

HP Operations Orchestration

For the Windows and Linux

Software Version: 10.10

Installation Guide

Document Release Date: May 2014

Software Release Date: May 2014



Legal Notices

Warranty

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

The information contained herein is subject to change without notice.

Restricted Rights Legend

Confidential computer software. Valid license from HP required for possession, use or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

Copyright Notice

© Copyright 2005-2014 Hewlett-Packard Development Company, L.P.

Trademark Notices

Adobe™ is a trademark of Adobe Systems Incorporated.

This product includes an interface of the 'zlib' general purpose compression library, which is Copyright © 1995-2002 Jean-loup Gailly and Mark Adler.

AMD and the AMD Arrow symbol are trademarks of Advanced Micro Devices, Inc.

Google™ and Google Maps™ are trademarks of Google Inc.

Intel®, Itanium®, Pentium®, and Intel® Xeon® are trademarks of Intel Corporation in the U.S. and other countries.

Java is a registered trademark of Oracle and/or its affiliates.

Microsoft®, Windows®, Windows NT®, Windows® XP, and Windows Vista® are U.S. registered trademarks of Microsoft Corporation.

Oracle is a registered trademark of Oracle Corporation and/or its affiliates.

UNIX® is a registered trademark of The Open Group.

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>

This site requires that you register for an HP Passport and sign in. To register for an HP Passport ID, go to: <http://h20229.www2.hp.com/passport-registration.html>

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.

Support

Visit the HP Software Support Online web site at: <http://www.hp.com/go/hpssoftwaresupport>

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

HP Software Solutions Now accesses the HPSW Solution and Integration Portal Web site. This site enables you to explore HP Product Solutions to meet your business needs, includes a full list of Integrations between HP Products, as well as a listing of ITIL Processes. The URL for this Web site is <http://h20230.www2.hp.com/sc/solutions/index.jsp>

Contents

Contents	4
Introduction	6
Installing HP Operations Orchestration	9
Installing HP OO Central Using the Installation Wizard (Windows)	9
Installing HP OO Central Using the Installation Wizard (Linux)	21
Installing an HP OO RAS Server Using the Installation Wizard	32
Installing HP OO Studio Using the Installation Wizard	34
Installing HP OO Silently	39
Installing a Load Balancer	40
Starting HP OO	41
Starting HP OO on Windows	41
Starting HP OO on Linux	41
Backing Up the Central Security Files	42
Uninstalling HP Operations Orchestration	42
Uninstalling HP OO on Windows	43
Uninstalling HP OO on Linux	44
Uninstalling HP OO Silently	44
System Requirements	46
Software Requirements	46
Software Requirements for Central and RAS	46
Software Requirements for the Database Server	47
Software Requirements for Studio	47
Hardware Requirements	48
Hardware Requirements for HP OO Central and Database Servers	48
Hardware Requirements for RAS Installations	49
Hardware Requirements for the Central Client	49
Hardware Requirements for HP OO Studio Installed on its Own Machine	49
Virtual Systems	51
Cloud Deployments	51

Appendix	52
Changing the Database Settings	52
Using JRE From OpenJDK 7	52

Introduction

This document describes how to install and configure HP Operations Orchestration version 10.10 using the Installation and Configuration wizard. It also includes instructions for silent installations.

This document is relevant for customers who are:

- Installing a new installation of HP OO, on a machine where it was not previously installed.
- Installing HP OO after having installed the HP OO Community Edition.
- Upgrading from HP OO 9.x. For more information about upgrading from HP OO 9.x, see *Upgrading to HP OO 10.x from HP OO 9.x*.

This document is not relevant for customers who are upgrading from an earlier version of HP OO 10.x. See *Upgrading to a New Version of HP OO 10.x*.

Prerequisites and Installation Notes

- Before installing Central, Studio, or RAS, check with your system administrator that you have administrator permission on the system where you are installing HP OO. In addition, make sure that the database has the appropriate permissions set. See the *Release Notes* for details on exceptions and special cases.
- Before installing Studio, download and install Microsoft Visual C++ 2008 SP1 redistributable package (x86), from:

<http://www.microsoft.com/en-us/download/details.aspx?id=29>

Note: You need to download and install the version for the x86 platform, regardless of your Windows version (for example, if it is Windows x64).

- The upgrade procedure does not modify the HP OO 9.x database and file system. HP OO version 10.10 or later requires a new schema during installation.
- In a clustered environment, you need to synchronize the computers' clock times. The clocks must be synchronized with each other, to the second. It is recommended to use NTP sync to regularly maintain an accurate system time between all nodes (Central and Rases).
- Before installing or upgrading the software, make sure to back up your system. Consult with your system administrator.
- If you want to install HP OO on a secured environment, see the *HP OO System Configuration and Hardening Guide*.

- **LWSSO:** If you choose to upgrade the LWSSO settings from HP OO 9.x, these LWSSO settings will be migrated, but LWSSO will be disabled in HP OO 10.10 (even if it was previously enabled in HP OO 9.x).
- See the *Concepts Guide* for a detailed overview of deploying a RAS behind a firewall.

SQL Scripts

If, for security reasons, the HP OO database user lacks the ability to create objects such as tables, indexes, sequences, and so on, you can use SQL scripts from the ISO image to manually create the database objects using an elevated privileges database connection.

Before using these scripts, you need to have the database or schema already created. The scripts to create the database or schema can be found in the "Manually Creating an HP OO Database" sections of the *HP OO Database Guide* document.

The SQL scripts are located at `\docs\sql` on the ISO image. They include:

- `mssql.sql`
- `mysql.sql`
- `oracle.sql`
- `postgres.sql`

Database-specific Adaptations

This section describes several key database-specific adaptations and requirements. For detailed instructions, see the *HP OO Database Guide*.

- **MySQL:** If you are deploying HP OO using a MySQL database, you need to configure the MySQL server configuration file **my.ini** (Windows) or **my.cnf** (Linux) with the following options:

```
transaction-isolation = READ-COMMITTED
default-storage-engine = INNODB
character-set-server = utf8
max_allowed_packet = 250M
innodb_log_file_size = 256M
max_connections = 1000
```

- **Postgres:** If you are deploying HP OO using a Postgres database, you need to configure the Postgres server configuration file **postgresql.conf** with the following options:

```
default_transaction_isolation = 'read committed'
autovacuum = on
```

```
track_counts = on  
max_connections = 1000
```

- **Oracle:**

If you are deploying HP OO using an Oracle database, you need to configure the Oracle server PROCESSES and OPEN_CURSORS to guarantee up to 1000 concurrent connections for HP OO and up to 900 open cursors per session.

- **SQL Server**

If you are deploying HP OO using an SQL Server database, you need to set the following options for the database:

ALLOW_SNAPSHOT_ISOLATION	ON
READ_COMMITTED_SNAPSHOT	ON
AUTO_CREATE_STATISTICS	ON
AUTO_SHRINK	OFF

Installing HP Operations Orchestration

This section describes how to install HP Operations Orchestration version 10.10. See ["System Requirements" on page 46](#) to verify that your system meets the minimum system requirements.

Make sure that the person running the installation has Administrator privileges, in order to avoid UAC (user access control) errors. If you are not sure about your UAC settings, you can also right-click on the installer and choose to run it as an Administrator.

Note: Special characters, except the underscore (_), cannot be used for the database name or SID field. You can enter up to 30 characters for the database name or SID.

There are different ways that you can install HP OO:

- Using the Installation Wizard – see ["Installing HP OO Central Using the Installation Wizard \(Windows\)" below](#) or ["Installing HP OO Central Using the Installation Wizard \(Linux\)" on page 21](#)
- Silently, via the command line – see ["Installing HP OO Silently" on page 39](#)

Installing HP OO Central Using the Installation Wizard (Windows)

There are three components that can be installed: Central, Studio, and RAS (optional). This topic discusses how to install Central.

For instructions about installing a RAS, see ["Installing an HP OO RAS Server Using the Installation Wizard" on page 32](#).

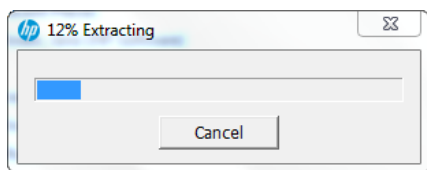
For instructions about installing Studio only, see ["Installing HP OO Studio Using the Installation Wizard" on page 34](#).

To install Central on Windows:

1. Download the ISO file from the HP SSO Portal and extract it into a local drive on your computer.

Note: To run the installer from the HP Operations Orchestration DVD, insert the DVD and copy the installation file to a local drive on your computer.

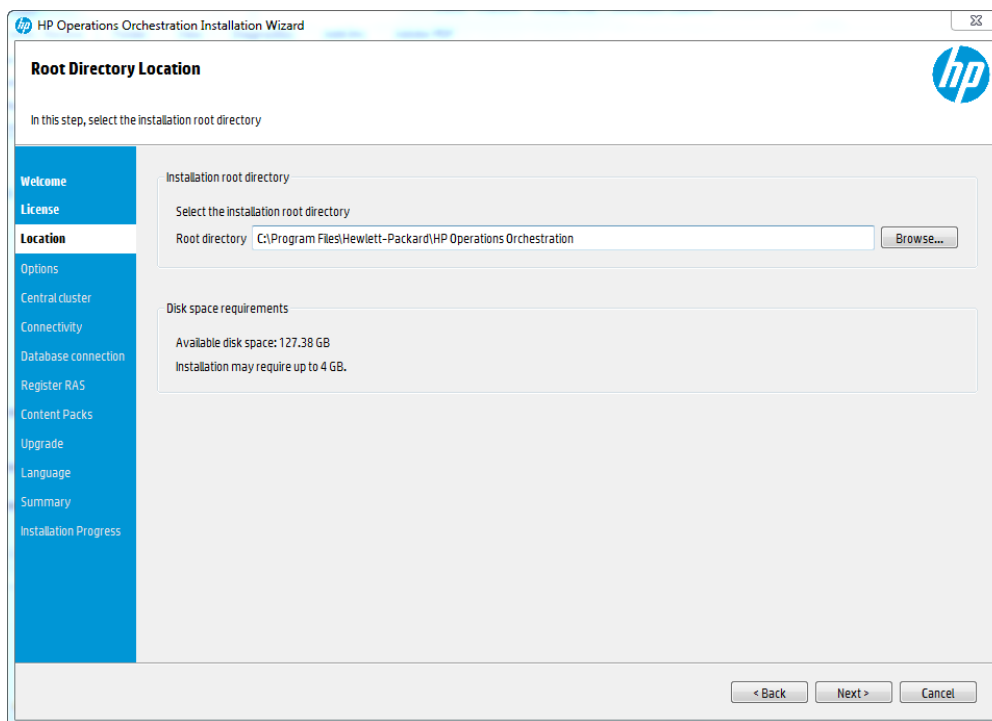
2. To start the installer, double-click the **installer-win64.exe** installation file.
3. After you start the installer, the installation package is extracted, and the **HP Operations Orchestration Installation and Configuration Wizard** automatically appears. Click **Next**.



4. In the **License** step, select **I Agree**, and then click **Next**.
5. In the **Location** step, select the location for the installation root directory, and then click **Next**.

If the directory does not exist, the directory will be created automatically. You are prompted to confirm the creation of the new location.

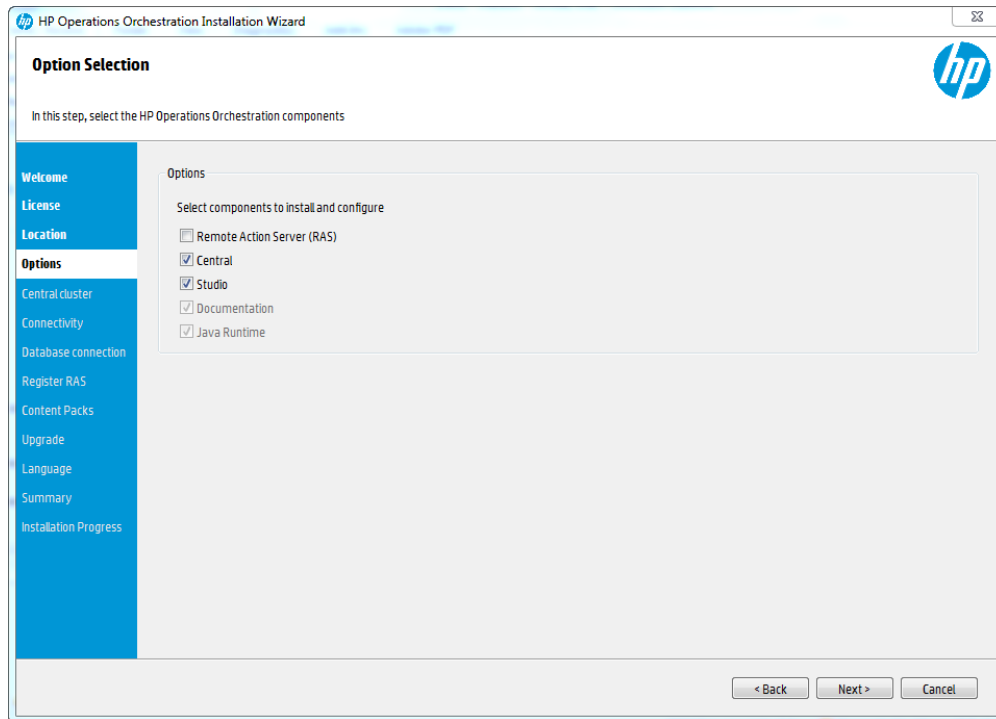
Note: The default path is C:\Program Files\Hewlett-Packard\HP Operations Orchestration. Valid characters for the installation path include English letters, digits, spaces, hyphens (-) and underscores (_).



6. In the **Options** step, select **Central**, and then click **Next**.

Note: You can install Central without setting up a RAS server. If you install a RAS Server, it is recommended that you install this on a separate server to Central. See ["Installing an HP OO RAS Server Using the Installation Wizard"](#) on page 32. See the *Architecture Guide*

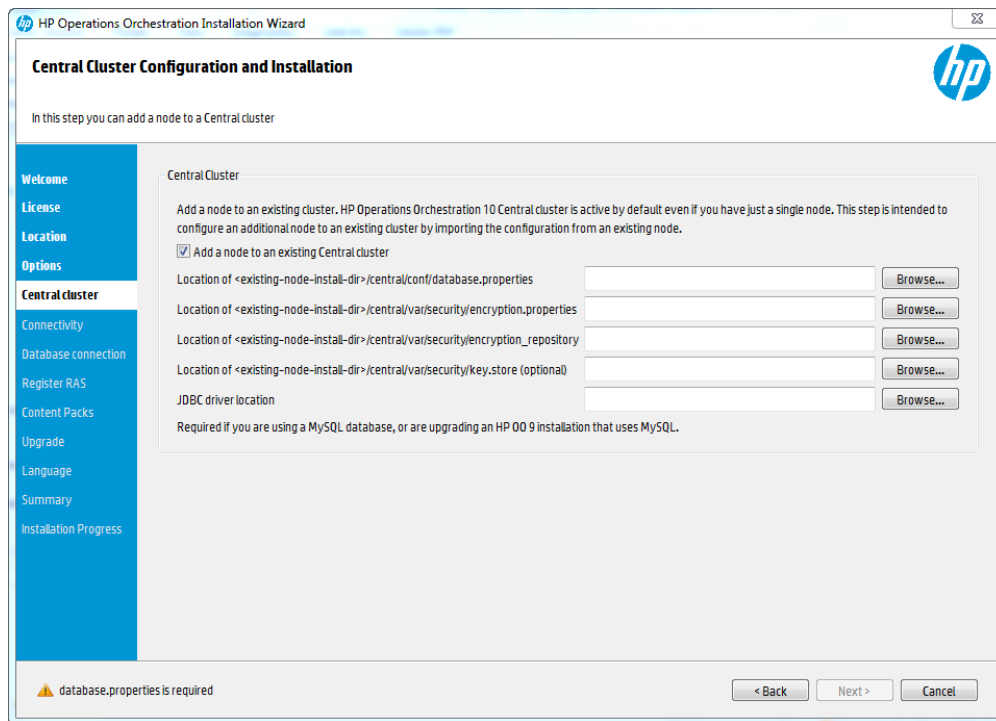
for more information.



7. In the **Central Cluster** step, you can add a node to an existing Central cluster. Clustering provides high availability and scalability to enhance throughput.

To create a cluster, run the Installation wizard the first time to create the first Central. Then run it again on the other machine to create the next node and, during this second installation, make it point to same database schema.

For more information about clustering, see "Configuring High Availability" in the *HP OO Architecture Guide*.



8. In the **Connectivity** step, configure the ports for the Central Server as required. The default values appear next to each port.
9. (Optional) In the **Connectivity** step, you can import a secure SSL certificate. Select **Provide a secure SSL certificate**, and then click **Browse** to select the secure SSL certificate.

If you leave this check box cleared, HP OO uses the default self-signed certificate that is valid for 10 years.

Central Server Connectivity
In this step, configure the Central Server ports and SSL

Connectivity
Configure the Central Server port numbers and SSL properties

HTTP 8080
HTTPS 8443

☒ Provide a secure SSL certificate (when not provided, a self-signed certificate is used)

Central SSL/TLS certificate

The SSL/TLS Certificate should be in PKCS12.
Usually this is a file with a .pfx or .p12 extension. Consult your Certificate Authority for more details

Central SSL/TLS Certificate password

Confirm Password

CA root certificate location (.crt or .cer file)

The CA root certificate of the Central SSL/TLS certificate. The CA root certificate will be imported into the RAS truststore.

☐ Do not start Central server after installation (Must be checked when you want to configure HP OO to be compliant with FIPS 140-2.)

Success

Note: Do not use a network path for the location of the certificates.

10. Enter the Central SSL/TLS certificate password, and enter it again for confirmation.
11. If you are installing both Central and RAS at the same time, the **CA root certificate location** field is available and you will need to specify the location of the CA root certificate. If you are only installing Central and not RAS, this field is grayed out.

CA root certificate location (.crt or .cer file)

The CA root certificate of the Central SSL/TLS certificate. The CA root certificate will be imported into the RAS truststore.

Click **Browse** to select the CA root certificate that will be imported into the RAS truststore.

Note: Do not use a network path for the location of the certificates.

For more information about installing HP OO on a secured environment, see the *HP OO System Configuration and Hardening Guide*.

12. If you are configuring HP OO to be compliant with FIPS 140-2, you must select the **Do not start Central server after installation** check box.

If you are installing a new Central in cluster mode and the installer version is older than the current Central, make sure to select the **Do not start Central server after installation** check box, because the installer will fail when trying to start Central.

13. Click **Test ports availability**. If the ports are available, a **Success** check mark appears. If you encounter an error, adjust the ports accordingly.
14. Click **Next** to continue.
15. In the **Database Connection** step, configure and create the database schema.

- a. The first step is to select the database vendor, and then enter the connection properties.

Note: When the **Connect to existing database/schema** option is selected, be careful not to use administrative user accounts in the **Username** and **Password** fields. Doing so will install HP OO under the administrative account.

You will need to provide a user with elevated privileges when the **Create the database/schema** option is used, in the **Admin username** and **Admin password** fields.

You can select from the following database types:

- **Oracle:** Do not use **SYS**, **SYSTEM**, or other administrative accounts credentials in the **Username** and **Password** fields.
- **Microsoft SQL Server:** Do not use **sa** or other administrative account credentials in the **Username** and **Password** fields.
- **Oracle MySQL:** Do not use the **root** credential in the **Username** and **Password** fields.
- **PostgreSQL:** Do not use the **postgres** credential in the **Username** and **Password** fields.

Note: PostgreSQL database names are case-sensitive.

- **Internal database:** This uses an H2 local database. This should not be used for production.
- **Other database:** (use to enable advanced features in supported databases). If you select **Other database**, you can only use a database type that is supported for use with HP OO. See "[System Requirements](#)" on page 46 for more information.

Note: The **Other database** option also supports any valid JDBC URL.

b. After selecting the database type, select one of the following:

- **Connect to existing database/schema:** Connect to an existing schema, user, or database. The installer verifies that the schema, user, or database exist.
- **Create the database/schema:** Enables you to create a new database or schema. Information in the **Database**, **Username** and **Password** fields will be used in order to create the new schema, user, or database for HP OO.

Confirm the password by typing it again in the **Confirm Password** field.

Provide existing database user credentials in the **Admin username** and **Admin password** fields. This elevated-privileges user must be able to connect to the database and create the new schema, user, or database for HP OO.

c. Enter the hostname or IP address and other connection details.

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

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

Note: If you are upgrading from a 9.x version that is installed on Oracle, you must enter the SID of this database in the **SID** field, and not the database name.

- d. Click **Test Connection**. If you are unable to connect to the database, you will not be able to proceed to the next steps in the wizard.

The installer checks for non-empty schemas/databases, and shows a warning message if the schema or database is not empty. If the installation fails during schema validation, the installation process is stopped.

Note: This test only verifies the connection between HP OO and the selected database, and does not verify the conditions required by the database, like the user's read/write permissions on the provided schema.

Note: For all the database vendors, if you select to create a new database, the created database uses **case-sensitive** collation as follows:

- MySQL: **utf8_bin collation** is used for the new database.
- Postgres: Case-sensitive by design. No need for specific settings. **UTF-8** encoding is supported
- Oracle: Case-sensitive by default. No need for specific settings. **UTF-8** encoding is supported.
- MS SQL: Use only the following database collations per your required language:
 - English: SQL_Latin1_General_CP1_CS_AS
 - Japanese: Japanese_Unicode_CS_AS
 - Simplified Chinese: Chinese_Simplified_Stroke_Order_100_CS_AS
 - German: SQL_Latin1_General_CP1_CS_AS
 - French: French_100_CS_AS
 - Spanish: SQL_Latin1_General_CP1_CS_AS

However, if you already have a database installed, HP OO creates the tables using the database specific collation. It is important to note that using other collations can cause characters to appear in gibberish in the user interface for localized installations. In addition, other collations are not officially supported in Microsoft SQL Server for localized installations.

If the installer is used in order to create a new SQL Server database, selecting your language in the language selection page sets the correct collation for the new database.

Using one of the above collations enables using the **varchar** datatype for textual columns instead of the **nvarchar** data type. Using the **varchar** data type is more efficient and reduces overall database size.

Selecting a specific language also means that an HP OO system that uses SQL Server is limited to the set of languages supported by that specific collation. For example, if the **SQL_Latin1_General_CP1_CS_AS** collation is used, English, German, and Spanish characters may be used, but Japanese characters may not. If **Japanese_Unicode_CS_AS** is used, French accent characters will not be presented properly. For the complete specification of each collation, see the Microsoft SQL Server documentation.

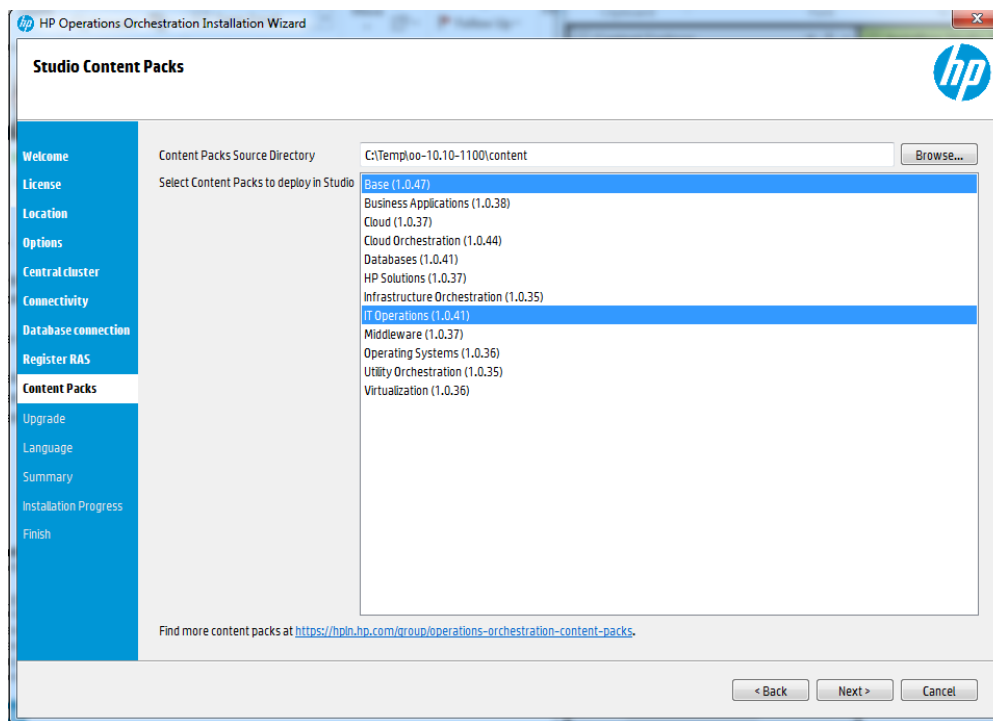
For more information about setting up the database schema, see the *HP OO Database Guide*.

16. In the **Content Packs** step, you can import an existing content pack. Browse to the location where the content pack is located, and then click **OK**.

Note: The installation folder and DVD include the released content packs.

The available content packs located in the selected folder appear in the list. Select the content pack (or packs) that you want to import, and then click **Next**.

Note: You can use the **Ctrl** or **Shift** keys for multiple selection.



Note: You can download additional and updated content packs on HPLN, using the link in the lower part of the wizard.

17. If you are upgrading from HP OO version 9.x, you can set the upgrade settings in the **Upgrade** step.

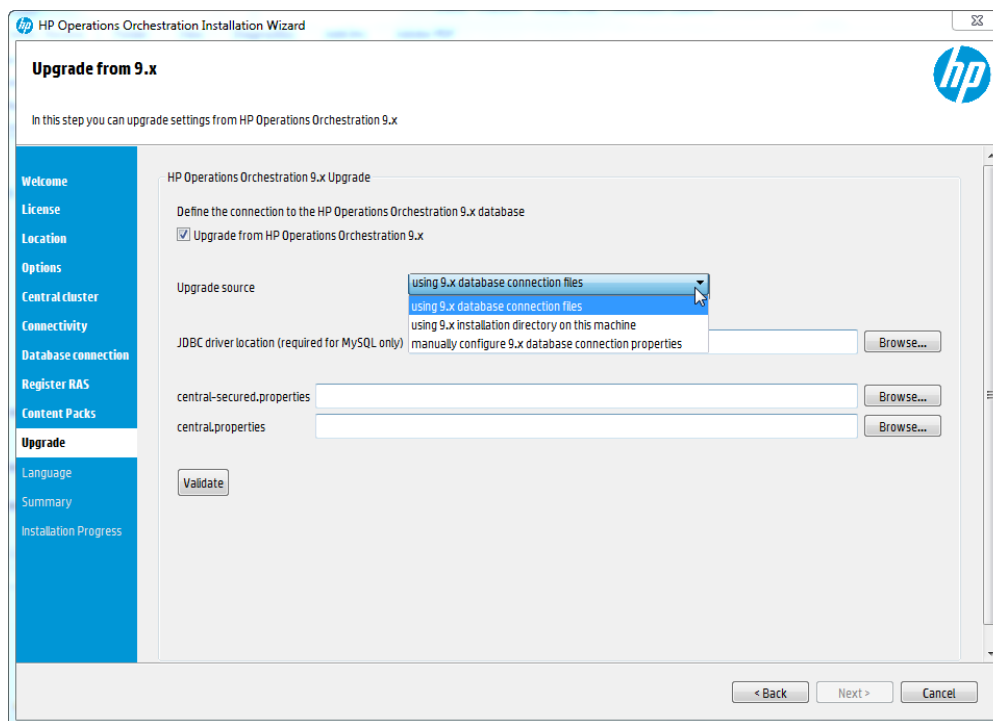
If you select **Upgrade from HP Operations Orchestration 9.x**:

- a. From the **Upgrade source** list, select how to identify the 9.x installation.
- b. Enter the locations to the required files or paths, or the 9.x database properties, depending on the case.

This extracts and loads the system configuration information, such as users, LDAP, LWSSO, security data, system properties, and system accounts.

- c. Click **Validate** to verify your 9.x version.

For more information about upgrading from HP OO 9.x, see *Upgrading to HP OO 10.x from HP OO 9.x*.

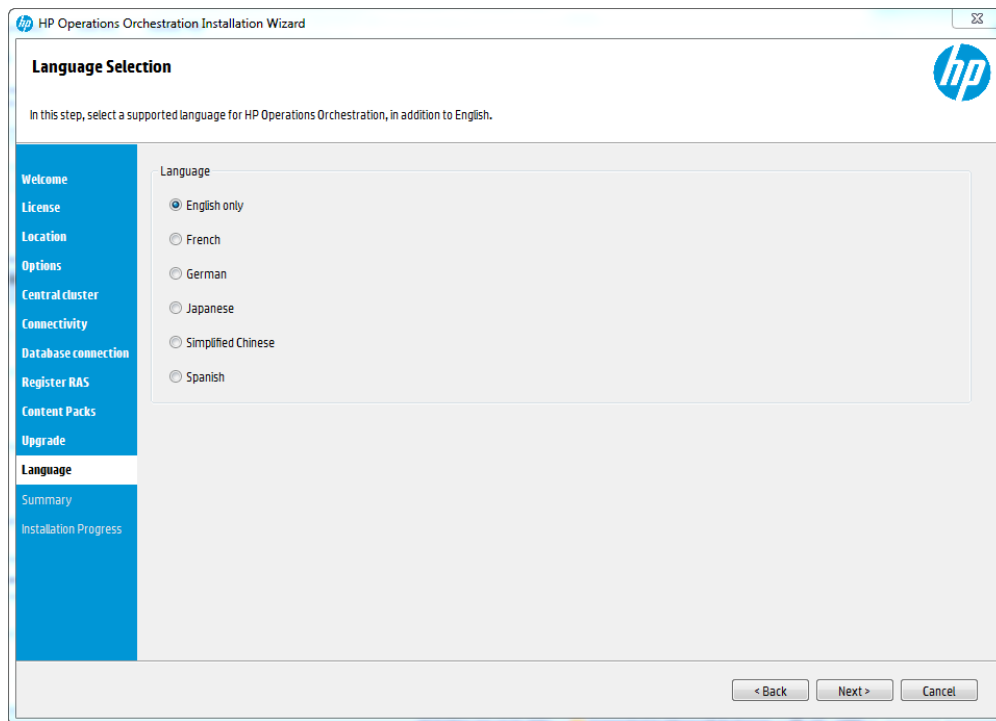


18. In the **Language** step, select a supported language for HP Operations Orchestration, in addition to English, and then click **Next**.

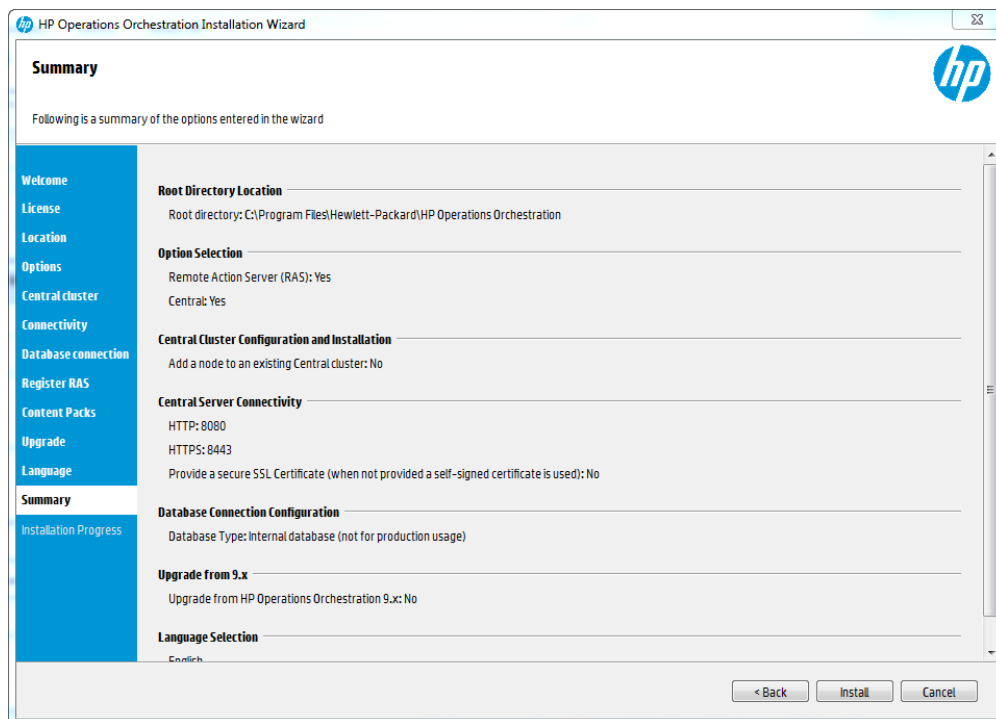
This language support will be used for:

- The MS SQL collation language, if relevant
- The **central-wrapper.conf** language for content. This language support may be required if, for example, you need to ping a server that is configured in Japanese.

Note: You can change the language support choice after installation, by editing the **central-wrapper.conf** file, located in the installation directory under **central/conf**.



19. The **Summary** page displays the installation and configuration settings that you selected and entered in the wizard. Check that the settings are correct. If you want to correct one of the items, click **Back**.



20. Click **Install**. The installation begins, and the wizard displays a check mark next to each successfully installed item on the **Progress** page. When the installation is complete, click **Next**.

Note: If there is a problem with one of the installation or configured items, the installation attempts to continue with the rest of the items regardless of that error. Check the **installer.log** file, located in **C:\HP\oo** (or selected installation folder), to check for errors.

21. (Optional) In the **Finish** page, select **Open Welcome Page** to display the HP OO Welcome page in your default web browser, in the language that was selected on the **Language** page.
22. Click **Finish** to close the Installation and Configuration wizard.

Central is installed and menu shortcuts are created on your system. See ["Starting HP OO" on page 41](#).

Installing HP OO Central Using the Installation Wizard (Linux)

There are three components that can be installed: Central, Studio, and RAS (optional). But note that Studio (the flow authoring tool) only works on Windows. So if you are installing HP OO on Linux, note that you will have to run the installer again on Windows, in order to install Studio.

For instructions about installing a RAS, see ["Installing an HP OO RAS Server Using the Installation Wizard" on page 32](#).

For instructions about installing Studio, see ["Installing HP OO Studio Using the Installation Wizard" on page 34](#).

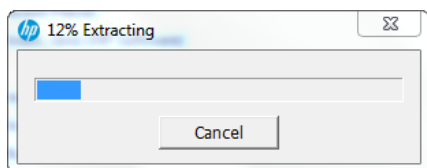
To install Central on Linux:

1. Download the ISO file from the HP SSO Portal and extract it into a local drive on your computer.

To run the installer from the HP Operations Orchestration DVD, insert the DVD, copy the installation file to a local drive on your computer. Then, run this command from an X Window terminal:

```
bash installer-linux64.bin
```

2. To start the installer, double-click the **installer-linux64.bin** installation file .
3. After you start the installer, the installation package is extracted, and the **HP Operations Orchestration Installation and Configuration Wizard** automatically appears. Click **Next**.

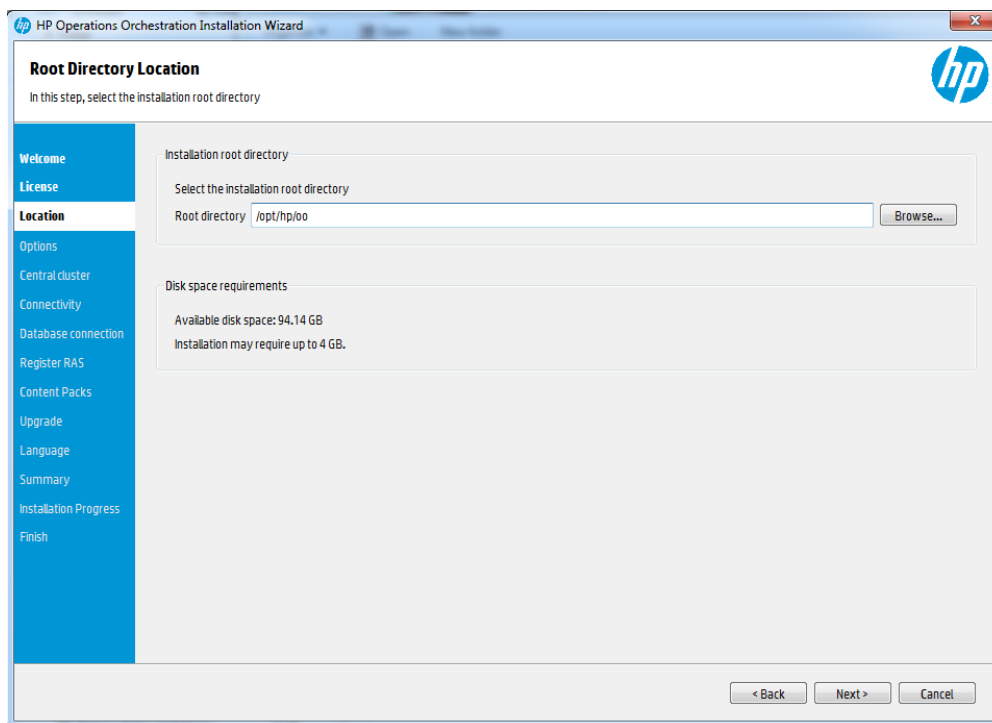


4. In the **License** step, select **I Agree**, and then click **Next**.
5. In the **Location** step, select the location for the installation root directory, and then click **Next**.

If the directory does not exist, the directory will be created automatically. You are prompted to confirm the creation of the new location.

Note:

The default path is `/opt/hp/oo`. Valid characters for the installation path include English letters, digits, spaces, hyphens (-) and underscores (_).



6. In the **Options** step, select **Central** and then click **Next**.

Note: You can install Central without setting up a RAS server. If you install a RAS Server, it is recommended that you install this on a separate server to Central. See ["Installing an HP OO RAS Server Using the Installation Wizard"](#) on page 32. See the *Architecture Guide*

for more information.

7. In the **Central Cluster** step, you can add a node to an existing Central cluster. Clustering provides high availability and scalability to enhance throughput.

To create a cluster, run the Installation wizard the first time to create the first Central. Then run it again on the other machine to create the next node and, during this second installation, make it point to same database schema.

For more information about clustering, see "Configuring High Availability" in the *HP OO Architecture Guide*.

The screenshot shows the 'Central Cluster Configuration and Installation' window of the HP Operations: Orchestration Installation Wizard. The window has a sidebar on the left with navigation links: Welcome, License, Location, Options, Central cluster (selected), Connectivity, Database connection, Register RAS, Content Packs, Upgrade, Language, Summary, and Installation Progress. The main area is titled 'Central Cluster' and contains the following text: 'Add a node to an existing cluster. HP Operations Orchestration 10 Central cluster is active by default even if you have just a single node. This step is intended to configure an additional node to an existing cluster by importing the configuration from an existing node.' Below this text is a checkbox labeled 'Add a node to an existing Central cluster' which is checked. There are five input fields with 'Browse...' buttons next to them, each preceded by a path template: 'Location of <existing-node-install-dir>/central/conf/database.properties', 'Location of <existing-node-install-dir>/central/var/security/encryption.properties', 'Location of <existing-node-install-dir>/central/var/security/encryption_repository', 'Location of <existing-node-install-dir>/central/var/security/key.store (optional)', and 'JDBC driver location'. A note below the fields states: 'Required if you are using a MySQL database, or are upgrading an HP OO 9 installation that uses MySQL.' At the bottom left, there is a warning icon and the text 'database.properties is required'. At the bottom right, there are three buttons: '< Back', 'Next >', and 'Cancel'.

8. In the **Connectivity** step, configure the ports for the Central Server as required. The default values appear next to each port.
9. (Optional) In the **Connectivity** step, you can import a secure SSL certificate. Select **Provide a secure SSL certificate**, and then click **Browse** to select the secure SSL certificate.

If you leave this check box cleared, HP OO uses the default self-signed certificate that is valid for 10 years.

Central Server Connectivity
In this step, configure the Central Server ports and SSL

Connectivity
Configure the Central Server port numbers and SSL properties

HTTP 8080
HTTPS 8443

☒ Provide a secure SSL certificate (when not provided, a self-signed certificate is used)

Central SSL/TLS certificate

The SSL/TLS Certificate should be in PKCS12.
Usually this is a file with a .pfx or .p12 extension. Consult your Certificate Authority for more details

Central SSL/TLS Certificate password

Confirm Password

CA root certificate location (.crt or .cer file)

The CA root certificate of the Central SSL/TLS certificate. The CA root certificate will be imported into the RAS truststore.

☐ Do not start Central server after installation (Must be checked when you want to configure HP OO to be compliant with FIPS 140-2.)

✔ Success

Note: Do not use a network path for the location of the certificates.

10. Enter the Central SSL/TLS certificate password, and enter it again for confirmation.
11. If you are installing both Central and RAS at the same time, the **CA root certificate location** field is available and you will need to specify the location of the CA root certificate. If you are only installing Central and not RAS, this field is grayed out.

CA root certificate location (.crt or .cer file)

The CA root certificate of the Central SSL/TLS certificate. The CA root certificate will be imported into the RAS truststore.

Click **Browse** to select the CA root certificate that will be imported into the RAS truststore.

Note: Do not use a network path for the location of the certificates.

For more information about installing HP OO on a secured environment, see the *HP OO System Configuration and Hardening Guide*.

12. If you are configuring HP OO to be compliant with FIPS 140-2, you must select the **Do not start Central server after installation** check box.

If you are installing a new Central in cluster mode and the installer version is older than the current Central, make sure to select the **Do not start Central server after installation** check box, because the installer will fail when trying to start Central.

13. Click **Test ports availability**. If the ports are available, a **Success** check mark appears. If you encounter an error, adjust the ports accordingly.
14. Click **Next** to continue.
15. In the **Database Connection** step, configure and create the database schema.

- a. The first step is to select the database vendor, and then enter the connection properties.

Note: When the **Connect to existing database/schema** option is selected, be careful not to use administrative user accounts in the **Username** and **Password** fields. Doing so will install HP OO under the administrative account.

You can use an elevated privileges user connection only when the **Create the database/schema** option is used, in the **Admin username** and **Admin password** fields.

You can select from the following database types:

- **Oracle:** Do not use **SYS**, **SYSTEM**, or other administrative accounts credentials in the **Username** and **Password** fields.
- **Microsoft SQL Server:** Do not use **sa** or other administrative account credentials in the **Username** and **Password** fields.
- **Oracle MySQL:** Do not use the **root** credential in the **Username** and **Password** fields.
- **PostgreSQL:** Do not use the **postgres** credential in the **Username** and **Password** fields.

Note: PostgreSQL database names are case-sensitive.

- **Internal database :** This uses an H2 local database. This should not be used for production.
- **Other database** (use to enable advanced features in supported databases). If you select **Other database**, you can only use a database type that is supported for use with HP OO. See "[System Requirements](#)" on page 46 for more information.

Note: The **Other database** option also supports any valid JDBC URL.

b. After selecting the database type, select one of the following:

- **Connect to existing database/schema:** Connect to an existing schema, user, or database. The installer verifies that the schema, user, or database exist.
- **Create the database/schema:** Enables you to create a new database or schema. Information in the **Database**, **Username** and **Password** fields will be used in order to create the new schema, user, or database for HP OO.

Confirm the password by typing it again in the **Confirm Password** field.

Provide existing database user credentials in the **Admin username** and **Admin password** fields. This elevated-privileges user must be able to connect to the database and create the new schema, user, or database for HP OO.

c. Enter the hostname or IP address and other connection details.

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

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

Note: If you are upgrading from a 9.x version that is installed on Oracle, you must enter the SID of this database in the **SID** field, and not the database name.

- d. Click **Test Connection**. If you are unable to connect to the database, you will not be able to proceed to the next steps in the wizard.

The installer checks for non-empty schemas/databases, and shows a warning message if the schema or database is not empty. If the installation fails during schema validation, the installation process is stopped.

Note: This test only verifies the connection between HP OO and the selected database, and does not verify the conditions required by the database, like the user's read/write permissions on the provided schema.

Note: For all the database vendors, if you select to create a new database, the created database uses **case-sensitive** collation as follows:

- MySQL: **utf8_bin collation** is used for the new database.
- Postgres: Case-sensitive by design. No need for specific settings. **UTF-8** encoding is supported
- Oracle: Case-sensitive by default. No need for specific settings. **UTF-8** encoding is supported.
- MS SQL: Use only the following database collations per your required language:
 - English: SQL_Latin1_General_CP1_CS_AS
 - Japanese: Japanese_Unicode_CS_AS
 - Simplified Chinese: Chinese_Simplified_Stroke_Order_100_CS_AS
 - German: SQL_Latin1_General_CP1_CS_AS
 - French: French_100_CS_AS
 - Spanish: SQL_Latin1_General_CP1_CS_AS

However, if you already have a database installed, HP OO creates the tables using the database specific collation. It is important to note that using other collations can cause characters to appear in gibberish in the user interface for localized installations.

In addition, other collations are not officially supported in Microsoft SQL Server for localized installations.

If the installer is used in order to create a new SQL Server database, selecting your language in the language selection page sets the correct collation for the new database.

Using one of the above collations enables using the **varchar** datatype for textual columns instead of the **nvarchar** data type. Using the **varchar** data type is more efficient and reduces overall database size.

Selecting a specific language also means that an HP OO system that uses SQL Server is limited to the set of languages supported by that specific collation. For example, if the **SQL_Latin1_General_CP1_CS_AS** collation is used, English, German, and Spanish characters may be used, but Japanese characters may not. If **Japanese_Unicode_CS_AS** is used, French accent characters will not be presented properly. For the complete specification of each collation, see the Microsoft SQL Server documentation.

For more information about setting up the database schema, see the *HP OO Database Guide*.

16. If you are upgrading from HP OO version 9.x, you can set the upgrade settings in the **Upgrade** step.

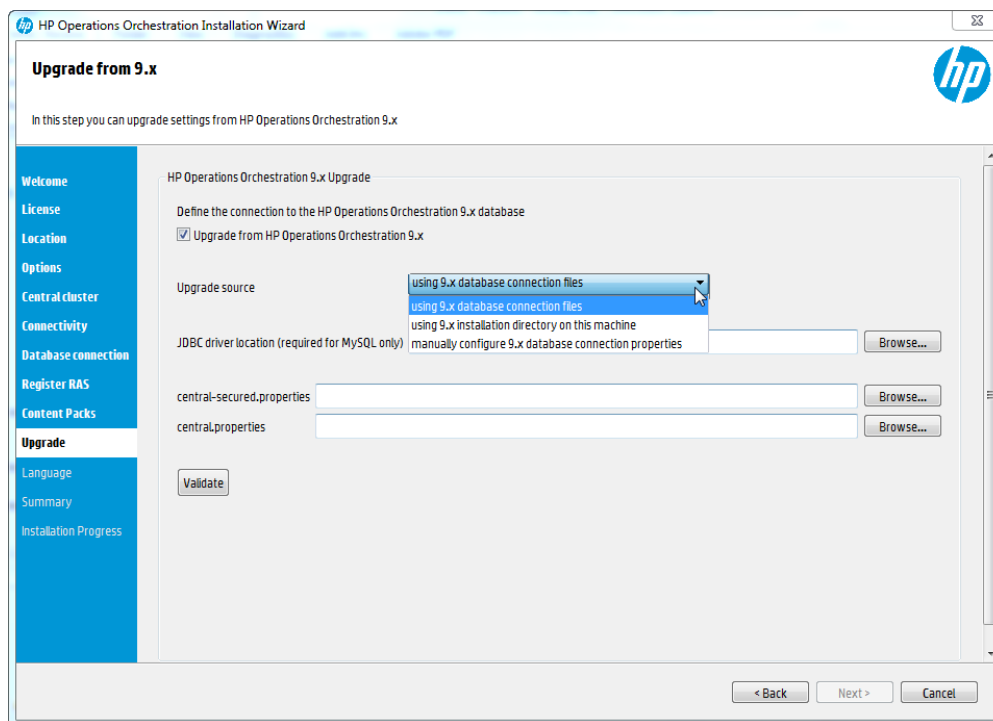
If you select **Upgrade from HP Operations Orchestration 9.x**:

- a. From the **Upgrade source** list, select how to identify the 9.x installation.
- b. Enter the locations to the required files or paths, or the 9.x database properties, depending on the case.

This extracts and loads the system configuration information, such as users, LDAP, LWSSO, security data, system properties, system accounts.

- c. Click **Validate** to verify your 9.x version.

For more information about upgrading from HP OO 9.x, see *Upgrading to HP OO 10.x from HP OO 9.x*.

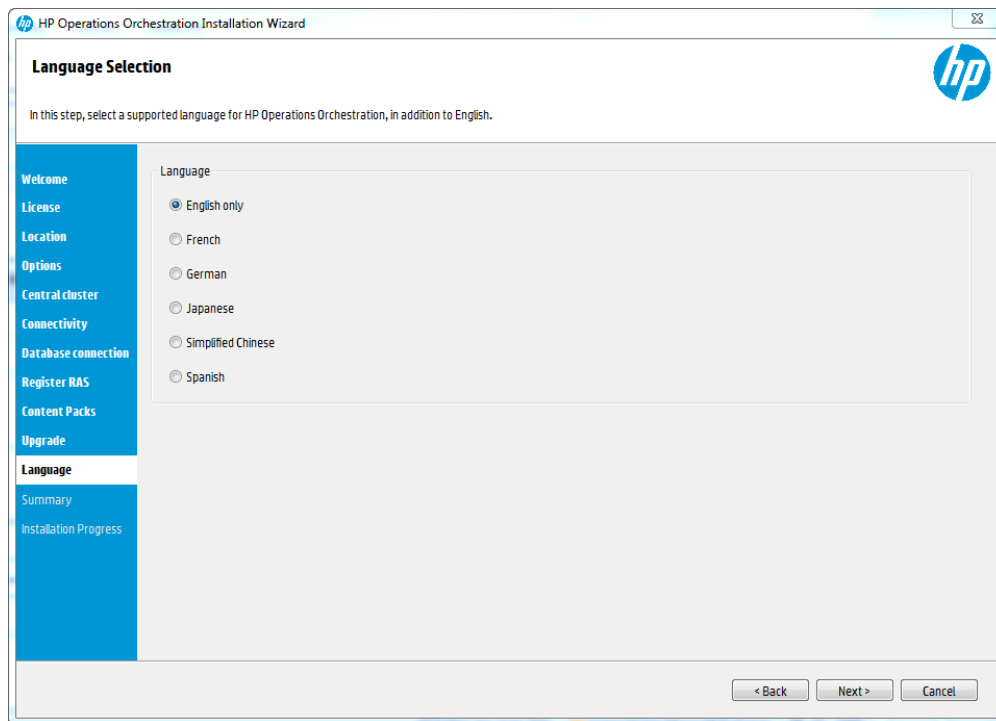


17. In the **Language** step, select a supported language for HP Operations Orchestration, in addition to English, and then click **Next**.

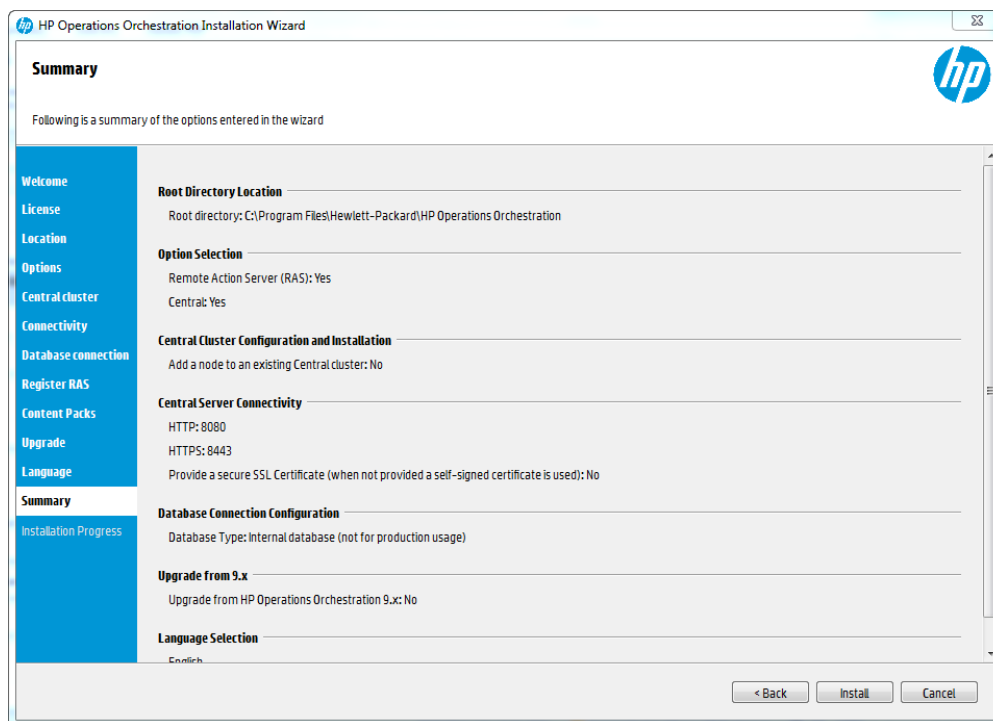
This language support will be used for:

- The MS SQL collation language, if relevant
- The **central-wrapper.conf** language for content. This language support may be required if, for example, you need to ping a server that is configured in Japanese.

Note: You can change the language support choice after installation, by editing the **central-wrapper.conf** file, located in the installation directory under **central/conf**.



18. The **Summary** page displays the installation and configuration settings that you selected and entered in the wizard. Check that the settings are correct. If you want to correct one of the items, click **Back**.



19. Click **Install**. The installation begins, and the wizard displays a check mark next to each successfully installed item on the **Progress** page. When the installation is complete, click **Next**.

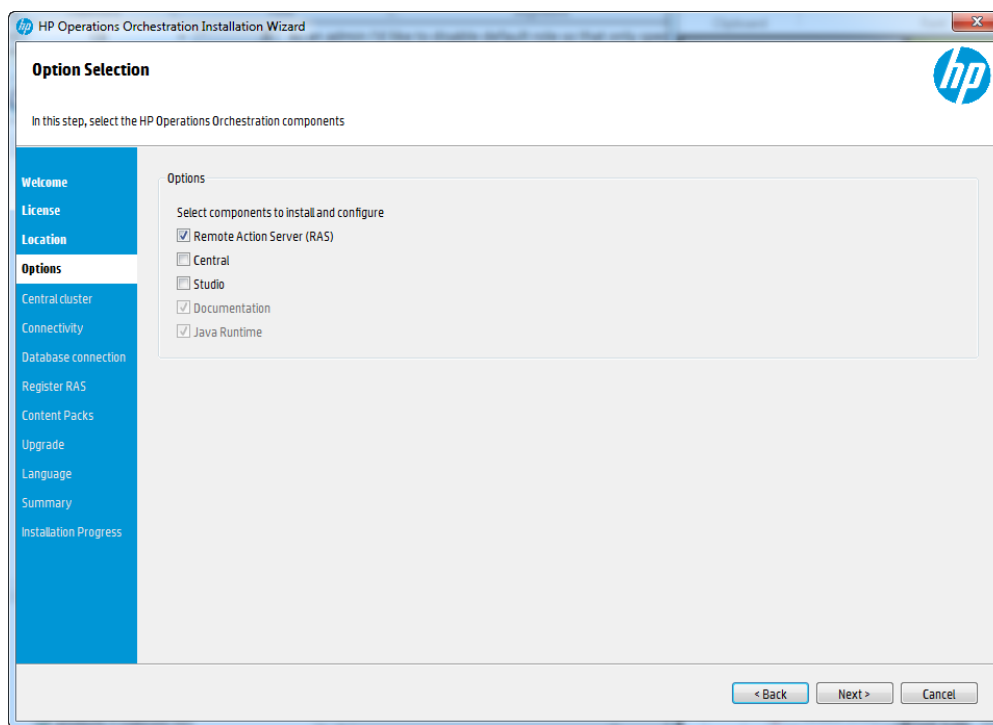
Note: If there is a problem with one of the installation or configured items, the installation attempts to continue with the rest of the items regardless of that error. Check the **installer.log** file, located in **/HP/oo** (or selected installation folder), to check for errors.

20. (Optional) In the **Finish** page, select **Open Welcome Page** to display the HP OO Welcome page in your default web browser, in the language that was selected on the **Language** page.
21. Click **Finish** to close the Installation and Configuration wizard.

Central is installed and menu shortcuts are created on your system. See ["Starting HP OO" on page 41](#).

Installing an HP OO RAS Server Using the Installation Wizard

1. Run the Installation Wizard for your operating system as described in ["Installing HP OO Central Using the Installation Wizard \(Windows\)" on page 9](#) or ["Installing HP OO Central Using the Installation Wizard \(Linux\)" on page 21](#).
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]. Otherwise, errors will occur.

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**.
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 System Configuration and 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.

Installing HP OO Studio Using the Installation Wizard

This topic discusses how to install Studio via the Installation Wizard.

Note: Studio only works on Windows, so it cannot be installed on Linux.

For instructions about installing a RAS, see ["Installing an HP OO RAS Server Using the Installation Wizard" on page 32](#).

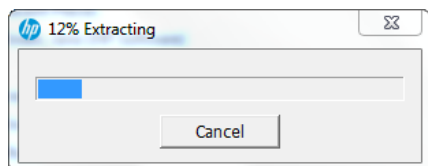
For instructions about installing Central, see ["Installing HP OO Central Using the Installation Wizard \(Windows\)" on page 9](#).

To install Studio:

1. Download the ISO file from the HP SSO Portal and extract it into a local drive on your computer.

Note: To run the installer from the HP Operations Orchestration DVD, insert the DVD and copy the installation file to a local drive on your computer.

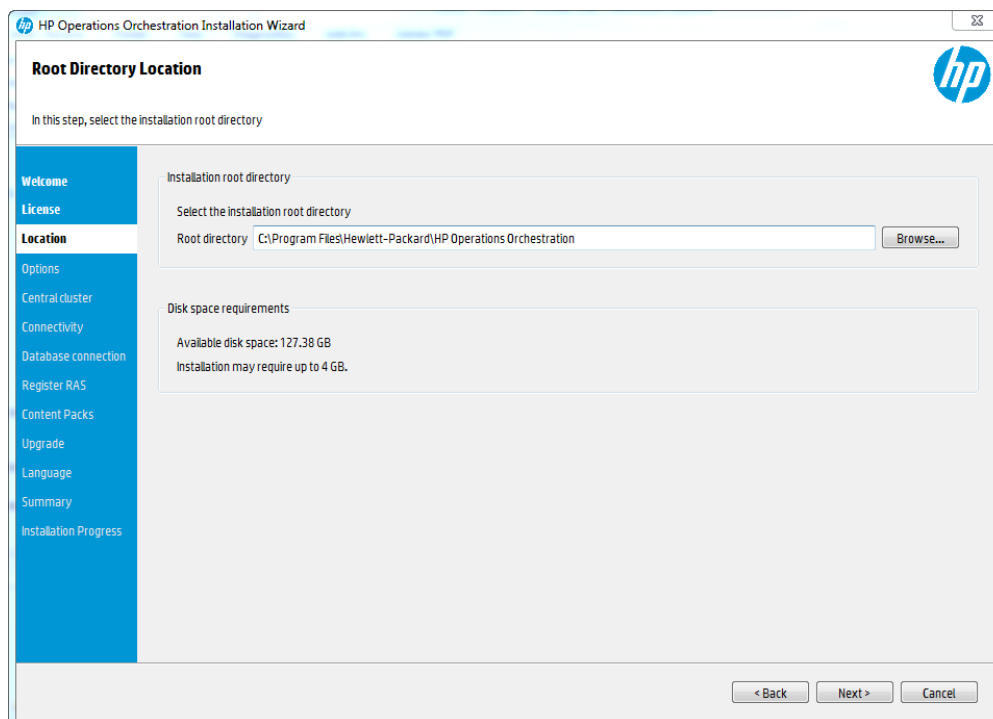
2. To start the installer, double-click the **installer-win64.exe** installation file.
3. After you start the installer, the installation package is extracted, and the **HP Operations Orchestration Installation and Configuration Wizard** automatically appears. Click **Next**.



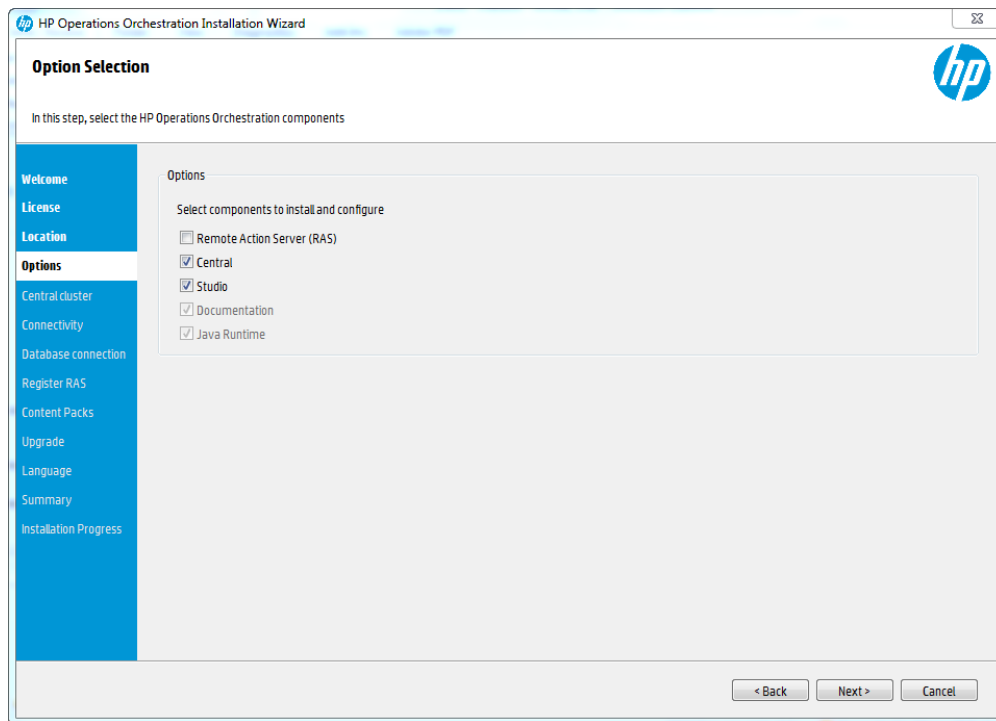
4. In the **License** step, select **I Agree**, and then click **Next**.
5. In the **Location** step, select the location for the installation root directory, and then click **Next**.

Note: The default path is C:\Program Files\Hewlett-Packard\HP Operations Orchestration. Valid characters for the installation path include English letters, digits, spaces, hyphens (-) and underscores (_).

If the directory does not exist, the directory will be created automatically. You are prompted to confirm the creation of the new location.



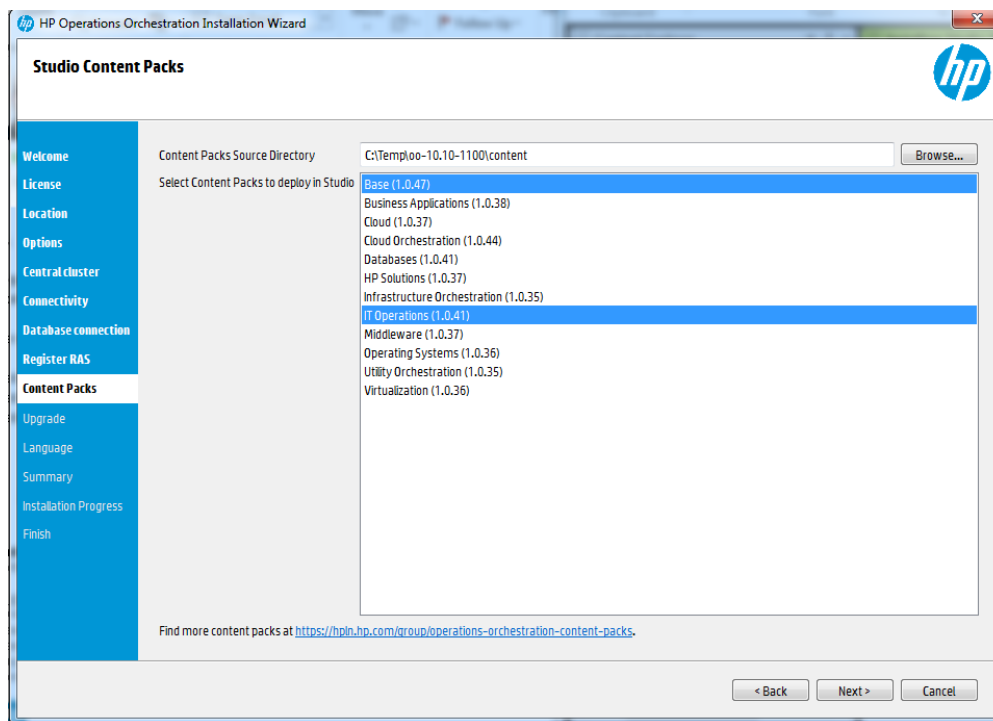
6. In the **Options** step, select **Studio**, and then click **Next**.



7. In the **Content Packs** step, you can import an existing content pack. Browse to the location where the content pack is located, and then click **OK**.

Note: The installation folder and DVD include the released content packs.

The available content packs located in the selected folder appear in the list. Select the content pack (or packs) that you want to import, and then click **Next**.

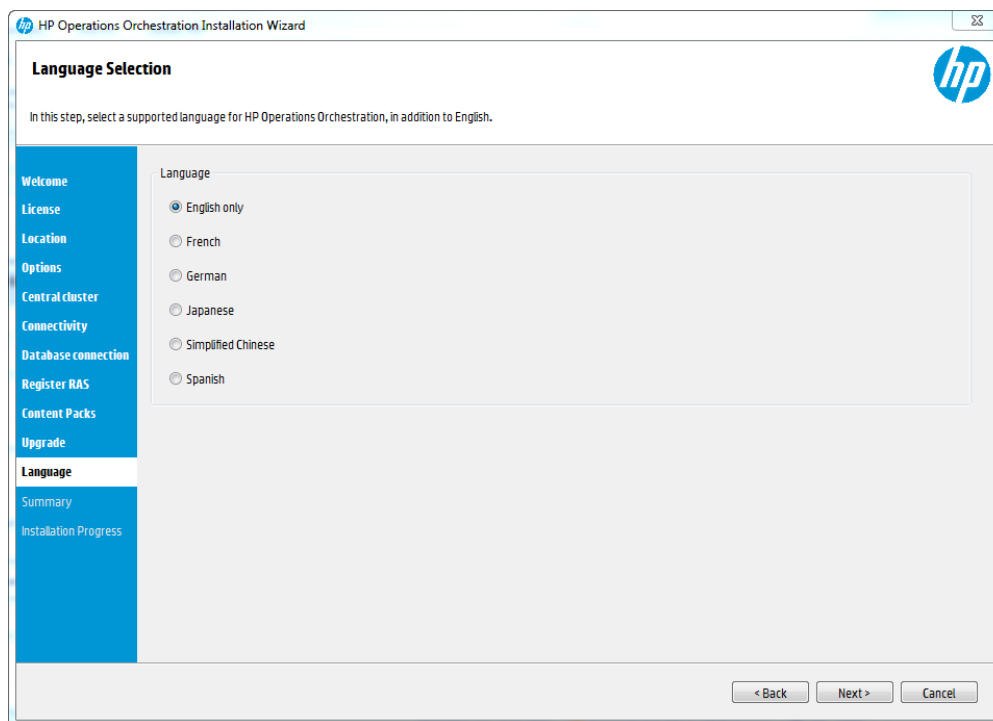


Note: You can download additional and updated content packs on HPLN, using the link in the lower part of the wizard.

8. In the **Language** step, select a supported language for HP Operations Orchestration, in addition to English, and then click **Next**.

This language support will be used for the Studio UI.

Note: You can change the language support choice after installation, by editing the **Studio.properties** file, located in the installation directory under and **studio/conf**.



9. The **Summary** page displays the installation and configuration settings that you selected and entered in the wizard. Check that the settings are correct. If you want to correct one of the items, click **Back**.
10. Click **Install**. The installation begins, and the wizard displays a check mark next to each successfully installed item on the **Progress** page. When the installation is complete, click **Next**.

Note: If there is a problem with one of the installation or configuration items, the installation attempts to continue with the rest of the items regardless of that error. Check the **installer.log** file, located in **C:\HP\oo** (or selected installation folder), to check for errors.

11. (Optional) In the **Finish** page, select **Launch Studio** to start Studio.
12. Click **Finish** to close the Installation and Configuration wizard.

Studio is now installed and menu shortcuts are created on your system.

Installing HP OO Silently

A silent installation is one that is started from the command line and completes without any input from the person who started it. There is no need to provide input through a wizard or dialog boxes. The silent installation receives its input from a text input file.

You can install and configure HP Operations Orchestration silently from a command line.

To install HP Operations Orchestration silently:

1. Open the **sample-silent.properties** text file (located in the **docs** folder, under the HP OO installation folder and in the **docs** folder on the ISO), with the required installation and configuration settings.

For more details about these settings, see the descriptions in the **sample-silent.properties** text file.

2. Save a copy of the text file as **silent.properties**.
3. Remove the comment sign (#) from the properties that you need, and add the value for each of these properties.
4. From a command line, type the following:

```
installer-win64.exe -s c:\\temp\\my-silent.properties
```

To disable the extracting installation files progress bar, add to the command line `-gm2`.

Use the `-n` option if you don't want to start Central after the installation has completed.

Note: `gm2` is not supported with Linux.

Note: The `-s` property accepts either a full or relative path depending on the operating system:

- Windows: Relative to the location of the `.exe` file.

For example: `dirA`, is the current directory, and `dirB`, is located under `dirA` and contains the installer and the **silent.properties** file. Open a Command window in `dirA` and enter the following:

```
dirB\\installer.exe -s silent.properties
```

Important: Make sure you add two backslashes `\\` and not one backslash `\`. The installation folder to which you download the installation file must not contain any spaces in the name.

- Linux: Relative to the location of the directory where the installer is launched.

Important Notes About Silent Installation

- Be careful not to put trailing spaces in your property values (especially when pasting). Otherwise, values that contain spaces at the end will not be read correctly and installation might fail.
- **Oracle:** Do not use `SYS`, `SYSTEM`, or other administrative account credentials in the `db.username/db.password` properties.
- **PostgreSQL:** Do not use `postgres` credentials in the `db.username/db.password` properties.

Note: PostgreSQL database names are case-sensitive.

- `db.type=H2`: This uses an H2 local database. This should not be used for production.
- `db.type=other`: Use to enable advanced features in supported databases. If you select **other**, you can only use a database type that is supported for use with HP OO. See the *System Requirements* for more information.
- Special characters, except the underscore (`_`), cannot be used for the database name or SID. In addition, you can enter up to 30 characters for the database name or SID.
- When you are upgrading from a remote 9.x Central that has localhost as the database in the **Central.properties** file using a silent installation, installation and upgrade do not complete successfully. This problem does not exist for wizard installations.
- All property values that contain a backslash (`\`) in the **silent.properties** file need to be escaped (with a double-backslash instead of a single one).

Places where this might be needed:

- On Japanese environments, in all the paths given. In Japanese environments, the path separator is the Yen sign and it needs to be escaped. For example, `C:¥¥folder`
- For RAS installations with a LDAP user given in form of `'domain\user'`. For example, `domain\\user`
- For a database user, if the database is set up with Windows system account authentication
- For any other user that contains a backslash in the name

Installing a Load Balancer

HP OO, it is possible to install any load balancing solution that you choose. This is a third party product, which is not part of HP OO.

For information about how to install your specific load balancer, see the documentation provided by your vendor.

For information about how to configure the load balancer, see "Configuring High Availability" in the *HP OO Configuration and Hardening Guide*.

After you have configured the load balancer to your environment, check that your RASes point to the new load balancer URL or modify this accordingly. For more information on how to configure the RASes, see the *HP OO Configuration and Hardening Guide*.

Starting HP OO

Starting HP OO on Windows

Starting Central

After Central is installed, the Central service on Windows is started automatically. Open a browser window, and enter the URL to the Central server that was set in the Installation and Configuration wizard.

For example:

`http://<host>:8080/oo`

`https://<host>:8443/oo`

Starting the Central service manually

If you need to start the Central service manually, the procedure is:

1. On the server that hosts HP OO, navigate to **Control Panel > Administrative Tools > Services**.
2. Start the **HP Operations Orchestration Central** service.

Starting Studio

Windows: From the **Start** menu, select **All Programs > HP Operations Orchestration > Studio**.

Starting RAS

After a RAS is installed, the Windows service is started automatically.

Starting HP OO on Linux

Starting Central

After Central is installed, the Central service is started automatically.

In order to access the Central user interface from the Linux machine, you need an X server with a web browser installed. It can also be accessed from any machine that has access to the Linux server that you installed, using the Central URL.

Note: Make sure the Linux machine has the ports opened in the iptables.

Open a browser window, and enter the URL to the Central server that was set in the Installation and Configuration wizard.

For example:

`http://<host>:8080/oo`

`https://<host>:8443/oo`

Starting or stopping the Central service manually

To start or stop Central:

```
<Install-dir>/central/bin/central start
```

```
<Install-dir>/central/bin/central stop
```

Note: These scripts are located in the **bin** folder.

Starting RAS

To start or stop the RAS service:

```
<Install-dir>/ras/bin/ras start
```

```
<Install-dir>/ras/bin/ras stop
```

Backing Up the Central Security Files

Some data on the database schema is encrypted and the keys for decryption are stored locally on the file system. If the file system becomes corrupted or deleted, the schema will be useless, because there will be no way to decrypt the data.

After installing HP OO, make sure to back up the **central\var\security** folder and the **central/conf/database.properties** file, so that it will be possible to recover from this scenario.

To recover:

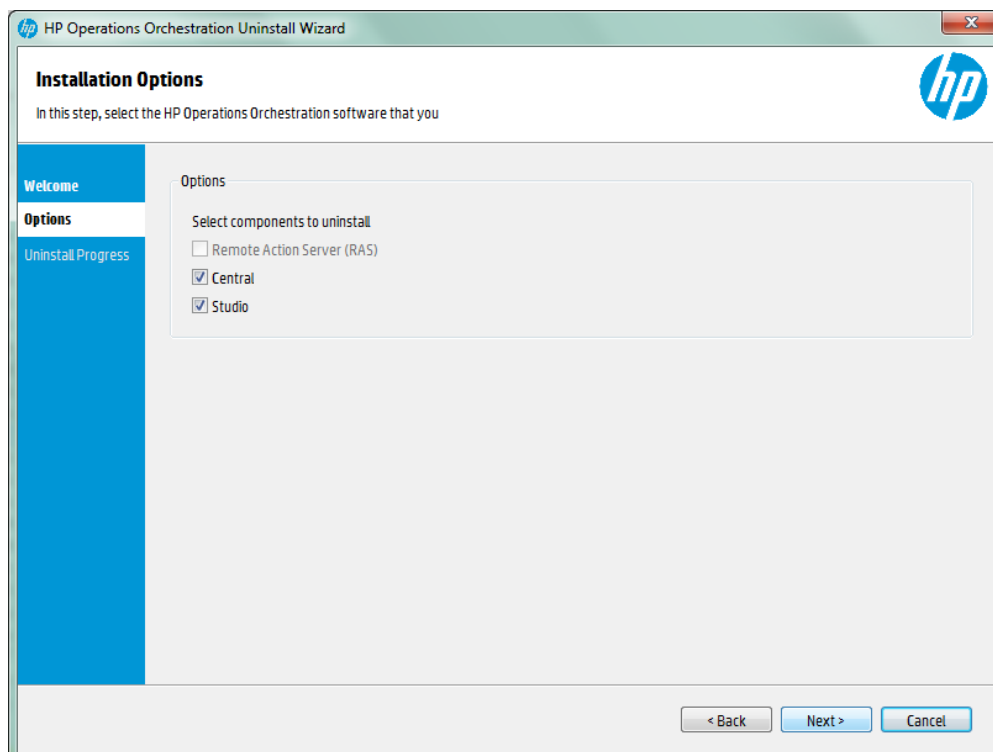
1. Install a new Central with an existing schema. The installation will fail on the **Start Central** step.
2. Stop the Central service and verify that Central is not running.
3. Override the **central/var/security** folder with the backed up folder.
4. Override the **central/conf/database.properties** file with the backed up file.

Uninstalling HP Operations Orchestration

Before uninstalling HP OO, make sure you back up your version of HP OO.

Uninstalling HP OO on Windows

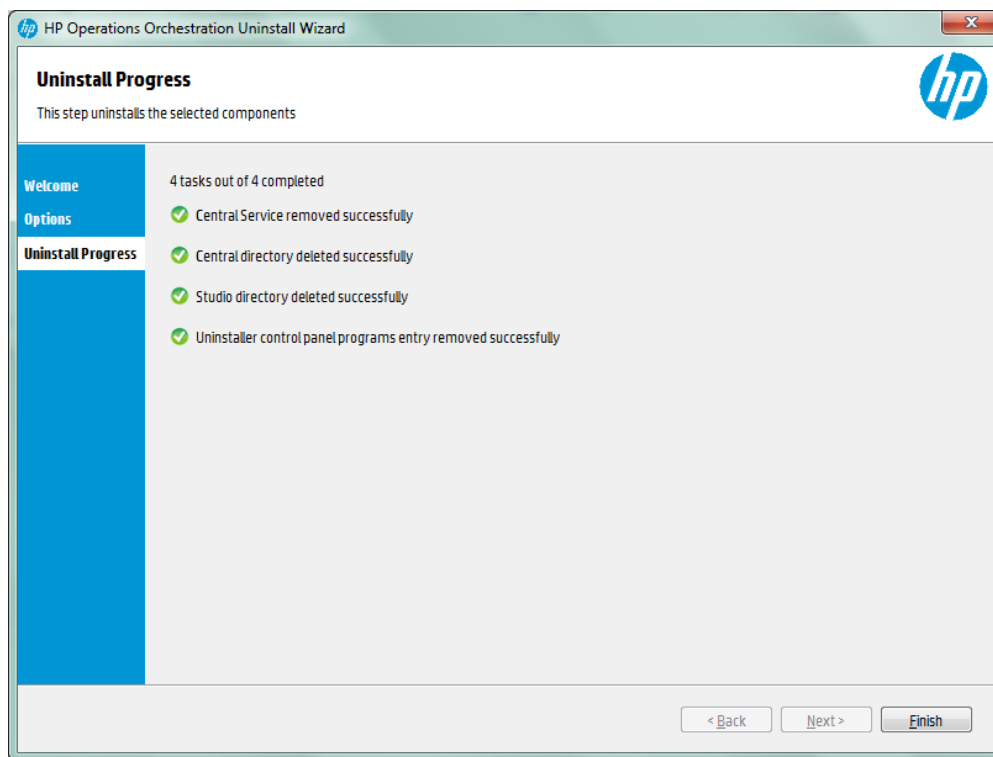
1. In the HP OO installation directory, for example, **C:\Program Files\Hewlett-Packard\HP Operations Orchestration**, double-click **uninstall.exe**, and then click **Next**.
2. Select the HP OO options that you want to uninstall, and then click **Next**. When prompted whether to continue, click **Yes**.



3. During the uninstall process, the following items are deleted and removed:

- Remove Central Service
- Delete Central directory
- Delete Studio directory
- Remove uninstaller control panel programs entry

Note: The database and database user are not removed or dropped.



4. Click **Finish**. The HP Operations Orchestration selected options are removed from your computer.

Note: Uninstalling a RAS/remote worker does not remove the entry from the database. You need to also remove the RAS from Central UI, by selecting the worker in the **Topology > Workers** tab and using the **Delete** button. For more information, see "Setting Up Topology – Workers" in the *HP OO Central User Guide*.

Uninstalling HP OO on Linux

To uninstall HP Operations Orchestration in Linux, enter the following:

```
export DISPLAY=<ip address>
./uninstall
```

After the uninstall completes successfully, you can delete the installation directory.

Uninstalling HP OO Silently

A silent uninstallation is one that is started from the command line and completes without any input from the person who started it. You can uninstall silently from either Windows or Linux.

To uninstall HP Operations Orchestration silently, type the following from a command line:

```
uninstall -s <components>
```

In the <components> placeholder, enter a comma-separated list of components to remove.

Possible components are: all, central, ras, and studio.

For example: `uninstall -s central,ras`

System Requirements

This section describes the system requirements for HP OO 10.10.

Software Requirements

Software Requirements for Central and RAS

The Central application requires a dedicated database schema.

Component	Requirement
Supported operating systems	<ul style="list-style-type: none"> • Microsoft Windows Server 2008 64 bit • Microsoft Windows Server R2 2008 64 bit • Microsoft Windows Server 2012 64 bit • Microsoft Windows Server R2 2012 64 bit • RedHat Enterprise Linux 5.x 64 bit • RedHat Enterprise Linux 6.x 64 bit • Ubuntu 12.04.x LTS
Supported databases	<ul style="list-style-type: none"> • Oracle 11g R2 • Oracle 11g R2 RAC • Oracle MySQL 5.5.x • Oracle MySQL 5.6.x • PostgreSQL 9.1.x • PostgreSQL 9.2.x • PostgreSQL 9.3.x • Microsoft SQL R2 Server 2008 • Microsoft SQL Server 2012

Supported browsers	<ul style="list-style-type: none"> • Microsoft Internet Explorer 9.x, 10.x, 11.x (latest) • Mozilla FireFox (latest + the two latest legacy versions) • Google Chrome (latest + the two latest legacy versions) <p>Recommended screen resolution: 1280 x 1024 or 1920 x 1080</p>
.NET Framework	Microsoft .NET Framework 4.5 or later, full installation. This is also required for RAS installations.

Software Requirements for the Database Server

Operating system support for database servers is according to the recommendations of the database vendor.

Software Requirements for Studio

Component	Requirement
Supported operating systems	<ul style="list-style-type: none"> • Microsoft Windows 8 64 bit • Microsoft Windows 8.1 64 bit • Microsoft Windows Server 2012 64 bit • Microsoft Windows Server R2 2012 64 bit • Microsoft Windows Server 2008 64 bit • Microsoft Windows Server R2 2008 64 bit • Microsoft Windows 7 64 bit
.NET Framework	<p>Microsoft .NET Framework 4.5 or later, full installation.</p> <p>This is also required for debugging flows with .NET operations. If you don't have .NET 4.5, any flows or operations with .NET will be marked as invalid in Studio.</p>
Service packs	<p>Microsoft Visual C++ 2008 SP1 redistributable package (x86).</p> <p>You need to download and install the version for the x86 platform, regardless of your Windows version (for example, if it is Windows x64).</p> <p>http://www.microsoft.com/en-us/download/details.aspx?id=29</p>

Hardware Requirements

The hardware requirements described here are the minimal supported configuration.

Many customers may require more powerful hardware, depending on their load and usage of the system. In some cases, scaling out (adding nodes) is preferable to scaling up (stronger hardware).

Hardware Requirements for HP OO Central and Database Servers

The minimum hard-drive space requirements differ depending on whether you install Central and the database on the same machine.

These requirements are for on-premise installations where the key components (central servers, RAS) are installed at the customer's site.

Component	Requirement per server (minimum)
CPU	<p>3 Gigahertz (GHz) for single-processor systems or 2 GHz for multi-processor systems</p> <p>Database server:</p> <ul style="list-style-type: none">• According to the database vendor's recommendations and requirements, but no less than 2 CPU cores <p>Central server:</p> <ul style="list-style-type: none">• Minimum: 1 CPU core• Recommended: 4 CPU cores
Memory (RAM)	<p>Database server:</p> <ul style="list-style-type: none">• As specified by the vendor, but no less than 4 Gigabyte (GB) <p>Central server:</p> <ul style="list-style-type: none">• Minimum: 2 GB• Recommended: 4 GB

Hard-drive space	<p>Database server:</p> <ul style="list-style-type: none"> • 2 GB for HP OO installation and base content pack deployment • Minimum of 48 GB for HP OO operations (minimum of 50 GB table space) <p>Central server:</p> <ul style="list-style-type: none"> • 2 GB
------------------	--

For off-premise installations, where the key components are installed on a cloud-based virtualized machine, the hardware requirements are:

- Central/RAS: For Cloud systems, an extra small machine
- Database: According to the database vendor's recommendations and requirements, but no less than a small machine.

Hardware Requirements for RAS Installations

Component	Requirement (minimum)
CPU	2 GHz for single- or multi-processor systems Minimum: 1 CPU core Recommended: 4 CPU cores
Memory (RAM)	1 GB
Hard-drive space	2 GB (this includes room for the flows and operations that are included in the installation)

Hardware Requirements for the Central Client

Web client machines for Central must meet the minimum hardware requirements for their web browser.

Hardware Requirements for HP OO Studio Installed on its Own Machine

Machines on which you install Studio must meet the minimum hardware requirements for their web browser or the following, whichever is higher.

Component	Requirement (minimum)
-----------	-----------------------

CPU	2 Gigahertz (GHz) for single- or multi-processor systems 1 CPU core
Memory (RAM)	2 GB (this is the amount of memory that the Studio process requires)
Hard-drive space	4 GB (this includes room for the flows and operations that are included in the installation)

Virtual Systems

Installation of the HP OO components on guest systems hosted by the following hypervisors is supported, as long as the guest systems meet the requirements described in this *System Requirements* document:

- VMware ESX Server, version 3.x or later
- Microsoft Hyper-V (for all supported Windows versions)

Cloud Deployments

HP Operations Orchestration can be installed on cloud computer units. On HP Cloud Services, the server components (Central, RAS) require a small machine, and the database should follow the database vendor's recommendations and requirements, but no less than a small machine.

Appendix

Changing the Database Settings	52
Using JRE From OpenJDK 7	52

Changing the Database Settings

1. Stop the Central cluster, or single node.
2. (Optional) generate an encrypted password using the following command:

```
<install-dir>/central/bin/encrypt-password --password <plain-text-pass>
```

3. On each node, change the user name or password values in the following file:

```
<install_dir>/central/conf/database.properties
```

Note: The password is stored encrypted, so make sure you include the {ENCRYPTED} prefix.

4. Restart the Central cluster.

Using JRE From OpenJDK 7

If you want to use the JRE from the OpenJDK 7 project, instead of the standard JRE that was provided in your HP OO installation, you can do so using the following procedure.

Note: The OpenJDK you use must be for Java SE 7.

The upgrade to HP OO 10.10 replaces the installed JRE. Therefore, the procedure must be done after upgrading to 10.10.

1. Stop Central/RAS and close Studio.
2. Back up and delete the **java** directory under the main HO OO installation directory.
3. Locate the **jre** directory in your OpenJDK package. Copy it to the HP OO installation directory and rename it to **java**.
4. Restart Central/RAS.

