.

7   Click **Save**.

> Functions must contain script code. You cannot save a function without script code.

Copying a Function

1   Go to Automation > Functions.

2   Select a function.

3   Click **Copy**.

4   Type a new name for function.

5   Click **Save**.

Modifying a Function

Before you modify a function, make sure that no workflows that use this function are running. If a workflow uses a function in multiple steps, and that function is modified after the workflow starts running, the function will be different in later steps that it was in earlier steps. This is because the function is imported just prior to step execution.

To modify a function:

1   Go to Automation > Functions.

2   Select the function that you want to modify.

3   Edit the desired information.

4   Click **Save**.

> You cannot modify read-only functions.

Deleting a Function

Because functions are imported at run time, it is possible to delete a function that is used by steps or other functions—this would break those steps or functions. HP DMA does not check to determine whether a function is being used before deleting it.

1 Go to Automation > Functions

2 Select the function to delete.

3 Click and confirm delete.

➤ You cannot delete read-only functions.

Policies

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. For example, you could create a Web Server Policy that defines what every web server in your data center looks like. This policy might contain the following attributes:

• Software List

• Root Password

• Apache User ID

• Apache User Password

The Software List attribute would be a list of software that must be installed on every web server. This might include openssl, apache, perl, etc.

Policy Attribute Types

Policies have three different types of attributes:

• Text: This is a simple text value that users can view while deploying and running automation.

• Password: This is a simple text value. However, the value is masked (obfuscated) when displayed so that users cannot see the value.

• List: This is a free-form text field that can contain comma-delimited lists of values or other large text data not suitable for a Text type attribute.

Policy Roles

When you create a policy, you can specify which users and user groups are allowed to Read or Write that policy. Read permission enables the user who is deploying a workflow to access the policy attributes when specifying parameter values. Write permission enables the user to modify the policy.

Policies Delivered in Solution Packs

Certain HP DMA solution packs include Policies. You can modify the attributes values for these Policies, but you cannot add or remove attributes. You can, however, make a copy of a solution pack Policy and then customize that copy.

Creating a New Policy

You can create and use Policies to provide values for various Deployment scenarios.

To create a new Policy:

1   Go to Automation > Policies.

2   Click **New Policy**.

3   Type a unique Name for your policy.

4   In the Attributes area, perform the following actions for each attribute you want to add:

   a   Specify a unique name (within the policy).

   b   From the drop-down list, select this attribute's type: Text, List, or Password. See Policy Attribute Types on page 35 for details.

   c   Click **Add**.

   d   Specify the value of the attribute.

5   *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).

6   Click **Save**.

Extracting a Policy

You can automatically create 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 page.

4   Specify values for each attribute listed.

5   *Optional*: Add any new attributes that you want to use.

6   *Optional*: Remove any attributes that you do not 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**.

Where is a Policy in Use?

1 Go to Automation > Policies.

2 Select a policy.

3 Click the **Deployments** tab to see where the policy is in use.

Deleting a Policy

1 Go to Automation > Policies.

2 Select a policy.

3 Click the **Deployments** tab to see where the policy is in use. You cannot delete a policy if it is being used. If the policy is being used, follow these steps for each deployment listed:

    a Select the deployment.

    b Click the Parameters tab.

    c Change any parameter values that reference this policy so that this policy is no longer referenced by the deployment.

    The **Delete** button on the Policy page will be activated after you disassociate the policy from all deployments.

4 Click the **Delete** button in the lower left corner of the Policy page.

Assigning Policies to Roles

To change permissions for a policy, select (or clear) the check boxes to grant (or revoke) Read and Write access. For more information on changing permissions as an administrator, see Permission Settings on page 75.

1 Go to Automation > Policies.

2 In the Policies pane, click the policy that you want to view.

The Attributes tab displays.

3 Click the **Roles** tab.

4 Select or clear the **Read** or **Write** check boxes as appropriate.

5 Click **Save**.

Deployments

Deployments associate a workflow with a target environment in which the workflow runs. Servers, instances, and databases can be managed in groups of hundreds per deployment. Using Custom Fields and policies, you can customize a workflow's behavior for groups of targets in the deployment. For example, you can create a CIS Compliance workflow that validates whether or not servers are configured securely. Then you can create a Development deployment to manage your development servers and a Production deployment to manage the production servers.

A deployment appropriately customizes a workflow's behavior for each set of servers on which it runs. When you assign a workflow to a deployment, the pool of available targets for the deployment is determined by that workflow's target level and type.

Searching for Deployments

There are two views for the Deployments page. You can search for a deployment by workflow or by target (drop-down list in the upper- right corner of the page). You can also filter by name.

Viewing Deployments

From the Automation > Deployments page, you can view all existing workflows. In the Deployments pane, you can view each workflow's associated deployments.

1   Go to Automation > Deployments.

2   In the Workflows pane, hover the mouse over the name of a workflow.

    All deployments associated with that workflow are then listed in the Deployments pane.

3   In the Deployments pane, select the deployment that you want to see.

Creating a New Deployment

1   Go to Automation > Deployments.

2   Click **New Deployment**.

3   Specify the deployment properties:

    •   Name: Type a unique deployment name.

    •   Workflow: Associate the deployment with a workflow.

        Read-only workflows cannot be used in deployments and will not be available in the drop-down list. You must first make a copy of a read-only workflow before you can use it in a deployment.

    •   Schedule: Select default schedule or create a custom schedule (see Scheduling a Deployment on page 40).

    •   Targets: Add or remove targets individually or as a group.

    •   Roles: (*Optional*) Specify any users or user groups that you want to be able to Read, Write, or Execute this deployment.

    •   Parameter Values: See Specifying Parameter Values in a Deployment on page 39.

4   Click **Save**.

▶   You can run the workflow from the current deployment by clicking the "Would you like to run the workflow now?" link.

Editing Deployment Attributes

1   Go to Automation > Deployments.

2 Select a workflow, and then click the associated deployment that you want to view.

3 Edit the deployment properties.

4 Click **Save**.

Viewing Parameters Associated with a Deployment

You can view parameters in multiple areas:

- Automation > Steps: Select a step, and click the Parameters tab.

- Automation > Workflows: Select a workflow, go to the Workflow tab, and expand one of the steps in the table by clicking the arrow to the left of the step's name.

  You can see the parameters for each step within the workflow. "User selected" is the default. If you map to an output parameter or to built-in metadata at the workflow level, the parameter is not available for editing at the deployment or run level.

- Automation > Deployments: Select a deployment, and click the Parameters tab.

- Automation > Run: Select a workflow and then a deployment.

  The parameters are read-only unless "Runtime value" is selected in the deployment.

- Solutions > Installed: Select a solution, go to the Steps tab, select a step, and then go to the Parameters tab for that step.

Specifying Parameter Values in a Deployment

1 Go to Automation > Deployments.

2 Select a workflow, and then click the associated deployment that you want to view.

3 Click the **Parameters** tab.

4 Perform one of the following actions for each parameter that you want to edit:

- Select **Fixed value**. Type or paste text into the text box.

  If the parameter is of type Password, the characters will be masked.

- Select **Custom Field** or **Policy Attribute**. Select a custom field or policy attribute from the drop-down list.

- Select **Runtime value** if you want to specify a parameter value when you run the workflow.

  NOTE: You cannot specify parameter values at run time for scheduled deployments.

- Click **Restore Defaults** to restore the values that you specified at the step level.

  If you modify a parameter value at the step level after that step was associated with a deployment, you must click **Restore Defaults** in order to modify the parameter value at the deployment level.

5 Click **Save**.

Deleting a Deployment

> ⛔ If you delete a workflow that has associated deployments, the associated deployments will be deleted automatically with the workflow.

1   Go to Automation > Deployments.

2   Select a workflow, and then click the associated deployment you want to delete.

3   Click **Delete** and then confirm the delete.

Assigning Deployments to Roles

To change permissions for a deployment, select (or clear) the check boxes to grant (or revoke) Read, Write, or Execute access. For more information about changing permissions as an administrator, see Permission Settings on page 75.

1   Go to Automation > Deployments.

2   Select a workflow, and then select the associated deployment that you want to work with.

3   Click the **Roles** tab.

4   Select or clear the **Read**, **Write**, or **Execute** check boxes as appropriate.

5   Click **Save**.

Scheduling a Deployment

HP DMA enables you to schedule a deployment. This is useful, for example, if you want the Discovery workflow to run periodically in your environment (see Discovery on page 54).

You can use one of the following pre-defined schedules, or you can specify a custom schedule.

Table 4   Pre-Defined Deployment Schedules

Schedule	When the Workflow Runs
None	When you click **Run**.
Every hour	Every hour at the top of the hour (for example: 06:00, 07:00, 08:00, and so on).
Twice a day	Every day at 11:15 and 23:15 UTC.
Once a day	Every day at 2:45 UTC.

Custom schedules are specified using standard cron expressions. For example, the following custom schedule would run the Workflow at 11:45 PM Coordinated Universal Time (UTC—also known as Greenwich Mean Time, or GMT) every Saturday:

Custom Schedule

Minutes (0-59):	45
Hours (0-23):	23
Days of month (1-31):	*
Months (1-12):	*
Weekdays (sun-sat or 0-6):	6

[Set schedule]

The following instructions show you how to schedule an existing deployment. You can also schedule a deployment as you create it.

To schedule a deployment:

1   Go to Automation > Deployments.

2   In the Workflows column, select the workflow associated with the deployment that you want to schedule.

3   In the Deployments column, select the deployment that you want to schedule.

4   From the **Schedule** drop-down menu, do one of the following things:

   —   Select one of the pre-defined schedules described in Table 4.

   —   Select **Custom**, and specify the schedule using a `cron` expression.

5   Click **Save**.

Deployment Considerations

Deployments with Runtime parameter values cannot be scheduled.

If a Smart Group is associated with a scheduled deployment, that Smart Group will be evaluated each time that this deployment runs (see Smart Groups on page 54).

If the schedule is removed from an existing deployment, any workflows that are running as part of a previously scheduled deployment will finish, but no new ones will start until a new schedule is set.

User Considerations

A scheduled deployment is run by the user who most recently saved that deployment. This user name is displayed on the Automation > Console and Automation > History pages.

Permissions Considerations

You must have permission to Read, Write, and Execute a deployment in order to schedule it.

In a scheduled deployment, the workflow is run by the user who most recently modified the deployment. If that user's Run permission is revoked after the deployment is scheduled, the deployment will not run—although it will continue to be scheduled, and a log message will be generated at each scheduled run time.

Timing and Concurrency Considerations

All schedules use the HP DMA server local time zone.

When a workflow runs as part of a scheduled deployment, a separate "job" is created for each target server, instance, and database—and a separate line appears on the Console and History pages. These separate jobs run concurrently. This is the same behavior that occurs if the deployment is run manually.

If the workflow takes longer to run on a given target (server, instance, or database) than the interval between deployments, scheduled deployments for that target will be skipped. If the scheduled deployment runs the workflow on multiple targets, HP DMA will skip only those targets where the workflow is still running.

If a scheduled deployment for a target is skipped, a job is created for that target but the workflow does not actually run. The job will show that the deployment for that target was skipped because another workflow was still running.

There is no limit on the number of scheduled deployments. Too many deployments executing simultaneously, however, can cause performance problems.

In a multiple HP DMA server implementation, only one HP DMA server will run the scheduled deployment—which HP DMA server actually runs the deployment is non-deterministic.

Run

To "run" a workflow, you specify a deployment and one or more targets. If the deployment contains Runtime specified parameters, they can be entered; otherwise the previously configured parameter values will be displayed.

There are several ways that you can run a workflow:

- From within a workflow or a deployment: After you create, edit, and then save a workflow or a deployment, click the "Would you like to run the workflow now?" link.

- From the Automation > Run page.

To run a workflow from the Run page:

1 Go to Automation > Run.

2 Select a workflow, a deployment, and the target (or targets) where you want to run the workflow.

3 Provide values for any Runtime parameters.

   All other parameter values will be displayed for you to review before executing the workflow. It is not possible to change non-Runtime parameter values at this time.

   Any workflow with Runtime parameters cannot be scheduled (see Scheduling a Deployment on page 40). Workflows with Runtime parameters must be executed manually using Automation > Run.

4 Click **Run Workflow**.

5 Go to the Console or History page to view information about the workflow's progress.

Console

The Console provides a real-time view of what automation is currently running on servers in your environment. In the output area, you can see "initiated," "running," and "finished" as each step completes. Output and error messages from the running steps can be used to debug problems in the automation code.

While the workflow is running, its status indicator on the Console says RUNNING. After the workflow finishes, its status indicator changes to one of the final states listed here:

Table 5   Workflow Status Indicators

Status	Description
RUNNING	The workflow is currently executing.
SUCCESS	The workflow completed execution, and it completed with conditions that the workflow author considered to be successful. The "Success" step was the last step executed.
FAILURE	The workflow completed execution, but the conditions in which it completed constitute a failure according to the workflow author. The "Failure" step was the last step executed.
FINISHED	The workflow ran to completion, but neither success nor failure was indicated. In this case, the last step executed was neither "Success" nor "Failure."
CANCELLED	The workflow was interrupted when someone clicked the "Cancel Workflow" button. The workflow was either in the middle of or had just completed the last step listed in the Output area.
SKIPPED	This status pertains only to scheduled deployments. It indicates that the workflow was scheduled to run, but the execution was skipped. This would happen, for example, or if a previous execution of this workflow were still running on this target.
ABORTED	A connectivity problem arose between either the HP DMA server or the SA server and one or more of the target servers.

After one minute, completed workflows are removed from the Console view—unless it has been selected to view details. All completed workflows can be found in the History view.

To view the progress of a workflow in the Console:

1   Go to Automation > Console.

2   Search for the desired workflow using the Filter box.

3   Select the workflow that you want to see. The steps appear in the left pane as they are executed.

4   Select a step in the Output area to view the progress of and output from that step in the right pane.

History

The History page provides an audit trail of who ran automation on which servers in your environment. It also provides a useful debugging tool for troubleshooting steps and workflows. Output and error messages are captured from all steps in workflows that are running or have finished running. History information for a step is added after that step is complete.

Figure 8　Workflow History

To view information about the execution history of a specific workflow, select that workflow in the table. The information appears in the tabs below the table.

History Page Tabs

The tabs in the lower portion of the History page contain detailed information about the workflow execution selected in the table.

Table 6   Information on History Page Tabs

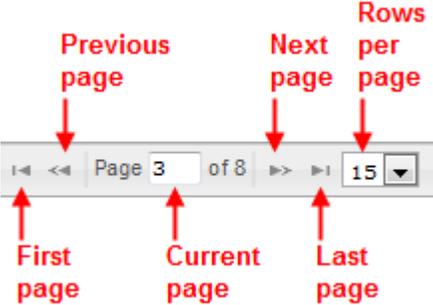| Tab Name	Information Displayed
Step Output	This tab lists each step that has been executed, its exit code, and any informational messages that it has generated.
	If this tab says "No Steps have started running," this means that the workflow has started but no steps have been executed.
Step Errors	This tab shows you any errors that occurred during the workflow execution.
Step Header	This tab is only applicable for Script steps, where it displays data using the `steplog.print_header` function.
Connector Output	This tab displays information about the interaction between HP DMA and your server management tool. It also displays output (stdout) from the HP DMA client on the target server.
Connector Errors	This tab shows you any errors that occur in the interaction between HP DMA and your server management tool. It also displays errors (stderr) from the HP DMA client on the target server.

Customizing the History Table

You can modify the presentation of the History table as well as the information displayed in it. Any changes that you make to the History table persist when you leave the History page and are re-applied when you return.

Table 7   How to Modify the History Table

Objective	How To
Resize a column.	Drag the column border to the left or right.
Reorder the columns.	Drag the column heading to the left or right.
Collapse the entire table.	Click the ⬤ in the upper right corner of the table.
Sort the table rows.	Click the heading of the column by which you want to sort. To toggle the sort, click the column heading again.
	The arrows show you which column the table is currently sorted by and the direction of the sort. For example:
	Started ⬍
Reload the table contents.	Click the ⟳ in the lower left corner of the table.
Export the contents of the table to a CSV file	Click the CSV above the upper right corner of the table.

Table 7   How to Modify the History Table

Objective	How To
Change the number of rows displayed	Use the paging controls under the table to set the number of rows displayed per page and view specific pages:
Filter the table.	To filter by Status, select a status from the drop-down menu. To filter by the date on which the workflow execution Started, click the box containing the date, and select a date from the calendar. To filter by any other column, type a string in the text box above that column.
Clear all filter criteria and any column size or order adjustments.	Click the ✖ in the lower left corner of the table.
Configure filter criteria.	Click the 🔍 in the lower left corner of the table. This opens the Search dialog (see Figure 9).

The Search dialog enables you to precisely configure the filter criteria for the History table.

Figure 9   Filter Criteria Settings

Table 8 shows you how to use this dialog to configure your search criteria.

Table 8   How to Modify the Filter Criteria

Objective	How To
Add a new filter criterion.	Click the ⊕ in the upper left corner.
Remove an existing filter criterion.	Click the ✖ to the right of that criterion.
Apply any changes that you have made to the filter criteria, and close the dialog.	Click **Find**.
Close the dialog without making changes to the filter criteria.	Click **Reset**, and then click **Find**.
Remove all filter criteria.	Click **Reset**, and then click the ✖ in the upper right corner of the dialog.

3 Environment

This chapter contains the following topics:

Dashboard

The Environment > Dashboard presents a list of the objects that HP DMA can currently use in automation. Environments contain the following hierarchy of objects:

The operations available for each object are explained in this section.

Organizations

An Organization is a logical grouping of servers. You can use organizations to separate dev/stage/prod resources or to separate logical business units.

Because user security for running workflows is defined at the organization level, organizations should be broken into units with user security in mind. You can specify which organizations a user can run workflows against. See Roles, Capabilities, and Permissions on page 69 for more information.

Navigating through the Organization Browser

The Environment page contains two parts: the organization browser is on the top, and the object editor is on the bottom.

To open the object editor, select an object in the organization browser. There you will be able to view specific properties for that object. If you have the necessary permissions, you will also be able to modify values and add additional objects to the object hierarchy.

Creating an Organization

The Default organization is built in to the software. All other organizations must be explicitly created.

> ➤ You must have Administrator capability in order to create an organization, delete an organization, or modify permissions for an organization.

To create an organization:

1 Go to Environment > Dashboard.

2 Click **New Organization**.

   The Properties tab displays.

3 Specify a unique Name for the organization.

4 Add the servers, instances, and databases that you want the organization to include.

Deleting an Organization

Before you can delete an organization, you must delete any server objects that it contains. An organization must be empty before it can be deleted.

To delete an organization:

1 Go to Environment > Dashboard.

2 In the organization browser, select the organization that you want to delete.

3 Click **Delete**, and confirm.

Servers

The next object in the Environment hierarchy is the server.

Servers cannot be used as HP DMA targets until you add them to an organization.

All SA managed servers that have the DMA Client Files software policy are available to add (see DMA Client Files Policy on page 63). The easiest way to ensure that servers have this policy is to use the Application Deployment feature in SA to attach and remediate it (see "Using HP DMA with Application Deployment" in the *SA User Guide: Application Deployment Manager*).

> ➤ The Viewing Server Information topic contains explicit instructions for navigating to the server in the organization browser. The subsequent topics assume that the server is visible.

Viewing Server Information

1 Go to Environment > Dashboard.

2 In the organization browser, select the organization to which the server belongs.

   The list of servers that belong to that organization appears in the organization browser.

3 Select the server that you want to view.

This opens the server editor. The editor contains several tabs that separate the server properties into logical groupings.'

Adding a Server to an Organization

1   In the organization browser, select the organization to which the server will belong.

2   Click the **Add servers** button.

The "Add servers to organizations" dialog opens. It contains a list of the SA managed servers that have the DMA Client Files policy (see DMA Client Files Policy on page 63) and are not already included in an organization.

You can use the Search filter to reduce the number of servers listed. The first 500 SA managed servers whose names contain the string specified in the Search box are listed. To filter the list of servers, specify text in this box, and then click **Search**.

Note that the SA host name for each available server is displayed in this dialog.

3   Select the server (or servers) that you want to add.

4   Click the **Add** button. The "Add servers to organizations" dialog closes.

5   Click **Save**.

Deleting a Server

Deleting a server deletes all instance and database objects associated with that server. It also deletes any deployments that reference this server.

To delete a server object:

1   In the organization browser, select the organization to which the server belongs.

2   Select the server name. The server editor opens.

3   Click **Delete**, and confirm.

Instances

The next object in the Environment hierarchy is the instance. A server is allowed to host multiple instances, but this is rarely done. An instance can be associated with multiple servers, as is the case with Oracle Real Application Clusters (RAC).

▶   The Viewing Instance Information topic contains explicit instructions for navigating to the instance in the organization browser. The subsequent topics assume that the instance is visible.

Viewing Instance Information

1   Go to Environment > Dashboard.

2   In the organization browser, select the organization to which the server belongs.

The list of servers that belong to that organization appears in the organization browser.

3   Select the server that hosts this instance.

The list of instances hosted by this server appears in the organization browser.

4   Select the instance that you want to view.

    This opens the instance editor. The editor contains several tabs that separate the instance properties into logical groupings.

Creating a New Instance

You can add new instances from the server editor. Instances are not available as targets until you create them manually or discover them automatically (see Discovery on page 54).

To create a new instance object:

1   In the organization browser, select the pertinent server name. The server editor opens.

2   Click **New instance**.

3   Edit the instance properties.

    • General

        — Name: This is a required property.

        — Type: Type of database instance (for example: Oracle, DB2, or SQL Server).

        — ASM: Only for Oracle instances. Select ASM (Automatic Storage Manager) if the Instance maintains its own file system.

    • Connection

        — User

        — Password

        — Host

        — Port

        — Domain (for Windows authentication)

    • Servers

    • Databases

4   Click **Save**.

Associating a Server with an Instance

If more than one server is associated with an instance—such as in an Oracle RAC configuration—you can add that server by using the instance editor.

The server must already be present in the organization. The ADD SERVER link simply associates the server with this instance. You cannot add a new server to the organization by using this button.

To associate an additional server with an instance:

1   In the organization browser, select the instance name. The instance editor opens.

2   In the Servers box, click the **ADD SERVER** link. The Add Servers dialog opens.

3   Select the server (or servers) that you want to add.

4   Click **Add**. The Add Servers dialog closes.

5   Click **Save**.

Deleting an Instance

Deleting an instance also deletes any database objects associated with that instance. It also deletes any deployments that reference this instance.

To delete an instance object:

1   In the organization browser, select the instance name. The instance editor opens.

2   Click **Delete**, and confirm.

Databases

The final object in the Environment hierarchy is the database. A database is typically associated with a single instance. Depending on its type, however, an instance may be associated with multiple databases.

➤   The Viewing Database Information topic contains explicit instructions for navigating to the database in the organization browser. The subsequent topics assume that the database is visible.

Viewing Database Information

1   Go to Environment > Dashboard.

2   In the organization browser, select the organization to which the pertinent server belongs.

The list of servers that belong to that organization appears in the organization browser.

3   Select the server that hosts this instance.

The list of instances hosted by this server appears in the organization browser.

4   Select the instance with which this database is associated.

The list of databases associated with this instance appears in the organization browser.

5   Select the database that you want to view.

This opens the database editor. The editor contains several tabs that separate the database properties into logical groupings.

Creating a New Database

Databases are not available as targets until you create them manually or discover them automatically (see Discovery on page 54).

To create a new database object:

1   In the organization browser, select the instance that you want to work with.

2   To create a new database object for this instance, click **New database**.

3   In the database editor, specify the Name of the new database.

4   Click **Save**.

Associate an Existing Database Object with an Instance

1   In the organization browser, select the instance that you want to work with.

    The instance editor opens.

2   Click the ADD DATABASE link. The "Add Database" dialog opens.

3   Select the database (or databases) that you want to add.

4   Click **Add**. The "Add Databases" dialog closes.

5   Click **Save**.

Deleting a Database

Deleting a database object also deletes any deployments that reference that database.

To delete a database object:

1   In the organization browser, select the database that you want to delete.

2   Click **Delete**, and confirm.

Smart Groups

Smart Groups are dynamic groups of servers, instances, or databases defined by some criteria. As information about the object changes, its membership in the groups is re-evaluated. For example, if a server has a Custom Field called sshd_running set to true, it may belong to an SSH Group of servers. When sshd_running for this server turns false, it is no longer in the SSH Group.

Grouping servers by dynamic criteria is useful for automation. A deployment can contain a list of static servers that the workflow can run on as well as a list of Smart Groups. Deploying a workflow to the SSH Group allows the flow to run only on servers with ssh enabled. You do not need to update the deployment each time sshd is started and stopped. The Smart Group takes care of that for you.

Each Smart Group is assigned to a role for Role-Based Access Control. A user can only create Smart Groups for roles assigned to that user. The role acts as the master server list on which the Smart Group will filter. The role must give the user both Read and Deploy permission on an organization for that organization's servers to be used in the Smart Group.

The Deployments tab on the Smart Group page tells you which deployments are currently using a particular Smart Group.

Discovery

HP DMA provides special Discovery workflows that you can use to automatically discover instances and databases residing on your managed servers. You can run the Discovery workflows manually, or you can set up scheduled deployments to run them periodically.

Authentication Settings

There are four authentication settings that you must specify before you can successfully run the Discovery workflows:

Table 9   Discovery Authentication Settings

Name	Required	Default	Description
Trust SSL Certificates	No	False	If "False" and the HP DMA server is not configured with an SSL certificate signed by a Certificate Authority (CA)—or a certificate that was manually added to a keystore—the Discovery workflow will fail. If "True," this step will trust any SSL certificate used to connect to the HP DMA server. This should only be used in a test environment.
Web Service User	Yes	User selected	The user who will run the Discovery workflow. This user must be capable of modifying the managed environment through the Discovery web service API.
Web Service Password	Yes	User selected	The password for the user who will run the Discovery workflow.
Web Service URL	Yes	User selected	URL for the Discovery web service API. For example: `https://DMA01.mycompany.com:8443/dma`

You can specify these settings two different ways:

- Define an HP DMA policy that specifies these settings, and then reference that policy in your deployment. This is the recommended approach.

- Specify explicit parameter values in your deployment. This method is not recommended for production environments.

Instructions for specifying the authentication settings are provided in the four Discovery Process steps.

Discovery Workflow Updates

The Discovery workflows are provided with your HP DMA software in the form of the HP DMA Discovery Solution Pack. Your HP DMA support agreement enables you to download updates to this solution pack free of charge. Be sure to check with HP periodically to ensure that you have the latest version.

▶ The following instructions apply only to an update. Do not attempt to import the same version of the Discovery solution pack that you already have. This will cause an error.

1   Download the ZIP file containing the HP DMA Discovery Solution Pack.

    If the solution pack is packaged in an ISO, first extract the ZIP file from the ISO.

2   Open the HP DMA UI (see Accessing HP DMA on page 10).

3   On the Solutions > Installed tab, click the **Browse** button in the lower right corner. The Choose File dialog opens.

4   Browse to and select the ZIP file that you downloaded, and click **Open**.

5   Click **Import solution pack**.

For more information about importing solution packs, see Solutions on page 65.

Discovery Process

There are four steps required to run the Discovery workflow:

- Create a Deployable Workflow on page 56
- Create a Discovery Deployment on page 58
- Run the Workflow on page 59
- View the Results on page 59

Basic instructions for each step are provided here. For more detailed information, see Workflows on page 12.

Create a Deployable Workflow

The workflow template provided by HP in your solution pack cannot be deployed. To use it, you must first create your own copy.

1   Go to the Automation > Workflows area.

2   From the list of workflows, select one of the Discovery workflow templates.

3   Click the **Copy** button in the lower left corner.

4   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).
- Target level – Must be Server.

5   On the Roles tab, grant Read permission to the groups whom you want to be able to view this workflow. Also grant Write permission to the groups who will be able to modify your copy of the workflow.

    Only those groups who have Login Access permission will be displayed on the Roles tab. By default, full permissions are granted to all groups to which you—the creator of this copy of the workflow—belong.
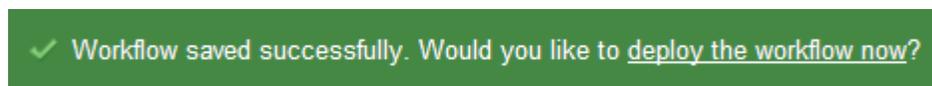
6   Make sure that **User Selected** is specified for each parameter (this is the default):

You will specify the authentication settings when you create the deployment.

7   Click the **Save** button (located in the lower right corner).

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

8   Click the **deploy the workflow now** link in the green message area.

For more information about creating and working with workflows, see

Use a Policy to Specify the Authentication Settings

Instead of explicitly specifying the Discovery authentication settings in the deployment, you can use a policy to supply this information. This approach can be advantageous, because the policy can then be used in any deployment.

To create a policy to provide authentication settings:

1   Go to the Automation > Policies page.

2   From the list of policies, select the Discovery policy.

3   In the Web Service Password box, type your password. The characters are obfuscated.

4   In the Web Service URL box, type the following:

    https://<DMAServer>:8443/dma

where <DMAServer> is the fully qualified host name or IP address of your HP DMA server.

5   In the Web Service User box, type your user name.

6   Go to the Roles tab.

7   Grant Read and Write permission to any additional roles who will be using this policy.

By default, any groups that you belong to will have Read and Write permission.

8   Click the **Save** button (lower right corner).

> When you create your Discovery deployment, be sure to use this policy to specify values for each of the authentication parameters. See Create a Discovery Deployment.

Create a Discovery Deployment

Before you can run your new workflow, you must create a deployment. A deployment associates a workflow with one or more specific HP DMA targets (in this case, servers).

To create a Discovery 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 area.

   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 – The workflow that you just created.

   — Schedule – Frequency with which the workflow will run. If you select None, the workflow will run only once when you explicitly tell it to run. See Scheduling a Deployment on page 40 for more information.

3 From the list of AVAILABLE Smart Groups on the left side of the Targets area, add the Smart Groups where the workflow will run. Any Smart Groups that you add appear in the SELECTED list on the right side.

   For information about composing Smart Groups, see Smart Groups on page 54.

   You can also add organizations or servers instead of Smart Groups. If you add individual servers, however, you will then have to update this deployment whenever new servers are added to the environment. If you use a properly configured Smart Group, new servers will be automatically added to your scheduled deployments when they are added to HP DMA.

4 Go to the Parameters tab.

5 Specify the authentication parameters.

   If you defined an authentication policy (see Use a Policy to Specify the Authentication Settings on page 57), specify the values from that policy:

Web Service Password: Discovery.Web Service Password
Required: Password for the discovery web service API.

Web Service URL: Discovery.Web Service URL
Required: URL for the discovery web service API.

Web Service User: Discovery.Web Service User
Required: User capable of modifying the managed environment through the discovery web service API.

   Type the first few characters of the name of the policy (in this case, Discovery) in each text box, and a list of choices appears. You can also type a dot "." to get a list of all available policy attributes. Select the appropriate item for each parameter.

   If you did not define an authentication policy, you can type in explicit values here.

6 Click **Save**.

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

> ✓ Deployment saved successfully. Would you like to <u>run the workflow now</u>?

7   Click the **run the workflow now** link in the green message area.

Run the Workflow

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

To run a Discovery 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:

   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, select the deployment that you just created.

2   In the list of targets on the left side, select the check box for each target where you want to run the Workflow.

3   Click the **Run Workflow** button in the lower right corner.

    The following message is displayed.

> ✓ Workflow started successfully. For status, see the <u>console</u> or <u>history</u>.

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

View the Results

While your workflow is running, you can watch its progress on the 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 one of the final states listed in Table 5 on page 43.

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:

•   Output tab – any informational messages that were produced

•   Errors tab – any errors that were reported

•   Header tab – values assigned to any output parameters

After the workflow runs, you can view a summary on the History page (see). This page lists all the workflows that have run on this server during the time period specified in the Filter box.

Confirm the Discovery

You can view the results of the Discovery workflow on the Environment page.

To view the instances and databases detected on a specific server:

1   In the organization browser, select the organization to which the server belongs.

2   Select the server. Any instances detected are listed in the next column.

3   Select an instance. Any databases detected are listed in the right-most column.

Custom Fields

Custom Fields are primarily used to customize workflows or show information about the environment. Custom Fields can be used in workflow steps to automatically apply values that are specific to an organization, server, instance, or database. For example, you can have a Custom Field that identifies a database as "Production" or "Test" and then use this field in workflows to choose between different behavior for the different types of databases.

➤   When you define a Custom Field for any item in the environment (organization,server, instance, or database), all other items of that type will also have that Custom Field. For example, if you create a Custom Field called Oracle Home for an instance target, all instance targets will have a Custom Field called Oracle Home—whether or not they actually represent Oracle instances. Except for the original item, the Custom Field will be blank (it will not have a value). Blank Custom Fields have no effect.

Viewing Custom Fields

From the Environment > Custom Fields page, you can view all existing Custom Fields that are defined in your HP DMA environment. You can view the Custom Fields that are associated with a particular organization, server, instance, or database when you view that object in the Environment browser. Custom Field values are assigned at the individual object level (see).

The Usage tab shows you which workflows, steps, deployments, and Smart Groups use a particular Custom Field.

The **Show empty values** check box enables you to show or hide Custom Fields that have no values.

Searching for Custom Fields

You can perform a real-time filter on any Custom Field. Type what you are searching for in the **Custom Fields** box, and see the filter results display as you type.

Creating Custom Fields

1   Go to Environment > Custom Fields.

2   Click **New field**.

3   Specify the following information on the Attributes tab:

   • Name: A unique name for this Custom Field.

   • Object: Organization, Server, Instance, or Database.

   • Type: Text, Multi-line text, List, or Password.

   • Options: Only available if the Custom Field is of type List.

      — Use the "Add option" button to add options.

      — Use the "Delete option" button to delete options.

4   To define the Custom Field you just created, see Assigning Values to Custom Fields on page 62.

5   Click **Save**.

Editing Custom Fields

1   Go to Environment > Custom Fields.

2   Click the Custom Field you want to edit.

3   Modify the following information on the Attributes tab:

   • Name

   • Object: Cannot be changed for existing Custom Fields as changing this state could result in broken automation.

   • Type: Cannot be changed for existing Custom Fields as changing this state could result in broken automation.

   • Options: Only available if the Custom Field is of type List.

      — Use the "Add option" button to add options.

      — Use the "Delete option" button to delete options.

   Options can be reordered with drag-and-drop.

4   Click **Save**.

Assigning Values to Custom Fields

1 Go to Environment > Dashboard.

2 Select the object (organization, server, instance, or database) whose Custom Fields you want to work with.

3 Click the Custom Fields tab.

4 Select the **Show empty values** box to view all the Custom Fields, including those that do not yet have values.

5 Specify the values in the Custom Field boxes.

   Note that Password type Custom Field values are always masked in the HP DMA user interface.

6 Click **Save**.

Removing Custom Fields

You cannot delete a Custom Field that is in use. You must first remove any references to a Custom Field before you can delete it.

To delete a Custom Field:

1 Go to Environment > Custom Fields.

2 Select the Custom Field that you want to delete.

3 Click **Delete**, and confirm.

Roles

Roles based access can be assigned to organizations by the HP DMA administrator.

- If you have Read permission for an organization, you can see the servers, instances, and databases in that organization.

- If you have Execute permission for an organization, you can run workflows in that organization.

- If you have Write permission for an Organization, you can modify the properties of the organization and the servers, instances, and databases that it contains.

From the Roles tab, you can view the permissions for a specific organization. If you have Administrator capability, you can assign access permissions to specific users or user groups for any Organization except Default. See Permission Settings on page 75 for more information.

To view the role-based permissions granted for an Organization:

1 Go to Environment > Dashboard.

2 Select the Organization whose role-based access permissions you want to see.

3 Click the **Roles** tab.

DMA Client Files Policy

➤ The policy discussed in this section is an HP Server Automation (SA) software policy, not an HP DMA automation policy.

Before you can run an HP DMA workflow on an SA managed server, that server must have a special SA software policy called DMA Client Files. This policy installs the files and software needed for HP DMA workflow execution.

See the *HP DMA Installation Guide* to learn how to add this policy to the SA Library.

Supported Platforms

The DMA Client Files policy runs on the platforms listed the *HP DMA Release Notes*.

Policy Updates

If the DMA Client Files policy is updated, be sure that your SA administrator remediates your target servers against that policy. This will ensure that all servers have the latest policy updates.

For more information, see "Remediating Servers with Software Policies" in the *SA User Guide: Software Management*.

Servers and Organizations

Only those SA managed servers that have the DMA Client Files policy (attached and remediated) are available to add to HP DMA organizations.

If you detach the DMA Client Files policy and then attempt to run a workflow from HP DMA, the workflow will fail. HP DMA does not re-attach the policy.

4 Solutions

A solution pack is a set of HP DMA workflows, steps, functions, and policies that address a specific process or problem. Solution packs are imported into HP DMA and can be deployed in five to ten minutes. Each solution pack contains the following items:

- Workflow templates for commonly-recurring IT administration tasks
- Workflow steps to provide an automation library
- Functions that implement step actions
- Policies that define desired automation behavior
- Documentation that defines best practices followed in the workflow templates

For information about available solution packs, contact your HP Software sales representative.

Installed Page

You can view all installed solution packs from the Solutions > Installed page.

History Page

You can view a recursive history of solution pack activity on the Solutions > History page, shown in Figure 10.

Figure 10 Solutions > History Page

Searching for a Solution

You can perform a real-time filter on any solution pack name or version. Type what you are searching for in the filter box, and see the filter results display as you type.

Viewing a Solution

The HP DMA Solutions page enables you to view the contents of a solution pack. From the Installed tab, you can view all the solution packs that your company already owns, as well as detailed information about each item contained and used within each solution pack.

1   In the Solutions pane, point to the solution pack name. As you point to the solution pack, the following information is displayed in the Details pane:

— Name

— Version

— Targets

— Installed

— Description

2 Select the solution that you want to view.

Click through the following tabs to view the selected Solution's components, associations, and implementation details:

- General tab: Provides solution pack description, active version, and associated usage notes.

- Policies tab: Displays the policies associated with the solution. See Policies on page 35.

- Workflows tab: Displays the workflows associated with the solution. See Workflows on page 12.

- Steps tab: Displays the steps associated with the solution. See Steps on page 21.

- Reports tab: Displays the reports associated with the solution (if any reports are available).

Installing a Solution

Only HP DMA users with Administrator capability can install, roll back, or delete a solution pack. See the *HP DMA Administrator Guide* for details.

5 Roles, Capabilities, and Permissions

This chapter describes the permissions you need to use and administer HP DMA. It includes the following topics:

- Access Control Overview on page 69
- Access Control Mechanisms on page 70
- Capabilities on page 71
- Permissions on page 72

➤ See the *SA Administration Guide* for additional information about setting global permissions.

Access Control Overview

HP DMA provides very finely grained role-based access control over the following things:

- Who can access HP DMA
- Who can view, modify, or deploy to a specific organization
- Who can view or modify a specific workflow
- Who can create a workflow
- Who can modify a specific step
- Who can view, modify, or execute a specific deployment
- Who can view or modify a specific policy
- Who can administer HP DMA, including setting permissions for all these items

Roles, capabilities and permissions are the mechanisms used to establish this control. Roles are simply groups of users who have the same levels of access. Capabilities determine which HP DMA operations each user can perform. Permissions help you precisely manage access to automation items (workflows, steps, policies, and deployments) and organizations.

Access Control Mechanisms

There are three mechanisms that affect what you can see and access in HP DMA:

- **Roles**

  Each HP DMA user has one or more roles. Roles are used to grant users permission to log in to HP DMA, to determine who can create new workflows, to grant users access to specific automation items, and to determine which users have administrative privileges.

- **Capabilities**

  Capabilities determine whether you can access HP DMA, whether you can create workflows, and whether you have HP DMA administrator privileges.

  Capabilities are set by the HP DMA administrator.

- **Permissions**

  Permissions determine whether you can view, create, or modify automation items and organizations.

  Permissions for automation items can be set by the user who created the item or any user who has Write permission for that item. They can also be set by the HP DMA administrator.

  Permissions for organizations can only be set by the HP DMA administrator.

A description of the minimum permissions needed to accomplish common HP DMA tasks is provided in this chapter. For a more comprehensive discussion of permissions, see the *HP DMA Administrator Guide*.

To view the roles and capabilities associated with your HP DMA user name, click your user name in the upper right corner:
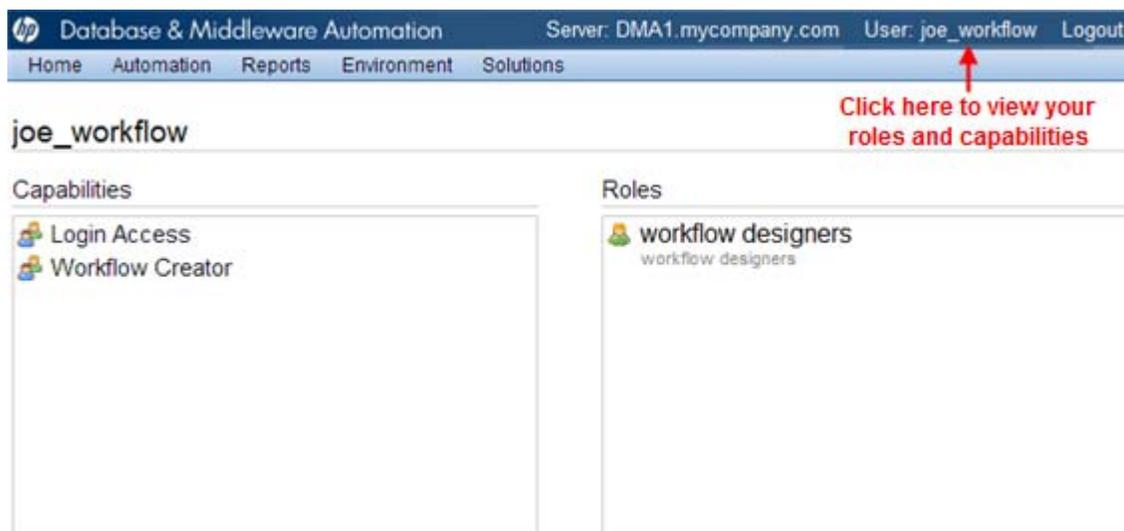
Roles

Roles are defined in your server management tool. In HP Server Automation (SA), for example, a role is an SA group to which a user belongs.

Roles must be registered in HP DMA before they can be used. This is done by your HP DMA administrator on the Role Registration page.

HP DMA determines your role when you log in. Your access is based on the roles that were registered at the time that you logged in.

Capabilities

The following capabilities determine whether you can access HP DMA and what you can do within the HP DMA UI. These capabilities are assigned by the HP DMA administrator.

Table 10   HP DMA Capabilities

Capability Name	Description
Login Access	This permission enables you to login in to HP DMA. With this permission you can: • View organizations for which you have Read access. • Edit organizations and associated target objects for which you have Write access. • Run workflows against targets in organizations for which you have Deploy access. There are additional permissions for specific automation items (see Permissions on page 72)
Workflow Creator	This permission enables you to create or copy HP DMA workflows. Each workflow also has its own Read and Write permissions.
Administrator	This permission enables you to act as the HP DMA administrator. With this permission you can: • Access the Setup page in the HP DMA UI (see the HP DMA Administrator Guide for more information). • Create or modify any HP DMA organization. • Grant users (roles) access to specific workflows, steps, deployments, policies, and organizations. • Configure the Outgoing Email settings.

Permissions

There are five things that have role-based permissions in HP DMA:

Table 11   HP DMA Role-Based Permissions

Item	Read	Write	Execute	Deploy
Workflows	yes	yes	n/a	n/a
Deployments	yes	yes	yes	n/a
Steps	n/a	yes	n/a	n/a
Policies	yes	yes	n/a	n/a
Organizations	yes	yes	n/a	yes

➤ In HP DMA, you will only see servers that reside in organizations for which you have Read permission. In order to add a server to an organization, you must have Write permission for that organization and Login Access capability.

Permissions for each automation item (workflow, step, policy, or deployment) are set by the user who creates the item—or by any user who has Write permission for the item. They can also be set by the HP DMA administrator.

If you want other users to be able to access a particular item that you create, you must explicitly grant them permission to do so. You can do this on the Roles tab for that item. Figure 11, for example, shows the Roles tab for a workflow.

Permissions for organizations are set by the HP DMA administrator.

Figure 11   Where to Set Workflow Permissions

Copy of Run Oracle Compliance Audit

| | | Documentation | Workflow | History | Deployments | Roles | |

Role	Read	Write
👤 **DMA Admins** DMA Admins	☑	☑
👤 **DMA Users** DMA Users	☑	☑

READ ALL   WRITE ALL

Only those roles that have Login Access capability appear in the list (see Capabilities on page 71).

The following instructions show you how to set the permissions for a workflow. The procedure for the other types of automation items is similar.

To grant a user or group permission to access a specific workflow:

1   Go to Automation > Workflows.

2   From the list of available workflows, select the workflow that you want to work with.

3   Go to the Roles tab.

4   In the table, do the following things:

- Select Read for user roles that you want to be able to view this workflow.

- Select Write for user roles that you want to be able to modify the workflow.

5   Click the **Save** button in the lower right corner.

➤   Users with Administrator capability can set permissions for all workflows, deployments, steps, policies, and organizations from the Setup > Permissions page. See Permission Settings on page 75 for more information.

6 Permission Settings

This chapter describes the permission settings to manage Database & Middleware Automation (see Roles, Capabilities, and Permissions on page 69).

➤ Most SA administrative settings—including those that determine which users and groups can access which SA managed servers—are managed by the HP Server Automation administrator outside of HP DMA. For more information, refer to the *SA Administration Guide*.

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HP DMA provides finely grained role-based access so that you can carefully control the specific capabilities that individual users and user groups have within HP DMA.

The following procedure shows you how to set the role-based access permissions. An overview is provided in Roles, Capabilities, and Permissions on page 69.

To grant access permissions to a user or user group:

1 Go to Setup > Permissions.

2 Select the user or user group to whom you want to grant permissions.

3 Go to one of the tabs:
   - Deployments
   - Workflows
   - Steps
   - Policies
   - Organizations

4 Select the pertinent boxes to grant Read, Write, Execute (applicable only to Deployments), and/or Deploy (applicable only to Organizations) permission to the selected user or group.

   You can use the **ALL** links (for example, **READ ALL** or **WRITE ALL**) below the permissions box to grant the pertinent permission to all users and groups.

   If an item has a "—" in one of the columns instead of a check box, that means that this permission is not applicable to that item. For example, you cannot grant Write permission to a read-only Step or Workflow.

5 Click **Save**.

A Bridged Execution Workflows

This appendix discusses bridged execution workflows, an advanced automation feature available in HP DMA.

Overview

When a traditional HP DMA workflow runs, all of its steps are executed against a single target. If you specify multiple targets, a separate "run" of the entire workflow is executed on each target.

In a **bridged execution workflow**, different steps within that workflow can run on different targets.

An Example

An example of a bridged execution workflow is a database refresh workflow that 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 type of workflow is useful if you want to clone a database—for example, to move it from a traditional IT infrastructure location into a private cloud, or to populate a test database with real production data.

The Workflow

The workflow in Figure 12 is a very simplified example of a database refresh workflow. This workflow uses two targets:

- The Source target is the database instance where the contents of a specific database will be exported.

- The Destination target is the database instance where those contents will be imported.

> For the purpose of this simplified example, all other parameters have been removed.

All targets for a bridged execution workflow must have the same target level (Server, Instance, or Database) as the workflow itself. In this example, the target level is Instance.

Figure 12 Simplified Database Refresh Workflow'
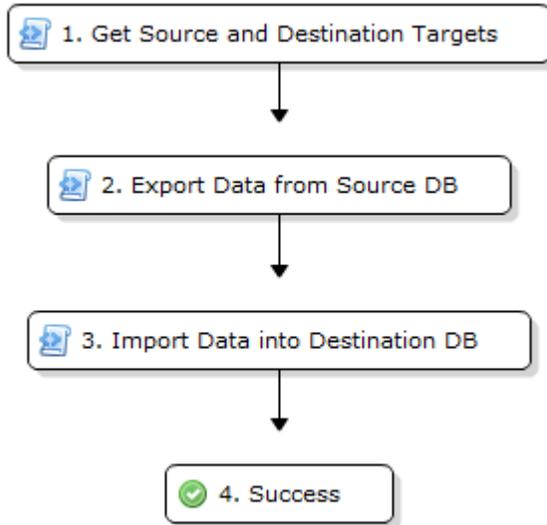
A bridged execution workflow requires special settings both in the steps and in the workflow to facilitate the orderly selection of targets at run time. The following topics explain how bridged execution workflows affect each phase and artifact in the automation process.

Get Source and Destination Targets

The sole purpose of this step is to determine the targets for the subsequent steps. This step has two input parameters: Source and Destination.

Both input parameters must be set to - User selected - in the workflow.

The step also has two output parameters with the same names: Source and Destination.

It is important that the input and output parameters of this step have exactly the same names.

Export Data from Source DB

The purpose of this step is to export the contents of the Source database. Its Step Target parameter is mapped to the Source output parameter of the first step.

Import Data into Destination DB

The purpose of this step is to import the data that was exported in the previous step into the Destination database. Its Step Target parameter is mapped to the Destination output parameter of the first step.

Targetable Steps

The Export Data from Source DB and Import Data into Destination DB steps are both "targetable" steps. This means that the target for each step is specified at run time.
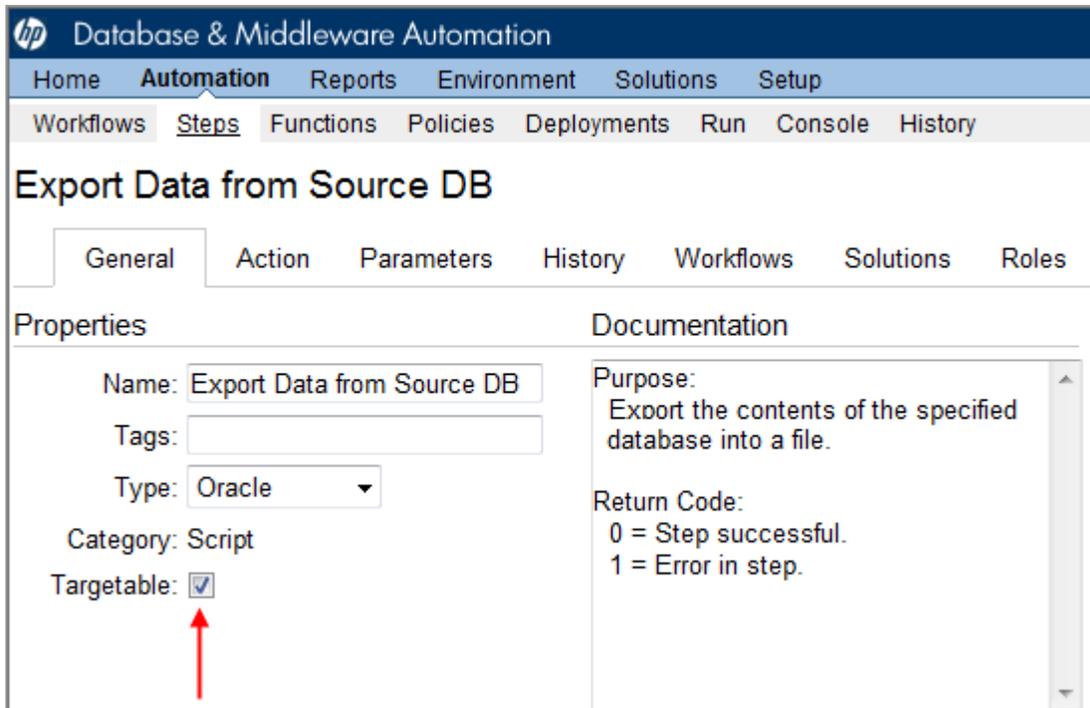
A targetable step has a special parameter called Step Target:
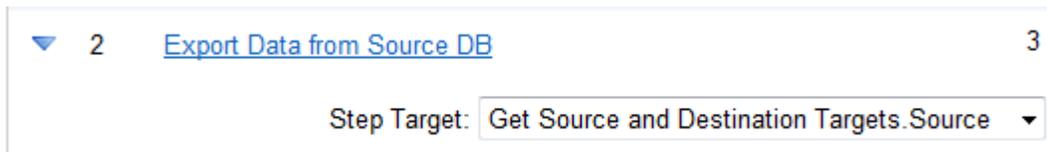
Step Target is only visible in the workflow editor. It does not appear on the Parameters tab in either the step or the deployment. Step Target must be mapped to an output parameter of a previous step.

Best Practice: As demonstrated in this example, the first step in a bridged execution workflow should gather the targets that subsequent steps will use. The Step Target parameter for each targetable step is then mapped to an output parameter of that first step.

The Deployment

The process of creating a deployment for a multi-target workflow is similar to the process for a traditional workflow with one salient difference. When you create (or modify) a deployment for a bridged execution workflow, the targets that you select on the Deployment page determine the list of available targets in the Select Target dialog on the Run page.

➤ The target parameters for the workflow (in this case, Source and Destination) do not appear on the Parameters tab in the deployment. This is because the targets must always be specified at run time in a bridged execution workflow. They cannot be specified in the deployment.

The Run

For a bridged execution workflow, the Run page looks different than it does for a traditional workflow. Figure 13 on page 82 shows the Run page for the simplified database refresh workflow prior to target selection.

Note the following:

- The SELECT links on the Run page enable you to specify each target required—in this case: Source, Destination, and Primary Target.

  When you click a SELECT link, the Select Target dialog opens:
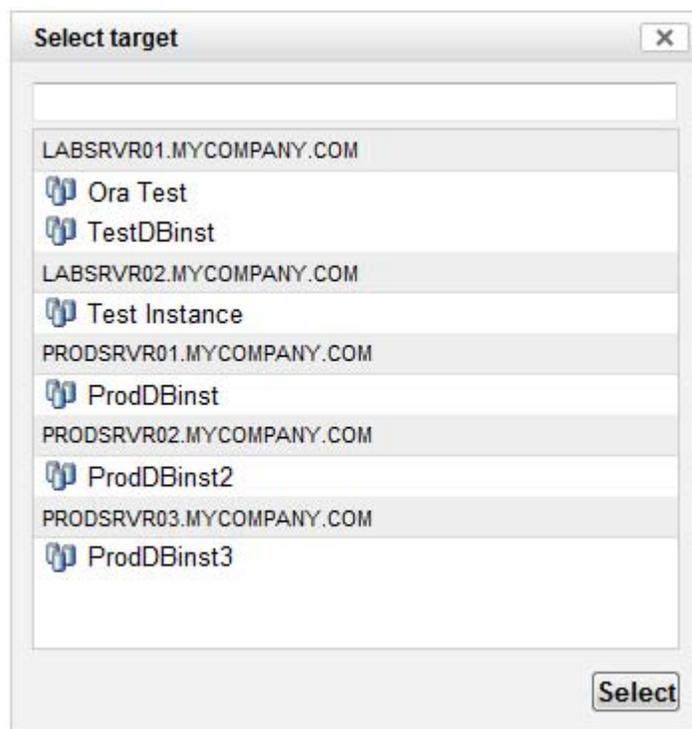
All available targets that you selected in the deployment are listed. You must select a single target from the list. If the list is long, you can filter it by typing characters in the text box at the top.

Select the target that you want to use, and click **Select**.

- The Primary Target is used by any steps in the workflow that are not targetable. In this particular workflow, there are no such steps.
- Until you select all the targets, the "Select targets" message is displayed in the lower right corner, and the **Run workflow** button is disabled.

  After you select the targets, the Run Workflow button is enabled (see Figure 14).

How to Run a Bridged Execution Workflow

The process of running a bridged execution workflow is the same as the process for a traditional workflow—until run time.

To run a bridged execution workflow:

1 On the Automation → Workflows page, create a deployable copy of the bridged execution workflow.

2 On the Automation → Deployments page, create a new (or modify an existing) deployment.

   Specify any parameter values that you want to use. Be sure to select any targets that you might want to specify at run time.

3 On the Automation → Run page, select your deployment.

   Click the SELECT link to specify each target used by the workflow.

4 Click **Run workflow** to execute the workflow.

Additional Considerations

An HP DMA user will not see deployments for a bridged execution workflow unless that user has Read permission for the organization

Deployments for bridged execution workflows are only visible to users who have Read permission for the organization where one (or more) of the specified targets resides.

For a bridged execution workflow, the target listed on the upper pane of the Console and History pages corresponds to the specified Primary Target. You can find information about a specific target in the output details for the pertinent step.

Figure 13 Run Page Before Target Selection

Figure 14 Run Page After Target Selection

B How to Import a File into the Software Repository

Many 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 (SA) Software Library as its software repository.

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

To import a file into the SA Software Library:

1   Launch the SA Client from the Windows Start Menu.

By default, the HP Client is located in Start > All Programs > HP Software > HP Server Automation Client

If the HP 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 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.