Database and Middleware Automation

Express Edition

Software Version: 10.50

Windows and Linux

User Guide

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Hewlett Packard Enterprise

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Contents

Introduction

The HPE Database and Middleware Automation Express Express Edition (DMA Express) converts and runs HPE DMA workflows so users can run them as flows in HP Operations Orchestration (HP OO). Hence, DMA Express extends HP OO capabilities, automating administrative and maintenance tasks without requiring installation of either the HP Server Automation infrastructure or the HPE DMA Server, both of which are required in a traditional DMA environment.

DMA Express features simplify enablement of self-service cloud environments and improve time-to-value by leveraging key functionalities between HP OO and HP Cloud Service Automation (HP CSA).

Specifically, the DMA Express Database Content Pack, delivered as DMA Express, enables HP CSA to seamlessly provide a Database-as-a-Service (DBaaS) capability to end-users, without requiring end-user expertise with database technologies. For example, the DMA Express database flows enable the following automated task features:

- Install database software
- Manage MS SQL and Oracle code releases
- Manage JBoss, WebSphere, and WebLogic code releases

There is no overlap between the DMA Express Database Content Pack and the HP OO Database Content Pack functionality. Instead, DMA Express serves to enhance and extend existing HP OO capabilities.

DMA Express supports the following database and middleware solutions:

- Oracle 11g R2 and 12c
- MS SQL Server Database 2012 and 2014
- My SQL 5.6, Enterprise Edition
- IBM WebSphere
- Oracle WebLogic Server 11g and 12c versions
- JBoss

DMA Express is supported on HP Operations Orchestration 10.20 or later.

Overview

This guide walks you through the process of installing the Database and Middleware Automation Express in HP Operations Orchestration (HP OO), and then executing and customizing the HPE DMA Express flows. This guide also provides pertinent reference information to use the DMA Express more effectively. The following sections are included:

Section	Description
"Requirements"	This section identifies all of the requirements for using DMA Express.
"Architecture" • "Development/test environment" • "Production environment" • "Anatomy of an HPE DMA flow"	This section describes the basic architecture and concepts of DMA Express, as well as key terms and behaviors in the context of typical installations of HP OO.
"Installation" • "Contents of DMA Express" • "Importing DMA Express Content Packs into HP OO Studio" • "Preparing the HPE DMA Express Client" • "Setting up System Properties for HPE DMA Express flows" • "Promoting DMA Express Content Packs into HP OO Central"	This section describes how to install the main components of DMA Express and how to set up HP OO System Properties.
"Flow Execution" • "Setting Flow Inputs" • "Example execution" • "Validating HPE DMA Express flows in a development/test environment" • "Running HPE DMA Express flows in a production environment"	This section describes how to run an flow in either HP OO Studio or HP OO Central.
"Customization" • "Structure of HPE DMA flows" • "Customizing HPE DMA Express	This section describes how to customize the HPE DMA Express flows and the HPE DMA Express Client.

Section	Description
flows" • "Customizing the HPE DMA Express Client"	
" Configuring and running an HPE DMA Express Flow - Example"	This section describes how to set up and run a typical DMA Express flow in HP OO Studio.
"Reference Material" • "HPE DMA Express flows" • "Additional documentation" • "Comparison of HPE DMA Express and HP OO uses"	This section provides additional reference materials about the HPE DMA Express flows that are available, where to find additional documentation, and a comparison of using the flows in either or HP OO.

Requirements

The following items are required to use the Database and Middleware Automation Express (DMA Express) in HP Operations Orchestration:

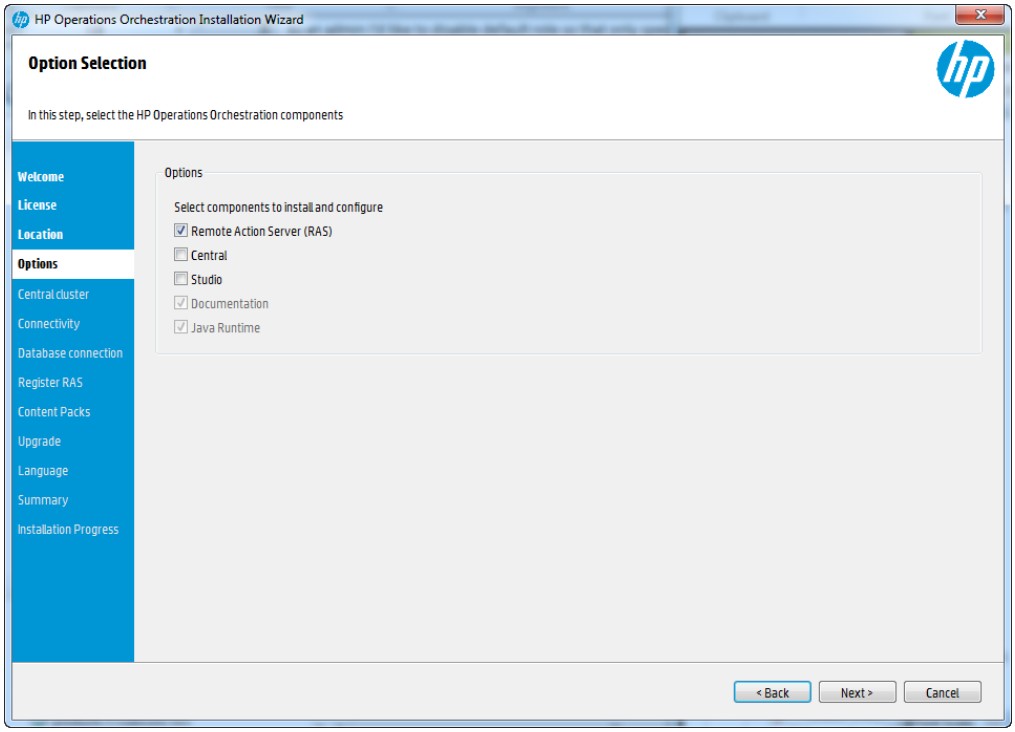
- License for HP Operations Orchestration version 10.20 or later
- HP OO Studio and/or HP OO Central installed
- HP OO Base Content Pack (1.5.3 or later) loaded
- License for DMA Express or Database and Middleware Automation
- installation media available
- Before running any DMA Express flows in HP OO Central/RAS (on Windows), you must be logged in and running the service using Administrator privileges.
- Pertinent Oracle or MS SQL binaries available—depending upon which HPE DMA Express flows you plan to run
    - Repositories:
        - HPE DMA OO Client (DMA Runtime)
        - Software repository

      You need repositories to store the HPE DMA Express Client scripts and software binaries (such as database software and patches). Depending on your specific setup, repositories can be a file server (for example, a Linux machine, which supports remote folder access) or server management software. Note that this file server cannot be a FTP server because neither DMA Express Client flows nor DMA Express remote copy functionality supports FTP or HTTP access and downloads to the binaries. The HPE DMA Express Client should not be the same as the software repository.
- *Recommended:* A Python Integrated Development Environment (IDE) that supports Python 2.5 and later—to add customized steps and functions to the HPE DMA Express Client. There are a number of commercial and open source Python IDEs available, such as PyCharm.
- *Recommended:* Target managed servers with the required operating systems—for additional information see "HPE DMA Express flows"
- *Recommended:* A version control system

Installing an HP OO RAS Server

Before you run any DMA Premium flows on a Windows target and the HP OO Central is installed on Linux, you must install Remote Access Service on a Windows machine. Perform the following steps to install RAS:

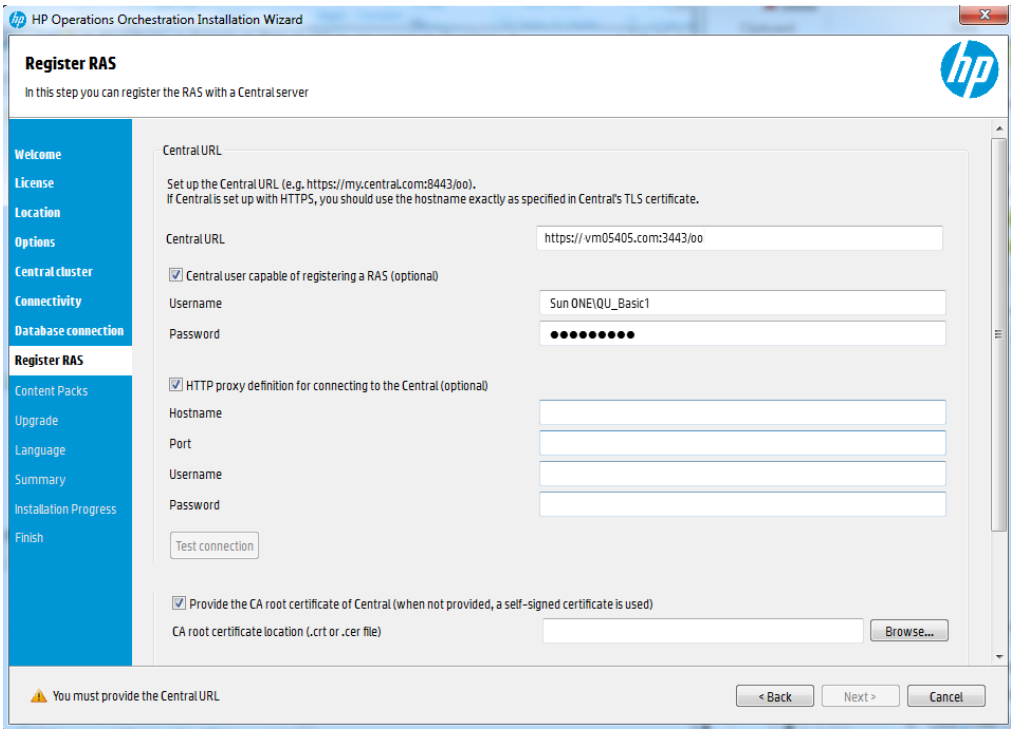
1. Run the HP OO Installation Wizard.
2. In the **Options** step, select **Remote Access Server (RAS)**, and then click **Next**.



3. In the **Register RAS** step, in the **Central URL** box, enter the properties and location of the Central.

   Make sure to use the FQDN (Fully Qualified Domain Name) for the Central URL.

   If you want to use IPv6, put the IPv6 address in brackets, for example, [3fff::20].



4. (Optional) Select the **Central user capable of registering a RAS** check box and enter the user name and password of this user.
5. (Optional) Select the **HTTP proxy definition for connecting to the Central** and enter the HTTP proxy definition.
6. Click **Test Connection**.

   > **Note:** If you test the connection to a Central with a custom CA certificate without providing the certificate to the RAS, a java.lng.RuntimeException error message will appear.

7. If you are installing Central and a RAS at the same time, if you provided a certificate for Central, you must provide the root CA certificate for the RAS. This certificate will be imported to the RAS TrustStore:

   a. Select the **Provide the CA root certificate of Central** check box.

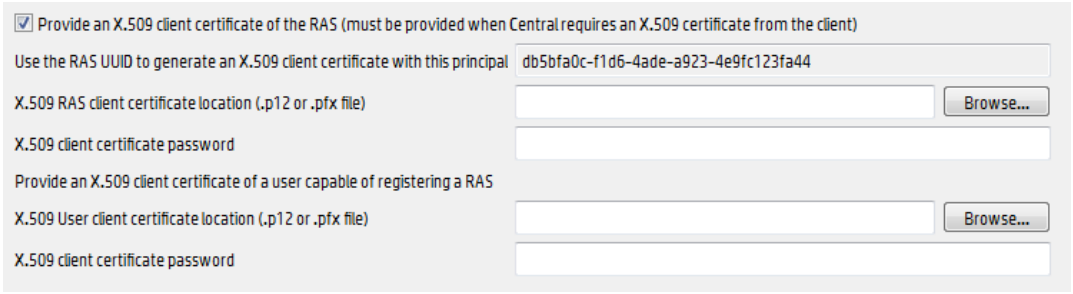
   b. Click **Browse** to select the relevant CA root certificate.

   c. Click **Test Connection**.

   If the default certificates were used in Central, you should leave this check box cleared, to automatically use the self-signed certificate.

For more information about using SSL certificates, see the HP OO Hardening Guide.

8. If Central requires an X.509 certificate from the client, follow these steps:
   a. Click the **Provide an X.509 client certificate of the RAS** check box. A UUID for the RAS is automatically generated.
   b. Create the client certificate using this RAS UUID. The client certificate must be in PKCS format and must be with a **.pfx** or **.p12** extension.
   c. Click **Browse** to select the X.509 client certificate that you created.
   d. Enter the password of the X.509 client certificate that you created.
   e. Click **Test Connection**.



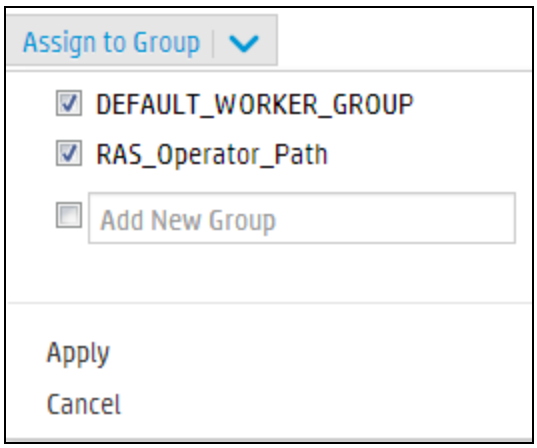
9. Click **Next**. A summary of the installation is displayed. Click **Install**.
10. Click **Finish** to complete the installation.

Creating a new worker group and assigning a worker to it

Perform the following steps to create the new worker group, DMA_RAS_Path and assign a worker to it:

1. In **System Configuration** workspace, select **Topology** > **Workers**.
2. Select the check box next to the worker name.
3. Click **Assign to Group** 

.
4. Click the check box next to the empty box and enter **DMA_RAS_Path**.



5. Click **Apply**.

Architecture

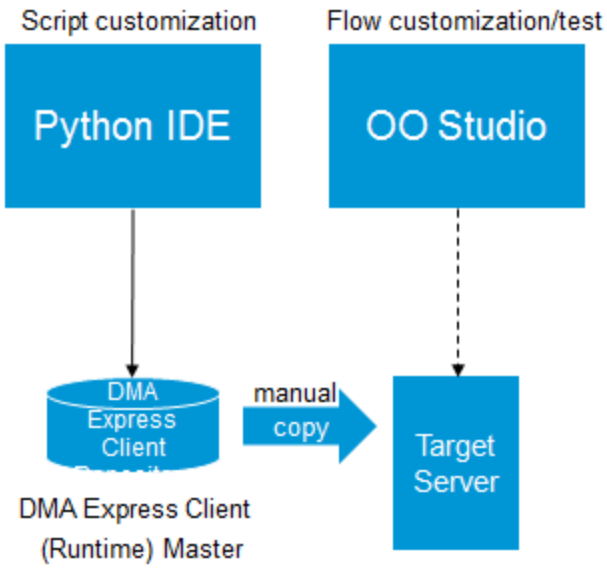
This section describes the basic architecture and concepts of the HPE DMA Express flow, as well as key terms and behaviors in the context of typical installations of HP OO.

Development/test environment

You should set up and use a development/test environment to:

- Test the delivered flows in your environment before running them in production
- Customize the delivered flows before using in production (optional)
- Customize the runtime before using in production (optional)

Example of development/test architecture



The following components are found in the diagram:

- Python Integrated Development Environment (IDE): HPE recommends using a Python IDE if you want to add customized steps and functions to the HPE DMA Express Client (DMA Runtime).

- HP OO Studio: The HP OO development environment. Here you can customize and validate HPE DMA Express flows the same way as any other HP OO flow.
- HPE DMA Express Client: The HPE DMA Express Client stores the scripts. Depending on your specific setup, the repository can be a file server, or server management software. The flows in the DMA Express can be customized to work with a wide array of repositories.
- Target Server: Any virtual or physical server supported by the HPE DMA Express flows included in the DMA Express (this does not include physical servers such as AIX).

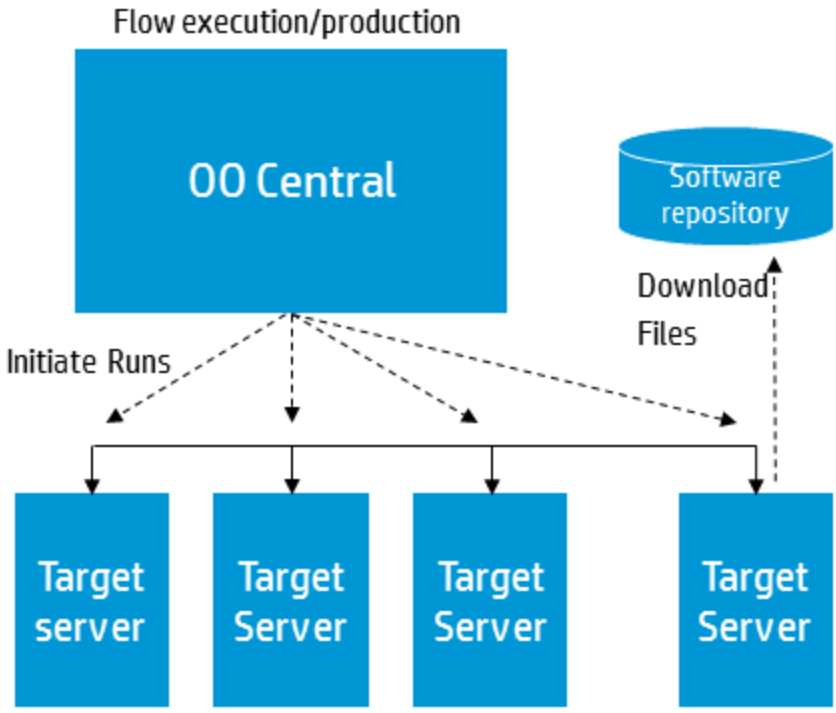
> **Note:** In the development/test environment, HP OO Studio should be used (rather than HP OO Central). Any required product binaries should be available on the target server. To simplify developing or testing flows, only a single target server is necessary.

Production environment

You should set up and use a production environment to:

- Run previously tested flows
- Take advantage of scale and run on multiple target servers
- Perform repetitive database functions

Example of production architecture



The following components are found in the diagram:

- HP OO Central: The HP OO central server, which runs HPE DMA Express flows in a production environment by operators.
- Software Repository: The software repository stores the software binaries—such as database software and patches—required as inputs to the HPE DMA Express flows in a common, accessible location. The software repository is a file server that can be access by the target server. The flows in DMA Express can be customized to work with a Linux machine, which acts as the file repository.
- Target Server(s): Any virtual or physical server managed using the HPE DMA Express flows included in DMA Express (this does not include physical servers such as AIX).

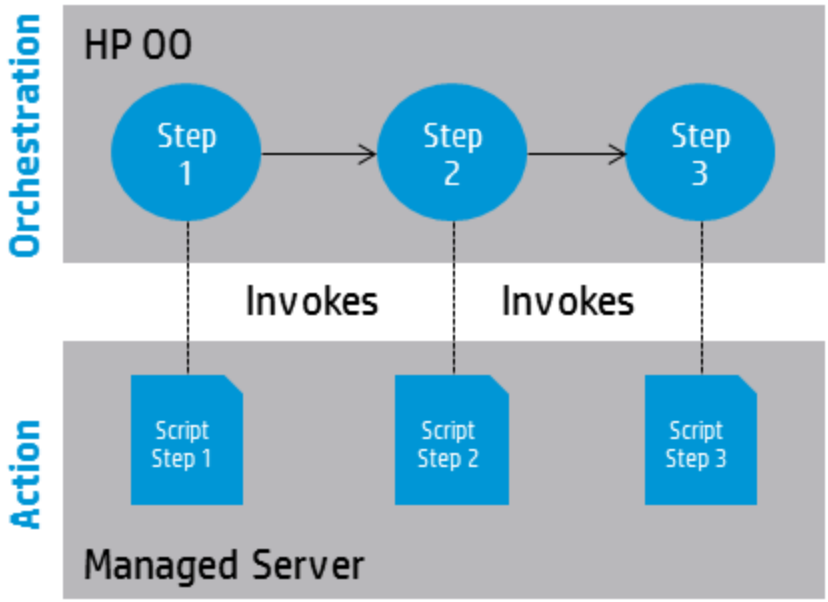
> **Note:** In the production environment, operators should run flows in HP OO Central (rather than HP OO Studio). Any required product binaries should be available in the software repository that is accessible by all of the target servers.

Anatomy of an HPE DMA flow

A fundamental entity in HP OO is the flow, which is a simple sequence of steps. There are two levels of abstraction that distinguish an HPE DMA Express flow from a typical HP OO flow:

- The Orchestration layer provides the fundamental steps and their sequence. The logic of HP OO flows is directed by the parameter mapping between steps. The steps use 'remote execution' to call scripts that reside on a target managed server.
- The Action layer provides the scripts that contain the details. The Jython scripts execute OS-level and API-level operations, parse results, and handle dependencies and potential error scenarios. The use of scripts simplifies the HPE DMA Express flows and improves the performance. The scripts are referred to as the HPE DMA Express Client (DMA Runtime).

In the following diagram, each circle in the HP OO flow represents an HP OO step and each rectangle represents a script that is invoked on a target managed server.



Action scripts contain a significant amount of built-in logic. An example is the script “DMA Remote Copy”. This script triggers the download mechanism by iterating through a list of files, logging into the software repository where the binaries are located, and then downloading the files.

If you want to develop or customize flows in HP OO Studio, you may need to work in both the Orchestration and Action layers.

Installation

This section describes how to install the main components of DMA Express and set up the HP OO System Properties. The DMA Express Database Content Pack, DMA Express Middleware Content Pack, and DMA Express Utilities Content Pack must be loaded into HP OO— HPE DMA Express Client (DMA Runtime) is automatically installed on each target when each flow runs. Generally you should work with the HPE DMA Express flows in HP OO Studio first and then, after you validate and customize the flows, promote them to HP OO Central.

This section includes:

Contents of DMA Express

DMA Express software is delivered electronically/online and located in a compressed file (.zip format).

You can extract this zip file on a supported system (preferably Linux) by using the following command:

```
unzip <pathname>A8B34-15001.zip
```

where `<pathname>` is the local path of the downloaded zip file.

If you want to unzip the files in a specified folder/directory, then use the following command :

```
unzip -d <folder/directory name> <pathname>A8B34-15001.zip
```

The master .zip file contains the following folders for each of following content packs, as well as licensing information and product documentation:

- **DMA_Express_10.50.000.000_Client_Solution_Pack** (also known as DMA Runtime)

  Includes all of the HPE DMA Express flows for the DMA Express Client
- **DMA_Express_10.50.000.000_Database_Content_Pack**

  Includes all of the HPE DMA Express flows for databases
- **DMA_Express_10.50.000.000_Documentation**

  Includes the HPE DMA Express 10.50 documentation
- **DMA_Express_10.50.000.000_Middleware_Content_Pack**

  Includes all of the HPE DMA Express flows for Middleware
- **DMA_Express_10.50.000.000_Util_Content_Pack**

  Includes a set of utilities for use with HPE DMA Express Edition
- **DMA_Express_10.50.000.000_Open_Source_Licenses.zip**

  Includes all of the HPE DMA Express Open Source license information
- **readme.txt**

For additional details about the flows in each Content Pack, see "HPE DMA Express Flows" in "Reference Material" on page 44.

Importing DMA Express Content Packs into HP OO Studio

Generally you will first use the DMA Express Content Packs in HP OO Studio. Later, when you are satisfied with your flows there, you can promote them to HP OO Central (see "Promoting DMA Express Content Packs into HP OO Central").

For details about how to import HP OO Content Packs, see “Importing Content Packs to a Project” in the *HP Operations Orchestration Studio Authoring Guide* and "Deploying a Content Pack" in the *HP Operations Orchestration Central User Guide*, available on the HP Software Support web site: https://softwaresupport.hp.com/

The -supplied Content Packs can be imported into HP OO Studio just like any other HP OO Content Pack:

1. If not already installed, import the HP OO Base Content Pack (version 1.4.3 or later)
2. Import the HPE DMA Express Edition Utilities included in the HPE DMA Express Master zip file—`DMA Express Utilities 10.50.000.000.jar`—into HP OO Studio.
3. Import the HPE DMA Middleware Content Pack that comes in the Master zip file— `DMA Express Middleware 10.50.000.000.jar`—into HP OO Studio.
4. Import the HPE DMA Express Database Content Pack that comes in the Master zip file—`DMA Express Database 10.50.000.000.jar`—into HP OO Studio.

Setting up System Properties for HPE DMA Express flows

Although not required, you should consider using HP OO System Properties to reduce the number of required inputs that must be entered for the HPE DMA Express flows. However, before you can input values for System Properties, you must first set up a System Account.

Setting up the System Account

You can use HP OO Studio to edit or override values for the System Account packaged with the DMA Express Database Content Pack. You must set the user name and password for the System Account before you can access the software repository server from which you download software bits.

To set up the login credentials for the System Account:

1. In HP OO Studio, click the Settings menu and select Studio Overrides.
2. In the Edit Studio Overrides dialog select System Account.
3. In the Add System Account dialog , specify `DMA Express Database 10.50.000.000 > Configuration > System Accounts > Source` for the target Path.

   The default target User Name is `root`. This is the user who logs in to the target and must be an account with administrative permissions. Enter and confirm the password.
4. Click OK.

   For additional information, see "Managing Configuration Items" > "Managing System Properties" in the documents:

   - *HP Operations Orchestration Studio Authoring Guide*
   - *HP Operations Orchestration Central User Guide*

   These documents are available on the HPE Software Support web site:

   https://softwaresupport.hp.com/

Assigning System Properties

HPE DMA Express flows can use HP OO System Properties to centralize standard flow inputs. The values for these system properties are preset and should not require modification; however, you can override them.

HP OO Input	Description
ExtendedTimeout	The duration for an extended processing timeout. The default value is 12,000,000 milliseconds (2 hours).
StandardTimeout	The duration for a standard processing timeout, The default value is 300,000 milliseconds (5 minutes).

Setting values for the System Properties can reduce the number of required inputs, improve usability, and make the HPE DMA Express flows more user-friendly. HPE DMA Express flows contain several inputs (a subset of the total number) that are typically set to the same values across many flows. Hence, ExtendedTimeout and StandardTimeout are good examples of inputs for a standard flow . If a server is particularly slow or there is going to be a very long processing period and you don't want the operation to time out, then you may wish to change the default values.

> **Important:** When modifying the value for system properties, be careful, as they apply to ***all*** of the HPE DMA Express flows. In other words, whenever you execute an HPE DMA Express flow using the system account, it will pick up and use the properties defined here. These settings apply to your production environment only; you will need to reset them for each new project or environment.

TargetHost would not be a suitable candidate for a standard flow input because users typically need to run the flows on multiple targets. Again, carefully determine what inputs can be standardized for your environment.

Preparing the HPE DMA Express Client

The DMA Express Client is automatically installed as part of a subflow in each DMA Express flow; this subflow runs as the first step in all DMA Express flows, and copies and unzips the Client files on the target. Thus, all DMA Express Client files must first be placed in the software repository so that they can be located and downloaded to the target(s).

The DMA Express Client binaries are available in the DMA Express 10.50 Client Solution Pack (located in the DMA Express Master zip file). These files must be copied into the file server or software repository before you run any HP OO flows:

- `dma_oo_client_bin_linux.zip`
- `dma_oo_client_bin_linux.zip.MD5`
- `dma_oo_client_bin_windows.zip`
- `dma_oo_client_bin_windows.zip.MD5`
- `dma_oo_client_code_linux.zip`
- `dma_oo_client_code_linux.zip.MD5`
- `dma_oo_client_code_windows.zip`
- `dma_oo_client_code_windows.zip.MD5`

Rules and guidelines for DMA Express Client binaries

Store the HPE DMA Express Client compressed files in a common, accessible location in the software repository. Depending upon your specific setup, repositories can be a file server (for example, a Linux machine, which supports remote folder access) or server management software. Note that this file server cannot be a FTP server because neither DMA Express Client flows nor DMA Express remote copy functionality supports FTP or HTTP access and downloads to the binaries.

As a general guideline, assume that the HPE DMA Express Client is a compressed file that needs to be copied to a target and then uncompressed into a specific directory tree.

The file server must be a Linux system, which acts as a file repository for all the binaries for both DMA Express and HP OO.

The target server can be either a Linux or Windows machine.

In terms of cross-platform support, the step that performs the installation works for Linux-to-Linux or Linux-to-Windows machines where the former is the file server and the latter the target server.

> **Important:** You must set up System account access before running any flows. For details, see "Setting up System Properties for HPE DMA Express flows" on page 20.

HPE recommends using a repository and a version control system to properly maintain versions.

Promoting DMA Express Content Packs into HP OO Central

When you are satisfied with the HPE DMA Express flows that you customized in HP OO Studio, you can promote them to HP OO Central.

> **Important:** HP OO Central/RAS services *must* be run as Administrator. This is a prerequisite to running any DMA Express flows in OO Central.

For details about how to package a Content Pack in HP OO Studio so that it can be deployed and run, see “Exporting a Content Pack” in the *HP Operations Orchestration Studio Authoring Guide*.

For details about how to promote Content Packs in HP OO Central, see “Promoting Content Packs” in the *HP Operations Orchestration Central User Guide*.

These documents are available on the HP Software Support web site: https://softwaresupport.hp.com/

Flow Execution

You can run the HPE DMA Express flows that are included in the DMA Express Database Content Pack in either HP OO Studio or HP OO Central. HPE recommends running HPE DMA Express flows first in HP OO Studio for testing and customization—before running in HP OO Central in a production environment for a larger scale and where there are more targets. HP OO flows run using the remote execution operation; they then contact the target and initiate action scripts on that target.

HPE DMA Express flows have a set of standard inputs and each flow may have additional inputs. Please see the flow description for details about additional inputs.

Setting Flow Inputs

You must provide inputs for your flow to execute successfully and accomplish what you intend. These inputs fall into the following categories:

- **Standard required flow inputs**

  Server target access information is required to access the target managed server (for example, hostname, username, or password).

  Source Host system account information are the credentials for the software repository server and the values should be overwritten in HP OO Studio.

HP OO Parameter	Description
serverTarget	The hostname of the target. This is the server to be managed through running the flow.
downloadSourcePath	The absolute path of the DMA Express Client binary folder (based on flows for either Windows or Linux).
downloadSourceHost	The hostname or IP-address of the target server to which the DMA Express Client binaries should be copied from.

> **Note:** Inputs that have common values across many flows can be assigned standard values. For more details, see "Setting up System Properties for HPE DMA Express flows".

- **Other flow-specific required inputs**

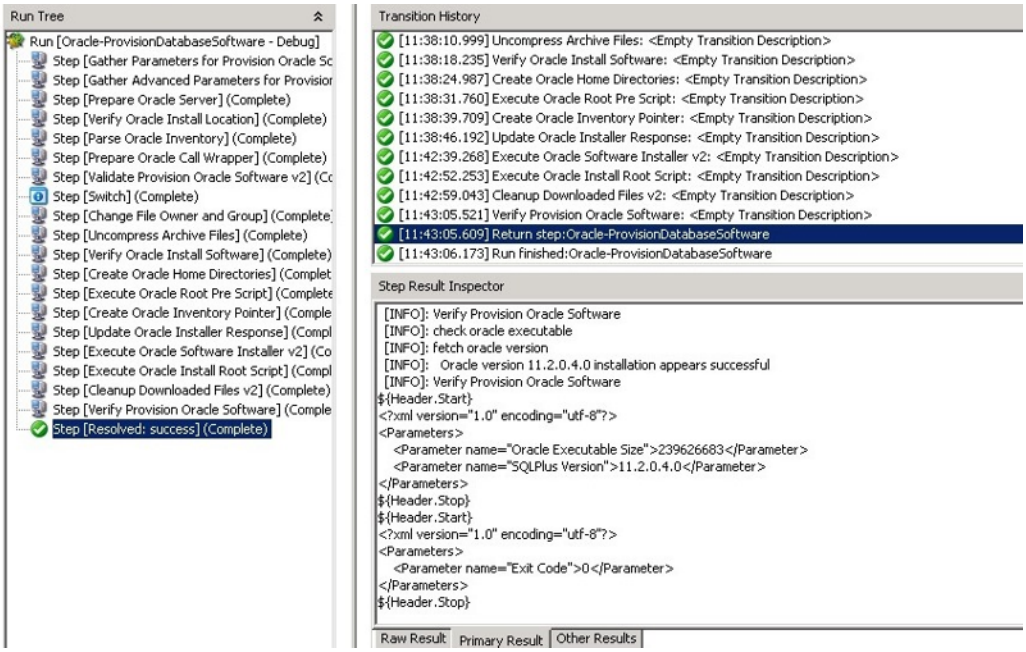
  These are required inputs that pertain to specific flows (for example, database configurations and environment information).

- **Flow-specific optional inputs**

  These are for advanced configurations of the flow and HP OO does not prompt for them (default behavior).

Example execution

Following is an example run of the Oracle - Provision Database Software flow:



HPE recommends using a repository and a version control system to properly maintain versions.

Validating HPE DMA Express flows in a development/test environment

You should initially develop, customize, and validate flows in a development/test environment using HP OO Studio. Refer to "Development/test environment" for details about its architecture.

For more details, see “Validating Content” in the *HP Operations Orchestration Studio Authoring Guide*, available on the HPE Software Support web site: https://softwaresupport.hp.com/.

Running HPE DMA Express flows in a production environment

After validating your flows in HP OO Studio, you can export them from HP OO Studio and promote them to HP OO Central. You then use HP OO Central for your production environment. Refer to "Production environment" for details about its architecture and components.

For more details, see “Running and Monitoring Flows” in the *HP Operations Orchestration Central User Guide*, available on the HPE Software Support web site: https://softwaresupport.hp.com/.

Flow Inputs - Downloading from SA

You can set the **downloadFromSA** parameter value to **True** for each of the HPE DMA Express flows that require to download binaries, like patch files, from SA software repository as specified by the **saFolderPath** parameter. The required binaries must be available in the path specified by the **saFolderPath** parameter and SA agent must be available in the target. Only an "SAUser" System Account user can set the **downloadFromSA** parameter value to **True**. The “SAUser” System Account (from the DMA Express Utility content pack) must be setup with the SA credentials using an OO Studio/OO Central override.

Customization

Depending on your goals, you can customize the HPE DMA Express flows included in the DMA Express Database Content Pack and/or add custom steps and functions to the HPE DMA Express Client (HPE DMA Runtime).

This section includes the following:

Structure of HPE DMA flows

The Database and Middleware Automation Express includes HPE DMA Express flows and the HPE DMA Express Client. The HPE DMA Express flows use the HPE DMA Express Client to initiate tasks and configuration changes on the managed server. As depicted in "Anatomy of an HPE DMA flow", the HPE DMA Express flows implement the orchestration layer and the HPE DMA Express Client implements the action layer.

Both layers can be used to customize HPE DMA Express flows content or to create additional content. Please take special care when customizing the HPE DMA Express Client:

- HPE recommends using a repository and a version control system to properly maintain versions.
- HP recommends only adding new elements into the prescribed directories. Overwriting existing elements or placing new elements into the wrong folders may cause unwanted side effects.

Customizing HPE DMA Express flows

You can customize HPE DMA Express flows just as you can with other HP OO flows. You can also create new HP OO flows using HPE DMA Express flows as subflows and create new HPE DMA Express flows by leveraging the HPE DMA Express Client.

Before creating or customizing HPE DMA Express flows, please review the delivered flows and the steps in the HPE DMA Express Client. The HPE DMA Express flows and the steps (python scripts) in the HPE DMA Express Client closely depend on each other and should be treated as a single unit.

> **Note:** HPE does not recommend changing the original HPE DMA Express flows shipped with the DMA Express Database Content Pack. Upon upgrade, all of the originally-delivered HPE DMA Express flows will be overwritten while custom flows will be preserved. Instead, a best practice is to make copies of the HPE DMA Express flows and then customize the copies.

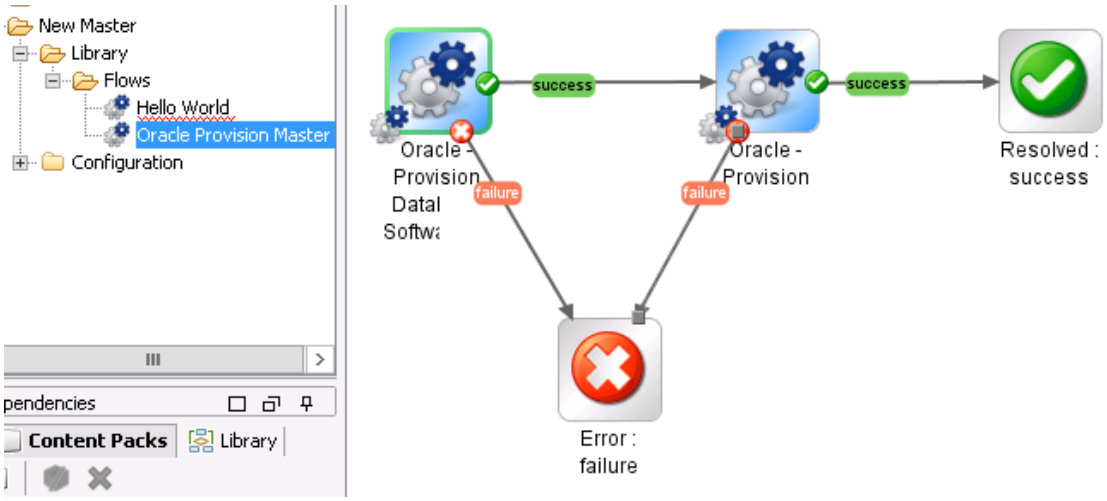
For details on using HP OO Studio to create and customize HP OO flows, see "Authoring a Flow - Basics" and "Advanced Authoring" in the *HP Operations Orchestration Studio Authoring Guide*, available at https://softwaresupport.hp.com/

Creating a Master flow

You can create a Master flow with HPE DMA Express flows in the same way you would any Master flow in HP OO Studio:

1. Create a new Master flow.
2. Simply drag and drop one or more HPE DMA Express flows into the new HP OO Master flow.
3. Map success and failure in the same way as any other flow developed in HP OO.

For example:



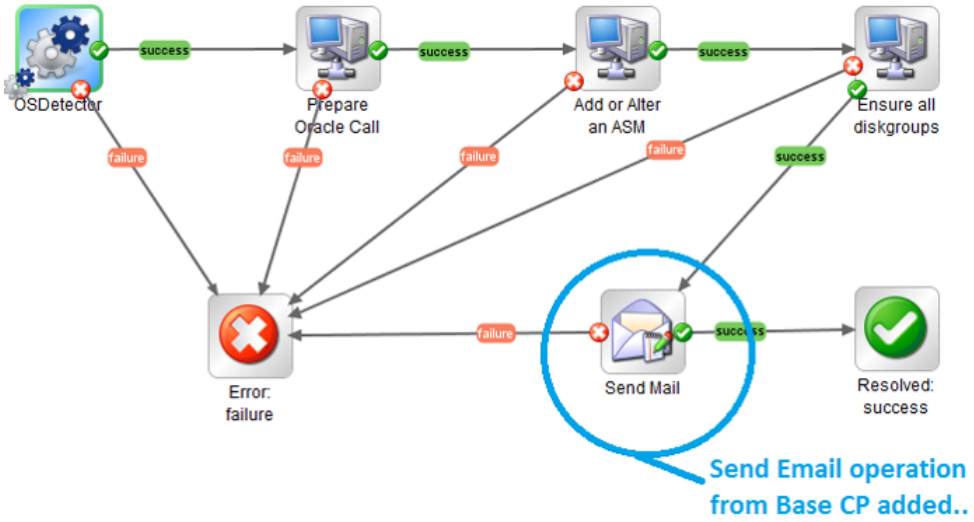
For additional information, see "Creating a Subflow Within a Flow" in the *HP Operations Orchestration Studio Authoring Guide*, available at https://softwaresupport.hp.com/

Adding a step to an HPE DMA Express flow

You can add a step—either an existing or HP OO step—to an HPE DMA Express flow in the same way you would any flow in HP OO Studio:

1. Make a copy of the desired HPE DMA Express flow.
2. Add the desired operations or subflows as steps to the new flow.
3. Set the necessary transitions.
4. Define or provide any new inputs.

For example:



For additional information, see "Creating a Flow - Step-by-Step" in the *HP Operations Orchestration Studio Authoring Guide*, available at https://softwaresupport.hp.com/

Customizing the HPE DMA Express Client

The HPE DMA Express Client (HPE DMA Runtime) consists of steps and functions as well as a complete Jython/Java runtime environment. You can easily add custom steps and functions.

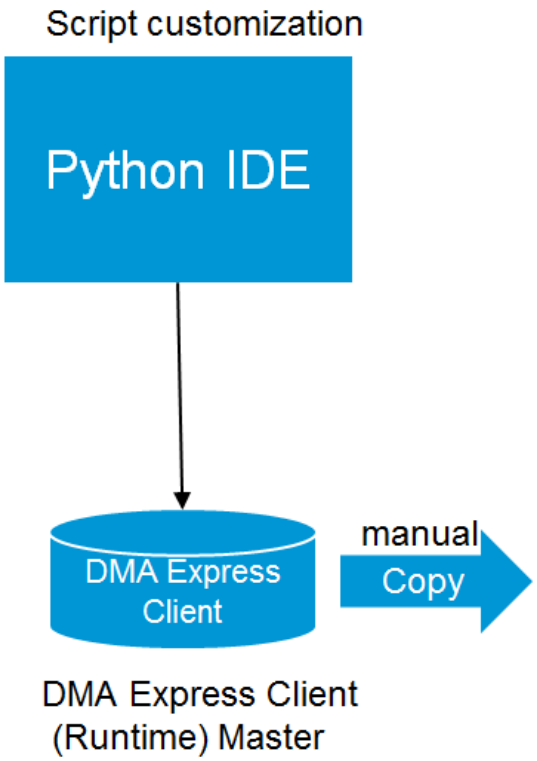
HPE recommends that you use a Python IDE to develop, customize, and test the action scripts—steps and functions—included in the HPE DMA Express Client compressed files. You must extract the specific action scripts from the HPE DMA Express Client compressed files, change the script as needed, and then repackage the HPE DMA Express Client compressed files. Afterwards, you must redistribute the HPE DMA Express Client to all target servers. To facilitate the customization of the HPE DMA Express Client, HPE recommends using a repository and a version control system to properly maintain versions.

> **Note:** HPE does **not** recommend modifying the steps and functions shipped with the DMA Express Database Content Pack and DMA Express Middleware Content Pack. Each step and function might be used by several HPE DMA Express flows and a change might introduce side effects that impact other HPE DMA Express flows. Also, future upgrades will overwrite all standard steps and functions while custom steps and functions will be preserved. Instead, HPE recommends making copies of the steps and functions and then customizing the copies.

For details, refer to the documentation for the specific Python IDE that you are using.

Adding a custom script to the HPE DMA Express Client

You can customize HPE DMA Express flows by adding or modifying steps that execute jython scripts on managed targets.



HPE DMA Express Client changes:

1. Use your Python IDE to create your own custom script
2. Add the script to the steps folder in the HPE DMA Express Client
3. Redistribute the script to the managed targets

HPE DMA Express flow changes:

1. Use HP OO Studio to create an HP OO operation that executes the script—add a Remote Command operation in the same way as you would add any other step
2. Define inputs to execute (see "Defining inputs to execute custom jython scripts")
3. Add step results for output parameters (see "Using script output values as step results")

Defining inputs to execute custom jython scripts

You can customize the input values that describe how HPE DMA Express flows are structured in HP OO.

Note: When making customizations, use camel case when entering your parameters.

Using HP OO Studio:

1. Go to Remote Command, which is located in the Base (1.4.3) Content Pack:

2. Click the Inputs tab
3. Set the following inputs:

Input	Example 'From' value	Description
command	`${jythonPath} ${stepsPath} RemoteCommandExample.py`	Concatenate: ◦ Jython path: `/opt/hp/dma/ooclient/bin/jython.sh` ◦ Step path: `/opt/hp/dma/ooclient/steps/` ◦ Script name
arguments	`'OracleAccount=oracle;OracleBase=/opt/app/oracle; OracleHome=/opt/app/oracle/product/11.2.0/dbhome_1; OracleSoftware =p13390677_112040_Linux-x86-64_1of7.zip, p13390677_112040_Linux-x86-64_2of7.zip; ServerTarget=dmatarget37.usa.hp.com;'`	Set the value as camelCase strings Parameters can be assigned from step context using `${ParamName}`
host	`${serverTarget}`	Hostname of target server
password	`${serverTargetPassword}`	Password to be used on target server
username	`${serverTargetUsername}`	Username to be used on target server
protocol	`${protocol}`	OS-specific protocol to run command For example: `ssh/wmi`

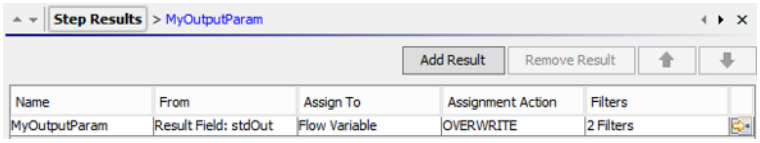
Input	Example 'From' value	Description
`timeout`	`${StandardTimeout}`	Time allowed before the step will exit as failure (in milliseconds)

Using script output values as step results

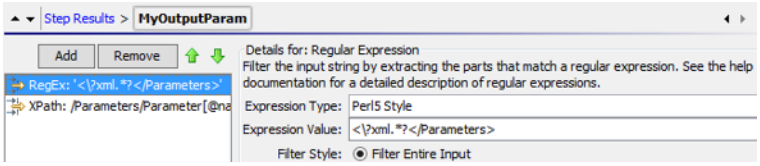
You can add the standard outputs required by HPE DMA Express flows.

Using HP OO Studio:

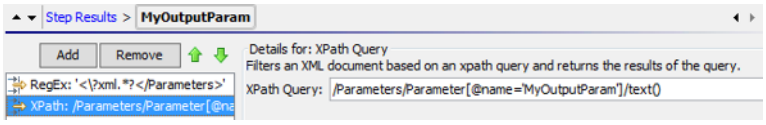
1. Go to Step Results > Add Result. Define an output parameter name. Set the 'From" field to `Result Field: stdOut`. For example:



2. For this new parameter, click the arrow ( ) in the bottom-right corner.
3. Add two filters to parse xml output from the script.
   a. `RegEx` filter, for example:



   b. `XPath` filter, for example:



Accessing step inputs and writing step outputs

When you write your own python scripts for the HPE DMA Express Client, you will need to reference the inputs provided in the Remote Command arguments string and write values to `stdOut` to be used as step results and output parameters.

There are many ways to handle the inputs and outputs in your customized scripts. The following examples are based on how inputs and outputs are implemented in scripts.

1. Create code to reference the inputs that are provided in the Remote Command arguments string, for example:

```
io_params = parametertools.parse_dma_params(sys.argv[1])

#### Parameter Inputs ####

ORACLE_HOME = io_params['Oracle Home'].strip()
ORACLE_BASE = io_params['Oracle Base'].strip()
ORACLE_ACCOUNT = io_params['Oracle Account'].strip()
```

2. Create code to write values—step results and/or output parameters— to `stdOut`, for example:

```
parametertools.print_header({
   'Oracle Home': ORACLE_HOME,
   'Oracle Base': ORACLE_BASE,
   'Oracle Account': ORACLE_ACCOUNT
})
```

3. Copy the script to the steps directory.
4. Repackage and redistribute the Runtime to the managed targets.

Example of an operation using a custom script

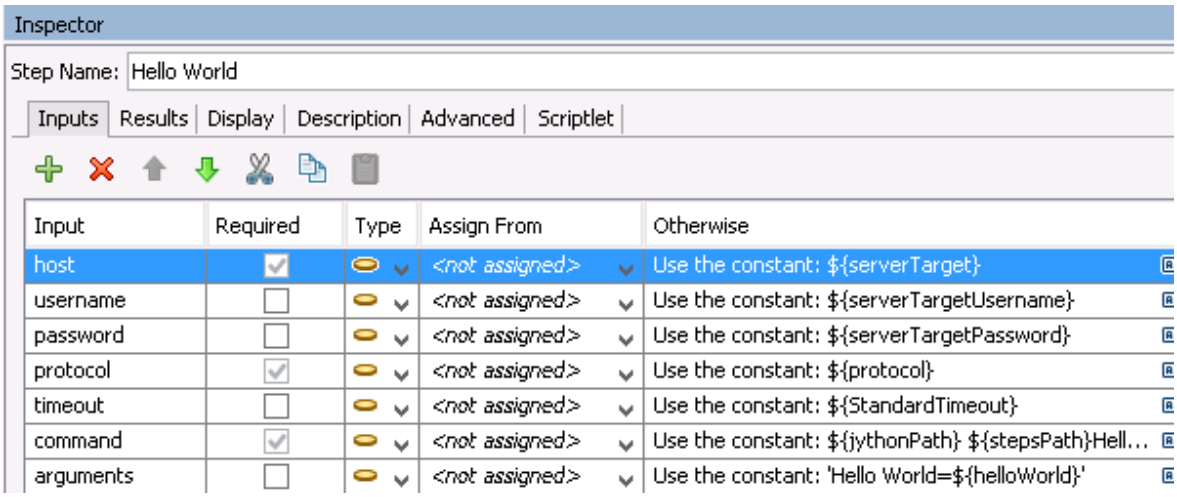
Here is an example of the 'Hello World' operation using a script.

Hello World script

```
## World Example Script ###
import sys

sys.path.append('/opt/hp/dma/ooclient/functions')

import parametertools
import steplog
import os

outputs = {}

io_params = parametertools.parse_dma_params_for_oo(sys.argv[1])
helloworld = io_params['Hello World']
```

```
def main():
 steplog.info(helloworld)

outputs['Hello World'] = helloworld
 parametertools.print_header(outputs)

#### Call to main() ####
if __name__ == '__main__':
 try:

main()
 except StandardError, e:

steplog.handle_exception(e)
```

Hello World operation input values



Input	Example 'From' value
host	`${Server Target}`
username	`${Server Target Username}`
password	`${Server Target Password}`
protocol	`${protocol}`
timeout	`${StandardTimeout}`
command	`${jythonPath} ${stepsPath}HelloWorld.py`
arguments	`'Hello World=${helloWorld}'`

Setting Debug Level

You can specify debugLevel input parameter in any workflow to display debug messages on the console. The console displays the debug messages with a [DEBUG] tag. The INFO_DEBUG_LEVEL, debug value of 3, is set as default. You can modify the default debugLevel to 4 or 5 to turn on additional level of debug messages. The debugLevel value of 4 or 5 provides more debug information, helping you troubleshoot common issues. The following debug levels can be specified:

Debug Level	Debug Value	Description
ERROR_DEBUG_LEVEL	1	Displays all the error messages.
WARNING_DEBUG_LEVEL	2	Displays all the warning messages, as well as error messages,
SUCCESS_DEBUG_LEVEL	3	Displays all the success messages, as well as warning and error messages.
INFO_DEBUG_LEVEL	3	Displays all the information messages, as well as warning and error messages.
NOTICE_DEBUG_LEVEL	3	Displays all the notice messages, as well as warning and error messages.
DEBUG_DEBUG_LEVEL	4	Displays all the debug messages, as well as notice, information, success, warning, and error messages.
VERBOSE_DEBUG_LEVEL	5	Displays all the verbose messages, as well as debug, notice, information, success, warning, and error messages.

Configuring and running an HPE DMA Express Flow - Example

This section describes how to configure and run a typical DMA Express flow. For the purposes of this example, we will be configuring and running the Oracle Provision Database Software v2 flow.

Before starting, you must have HP OO Studio installed locally. Also, you should navigate to the folder where the HPE DMA Express Content Packs are located and identify the flows and relevant Content Packs that you need to use. For additional details see "Importing DMA Express Content Packs into HP OO Studio" on page 19.

> **Important:** You must first have set up and logged in to the System Account. For details, see "Setting up the System Account" in "Setting up System Properties for HPE DMA Express flows" on page 20.

HPE DMA Express Edition Content Packs and Flows

Content Pack File Name	Available Platforms and Flows
`DMA Express Database 10.50.000.000.jar`	***Oracle Flows*** • Install or Configure ASMLib • Oracle - Provision or Upgrade Grid Infrastructure • Oracle - Provision Database • Oracle - Provision Pluggable Database • Oracle - Drop Database • Oracle - Start or Stop Database • Oracle - Provision Database Software • Oracle - Provision Client • Oracle - SQL Release • Orace - SQL Release ***My SQL Flows*** • MySQL - Create Database • MySQL - Drop Database • MySQL - Install Instance • MySQL - Start or Stop ***MS SQL Flows***

HPE DMA Express Edition Content Packs and Flows, continued

Content Pack File Name	Available Platforms and Flows
	• DB Release for SQL Server • MS SQL - Create Database • MS SQL - Drop Database • MS SQL - Install Standalone SQL Instance • MS SQL - Start or Stop Instance
DMA Express Middleware 10.50.000.000.jar	***JBoss*** • JBoss - Code Release ***WebSphere*** • WebSphere - Code Release ***WebLogic*** • WebLogic - Code Release
DMA Express Utilities 10.50.000.000.jar	***Utilities*** • DMA CleanUp Code Base • DMA CleanUp JRE • DMA CleanUp Target • DMA CleanUp Unix Files • DMA CleanUp Windows Files • DMA Copy Linux Code • DMA Copy Linux JRE • DMA Copy Windows Code • DMA Copy Windows JRE • DMA Install Client • DMA Install Linux Client • DMA Install Windows Client • DMA OSDetector • DMA Remote Copy • DMA Remote Linux Copy • DMA Remote Windows Copy

For detailed descriptions of each DMA Express flow, see "HPE DMA Express flows" on page 45.

To Configure and Run and HPE DMA Express Flows in HP OO Studio:

1. In OO Studio, import the Content Pack containing the flow you need to configure and run. Here, we are importing the DMA Express Database 10.50 Content Pack, which is named `DMA Express Database 10.50.jar`, and contains the Oracle - Provision Database Software v2 flow.

   After the Content Pack is successfully imported, it appears in the list of Content Packs:

2. Locate and select the flow you wish to set up and run. Because the flows are read-only, you must copy and paste the flow into a local directory. Here, we have created a new project, MyProject, in OO Studio and placed the flow there.

3. Select the flow and click the green Run icon . A dialog box with parameter fields appears. Enter the required parameter values:

Parameter Values for the Oracle - Provision Database Software v2 Flow

Parameter Name	Value
serverTarget	<hostname>
serverTargetUsername	root
serverTargetPassword	******** The server target password
cleanJRE	True, Yes, or False Case sensitive–any value other than True or Yes is treated as False
cleanCodeBase	True, Yes, or False Case sensitive–any value other than True or Yes is treated as False
downloadSourceHost	<hostname> The name of the file server repository hosting all the software (including DMA Express Client binaries, Oracle software binaries, etc., that will be downloaded)
downloadSourcePath	/oo/software The path on the file server where the binaries are located
oracleAccount	oracle
oracleBase	/opt/app/oracle
oracleHome	/opt/app/oracle/product/11.2.0/dbhome_1
oracleSoftware	p13390677_112040_Linux-x86-64_1of7.zip, p13390677_112040_Linux-x86-64_2of7.zip

Parameter Values for the Oracle - Provision Database Software v2 Flow, continued

Parameter Name	Value
server.BecomeRoutine	su

4. Click **Continue**. As the flow runs, you can view its progress in the Run Tree and Transition History panes of OO Studio. When the flow completes, OO Studio displays a message indicating flow completion.

Reference Material

The following reference material is available in this section:

HPE DMA Express flows

The following HPE DMA Express flows are included in the `DMA Express Database 10.50.000.000.jar`:

Product	HPE DMA Express flow	Description
Oracle 11g R2 and 12c	Oracle - Provision Client V2	Silently installs the Oracle Client on the target system.
	Oracle - Provision Database Software V2	Installs Oracle Database software on a server in the location specified by the Oracle Home parameter.
	Oracle - Provision Database V2	Provisions an Oracle database in an Oracle Standalone environment.
	Oracle - Provision or Upgrade Grid Infrastructure	Installs Oracle Grid Infrastructure for a Standalone Server or for a Clustered environment.
	Oracle - Provision Pluggable Database	Provisions a pluggable database (PDB) within an Oracle Container Database (CDB).
	Oracle - Start or Stop Database	Starts or stops the Oracle database Instance on an Oracle Standalone or within a Grid Standalone environment. The specified Oracle database Instance must already be provisioned and not running.
	Oracle - SQL Release	Deploys SQL scripts onto a single or multiple target databases.
	Oracle - Drop Database	Deletes the Oracle database Instance on an Oracle Standalone or Grid Standalone environment.
MS SQL Server Database 2012 and 2014	MS SQL - Install Standalone SQL Instance	Installs a new standalone instance of SQL Server 2008/2008 R2/2012/2014 on an already existing Windows 2008/2008 R2/2012/2012 R2 server. For additional information on using this HPE DMA Express flow, see the following document: [2] • *Standardize Microsoft SQL Server Standalone Provisioning Using*

Product	HPE DMA Express flow	Description
	MS SQL - Start or Stop Instance	Starts or stops the MS SQL database instance.
	MS SQL - Drop Database	Drops the database specified by the deployment target.
	MS SQL - Create Database	Creates a new database on the target instance. The only required parameter is “Database Name”, but there are several optional parameters to customize the process.
	DB Release for SQL Server	Checks a list of T-SQL script files for disallowed commands, then executes the files on the target database (if they pass all required tests). If the files do not exist on the local disk, they will be downloaded from the core.
My SQL 5.6, Enterprise Edition	MySQL - Create Database	Creates a MySQL database and adds it to the HPE DMA Express environment.
	MySQL - Drop Database	Drops a MySQL database and to remove it from the environment.
	MySQL - Install Instance	Installs a new standalone instance on a MySQL server.
	MySQL - Start or Stop	Starts or stops the MySQL database instance.

The following HPE DMA Express flows are included in the `DMA Express Middleware 10.50.000.000.jar`:

Product	HPE DMA Express flow	Description
IBM WebSphere 8 or WebSphere 8.5.x.	WebSphere - Code Release	Automates application deployments in IBM WebSphere.
WebLogic Server 11g and 12C	WebLogic - Code Release	Automates application deployments in the Oracle WebLogic Server.
JBoss Application Server	JBoss - Code Release	Automates the deployment of applications in the JBoss Application Server. This flow requires that the JBoss Application Server be installed beforehand.

The following HPE DMA Express flows are included in the `DMA Express Utilities 10.50.000.000.jar`:

HPE DMA Express flow	Utility Description
DMA CleanUp Code Base	Deletes the code base in the Windows target box.
DMA CleanUP JRE	Deletes the DMA Express Client environment in the Windows target box. Also deletes the jre1.7, bin, lib, and jython folder. In cases where one of the folders does not exist, it goes ahead and deletes the others.
DMA CleanUp Target	Deletes the step code and the DMA Express Client environment in the DMA target box. **Note:** This flow will delete the DMA Express Client and code base separately. These subflows are independent of each other. If one of the files is not present, then it will go ahead and delete others. Deleting DMA Express Client also deletes the jre1.7, bin, lib, and jython folder. Deleting the codebase also deletes the steps and functions folders.
DMA CleanUp Unix Files	Deletes the step code and the runtime environment in the Unix target box.
DMA CleanUp Windows Files	Deletes the step code and the runtime environment in the Windows target box.
DMA Copy Linux Code	Copies the steps and functions from the Linux file server to the Linux target server. You cannot run this OO subflow independently because it is a sub-flow of the DMA Install Linux Client flow.
DMA Copy Linux JRE	Copies the JRE and jython related files from the Linux file server to the Linux target server. You cannot run this OO subflow independently because it is a sub-flow of the DMA Install Windows Client flow.
DMA Copy Windows Code	Copies the steps and functions from the Linux file server to the Windows target server.You cannot run this OO subflow independently because it is a sub-flow of the DMA Install Windows Client flow.
DMA Copy Windows JRE	Copies the JRE and jython-related files from the Linux file server to the Windows target server. You cannot run this OO subflow independently because it is a sub-flow of the DMA Install Windows Client flow.
DMA Remote Copy	Installs the OO Runtime packs onto the target machine by copying

HPE DMA Express flow	Utility Description
	them from a source host (file server) and extracting them onto the target. The OO Runtime packs should be present in the source host/file server before executing this flow.
DMA Install Client	Installs the DMA Client (for Windows and Linux) onto the target servers by copying the binaries from a file server (where the binaries are located in a shared folder) onto the target machine. Requirements: • The OO installer should be version 10.2x • The file server where the binary will be should be a Linux machine • The following files must be present: ◦ dma_oo* client files • The machine on which OO is installed should have the scp utility installed and accessible (Added in the PATH environment). • The target server user credentials should have the required permissions to copy the binary.
DMA Install Linux Client	Installs the DMA Express Client binaries on the Linux target server. The following files must be present in the file server (Linux) before you run any flows: • dma_oo_client_bin_linux.zip • dma_oo_client_bin_linux.zip.MD5 • dma_oo_client_code_linux.zip • dma_oo_client_code_linux.zip .MD5
DMA Install Windows Client	Installs the DMA Express Client binaries on the Windows target server. The following files must be present in the file server (Windows) before you run any flows: • dma_oo_client_bin_windows.zip • dma_oo_client_bin_windows.zip.MD5 • dma_oo_client_code_windows.zip • dma_oo_client_code_windows.zip .MD5
DMA OS Detector	Detects the OS running on the file server.
DMA Remote Copy	Installs the OO Runtime packs onto the target machine by copying

HPE DMA Express flow	Utility Description
	them from a source host (file server) and extracting them onto the target.
DMA Remote Linux Copy	This utility installs the OO Runtime packs onto the Linux target machine by copying them from a source host (file server)–preferably Windows machine–and extracting them onto the target.
DMA Remote Windows Copy	This utility installs the OO Runtime packs onto the Windows target machine by copying them from a source host (file server)–preferably Windows machine–and extracting them onto the target.

Additional documentation

The following documents provide additional information and are available on the HP Software Support web site: https://softwaresupport.hp.com/. You need your HP Passport credentials to access them.

Documents for HP Operations Orchestration :

- *Installation Guide*
- *Studio Authoring Guide*
- *Central User Guide*
- *Concepts Guide*

Documentation for the HPE Database and Middleware Automation workflows:

- *HPE DMA Workflows for Oracle*

Comparison of HPE DMA Express and HP OO uses

HPE Database and Middleware Automation provides two ways to execute its workflows (flows) for database and middleware lifecycle management, either within the platform or the HP Operations Orchestration (HP OO) platform. The following chart compares the features of each:

Traditional DMA Features	DMA Express Features
Provides all lifecycle management functionality. Used by administration experts such as DBAs and Middleware administrators.	Provides database and middleware lifecycle management for common self-service use cases for the IT generalist, such as App developers, QA teams, etc.
Requires installation and configuration of an HP Server Automation and infrastructure.	Easier installation and faster time-to-value. Requires implementation only of an HP OO infrastructure. No or SA infrastructure is required.
Uses the SA platform and the platform and workflow engine.	Runs HPE DMA Express flows directly in HP OO Studio or HP OO Central.
Implements centralized database and middleware management through the console.	Enables implementing a self-service cloud running standardized and pre-approved lifecycle management flows. HP Cloud Service Automation (HP CSA) is optional, but recommended for implementing catalog-based self-service.
Provides large-scale estate management of heterogeneous platform and versions.	Provides single environment, self-service management of homogenous platforms and versions.
Delivered as Workflows in Solution Packs.	Delivered as HPE DMA Express flows in the DMA Express Master zip file.
workflows and related step scripting code runs natively on each managed target.	workflow and step scripting code is wrapped in an HP OO flow construct and runs natively on each managed target. To simplify upgrading to traditional DMA, the shipped DMA Express script code is identical to its traditional DMA script counterparts.

Send documentation feedback

If you have comments about this document, you can contact the documentation team by email. If an email client is configured on this system, click the link above and an email window opens with the following information in the subject line:

Feedback on User Guide (Database and Middleware Automation 10.50)

Just add your feedback to the email and click send.

If no email client is available, copy the information above to a new message in a web mail client, and send your feedback to hpe_dma_docs@hpe.com.

We appreciate your feedback!