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Enterprise

HPE Enterprise Maps

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Windows and Linux Operating Systems

Installation and Configuration Guide

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Chapter 1: Installing and Configuring HPE EM

Installation guide provides information about supported hardware and software required to successfully install and run Enterprise Maps3.10.

This guide can be referred to for installing HPE Enterprise Maps and referring the installation steps where required.

Following are the steps required to set up an environment and configure HPE Enterprise Maps (HPE EM):

- ["Compatibility" on page 9](#)
Understand the suitability and usability.
- ["Prerequisites and Supported Platforms" on page 11](#)
Design your environment for HPE EM.
- ["Preparing Databases" on page 16](#)
Set up and configure your database for HPE EM.
- ["Preparing LDAP and CA Single Sign On" on page 23](#)
Set up LDAP and CA Single Sign On for HPE EM.
- ["HTTP Proxy Requirement" on page 26](#)
Install HTTP Proxy for HPE EM.
- ["Using the HPE EM Wizard Installer" on page 30](#)
Use the Wizard Installer to install for HPE EM.
- ["Advanced HPE EM Installation" on page 65](#)
Use the additional install command options.
- ["Configuring HPE EM" on page 67](#)
Configure your environments and deploy for HPE EM.
- ["Applying Custom Extensions " on page 74](#)
Applying customized extensions for HPE EM.
- ["Starting HPE EM" on page 75](#)
Start and perform UI-based final configuration for HPE EM.
- ["Setting JBOSS Clustering" on page 76](#)
Configuring EM in JBoss cluster environment

Chapter 2: Compatibility

This section covers the following topics:

- ["Languages" below](#)
- ["Internationalization Variances" below](#)
- ["Virtualization Products" below](#)

Languages

The user interface of HPE Enterprise Maps uses the English language out-of-the-box. Enterprise Maps allows data input in local languages.

Internationalization Variances

This version of Enterprise Maps runs on all locales described in this document. There are no known variances.

Virtualization Products

Transparent Technology and Virtualization Support

In recent years, a number of “transparent” hardware and software technologies and virtualization solutions (such as Citrix, Microsoft Cluster Software, and VMware) have become increasingly prevalent. These solutions operate in the technology layers adjacent to the operating systems or, in some cases, as extensions of the operating systems. Similarly, database solutions offer transparent components as supported elements.

HPE supports Enterprise Maps running on operating systems and databases on particular platforms as described in the matrix above, not specific hardware and software configurations. HPE will support Enterprise Maps customers who run HPE software products on supported operating systems and databases, irrespective of whether they are running transparent or virtualization solutions in their environment. HPE does not support these transparent or virtualization technologies directly. Since the providers of these technologies support a set of certified operating systems and hardware, the customer and the providers of these technologies will be responsible for any interactions or issues that arise at the hardware or operating system layer as a result of their use.

HPE will not require customers to re-create and troubleshoot every issue in a non-transparent environment; however, HPE does reserve the right to request that its customers diagnose certain issues in a native certified operating system environment without the transparent technology. HPE will only make this request when there is reason to believe that the environment is a contributing factor to the reported issue.

While Enterprise Maps is expected to function properly with these transparent technologies in place, there may be performance implications, which can invalidate HPE's typical sizing and recommendations. Analysis must be performed within the context of the specific application to be hosted in a virtual environment to minimize potential resource overload, which can have significant impact on performance and scalability, particularly under peak load.

Chapter 3: Prerequisites and Supported Platforms

Before installing HPE EM you must make sure that the environment you want to install to is appropriate and suitable for your needs.

The following sections describe the requirements and options available:

- "[Design Your Deployment](#)" below
- "[Prerequisites - Hardware](#)" on the next page
- "[Prerequisites - JDK Software](#)" on the next page
- "[Supported Database Types](#)" on page 13
- "[Supported Application Servers](#)" on page 13
- "[Prerequisites - Operating Systems](#)" on page 14
- "[Prerequisites - Browsers](#)" on page 14
- "[Prerequisites - Mail Clients](#)" on page 14
- "[Supported LDAP Implementations](#)" on page 14
- "[Prerequisites - Adobe Flash](#)" on page 15
- "[Supported Product Integrations](#)" on page 15

Design Your Deployment

- **Development**

If you are a developer, CIO, or other IT manager who wants to learn the functions of HPE EM, this is the correct type of deployment for you. It should be on one machine and preferably on one J2EE server instance.

HPE EM ships with an embedded application server. You are required to have a database and Java installed and configured before you run the HPE EM installer. Oracle XE or MSSQL Express and Oracle JDK 1.8 are satisfactory prerequisites for HPE EM.

Use the HPE EM installation wizard to install the product following the default settings. Server configuration for the application server is handled within this wizard and in the serverstart and serverstop scripts.

- **Trial Version**

If you want to evaluate HPE EM, you can download a Virtual Appliance (VA) trial version. You must have a VM host on your computer to run the VA trial version. The trial version contains a 60 instant-on license, which can be renewed.

To download the trial version, go to <http://www.hpe.com>. Select **Products > Software > Software A-Z > Free & Trial Software**. Search for the HPE Enterprise Maps Virtual Appliance related downloads and click the **Download** link.

- **Production**

Deploying HPE EM for use in a production environment is flexible enough to be clustered and linked to a database and directory service on separate machines. If you are creating such a deployment, you should already have a set of tools and procedures for deploying J2EE applications and managing relational databases.

When you design your HPE EM production environment, you may need additional configuration options that are available in the HPE EM wizard installer as well as in the configuration files.

HPE EM supports a silent non-wizard installation that can be executed at the command-line in one step. The silent installation can easily be plugged in to higher-level orchestration and deployment engines. For advanced security hardening, decoupled DBA scenarios, or recovery and failover procedures, see the HPE Live Network or the advanced documentation at the HPE Support website.

For information about a silent installation, run the jar file using the `-help` option:

```
java -jar hpe-em-3.10.jar -help
```

Prerequisites - Hardware

HPE recommends the following minimum hardware configuration for each physical node of a distributed production environment:

- Intel Xeon E processor family, 8 cores, 32 GB RAM, 40 GB free disk space, 1Gbps network card.
- Network bandwidth of 1 Gb/sec or higher.

For customization and evaluation purposes, HPE EM requires the following hardware:

- Intel Core i7 processor, 16 GB RAM, 40 GB free disk space, 1Gbps network card.
- Network bandwidth of 100Mb/sec or higher.

Warning: SPARC machines are not suitable for HPE EM deployments.

Example:

It is possible to evaluate HPE EM on a system that has the following configuration:

- x64-based PC Intel(R) Core(TM) i7-3720QM CPU @ 2.60GHz, 4 Core(s), 8 Logical Processor(s)
- Physical Memory (RAM) 16 GB
- 500GB HDD Intel(R) 7 Series Chipset Family SATA
- Intel(R) 82579LM Gigabit Network

Prerequisites - JDK Software

HPE EM supports the following JDK:

- Oracle (Sun) JDK 1.8 64-bit

Caution: HPE recommends using a 64-bit operating system in conjunction with a 64-bit JDK. 32-bit operating systems may not provide sufficient memory for this version of HPE EM.

To Ensure the Correct JDK is Used:

1. Open a command prompt (cmd in Windows) or a terminal session (UNIX/Linux).
2. Execute `echo %JAVA_HOME%` (Windows) or `echo $JAVA_HOME` (UNIX/Linux)
3. Do one of the following:
 - If `JAVA_HOME` points to JDK 1.8 then proceed with installation.
 - If `JAVA_HOME` does not point to JDK 1.8 then reset the `JAVA_HOME` environment variable to a valid JDK 1.8.

Warning: If you have both a JDK and JRE installed, `JAVA_HOME` must point to a valid JDK.

Supported Database Types

HPE EM supports the following databases:

- Oracle 11g
- Oracle 12c
- Microsoft SQL Server 2012 (SP1)
- Microsoft SQL Server 2014

HPE EM supports deployment to the following database and driver combinations:

Supported Database Drivers

Database	DB Version	Driver Packages	Driver Version	Driver Class
Oracle Database	11.2.0.3.0	ojdbc6.jar, orai18n.jar	11.2.0.3.0	oracle.jdbc.driver.OracleDriver
	12.1.0.1.0	ojdbc7.jar, orai18n.jar	12.1.0.1.0	
Microsoft SQL Server	2012 SP1 2014	sqljdbc4.jar	4.0	com.microsoft.sqlserver.jdbc.SQLServerDriver

Tip: For optimal performance, HPE recommends running a dedicated server for EM database. Hosting EM database together with other application databases on the same server also impacts the performance of EM significantly.

Supported Application Servers

Enterprise Maps supports only the embedded JBoss application server. This application server is built by HPE, based on JBoss EAP 6.4.0.GA sources.

Tip: For optimal performance, HPE recommends running a dedicated server for EM application. Hosting EM application together with other applications and services may also impact the performance of EM significantly.

Prerequisites - Operating Systems

The server running HPE EM must use a supported operating system.

HPE recommends the following operating systems:

- Windows Server 2008 R2
- Windows Server 2012 R2
- Windows 7 & 8.1
- Red Hat Enterprise Linux 5, 6 & 7 64-bit
- Oracle Enterprise Linux 6 64-bit
- CentOS 6.4 64-bit
- Ubuntu 13.10 64-bit

Caution: HPE recommends using a 64-bit operating system in conjunction with a 64-bit JDK. 32-bit operating systems may not provide sufficient memory for this version of HPE EM.

Prerequisites - Browsers

Client machines accessing HPE EM must use a supported browser. HPE EM supports the following browsers:

- Google Chrome 48
- Microsoft Internet Explorer 11
- Mozilla Firefox 44
- Mozilla Firefox ESR 38

Prerequisites - Mail Clients

If you want HPE EM to send automatic notifications, you must use a supported mail client. HPE EM supports the following mail clients:

- Microsoft Outlook 2013

Supported LDAP Implementations

When you install HPE EM, you can select to use an external LDAP server to retrieve information about users and groups.

HPE EM uses LDAP for authentication and to obtain user and group information. HPE EM accesses this information as read-only and never modifies it.

HPE EM supports the following LDAP implementations:

- Oracle Directory Server Enterprise Edition 11g
- Microsoft Windows Server 2008 Active Directory

Prerequisites - Adobe Flash

Client machines accessing HPE EM require Adobe Flash Player version 20.0.

Supported Product Integrations

HPE EM supports integration with the following products:

Product	Version	Features
HPE Cloud Service Automation (CSA)	4.60	Synchronization of CSA topology components as EM deployment specifications, build deployment models in EM and publish as service designs in CSA.
HPE Business Service Management (BSM)	9.13, 9.24	Synchronization of BSM configuration items with EM artifacts.
HPE Universal Configuration Management Database (uCMDB)	9.05, 10.20	Synchronization of uCMDB configuration items with HPE EM artifacts.
HPE Project and Portfolio Management (PPM)	9.21, 9.30	Primary source of financial and project information about applications in the corporation. Provides useful financial insights into enterprise architecture.
Sparx Systems Enterprise Architect	11,12.0	Primary source of system graphical design. Provides a complete lifecycle to build and maintain systems from analysis through maintenance. Note: HPE EM supports only standard project format (.eap).

Chapter 4: Preparing Databases

This section describes database administration tasks for HPE EM. The database administrator must perform tasks at the time of installation and may also have tasks when HPE EM is updated, extensions are applied, or data is migrated.

Before you can install HPE EM the database administrator must set up the database.

Read "[Database Installation Types](#)" below first for information about the different database installation scenarios which vary according to the required level of access to the database.

Caution: For performance reasons, HPE recommends verifying the network performance between the location of the application server and the location of the database. Check the traceroute to the database, HPE recommends a maximum response time of 10ms, 1 hop is optimum, 2 hops is ok.

Caution: Encryption keys for password encryption are stored in the EAR file. It is recommended that this file be protected with system file permissions.

The database specific sections describe database specific prerequisites and procedures describing how to create the various user types required by the different database installation scenarios.

- "[Set Up Oracle Database](#)" on the next page
- "[Set Up Microsoft SQL](#)" on page 20

Database Installation Types

- **Create Schema**

The Create Schema option, available in the HPE EM Wizard Installer and command-line deployment, creates tables and indexes in the default schema in an existing database or tablespace provided by the database administrator. Select this method if you have an account in a database with an empty schema (recommended) and privileges to create tables and indexes.

Note: In this document, power user refers to users with the privilege to create tables and indexes.

- **Create Database / Tablespace**

The option to create a database or tablespace is available in the HPE EM Wizard Installer and command-line deployment. This option automates database arrangement as much as possible, but requires database administrator credentials. The process creates users with the necessary permissions/access, database or tablespace depending on your database type, and continues with the creation of the schema.

There are some differences in the create database process depending on the database type:

- **Microsoft SQL**

This option requires an existing user with the database creator role.

This option creates a new physical database with collation inherited from the server settings.

- **Oracle Database**

This option requires an existing database and database administrator credentials.

This option does not create a new physical database. It creates a new tablespace to hold HPE EM data separately and creates a new database account which uses the new tablespace as its default tablespace.

- **Manual Database Arrangement**

The database administrator may want to arrange the database manually:

- In some cases, the database administrator (DBA) cannot share the DBA credentials required for the Create Database option or the power user credentials for the Create Schema option.
- In some cases, the database administrator may want to amend the default DDL scripts. For example, to create indexes in a separate tablespace.

In these cases, the database administrator must perform the database related installation operations manually as part of Decoupled Database Installation.

Typically the database administrator creates a power user account for the HPE EM schema and a common user account with minimal privileges to insert, select, update, and delete SQL operations in power user tables.

The database administrator does not distribute the power user credentials and provides the common user credentials to the HPE EM administrator to configure the application server datasource.

Set Up Oracle Database

Configure the Oracle database as follows for use with HPE EM:

- If you are upgrading from older HPE EM versions, use a new database. Using the same database as the previous version will lose your data.
- If you are clustering Oracle database (RAC), you must use Oracle Database 10.2.0.4 or higher. HPE EM does not support RAC in earlier versions.
- HPE EM installation requires a JDBC driver. Refer to the Supported Database Types for versions of JDBC driver to be used for different database servers.
- To use HPE EM Full Text Search, include the "Oracle Text" extension when installing the Oracle server. The "Oracle Text" extension is applied to Oracle by default.
- HPE strongly recommends creating a database that uses the Unicode for Database Character Set (NLS_CHARACTERSET=AL32UTF8). If you use a non-Unicode database, you may encounter problems storing and searching some national characters outside your character set. Changing the character set after installation is only possible by creating a new database.
- HPE recommends setting the `cursor_sharing` parameter to `FORCE` to improve performance and economize shared pool usage.
- In Oracle 12c, if exception `ORA04036: PGA memory used by the instance exceeds PGA_AGGREGATE_LIMIT` occurs, run the below command:

```
alter system set pga_aggregate_limit=0 scope=both;
```
- Create accounts based on the database installation type selected for HPE EM installation. The access required is defined by the database installation type:

- For the Create Database option, an account is created by the installer.
- For the Create Schema option, if you want to separate the HPE EM data (recommended), create a tablespace in the database. Create a power user to own the schema, with the new tablespace as its default tablespace.
- For Manual Database Arrangement, create a tablespace in the database, create a power user account to own the schema, with the new tablespace as its default tablespace. Optionally, create a common user account with minimal privileges.

Caution: If you are using Oracle DB with a UNIX 64-bit operating system (including Linux), a TNS-12535 error may occur during installation. This error occurs due to a problem with the random pool. Fix the problem by adding `/sbin/rngd -r /dev/urandom -o /dev/random -t 55 to /etc/rc.d/rc.local`.

Tip: HPE recommends the following free Oracle (performance) troubleshooting tool: AWR (Automatic Workload Repository) reports. These reports must be generated by the database administrator.

If required, see the following sections for additional Oracle setup details:

- ["Set Up an Oracle Power User" below](#)
- ["Set Up an Oracle Common User" on the next page](#)

Set Up an Oracle Power User

In order to use the Create Schema option during installation or for Manual Database Arrangement, the database administrator should create a *power user* with appropriate privileges to the database.

To Set Up a Power User in Oracle:

1. HPE recommends creating a new tablespace to hold HPE EM data.
2. Create an account that can create schema items, with the new tablespace as its default tablespace.
3. Grant privileges to the account to connect to the database and create tables, indexes, sequences, and views.

```
sqlplus <system/password>@<connect_identifier>
/* add "connect", "resource" roles to <user> */
grant connect to <user>;
grant resource to <user>;
/* add "create view", "create materialized view" privileges to <user> */
grant create any view to <user>;
grant create any materialized view to <user>;
/* Oracle 12c has revoked some system privileges from the RESOURCE role. In this
case EM database
user needs to be granted with explicit privileges */
grant unlimited tablespace to <user>;
grant CREATE ANY TABLE, SELECT ANY TABLE, DROP ANY TABLE, INSERT ANY TABLE, UPDATE
ANY TABLE,
DELETE ANY TABLE, CREATE SESSION, CREATE PROCEDURE, CREATE SEQUENCE to <user>;
```

```
/* add "create synonym", "drop synonym" privileges to <user>; required for setting  
up common user only */  
grant create any synonym to <user>;  
grant drop any synonym to <user>;  
  
exit;
```

Note: In Oracle 12c multitenant mode, user names must start with 'c##'.

4. Grant privileges for the user by executing the following commands:

```
GRANT SELECT ON sys.dba_pending_transactions TO <user>;  
GRANT SELECT ON sys.pending_trans$ TO <user>;  
GRANT SELECT ON sys.dba_2pc_pending TO <user>;  
GRANT EXECUTE ON sys.dbms_xa TO <user>;
```

Otherwise, you will get the following error in the server log:

```
WARN [com.arjuna.ats.jta.logging.loggerI18N]  
[com.arjuna.ats.internal.jta.recovery.xarecovery1]  
Local XARecoveryModule.xaRecovery got XA exception  
javax.transaction.xa.XAException, XAException.XAER_RMERR
```

5. Optionally, disable the default password expiry policy (so that the database password need not be changed every 6 months).

```
alter profile default limit password_life_time unlimited;
```

6. Optionally, grant the account the privilege to execute "CTXSYS"."CTX_DDL".

This privilege is a precondition for using the HPE EM full-text search feature on the database.

Set Up an Oracle Common User

In cases where the database administrator restricts access to the database to just select, insert, update, and delete operations, HPE EM requires a user with these privileges.

Note: This setup is applicable to database decoupled installation mode only. The HPE EM schema must exist before you create the common user. For more details, see ["Manual Database Deployment" on page 65](#).

To Set Up a Common User in Oracle:

1. Login as database administrator and create an account that is used by HPE EM at runtime.
2. Save the following SQL statements to the `script.sql` file:

```
set pagesize 0;  
set pagesize 0;  
set line 200;  
set verify off  
set feedback off  
spool ./grant.sql  
SELECT 'GRANT INSERT, UPDATE, DELETE, SELECT ON &1' || '.' || table_name || ' TO
```

```
&2;' FROM user_tables;  
SELECT 'GRANT SELECT ON &1' || '.' || sequence_name || ' TO &2;' FROM user_  
sequences;  
spool off  
spool ./synonyms.sql  
SELECT 'CREATE SYNONYM &2' || '.' || table_name || ' FOR &1' || '.' || table_name ||  
'; ' FROM user_tables;  
SELECT 'CREATE SYNONYM &2' || '.' || sequence_name || ' FOR &1' || '.' || sequence_  
name || ' ' FROM user_sequences;  
spool off
```

These statements generate scripts to set the environment, grant rights and create synonyms.

3. Connect to the database as the *power_user* and execute `script.sql` to produce the scripts `grant.sql` and `synonyms.sql`.

```
sqlplus power_user/password@SID  
-- generate grant and create synonym statements  
@script.sql power_user common_user  
exit
```

4. As the *power_user* or database administrator, execute `synonyms.sql` and `grant.sql` in sequence.

```
sqlplus power_user/password@SID  
-- execute synonym.sql  
@synonyms.sql  
-- execute grant.sql  
@grant.sql  
exit
```

Set Up Microsoft SQL

You can use HPE EM with a Microsoft SQL database. The database requires set up and configuration prior to installing HPE EM.

1. Use SQL Server Configuration Manager to enable the TCP/IP protocol and use a static port (for example 1433).
2. HPE EM installation requires a JDBC driver:

Database	DB Version	Driver Packages	Driver Version	Driver Class
Microsoft SQL Server	2012 SP1, 2014	sqljdbc4.jar	4.0	com.microsoft.sqlserver.jdbc. SQLServerDriver

3. HPE EM requires XA transactions support. For details about setting up XA transaction support, go to the following location:
<http://msdn2.microsoft.com/en-us/library/aa342335.aspx>
4. If you want to use the full-text search feature in HPE EM, make sure that the Full-Text Search engine is installed together with the database engine during the installation of MSSQL Server.
5. Create a login in the database server to hold HPE EM tables in the database. The login must have the *database creator* role.

The login must be able to access the master database for XA related stored procedures:

- Create a user in the master database for the login.
 - Assign the SqlJDBCXAUser role to the account.
6. Create users based on the database installation type selected for the HPE EM installation:
- For the Create Database option the installer uses the login to automatically arrange the database. The created database inherits collation from the MSSQL server default collation. HPE EM requires case-sensitive collation. Use a server with case-sensitive collation or manage database collation manually using the Create Schema option.
 - For the Create Schema option, if you want to separate the HPE EM data (recommended), use the login to create a database. The database must have case-sensitive collation.

Note: You can create the database on behalf of another account or use an existing account with an existing database, but you must then grant create table privileges to the new account or the existing account.

The installer uses the login to create the schema in this new database.

- For Manual Database Arrangement, use the power user login to create the database with case-sensitive collation. Then create the schema manually, and optionally create a common user account with minimal privileges.

If you intend to use user accounts and group names in HPE EM that contain non-Latin characters, you must specify an appropriate collation on the database that supports such non-Latin characters.

7. Activate snapshot isolation for the EM database. Execute the following statements:

- ALTER DATABASE [database_name] SET ALLOW_SNAPSHOT_ISOLATION ON;
- ALTER DATABASE [database_name] SET READ_COMMITTED_SNAPSHOT ON;

If required, see the following sections for additional MSSQL setup details:

- ["Set Up an MSSQL Common User" below](#)

Set Up an MSSQL Common User

In cases where the database administrator restricts access to the database to just select, insert, update, and delete operations, HPE EM requires a user with these privileges.

To Set Up a Common User in MSSQL:

1. Open Microsoft SQL Server Management Studio or the sqlcmd command-line editor.
2. Create a common user login in the server and user in the database created for HPE EM (emdb).

For example, execute the following statements:

```
USE [master]
GO
```

```
CREATE LOGIN [common_user] WITH PASSWORD=N'...', DEFAULT_DATABASE=[master],  
CHECK_EXPIRATION=OFF, CHECK_POLICY=OFF  
GO  
USE [emdb]  
GO  
CREATE USER [common_user] FOR LOGIN [common_user]  
GO
```

3. Grant rights to the common user to read and write to HPE EM tables.

For example, execute the following statements:

```
USE [emdb]  
GO  
EXEC sp_addrolemember N'db_datawriter',N'common_user'  
GO  
USE [emdb]  
GO  
EXEC sp_addrolemember N'db_datareader', N'common_user'  
GO
```

4. The login must be able to access the master database for XA related stored procedures.
Create a user in the master database for the login and add the user to the SqlJDBCXAUser role.

For example, execute the following statements:

```
USE [master]  
GO  
CREATE USER [common_user] FOR LOGIN [common_user]  
GO  
USE [master]  
GO  
EXEC sp_addrolemember N'SqlJDBCXAUser', N'common_user'  
GO
```

Chapter 5: Preparing LDAP and CA Single Sign On

Depending on your deployment you may want to integrate with LDAP or CA Single Sign On.

The set up of each, prior to HPE EM installation, is explained in the following sections:

- ["Prepare LDAP Integration" below](#)
- ["Set Up CA Single Sign On Endpoint Authentication" on the next page](#)

Prepare LDAP Integration

Automatic Service Discovery

The automatic discovery of LDAP servers means you do not have to hardwire the URL and port of the LDAP server. Instead you can use `ldap:///o=JNDITutorial,dc=example,dc=com` as a URL, and the real URL is deduced from the distinguished name `o=JNDITutorial,dc=example,dc=com`.

Automatic discovery of the LDAP service using the URL's distinguished name is supported only in Java 2 SDK, versions 1.4.1 and later, so make sure that your Java version supports this.

LDAP Service Properties

Enterprise Maps integration with LDAP uses a JNDI interface to connect to LDAP servers.

For more information, about the JNDI API, see <http://java.sun.com/products/jndi/tutorial/ldap/connect/create.html> and <http://java.sun.com/j2se/1.5.0/docs/guide/jndi/jndi-dns.html#URL>.

The following JNDI properties must be known to the server:

Property Name	Property Description	API Link
Naming Provider URL	URL of the LDAP service.	http://java.sun.com/j2se/1.5.0/docs/api/javax/naming/Context.html#PROVIDER_URL
Initial Naming Factory	Java class for the initial naming factory.	http://java.sun.com/j2se/1.5.0/docs/api/javax/naming/Context.html#INITIAL_CONTEXT_FACTORY
Security Principal	The name of the security	http://java.sun.com/j2se/1.5.0/docs/api/javax/naming/Context.html#SECURITY_PRINCIPAL

Property Name	Property Description	API Link
	principal for read access to the directory service.	
Password	Password of security principal.	http://java.sun.com/j2se/1.5.0/docs/api/javax/naming/Context.html#SECURITY_CREDENTIALS
Security Protocol	Name of the security protocol. Default is "simple."	http://java.sun.com/j2se/1.5.0/docs/api/javax/naming/Context.html#SECURITY_PROTOCOL

Set Up CA Single Sign On Endpoint Authentication

In CA Single Sign On, configure HPE EM endpoint authentication.

By default, HPE EM performs the following authentication on HPE EM endpoints:

- **FORM authentication:**

- /web/service/catalog/*
- /web/policy-manager/*
- /web/shared/*
- /web/artifactIconList.htm

- **HTTP basic authentication:**

- /em/platform/restBasic/*
- /platform/restSecure/*
- /policymgr/restSecure/*
- /reporting/restSecure/*
- /remote/navigator/*
- /remote/upload/*

- **Unauthenticated URL patterns:**

- /em/platform/rest/*
- /platform/rest/*
- /policymgr/rest/*
- /reporting/rest/*
- /web/design/*
- /remote/dql/*

Note: All endpoints are preceded by `http(s)://host:port/context` as set during installation.

Chapter 6: HTTP Proxy Requirement

Due to security and cluster support, an HTTP proxy server must be installed before installing HPE EM. Apache is the recommended proxy server. The HTTP proxy server will mitigate the impact of existing and future security defects in the embedded JBoss application server.

This section describes how to install HPE EM with a proxy server in the following topics:

- ["Install HPE Enterprise Maps with a Proxy Server" below](#)
- ["Test the Proxy Server Installation" on page 28](#)

Install HPE Enterprise Maps with a Proxy Server

Follow the steps below to enable accessing Enterprise Maps through a proxy server.

1. ["How to Install HPE EM with a Proxy Server" below](#) as follows:
 - a. Install the Apache Web Server
 - b. Configure the Apache Web Server as a Reversed Proxy
 - c. Enable SSL in the Apache Web Server (Optional)
2. ["How to Configure HPE EM with a Proxy Server" on page 28](#)

How to Install HPE EM with a Proxy Server

1. Install the Apache Web Server.

It is recommended that you use the Apache web server as the proxy server by enabling `mod_proxy`. A stable version of the Apache Web Server (2.4.10) can be downloaded from the Apache website <http://httpd.apache.org/>.

2. Configure the Apache Web Server as a Reversed Proxy:
 - a. After the Apache web server is installed, go to `APACHE_HOME\conf` and backup `httpd.conf`.
 - b. Edit the `httpd.conf` file as follows:

- Change the HTTP port: Listen **80**
- Enable the Proxy modules:

```
LoadModule proxy_module modules/mod_proxy.so
```

```
LoadModule proxy_connect_module modules/mod_proxy_connect.so
```

```
LoadModule proxy_ftp_module modules/mod_proxy_ftp.so
```

```
LoadModule proxy_http_module modules/mod_proxy_http.so
```

- Add these lines at the end:

```
ProxyRequests Off
```

```
ProxyPass /em http://[host]:[port]/em
```

```
ProxyPassReverse /em http://[host]:[port]/em
```

- o If SSL is enabled for this proxy server, also add the line:
SSLProxyEngine on
 - c. Restart the Apache Web Server.
3. Configure SSL for the Apache Web Server:
- a. Prepare the folder:
 - o Create openssldirectory inside Apache home.
 - o Copy openssl.cnf from /conf to /openssl
 - o CD to /openssl
 - b. Generate a new certificate request:

```
..\bin\openssl req -config .\openssl.cnf -new -out cert.csr
```

Provide the following information:

 - o Enter PEM pass phrase: **<password>**
 - o Verifying - Enter PEM pass phrase: **<password>**
 - o Country Name (2 letter code) [AU]: **<country>**
 - o State or Province Name (full name) [Some-State]: **<state>**
 - o Locality Name (example: city) []: **<city>**
 - o Organization Name:(example: company) [Internet Widgits Pty Ltd]: **<company>**
 - o Organizational Unit Name (example: section) []: **<organization unit>**
 - o Common Name (example: server FQDN or YOUR name) []: **<hostname>**
 - o Email Address []: **<email>**
 - o A challenge password []: **<password>**
 - o An optional company name []: **<company>**
 - c. Convert the private key file:

```
..\bin\openssl rsa -in privkey.pem -out cert.key
```

Provide below information:
Enter pass phrase for privkey.pem: **<password>**
 - d. Create a self-signed certificate (output is also a CA certificate):

```
..\bin\openssl x509 -in cert.csr -out cert.crt -req -signkey cert.key -days 365
```
 - e. Edit or add the following lines in httpd-ssl.cnf
 - o Change SSL port: Listen **443**
<VirtualHost _default_:443>
 - o Set certificate paths
SSLCertificateFile "C:/Program Files (x86)/Apache Software Foundation/Apache2.2/openssl/cert.csr"
SSLCertificateKeyFile "C:/Program Files (x86)/Apache Software Foundation/Apache2.2/openssl/cert.key"
SSLCertificateChainFile "C:/Program Files (x86)/Apache Software Foundation/Apache2.2/openssl/cert.crt"

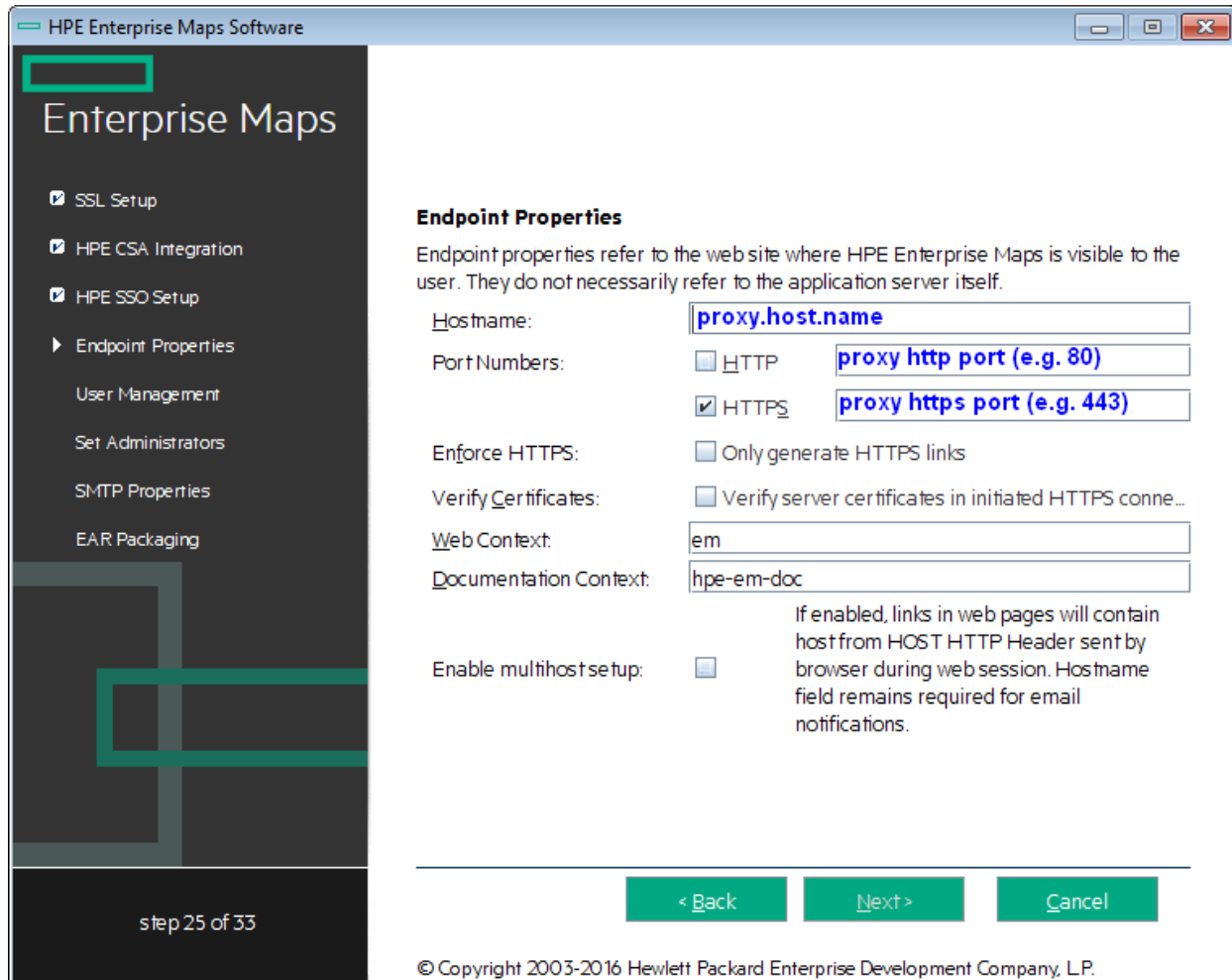
- f. Restart the Apache Web Server.
- g. On the client browser, add **cert.crt** to Trusted Root CA.

Caution: If **openssl** is installed with Apache web server, make sure it is patched frequently to avoid any security issues.

How to Configure HPE EM with a Proxy Server

To configure HPE Enterprise Maps with proxy server, provide proxy server hostname and ports instead of real server hostname and ports during HPE Enterprise Maps installation or by running **Setup** tool after HPE Enterprise Maps is installed.

Note: Make sure you redeploy **hp-soa-systinet.ear** file after changing Endpoint Properties in Setup tool (step 'Enterprise Application Deployment' in Advanced scenario).



Test the Proxy Server Installation

Access the proxy server with URL (*http://[proxyHost]:[proxyPort]/em*).

A successful configuration must result in the following:

1. HPE Enterprise Maps login is shown.
2. Browser address bar shows URL of the proxy server instead of the HPE Enterprise Maps server.

Chapter 7: Using the HPE EM Wizard Installer

The HPE EM Wizard Installer is the easiest way to install HPE EM. However, it may not be suitable for all the configuration options required by production environments.

Before using the HPE EM Installer, make sure that you have a correctly set up environment.

For hardware and software requirements, as well as supported platforms, see ["Prerequisites and Supported Platforms" on page 11](#).

For an evaluation environment, you need valid credentials to a configured database. For details, see ["Preparing Databases" on page 16](#).

JBoss does not require any additional configuration for evaluation purposes.

HPE EM installation wizard consists of the following steps:

1. ["Step 1 - Start the HPE EM Installation" on the next page](#)
2. ["Step 2 - Welcome" on the next page](#)
3. ["Step 3 - License" on page 32](#)
4. ["Step 4 - Installation Folder" on page 33](#)
5. ["Step 5 - Scenario Selection" on page 34](#)
6. ["Step 6 - Updates" on page 35](#)
7. ["Step 7 - Custom Extensions" on page 36](#)
8. ["Step 8 - Password Encryption" on page 37](#)
9. ["Step 9 - Database Selection" on page 38](#)
10. ["Step 10 - Database Setup" on page 39](#)
11. ["Step 11 - Database Parameters" on page 40](#)
 - ["Oracle Create Tablespace" on page 41](#)
 - ["Oracle Create Schema" on page 42](#)
 - ["MSSQL Create Database" on page 44](#)
 - ["MSSQL Create Schema" on page 45](#)
12. ["Step 12 - JDBC Drivers" on page 47](#)
13. ["Step 13 - Repository Import" on page 48](#)
14. ["Step 14 - HPE CSA Integration" on page 49](#)
15. ["Step 15 - HPE SSO Setup" on page 50](#)
16. ["Step 16 - HPE SSO Authentication Properties" on page 50](#)
17. ["Step 17 - Endpoint Properties" on page 51](#)
18. ["Step 18 - User Management Integration" on page 53](#)
 - a. ["LDAP Service Properties" on page 53](#)
 - b. ["LDAP Search Rules" on page 55](#)

- c. ["LDAP User Properties Mapping" on page 56](#)
 - d. ["LDAP Group Search Rules" on page 57](#)
 - e. ["LDAP Group Properties Mapping" on page 58](#)
19. ["Step 19 - System Email Configuration" on page 60](#)
 20. ["Step 20 - Administrator Account Configuration" on page 60](#)
 21. ["Step 21 - SMTP Server Authentication" on page 61](#)
 22. ["Step 22 - License Information" on page 62](#)
 23. ["Step 23 - Confirmation" on page 63](#)

Step 1 - Start the HPE EM Installation

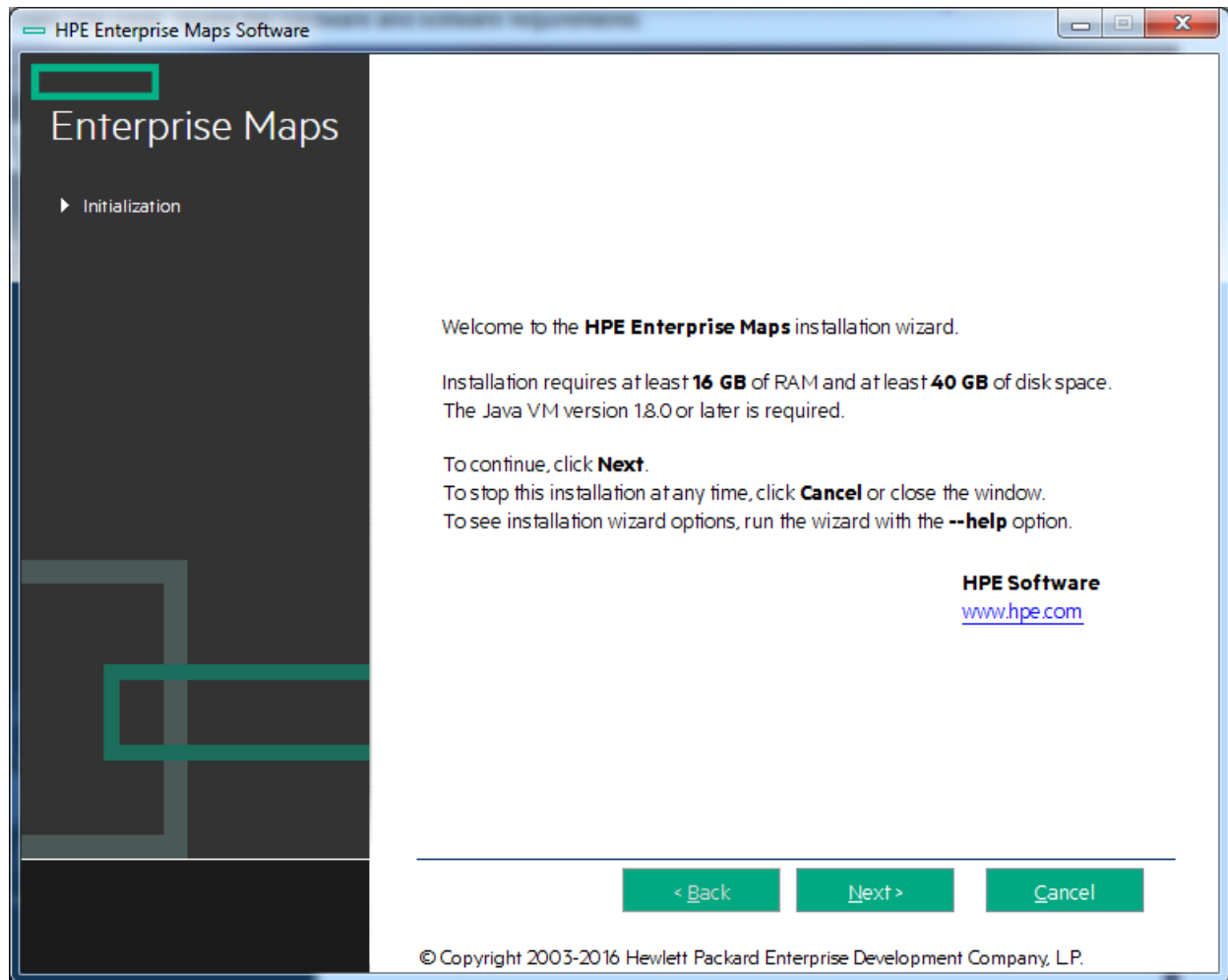
1. Make sure the application server is not running.
2. Do one of the following:
 - Execute the file `hpe-em-3.10.jar`, located on the installation CD or in your distribution directory.
 - Execute the following command:
`java -jar hpe-em-3.10.jar`

The HPE EM Installation wizard opens displaying the Welcome page.

Continue to ["Step 2 - Welcome" below](#).

Step 2 - Welcome

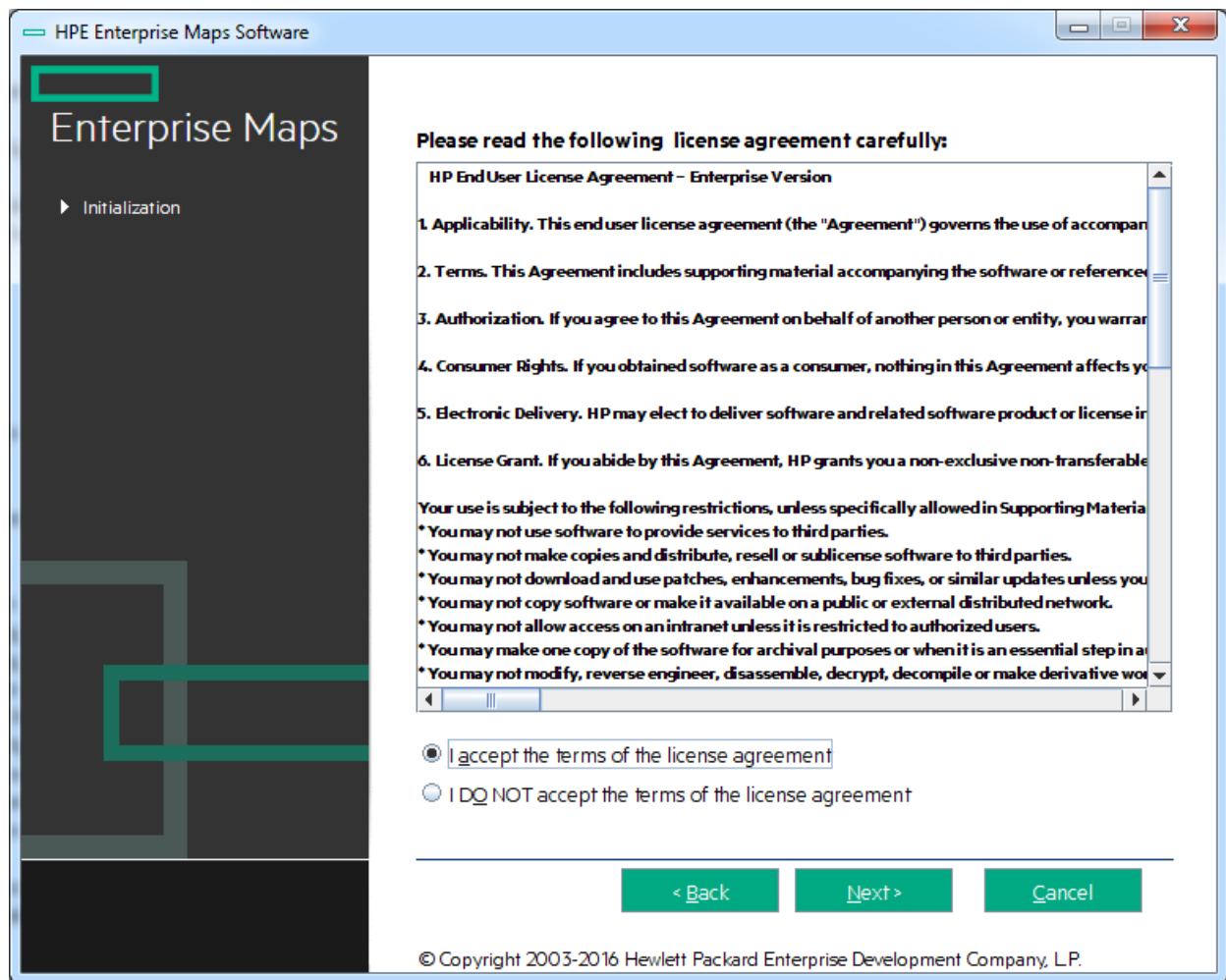
In the Welcome page, review the hardware and software requirements.



Click **Next** to continue to "Step 3 - License" below.

Step 3 - License

In the License page, review the license. The License page shows the license in English, German, Spanish, and French.



Click **Show the license agreement in more languages** to open a PDF which contains the license agreement in different languages including Japanese, Korean, Chinese, and Taiwanese.

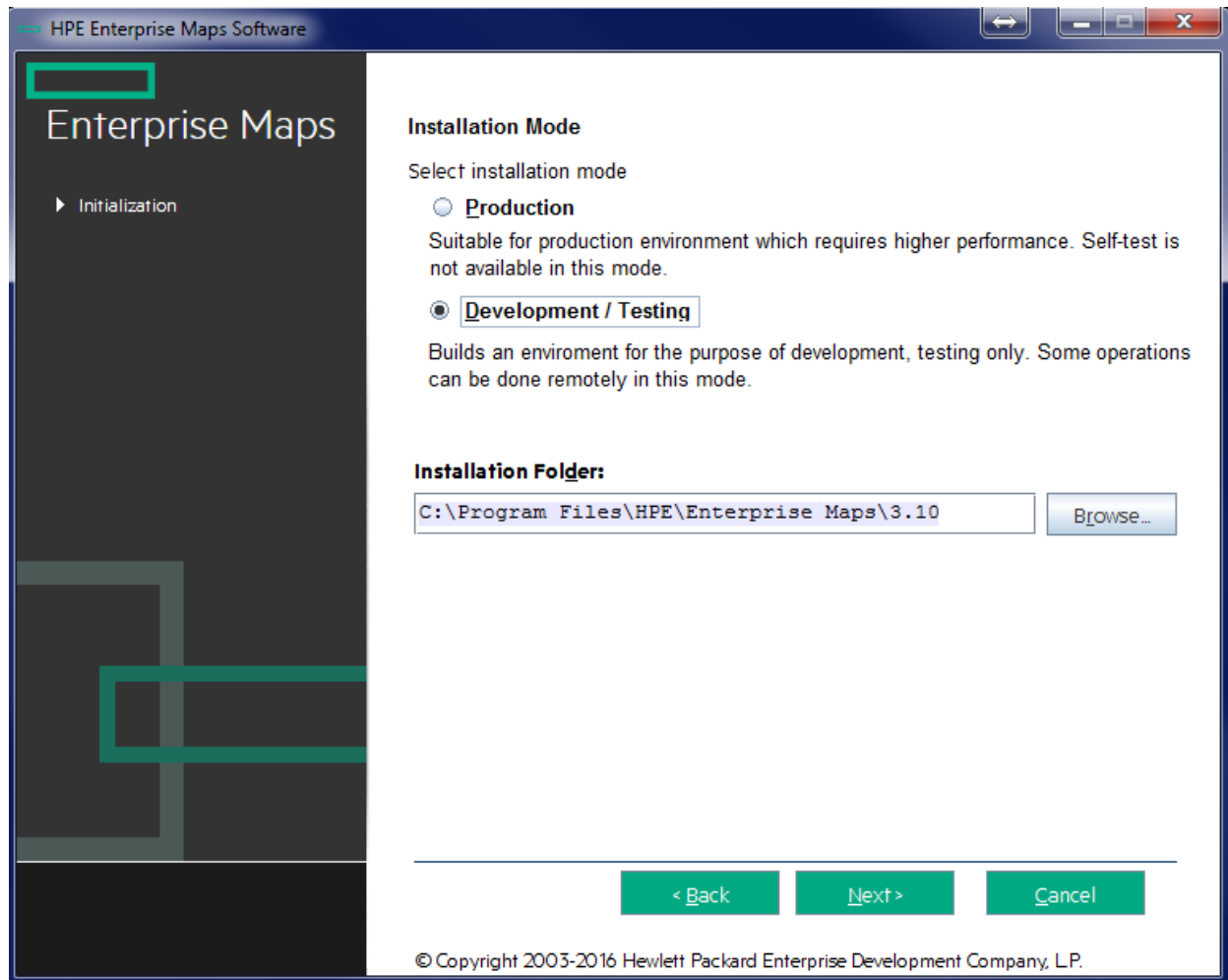
Select **I Accept the Terms of the License Agreement**.

Click **Next** to continue to "[Step 4 - Installation Folder](#)" below.

Step 4 - Installation Folder

In the Installation Folder page, input or click **Browse** to select the location you want to use as your Enterprise Maps installation folder.

Note: The location name cannot contain more than 80 characters.



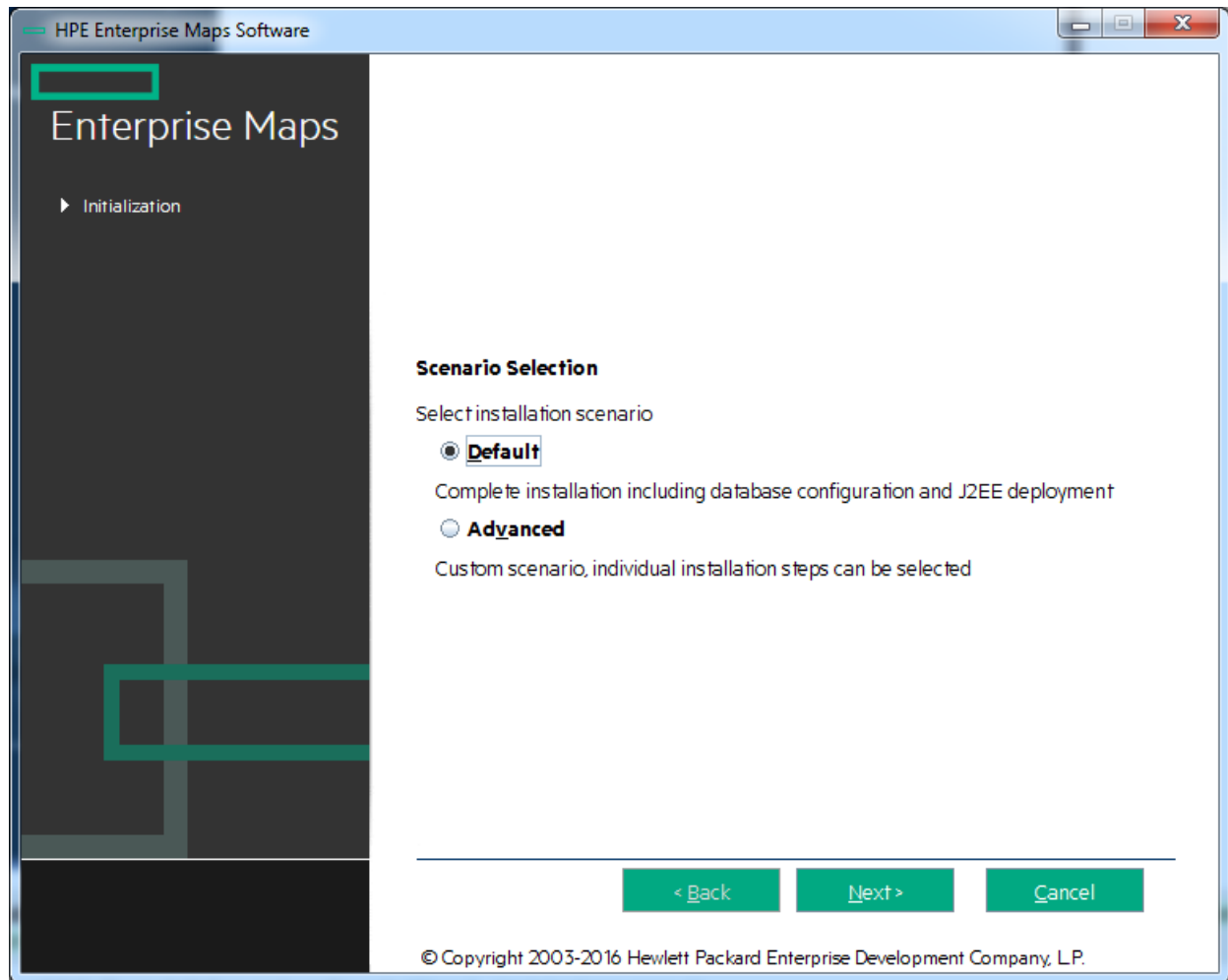
Note: In this document, the installation location is referred to as EM_HOME.

Note: To avoid error when installing HPE EM into a Windows system folder, disable User Access Control (UAC) in Windows Control Panel.

Click **Next** to unpack the distribution files to the chosen location and continue to "[Step 5 - Scenario Selection](#)" below.

Step 5 - Scenario Selection

In the Scenario Selection page, select **Default**.

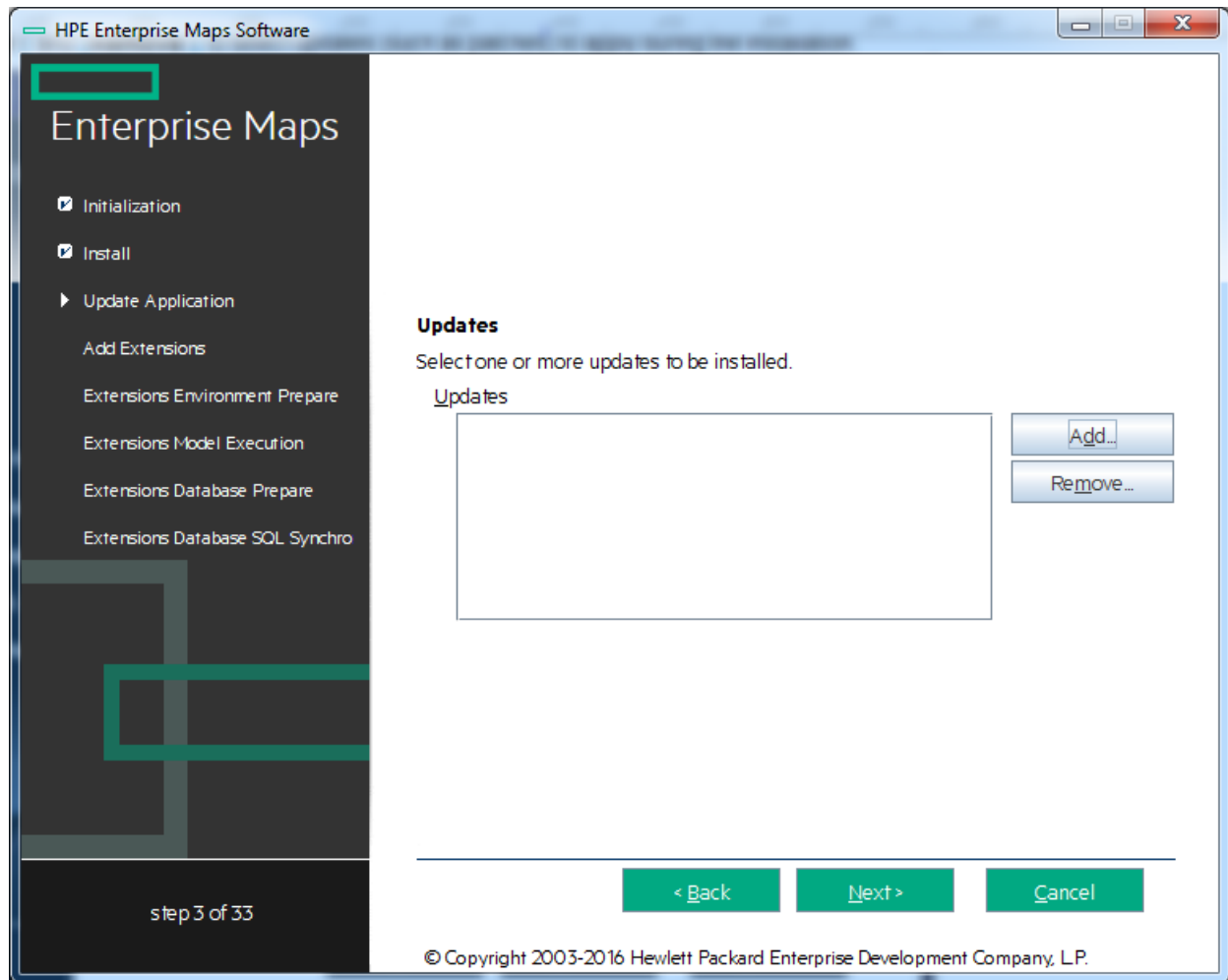


Note: The **Advanced** scenarios enable you to perform parts of the installation separately.

Click **Next** to validate the installation and continue to "[Step 6 - Updates](#)" below.

Step 6 - Updates

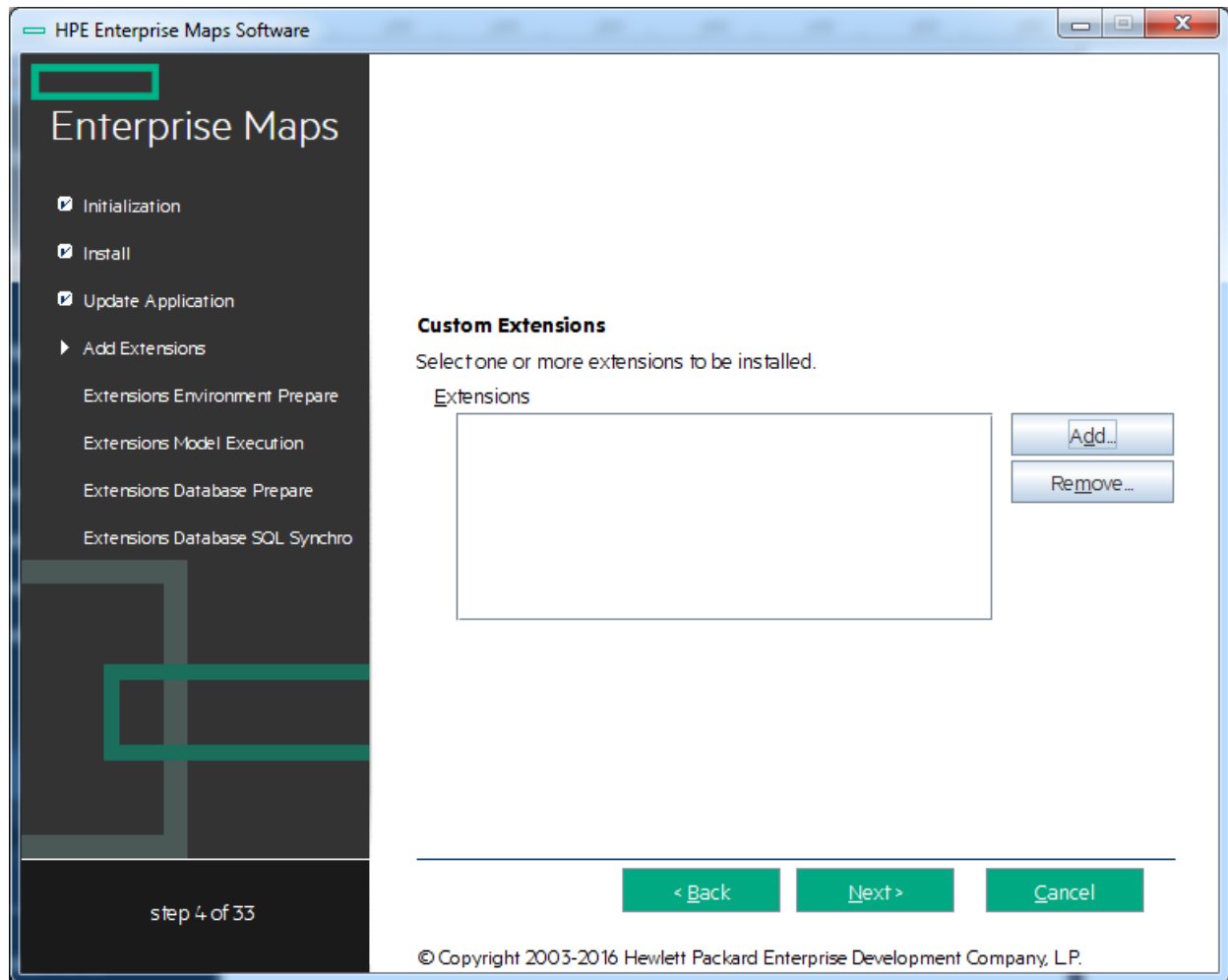
In the Updates page, use **Add** and **Remove** to select updates (such as patches) to apply during the installation.



Click **Next** to verify any selected updates and continue to "[Step 7 - Custom Extensions](#)" below.

Step 7 - Custom Extensions

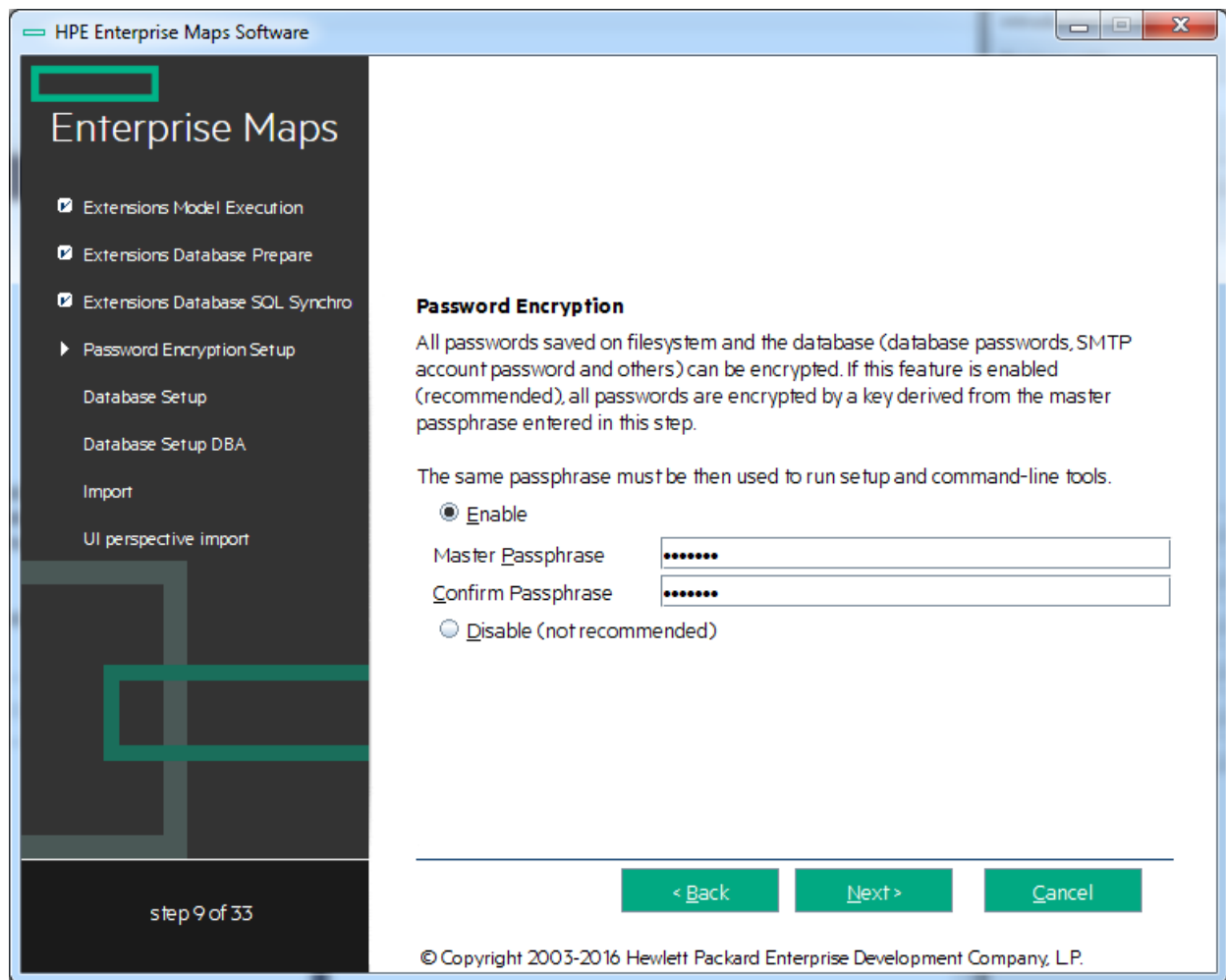
In the Custom Extensions page, use **Add** and **Remove** to select existing extensions that will extend the functionality of HPE EM. The selected extensions will be applied during the installation.



Click **Next** to validate any selected extensions and continue to "[Step 8 - Password Encryption](#)" below.

Step 8 - Password Encryption

In the Password Encryption page select whether HPE EM protects credentials for access to other systems with strong encryption.



Do one of the following:

- For production or sensitive installations, select **Enable** and type the **Master Passphrase** and **Confirm Passphrase**.
- For demo installations, select **Disable**.

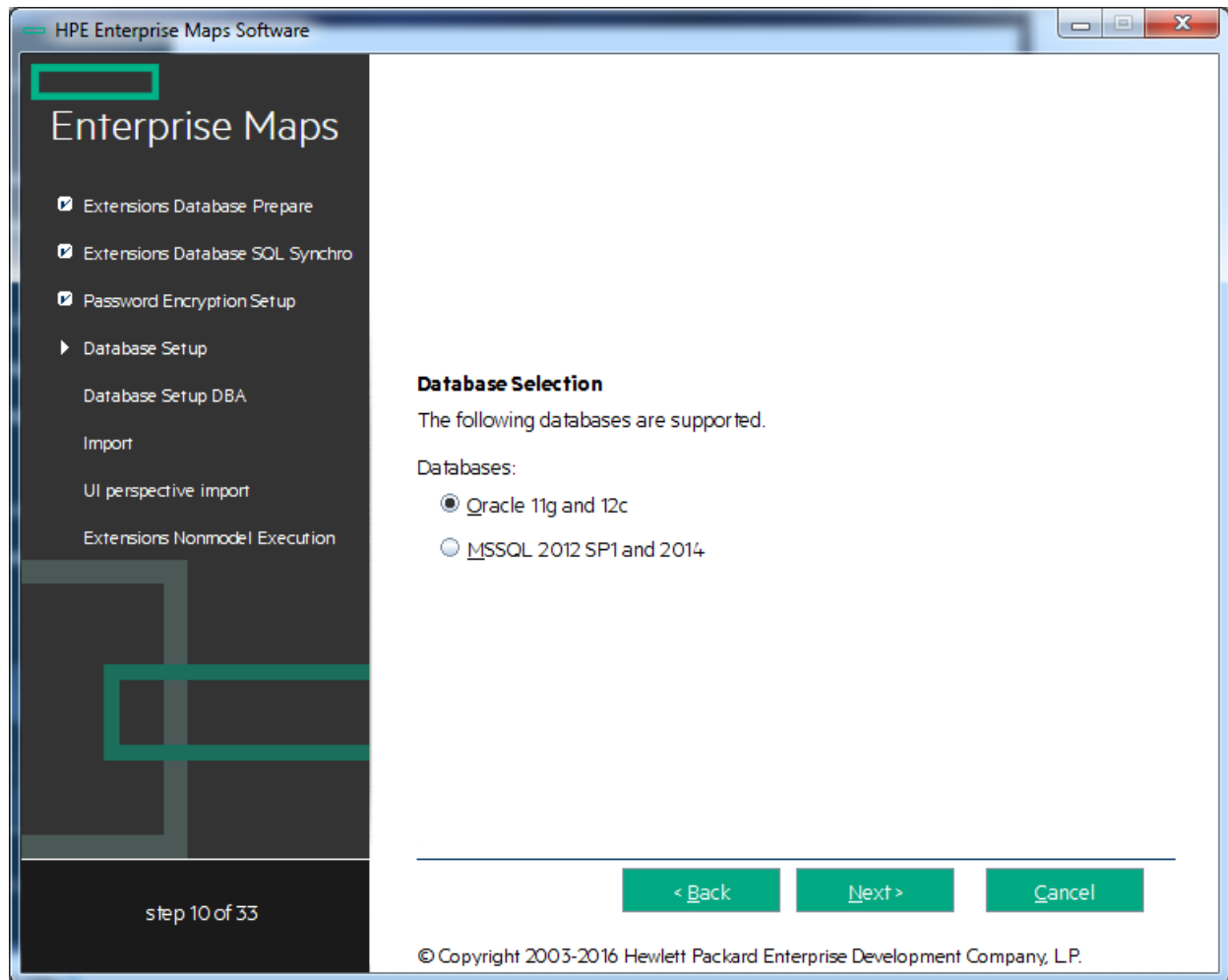
Note: After installing with encryption, all passwords stored in the configuration file are in an encrypted, unreadable form without the provided passphrase. To execute some command line tools, you may need to enter a passphrase or provide it using the **--passphrase** command line option.

If you want to export an image without using the passphrase, you must turn off the server passphrase, export the image, and then turn on the server passphrase. Otherwise you will get an error.

Click **Next** to continue to "[Step 9 - Database Selection](#)" below.

Step 9 - Database Selection

In the Database Selection Page, select one of the following database types to use:

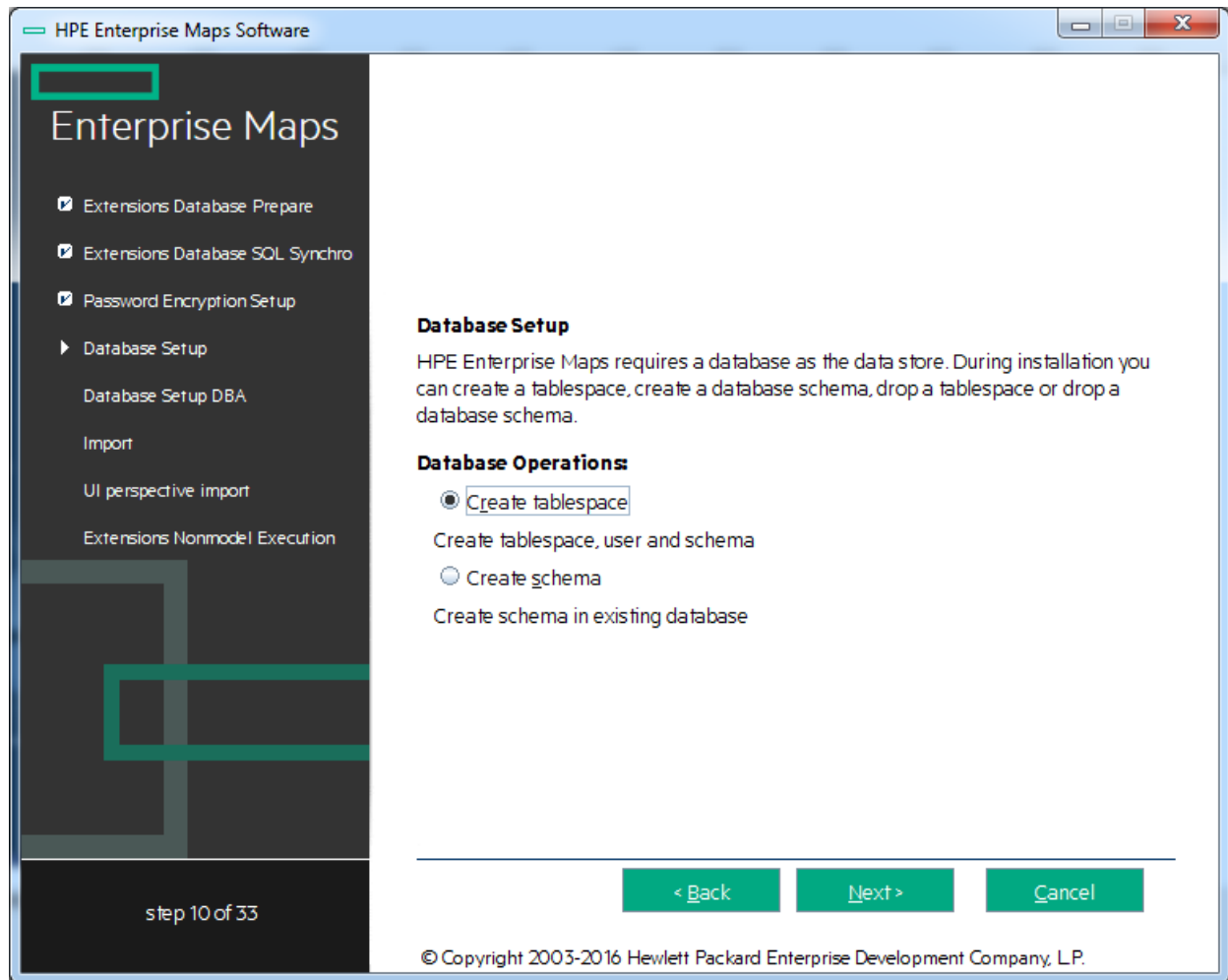


- **Oracle 11g and 12c**
- **MSSQL 2012 SP1 and 2014**

Select your database type and click **Next** to continue to "[Step 10 - Database Setup](#)" below.

Step 10 - Database Setup

In the Database Setup Operations page, select your database installation type:



If you chose Oracle, your choices are:

- **Create Tablespace**
- **Create Schema**

If you choose MSSQL, your choices are:

- **Create Database**
- **Create Schema**

Select the appropriate option according to your database administrator.

Click **Next** to open the Database Options page specific to the database and database installation type.

Continue to "[Step 11 - Database Parameters](#)" below.

Step 11 - Database Parameters

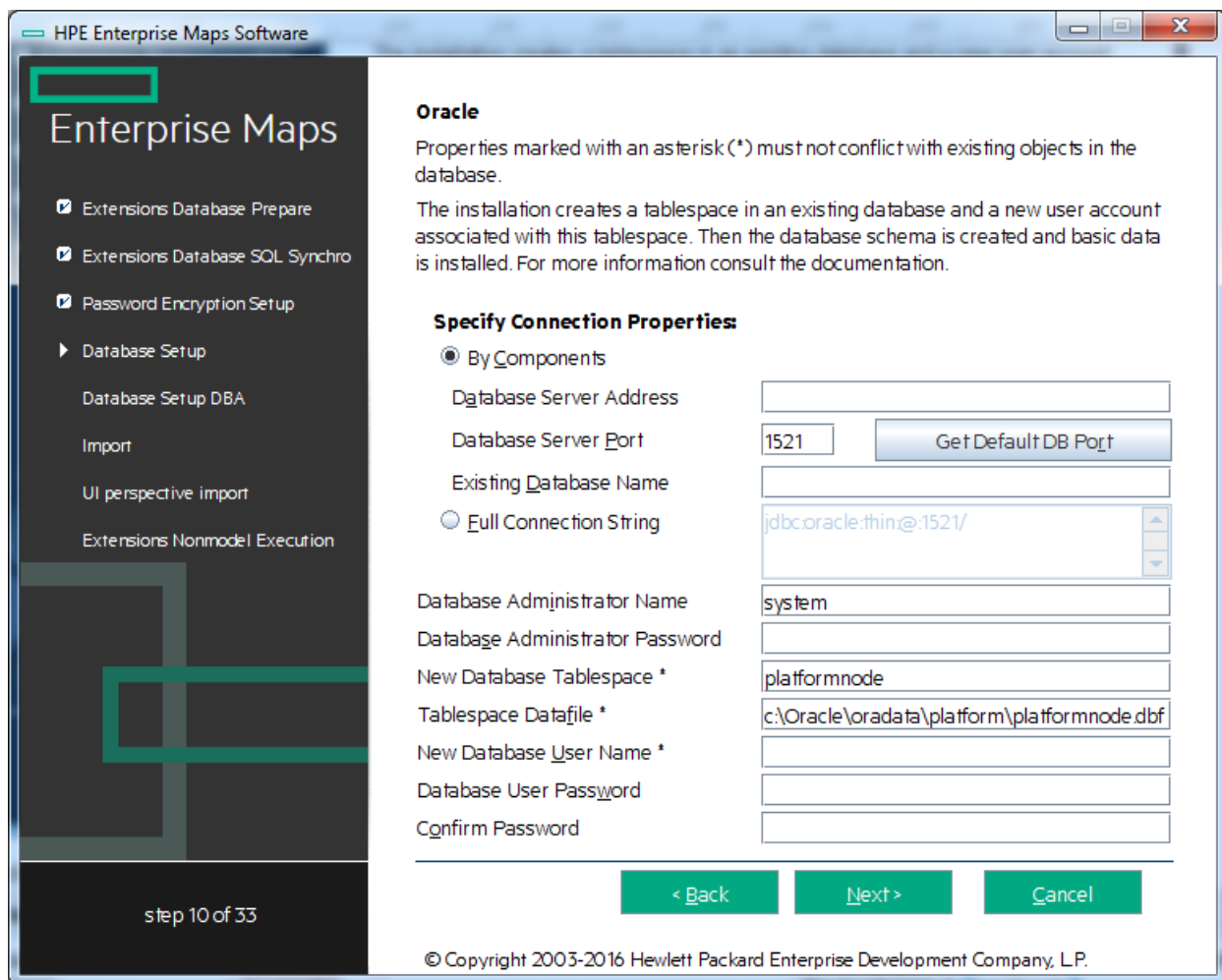
The required database parameters vary depending on your database type and setup type.

For details, see the appropriate section:

- "Oracle Create Tablespace" below
- "Oracle Create Schema" on the next page
- "MSSQL Create Database" on page 44
- "MSSQL Create Schema" on page 45

Oracle Create Tablespace

In the Oracle tablespace page, set the following parameters:



Oracle Create Tablespace Parameters

Parameter	Description	Notes
Database Server Address	Hostname or IP address where the database server is accessible.	For example, in the database connection string <code>jdbc:oracle:thin:@orahost:1521/platform</code> the hostname is <code>orahost</code> .
Database Server Port	Connection port for the database.	For example, in the database connection string <code>jdbc:oracle:thin:@orahost:1521/platform</code> the port number is 1521.

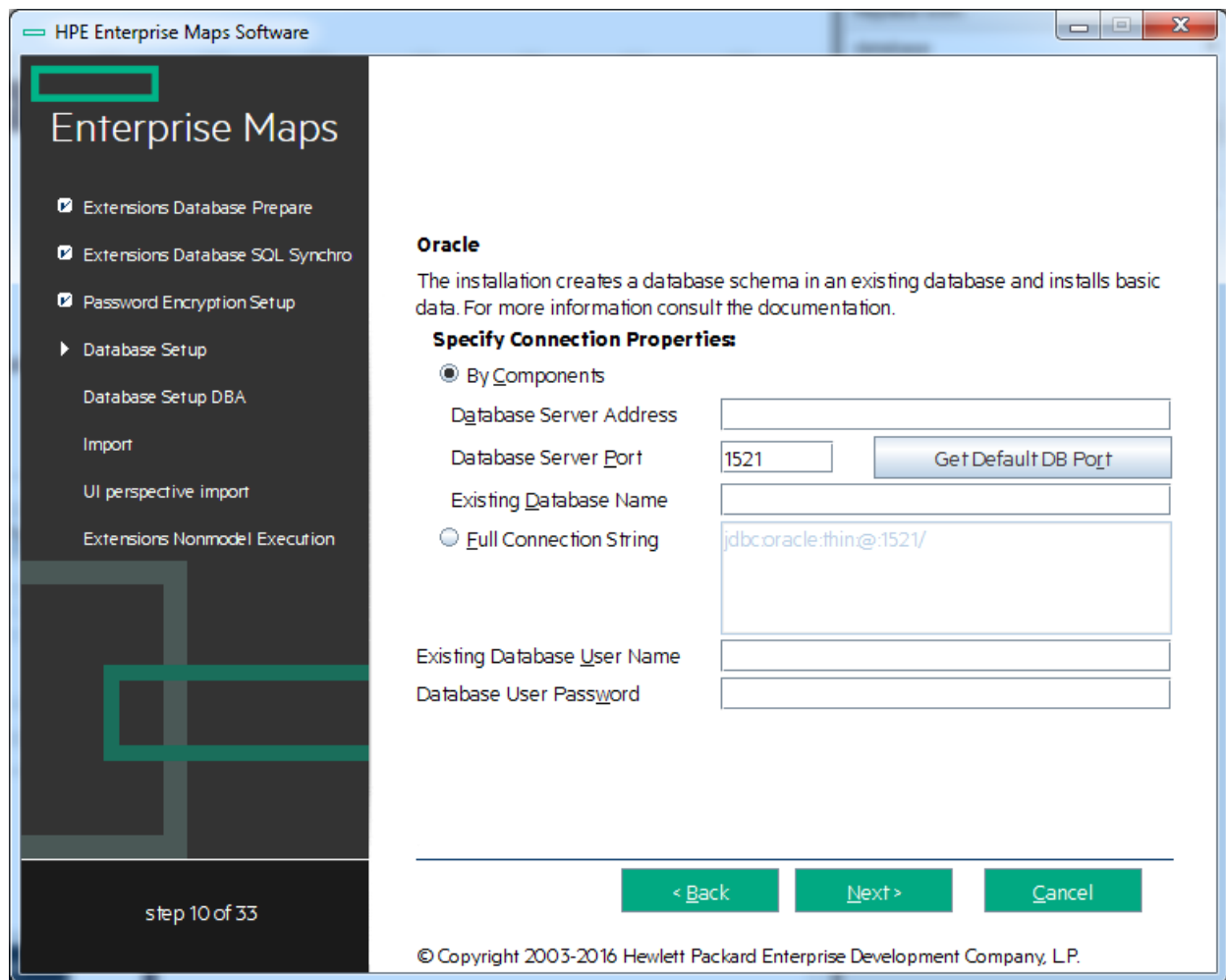
Oracle Create Tablespace Parameters, continued

Parameter	Description	Notes
Existing Database Name	Name of the database.	For example, in the database connection string <code>jdbc:oracle:thin:@orahost:1521/platform</code> the database name is <code>platform</code> .
Full Connection String	Full connection string to the database.	Select this as option as an alternative to inputting the individual connection parameters.
Database Administrator Name	User name and password of the administrator of the database.	
Database Administrator Password		
New Database Tablespace	Name of the tablespace to create.	The tablespace name must not conflict with existing objects in the database.
Tablespace Datafile	Path to the tablespace datafile that is stored on the database host machine.	The new database tablespace must not conflict with existing objects in the database.
New Database User Name	Name and password of a new database user.	The user name must not conflict with existing objects in the database.
Database User Password		
Confirm Password		

Click **Next** to continue to ["Step 12 - JDBC Drivers" on page 47](#).

Oracle Create Schema

In the create a new Oracle schema page, set the following parameters:



Oracle Create Schema Parameters

Parameter	Description	Notes
Database Server Address	Hostname or IP address where the database server is accessible.	For example, in the database connection string <code>jdbc:oracle:thin:@orahost:1521/platform</code> the hostname is <code>orahost</code> .
Database Server Port	Connection port for the database.	For example, in the database connection string <code>jdbc:oracle:thin:@orahost:1521/platform</code> the port number is 1521.
Existing Database Name	Name of the database.	For example, in the database connection string <code>jdbc:oracle:thin:@orahost:1521/platform</code> the database name is <code>platform</code> .
Full Connection String	Full connection string to the database.	Select this as option an alternative to inputting the individual connection parameters.
Existing Database	User name and password to connect to the database.	

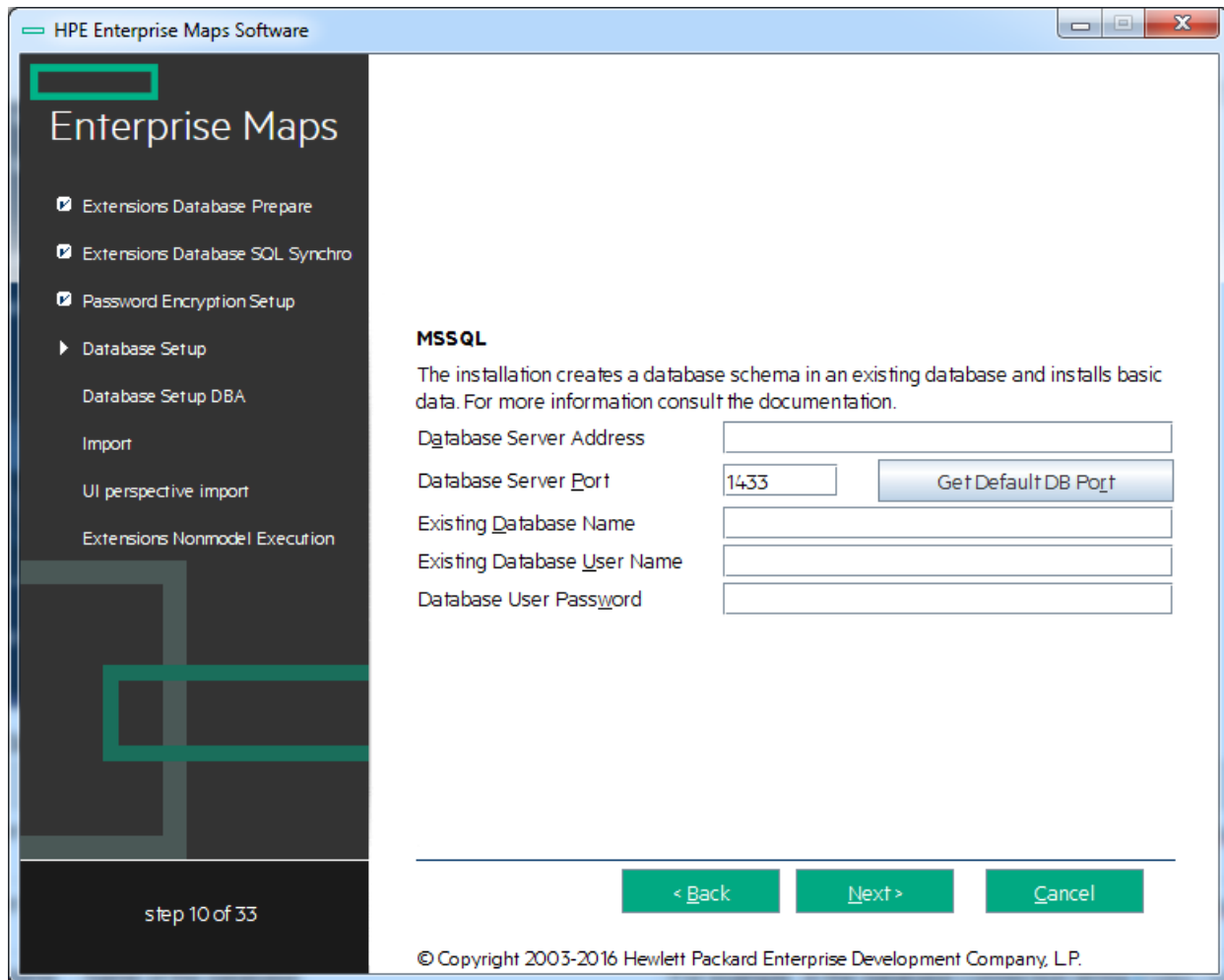
Oracle Create Schema Parameters, continued

Parameter	Description	Notes
User Name		
Database User Password		

Click **Next** to continue to "Step 12 - JDBC Drivers" on page 47.

MSSQL Create Database

In the create a new MSSQL database page, set the following parameters:



MSSQL Create Database Parameters

Parameter	Description	Notes
Database Server	Hostname or IP address where the database server is	For example, in the database connection string jdbc:sqlserver://sqlhost:1433:platform the

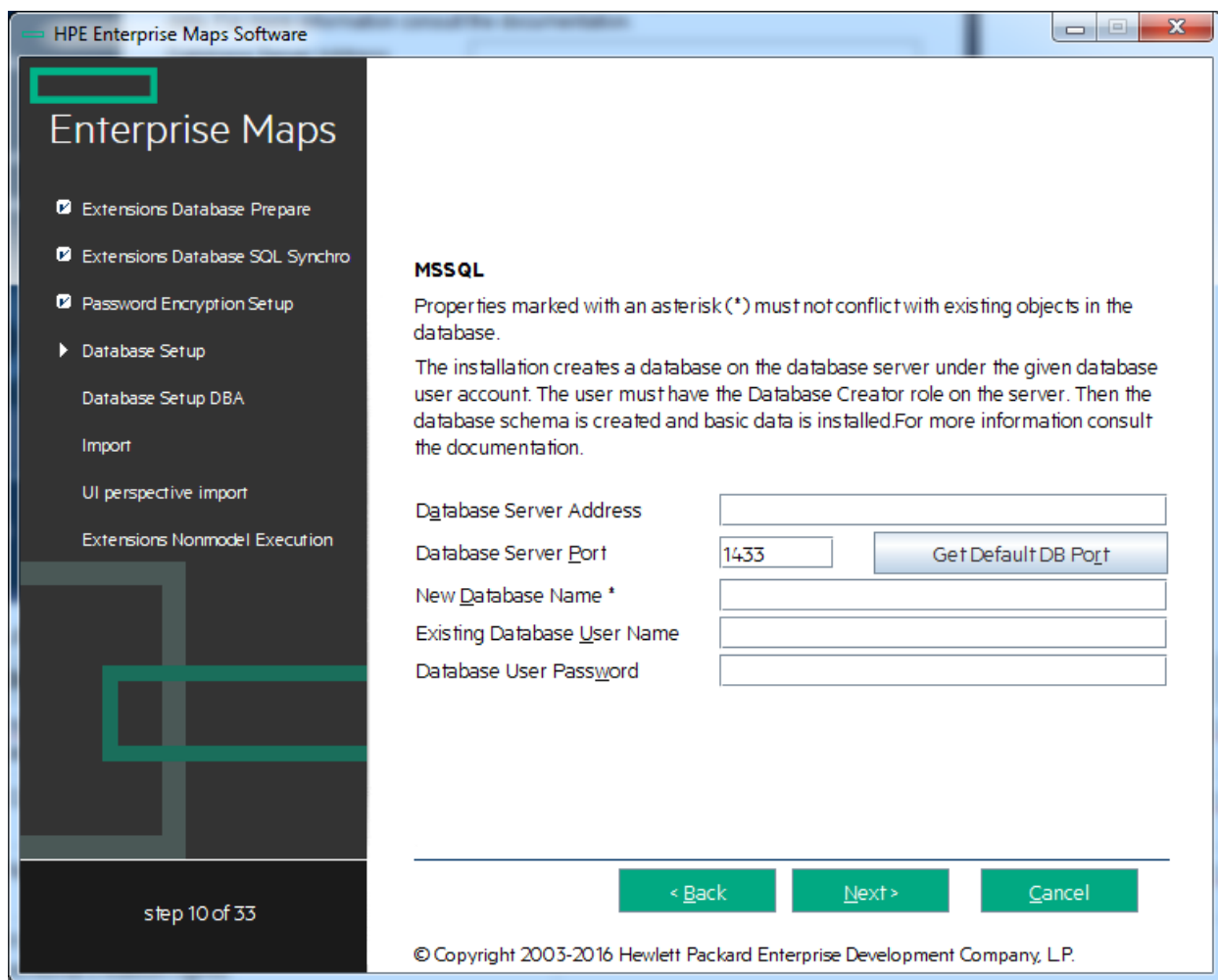
MSSQL Create Database Parameters, continued

Parameter	Description	Notes
Address	accessible.	hostname is sqlhost.
Database Server Port	Connection port for the database.	For example, in the database connection string <code>jdbc:sqlserver://sqlhost:1433:platform</code> the port number is 1433.
New Database Name	Name of the database.	For example, in the database connection string <code>jdbc:sqlserver://sqlhost:1433:platform</code> the database name is platform.
Existing Database User Name	For the Create Database option the user must have the database creator role.	
Database User Password		

Click **Next** to continue to ["Step 12 - JDBC Drivers"](#) on page 47.

MSSQL Create Schema

In the create a new MSSQL schema page, set the following parameters:



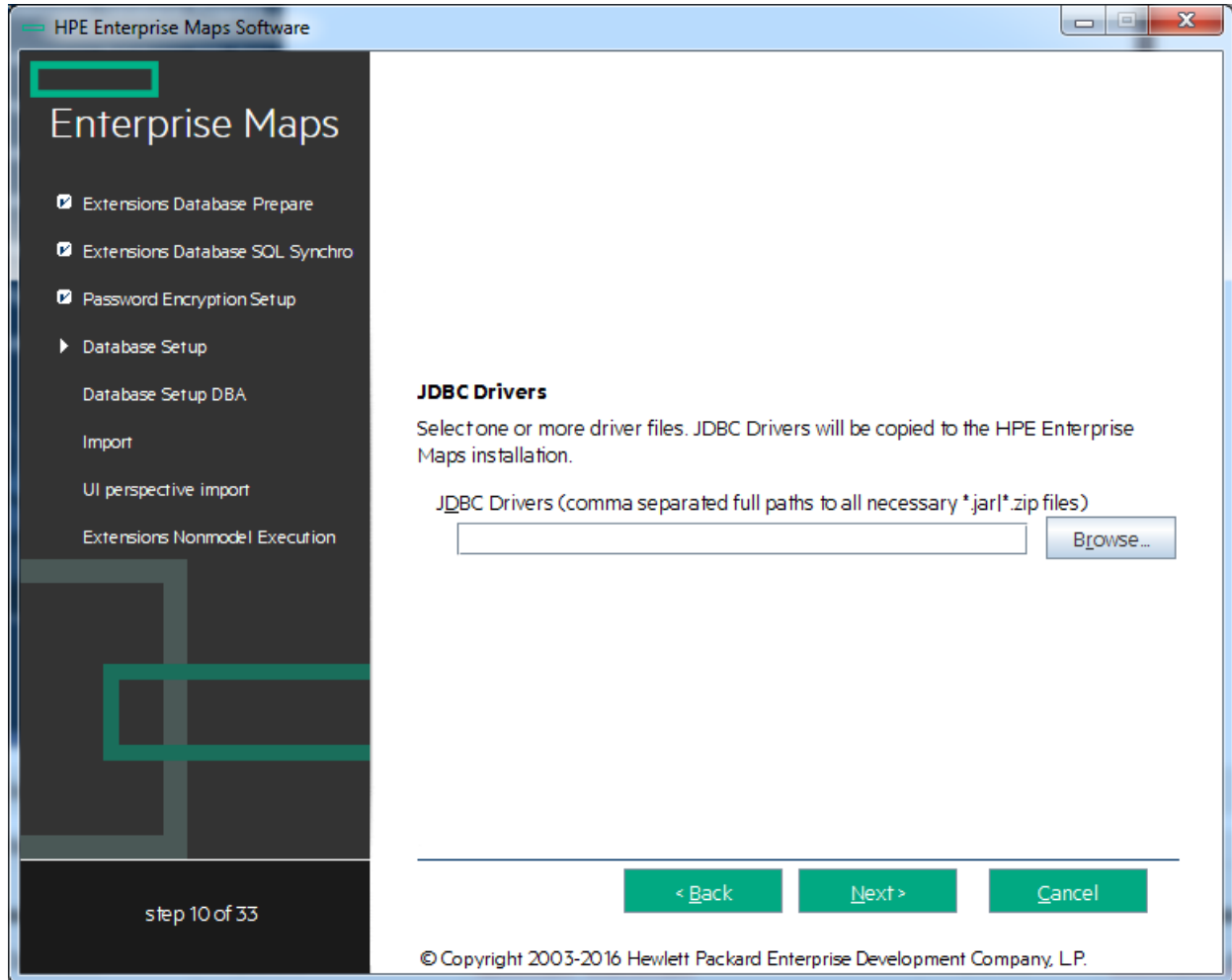
MSSQL Create Schema Parameters

Parameter	Description	Notes
Database Server Address	Hostname or IP address where the database server is accessible.	For example, in the database connection string <code>jdbc:sqlserver://sqlhost:1433:platform</code> the hostname is <code>sqlhost</code> .
Database Server Port	Connection port for the database.	For example, in the database connection string <code>jdbc:sqlserver://sqlhost:1433:platform</code> the port number is 1433.
Existing Database Name	Name of the database.	For example, in the database connection string <code>jdbc:sqlserver://sqlhost:1433:platform</code> the database name is <code>platform</code> .
Existing Database User Name	For the Create Schema option the user must have schema creation rights.	
Database User Password		

Click **Next** to continue to "Step 12 - JDBC Drivers" below.

Step 12 - JDBC Drivers

In the JDBC Drivers page, input or click **Browse** to select the drivers to use.



Note: Separate multiple driver names with commas.

Supported Oracle Drivers

Database	DB Version	Driver Packages	Driver Version	Driver Class
Oracle Database	11.2.0.3.0	ojdbc6.jar, orai18n.jar	11.2.0.3.0	oracle.jdbc.driver.OracleDriver
	12.1.0.1.0	ojdbc7.jar, orai18n.jar	12.1.0.1.0	

Supported MSSQL Drivers

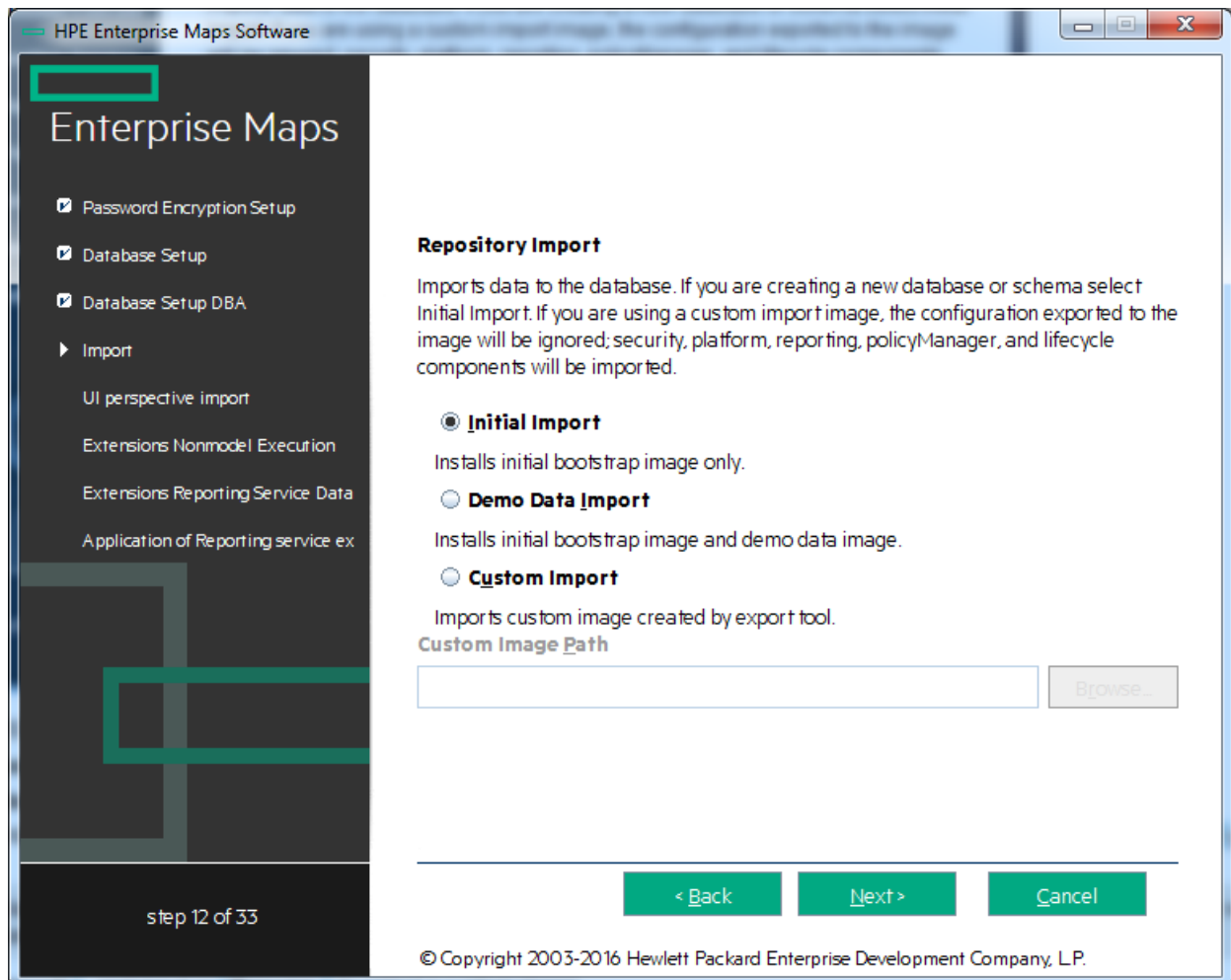
Database	DB Version	Driver Packages	Driver Version	Driver Class
Microsoft SQL Server	2012 SP1, 2014	sqljdbc4.jar	4.0	com.microsoft.sqlserver.jdbc.SQLServerDriver

Click **Next** to validate the database parameters, the configuration tables, and the driver.

Continue to "[Step 13 - Repository Import](#)" below.

Step 13 - Repository Import

In the Repository Import page, select the initial data you want to upload to HPE EM.



Do one of the following:

- Select **Initial Import** to import a bootstrap image only.
- Select **Demo Data Import** to import the included demo data set.

The demo data contains a demo domain containing a large number of artifacts and some users. The user details for JBoss are contained in the `user.properties` file and may be changed later.

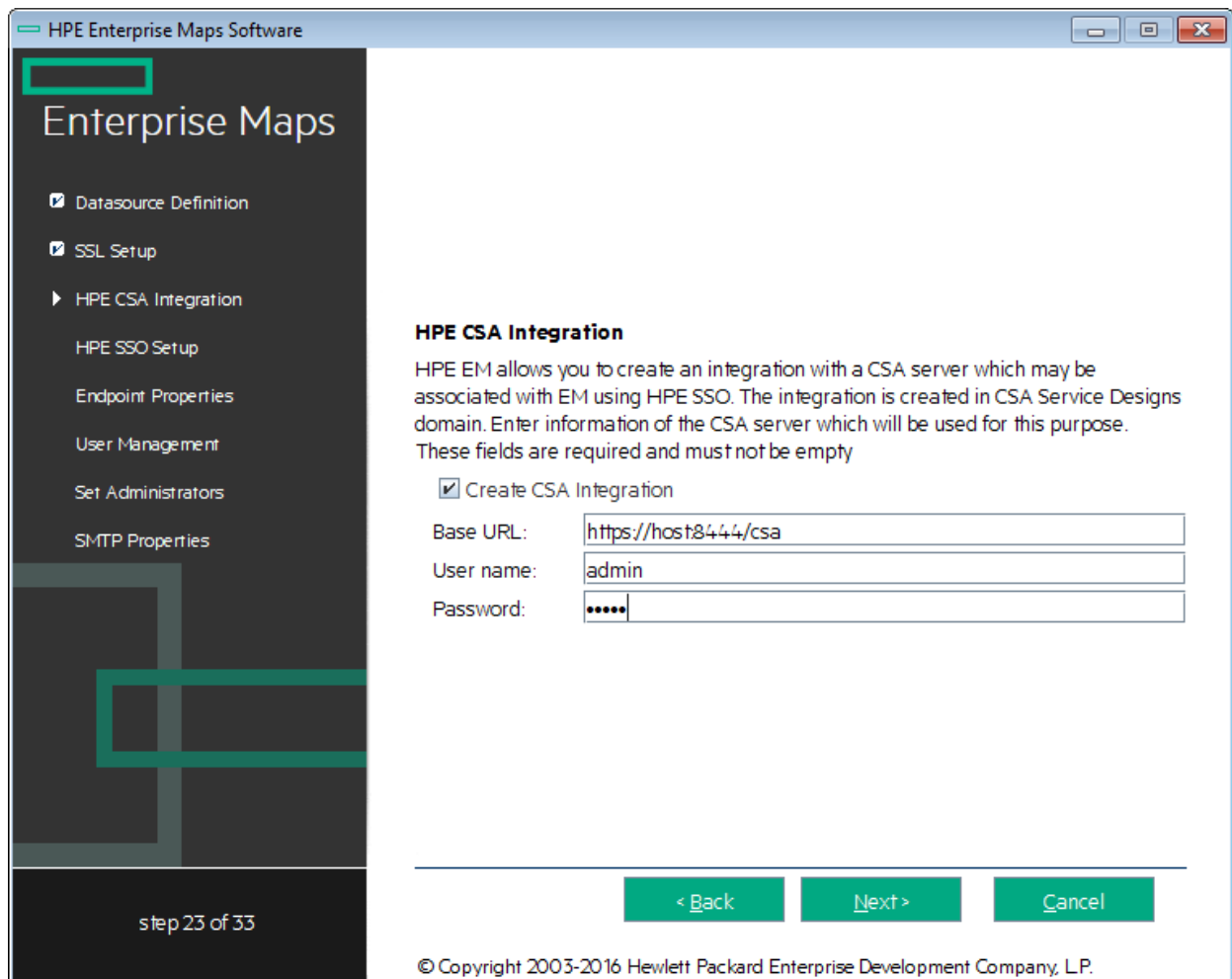
Note: The compliance status of artifacts included in the demo data does not reflect their initial status as the import does not contain any policy validation data. Regenerate the validation data manually or allow the automatic validation task to regenerate it.

- Select **Custom Import**, and input or **Browse** to select a custom image.

Click **Next** to validate the data image and continue to "[Step 14 - HPE CSA Integration](#)" below.

Step 14 - HPE CSA Integration

In HPE CSA Integration page, select **Create CSA Integration** and enter the credentials for the integration to be performed automatically.



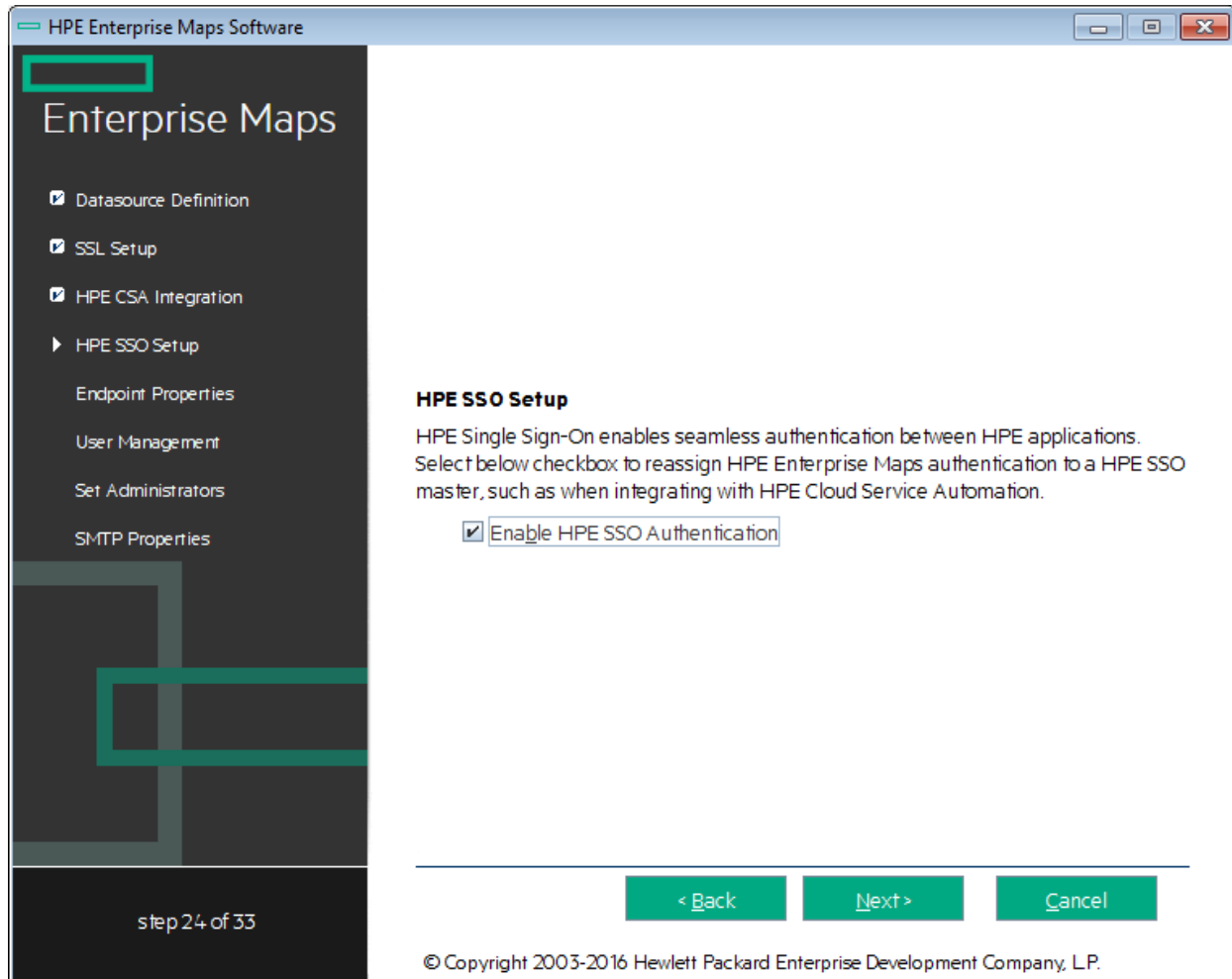
The screenshot shows the HPE Enterprise Maps Software wizard window. The title bar reads "HPE Enterprise Maps Software". The left sidebar contains a list of steps: "Datasource Definition", "SSL Setup", "HPE CSA Integration" (highlighted with a green box), "HPE SSO Setup", "Endpoint Properties", "User Management", "Set Administrators", and "SMTP Properties". The main content area is titled "HPE CSA Integration" and contains the following text: "HPE EM allows you to create an integration with a CSA server which may be associated with EM using HPE SSO. The integration is created in CSA Service Designs domain. Enter information of the CSA server which will be used for this purpose. These fields are required and must not be empty". Below this text is a checkbox labeled "Create CSA Integration" which is checked. There are three input fields: "Base URL:" with the value "https://host8444/csa", "User name:" with the value "admin", and "Password:" with masked characters "*****". At the bottom of the form are three buttons: "< Back", "Next >", and "Cancel". The footer of the window reads "© Copyright 2003-2016 Hewlett Packard Enterprise Development Company, L.P." and the bottom left corner of the sidebar shows "step 23 of 33".

Note: When a CSA integration is created (whether automatically or manually), there is always a sync task created and associated with this integration. Only difference being the task associated with automatic integration is scheduled to run hourly.

Click **Next** to continue to "[Step 15 - HPE SSO Setup](#)" on the next page

Step 15 - HPE SSO Setup

In the HPE SSO (Single Sign-On) Setup Page, select **Enable HPE SSO Authentication** if you wish to use HPE SSO.

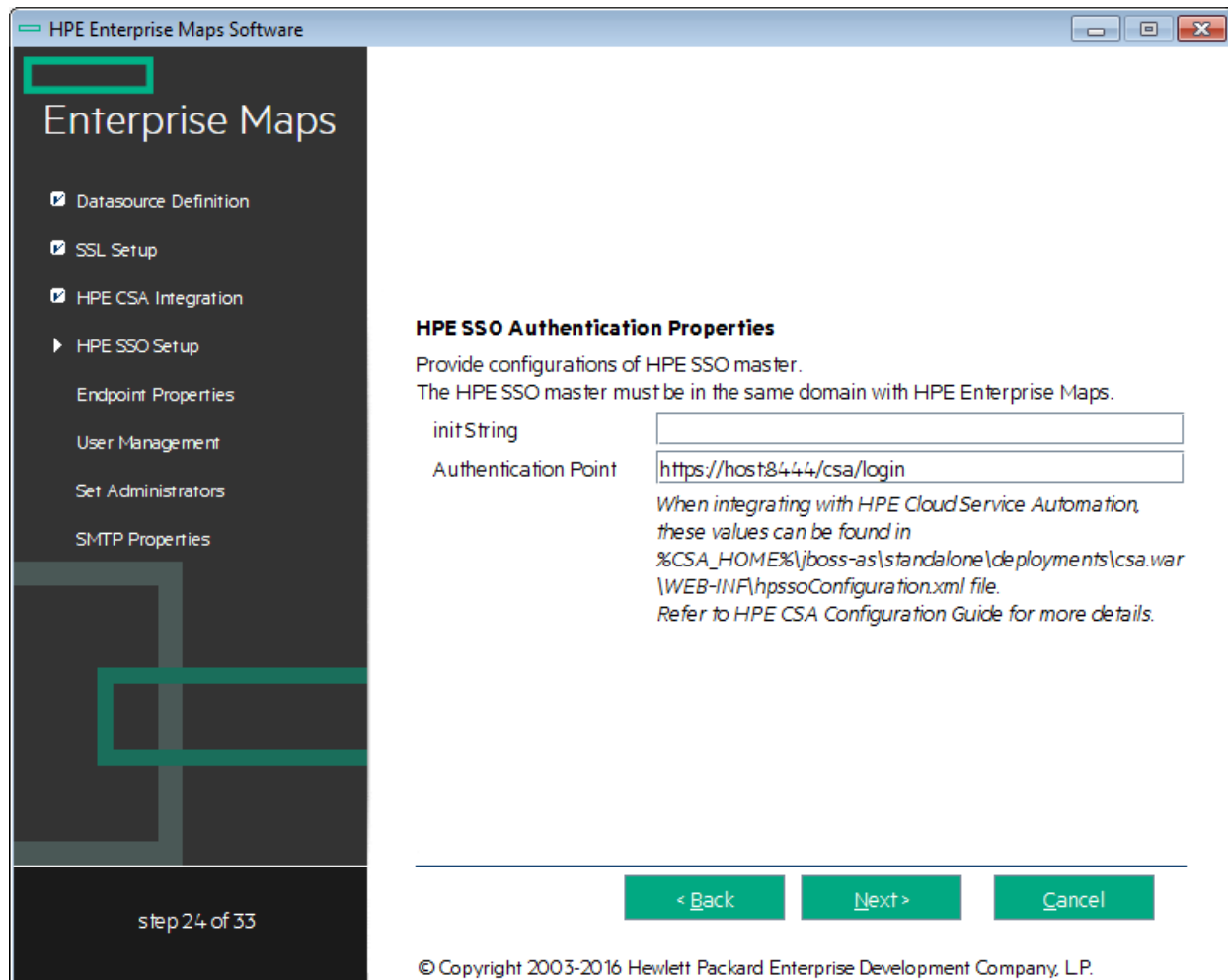


Click **Next** to continue to "Step 16 - HPE SSO Authentication Properties" below.

Else, click **Next** without any selection to continue to "Step 17 - Endpoint Properties" on the next page.

Step 16 - HPE SSO Authentication Properties

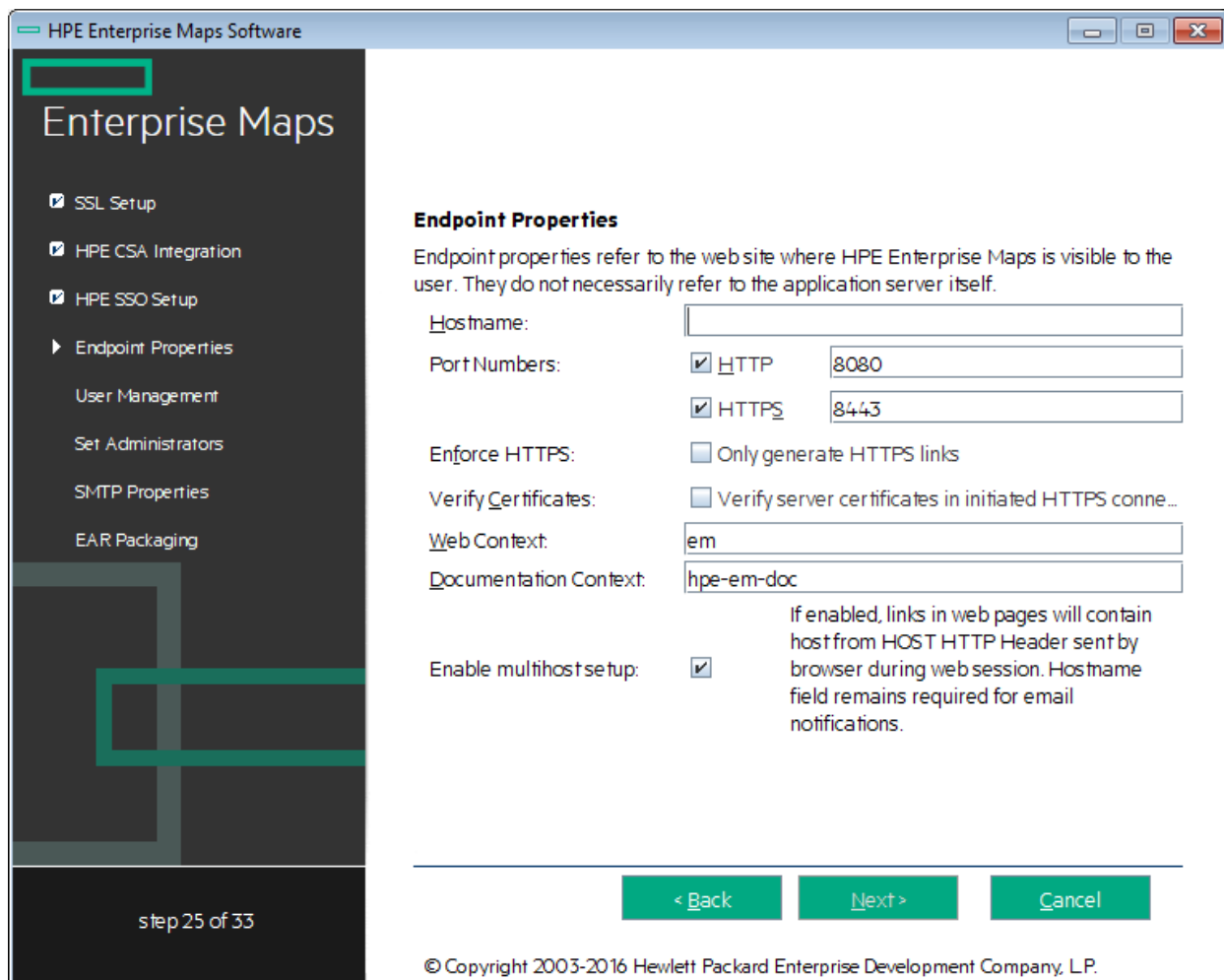
In the HPE SSO Authentication Properties Page, provide the configuration of HPE SSO master.



Click **Next** to continue to "Step 17 - Endpoint Properties" below.

Step 17 - Endpoint Properties

In the Endpoint Properties page, specify the endpoint properties:



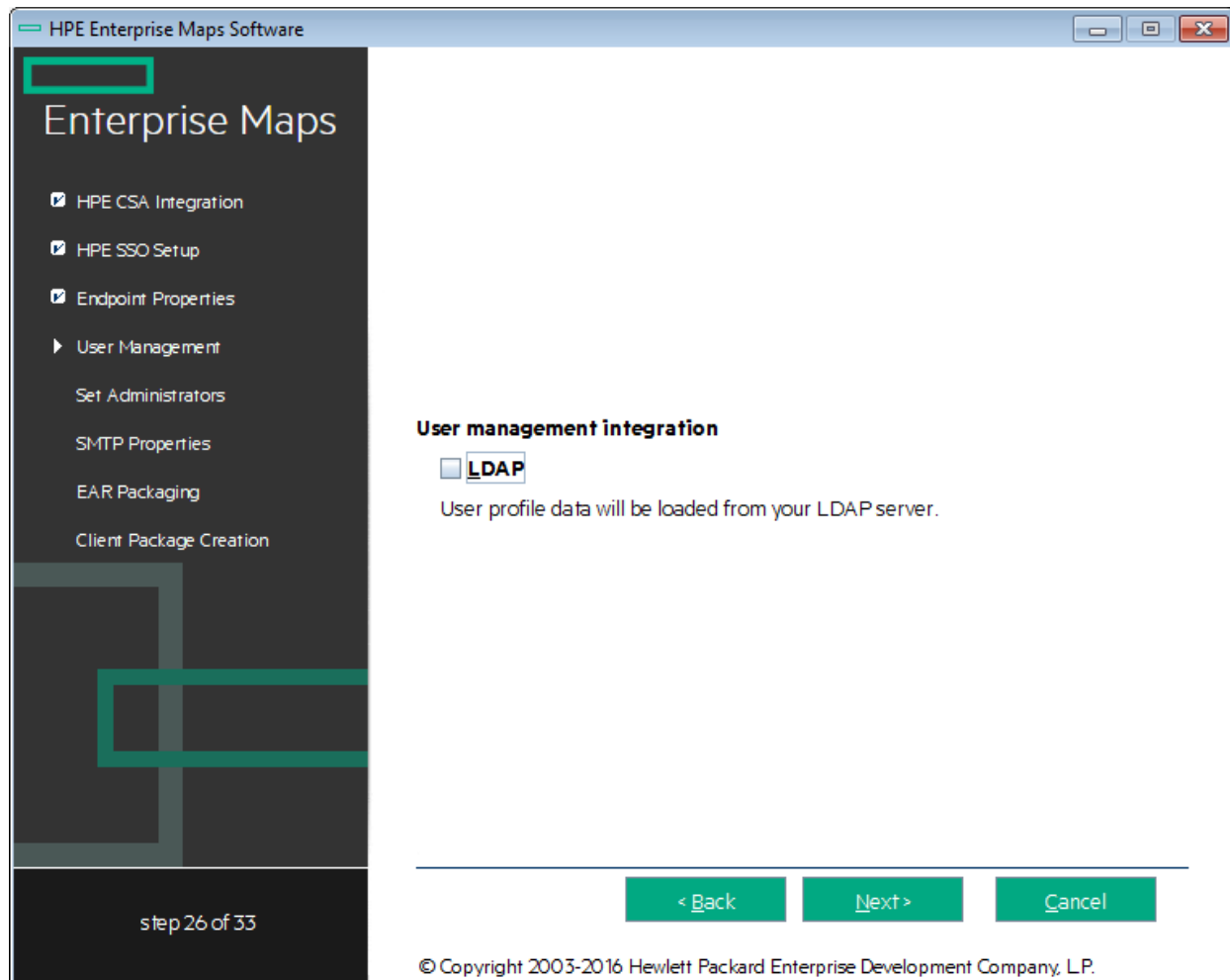
1. Enter the **Hostname**.
 - For integration with CA Single Sign On, set the endpoint to the proxy server integrated with CA Single Sign On.
 - For a JBoss cluster, specify the load balancing server hostname and ports.
2. If necessary, change the default **Port Numbers**: HTTP = 8080, HTTPS = 8443. You select one or both port numbers.

Caution: If you change the port numbers from their default values, you must also change the application server configuration to use these ports.
3. (Optional) Select **Enforce HTTPS** if you want to generate only HTTPS links.
4. (Optional) Select **Verify Certificates** if you want the server certificates to be verified in initiated HTTPS connections.
5. Use the default **Web Context**: **em**.
6. Use the default **Documentation Context**: **hpe-em-doc**.
7. (Optional) Select **Enable multihost setup** to use the specified **Hostname** in the HTTP header for all web pages during the web session.
8. Refer "[How to Configure HPE EM with a Proxy Server](#)" on page 28.

Click **Next** to continue to "[Step 18 - User Management Integration](#)" on the next page.

Step 18 - User Management Integration

In the User Management Integration page, select if you want to integrate with LDAP or store accounts in your database.



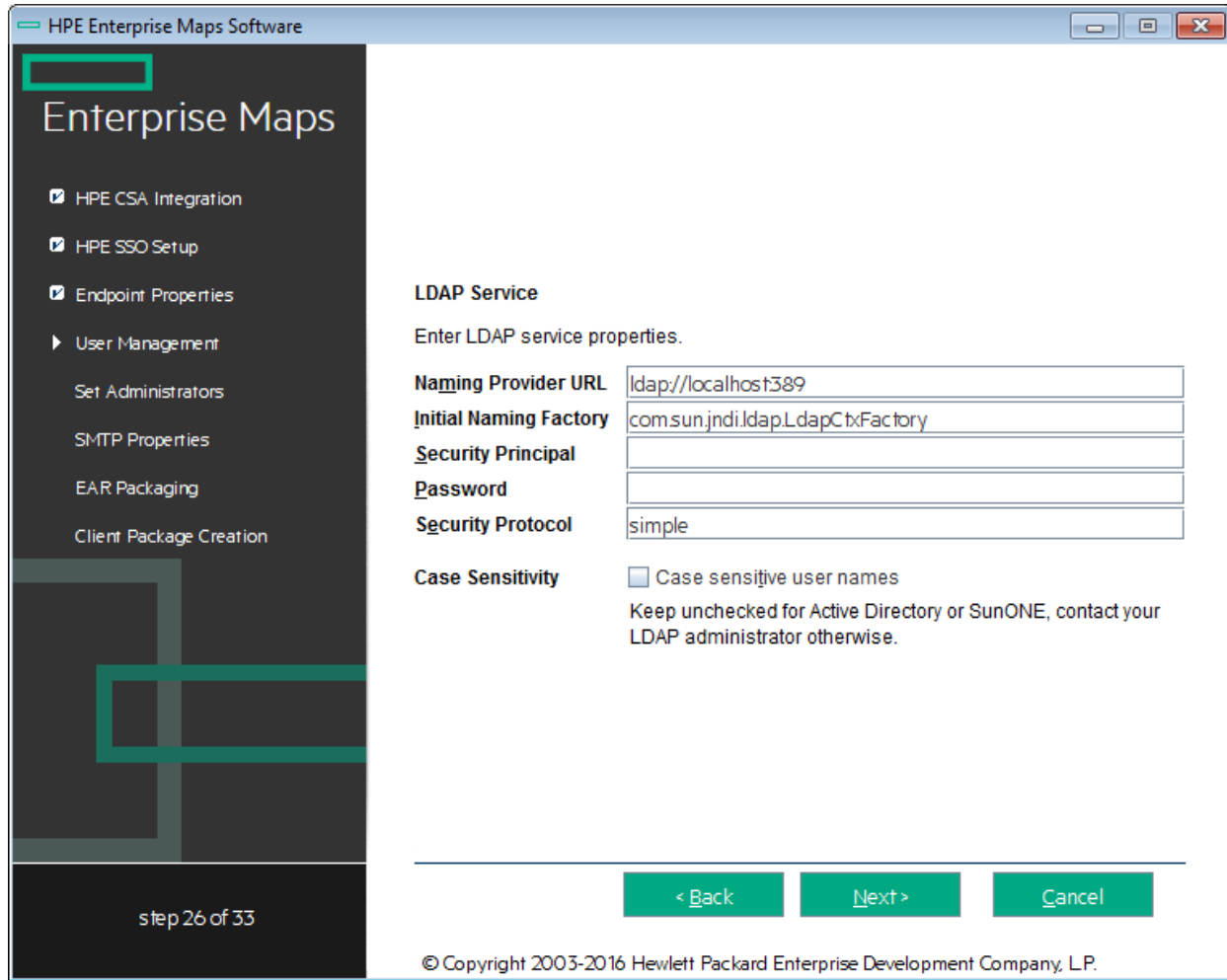
- Select **LDAP** if you want to integrate with an LDAP server account store.
- Do not select **LDAP** if you want to store accounts in your database.

If you selected LDAP, click **Next** to continue to "[LDAP Service Properties](#)" below.

If you did not select LDAP, click **Next** to continue to "[Step 19 - System Email Configuration](#)" on page 60.

LDAP Service Properties

In the LDAP Service page, set the following LDAP connection parameters, credentials, and case-sensitivity properties:



LDAP Service Properties

Property	Description
Naming Provider URL	URL on which LDAP is installed (for example: ldap://localhost:389).
Initial Naming Factory	Keep the default.
Security Principal	Principal to login to LDAP (for example: uid=admin, ou=Administrators, ou=TopologyManagement, o=NetscapeRoot).
Password	Username password.
Security Protocol	Keep the default.
Case Sensitivity	When checked, sets all user names to be case sensitive. The default for HPE EM logins is case-insensitive.
	Note: You must ensure that the application server

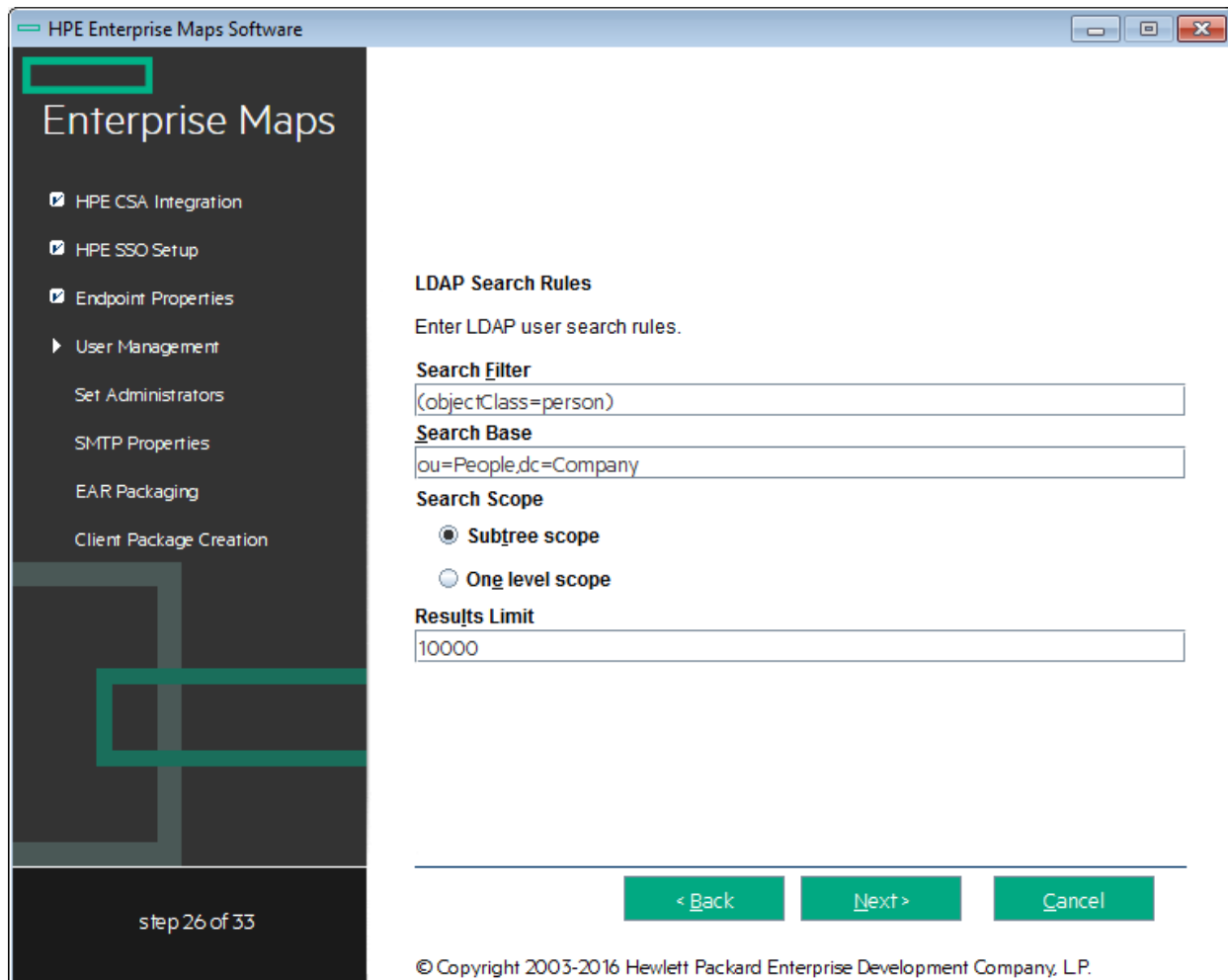
LDAP Service Properties, continued

Property	Description
	uses matching case-sensitive or -insensitive authentication.

Click **Next** to continue to "LDAP Search Rules" below.

LDAP Search Rules

In the LDAP Search Rules page enter the following search rule properties:



LDAP Search Rules Properties

Property	Description
Search Filter	The notation of the search filter conforms to the LDAP search notation. You can specify the LDAP node property that matches the user account or group.
Search	LDAP is searched from this base according to the Search Scope settings.

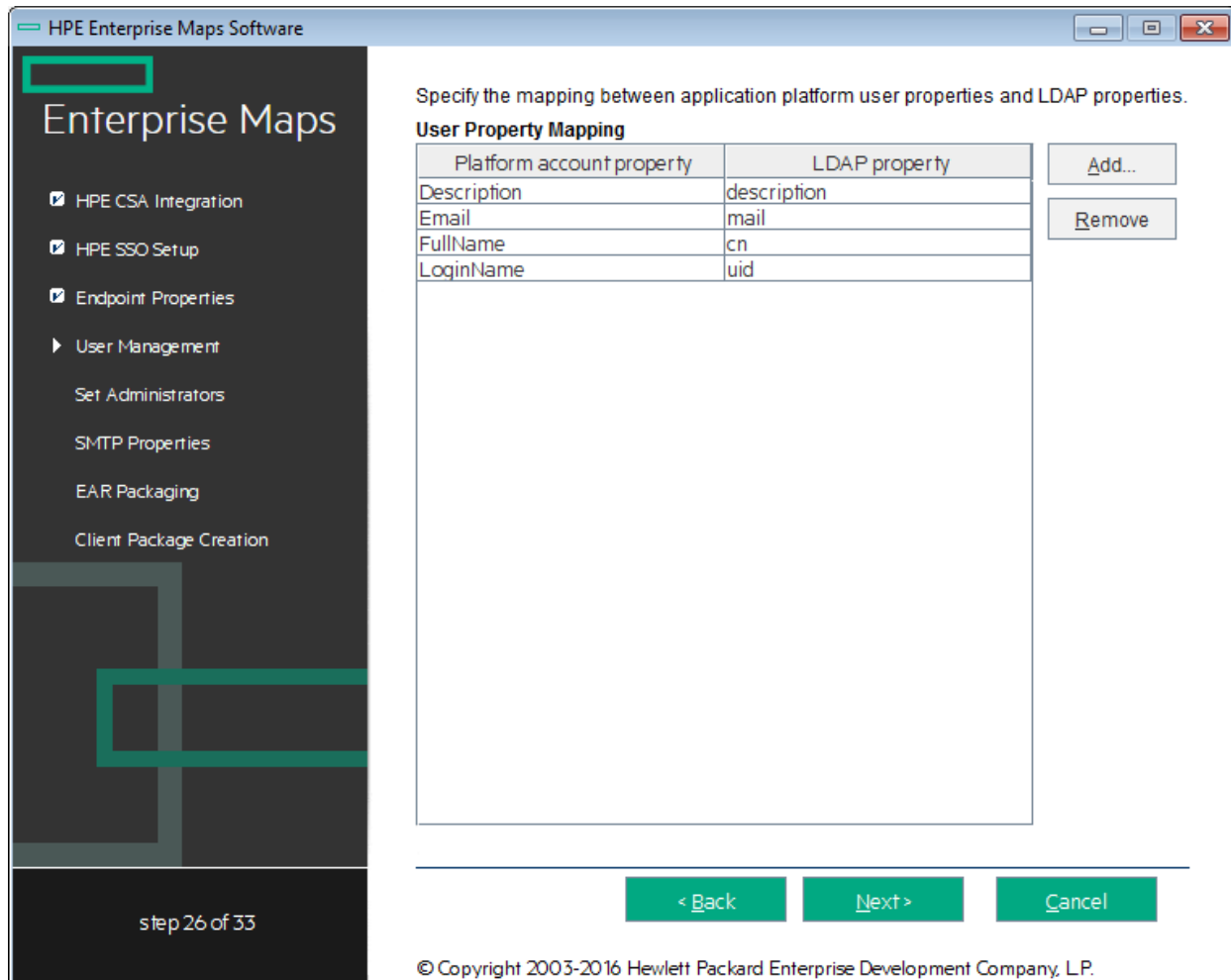
LDAP Search Rules Properties, continued

Property	Description
Base	
Search Scope	<ul style="list-style-type: none">Subtree Scope: The search base and all its sub-nodes are searched.One-level Scope: Only direct sub-nodes of the search base (entries one level below the search base) are searched. The base entry is not included in the scope.
Results Limit	Number of items returned when searching LDAP. If more results are returned by an LDAP search the remainder are disregarded and not shown.

Click **Next** to continue to "LDAP User Properties Mapping" below.

LDAP User Properties Mapping

In the User Property Mapping page, use **Add** and **Remove** to set the user property mappings



You must map the following mandatory user account properties from an LDAP server:

```
java.lang.String loginName
```



```
java.lang.String fullName
```

You can map the following optional user account properties from an LDAP server:

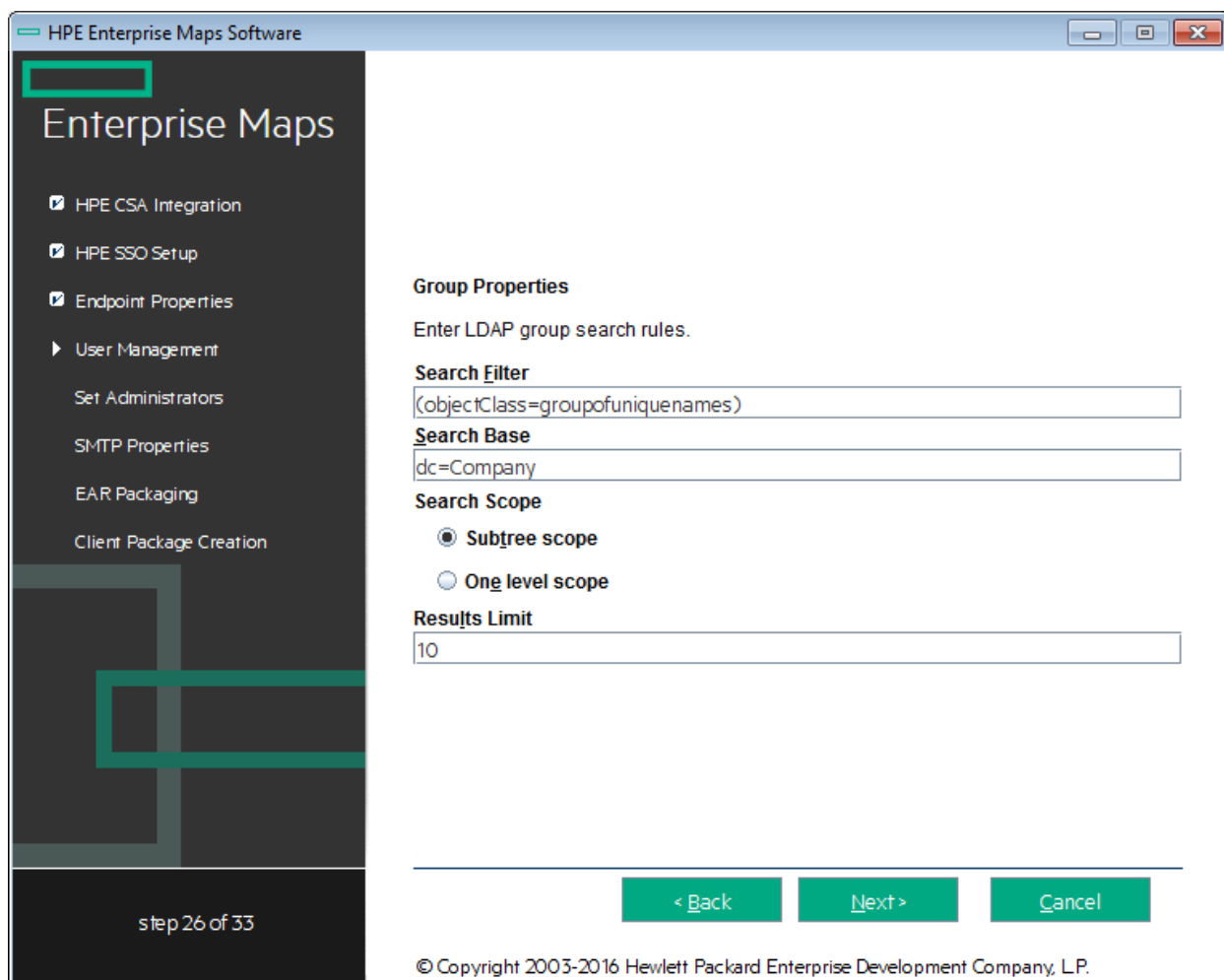
```
java.lang.String Email  
java.lang.String Description  
java.lang.String LanguageCode  
java.lang.String Phone  
java.lang.String AlternatePhone  
java.lang.String Address  
java.lang.String City  
java.lang.String Country
```

Caution: Ensure that your mappings are correct and that these properties exist on your LDAP server. The incorrect mapping of any properties, even optional ones, can have a severe performance impact for sign-in for some LDAP services.

Click **Next** to continue to ["LDAP Group Search Rules" below](#).

LDAP Group Search Rules

In the Group Properties page, enter the following group search rules properties:



LDAP Group Search Rules Properties

Property	Description
Search Filter	The notation of the search filter conforms to the LDAP search notation. You can specify the LDAP node property that matches the user account or group.
Search Base	LDAP is searched from this base according to the Search Scope settings.
Search Scope	<ul style="list-style-type: none"> Subtree Scope: The search base and all its sub-nodes are searched. One-level Scope: Only direct sub-nodes of the search base (entries one level below the search base) are searched. The base entry is not included in the scope.
Results Limit	Number of items returned when searching LDAP. If more results are returned by an LDAP search the remainder are disregarded and not shown.

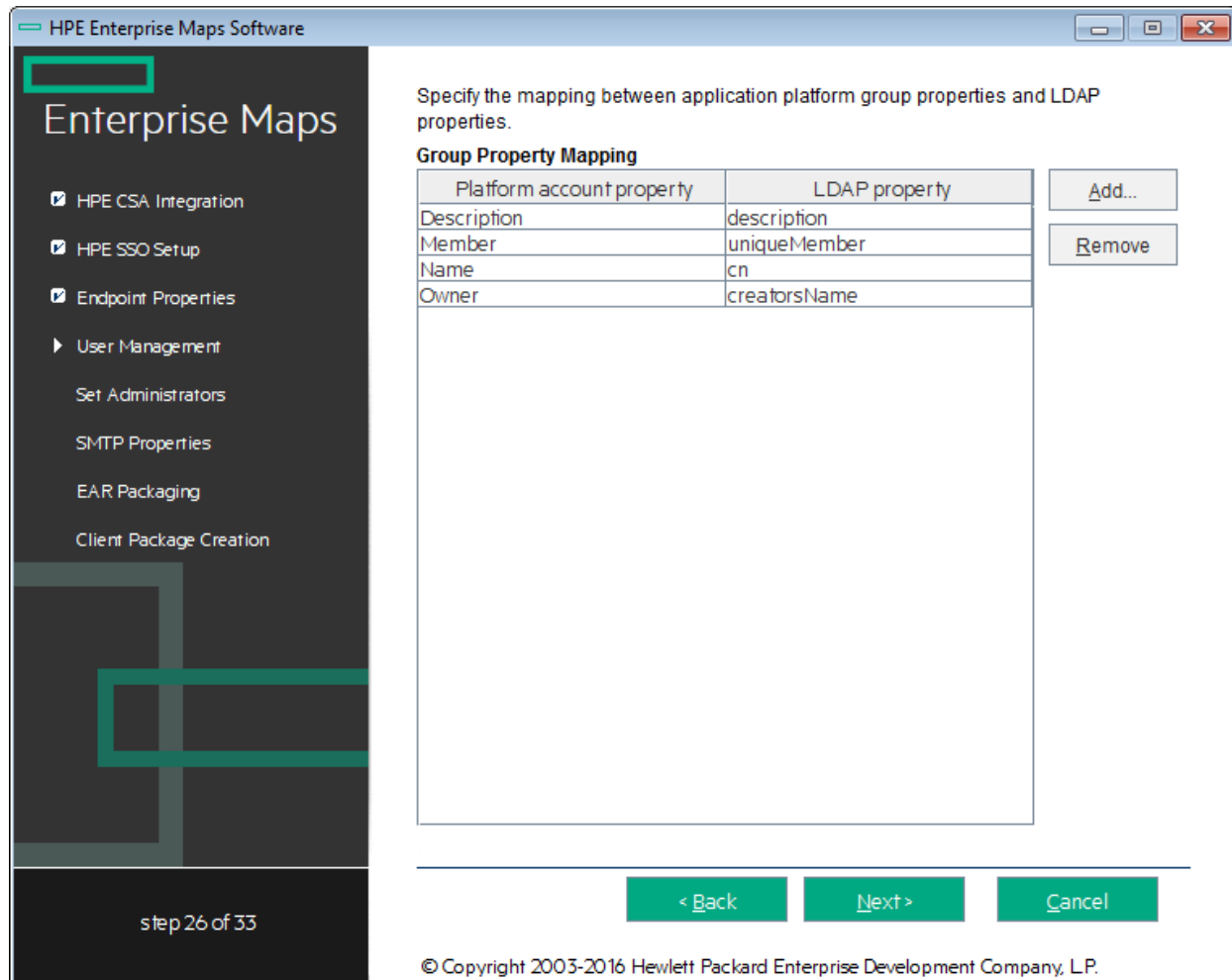
Click **Next** to continue to "LDAP Group Properties Mapping" below.

LDAP Group Properties Mapping

In the Group Property Mapping page, use **Add** and **Remove** to set the group property mappings. between

application user properties and LDAP properties.

The properties to map are: **Description**, **Member**, **Name**, and **Owner**.



The following mandatory group properties must be mapped from an LDAP server:

```
java.lang.String name  
java.lang.String member
```

The following optional group properties can be mapped from an LDAP server:

```
java.lang.string Owner  
java.lang.String Description
```

Caution: Ensure that your mappings are correct and that these properties exist on your LDAP server. The incorrect mapping of any properties, even optional ones, can have a severe performance impact for sign-in for some LDAP services.

Click **Next** to continue to "[Step 19 - System Email Configuration](#)" on the next page.

Step 19 - System Email Configuration

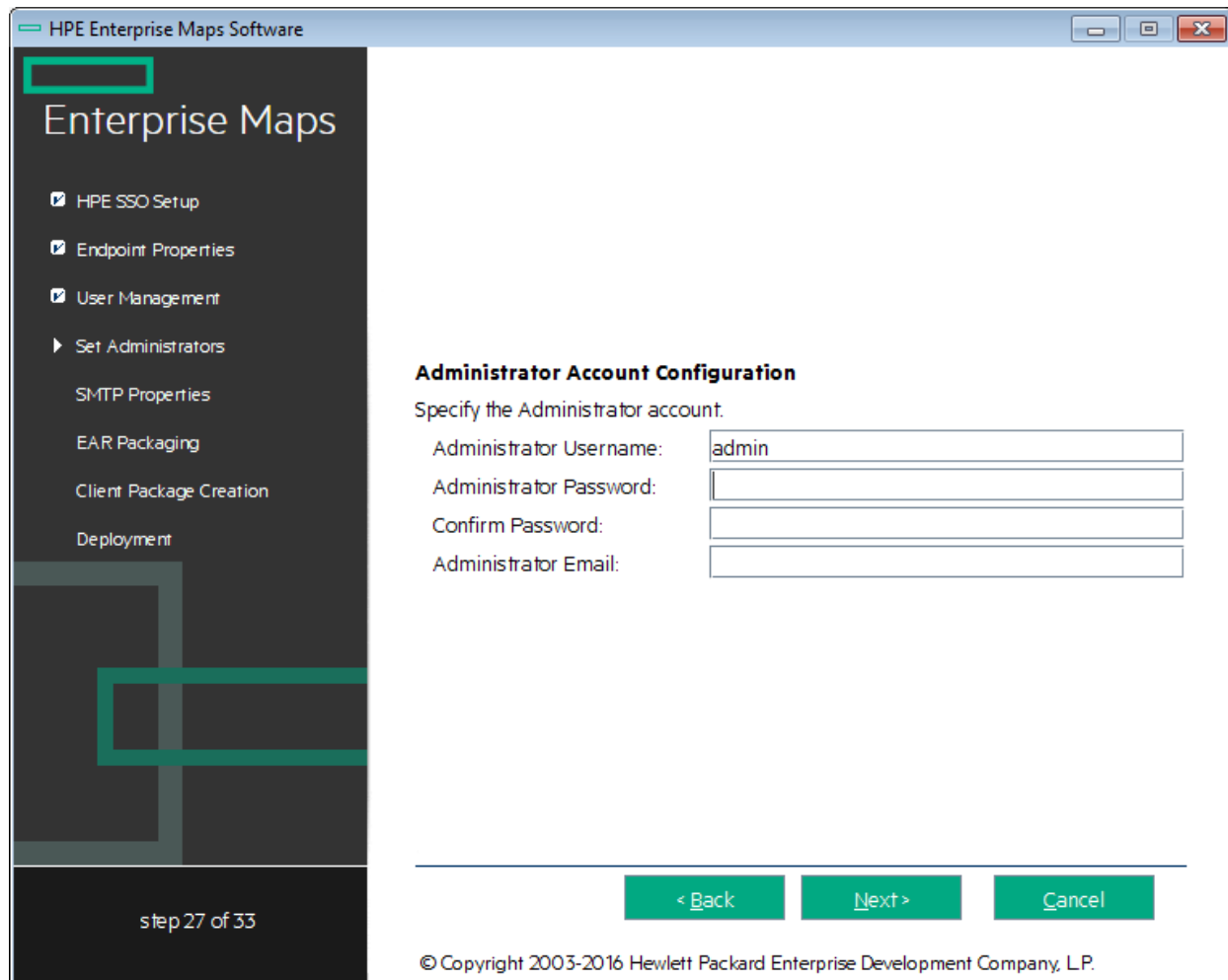
Enter the system mail account to be used as the source of automatic notification mails and system messages.

The screenshot shows the 'HPE Enterprise Maps Software' installation wizard window. The title bar reads 'HPE Enterprise Maps Software'. On the left is a dark sidebar with the 'Enterprise Maps' logo and a list of configuration steps: 'HPE SSO Setup', 'Endpoint Properties', 'User Management', 'Set Administrators', 'SMTP Properties', 'EAR Packaging', 'Client Package Creation', and 'Deployment'. The 'Deployment' step is highlighted with a green box. At the bottom of the sidebar, it says 'step 27 of 33'. The main content area is titled 'System Email Configuration' and contains the following text: 'The system e-mail address is used as the sender address for e-mail notifications generated by HPE Enterprise Maps. HPE Software recommends setting-up a generic e-mail address(e.g. repository@company.com) and redirecting it to the real administrator of your installation.' Below this text is a text input field labeled 'System Email:'. At the bottom of the window, there are three buttons: '< Back', 'Next >', and 'Cancel'. The copyright notice at the bottom reads '© Copyright 2003-2016 Hewlett Packard Enterprise Development Company, L.P.'

Click **Next** to continue to "[Step 20 - Administrator Account Configuration](#)" below.

Step 20 - Administrator Account Configuration

In the Administrator Account Configuration page, set the HPE EM administrator credentials.



1. Enter the **Administrator Username**.

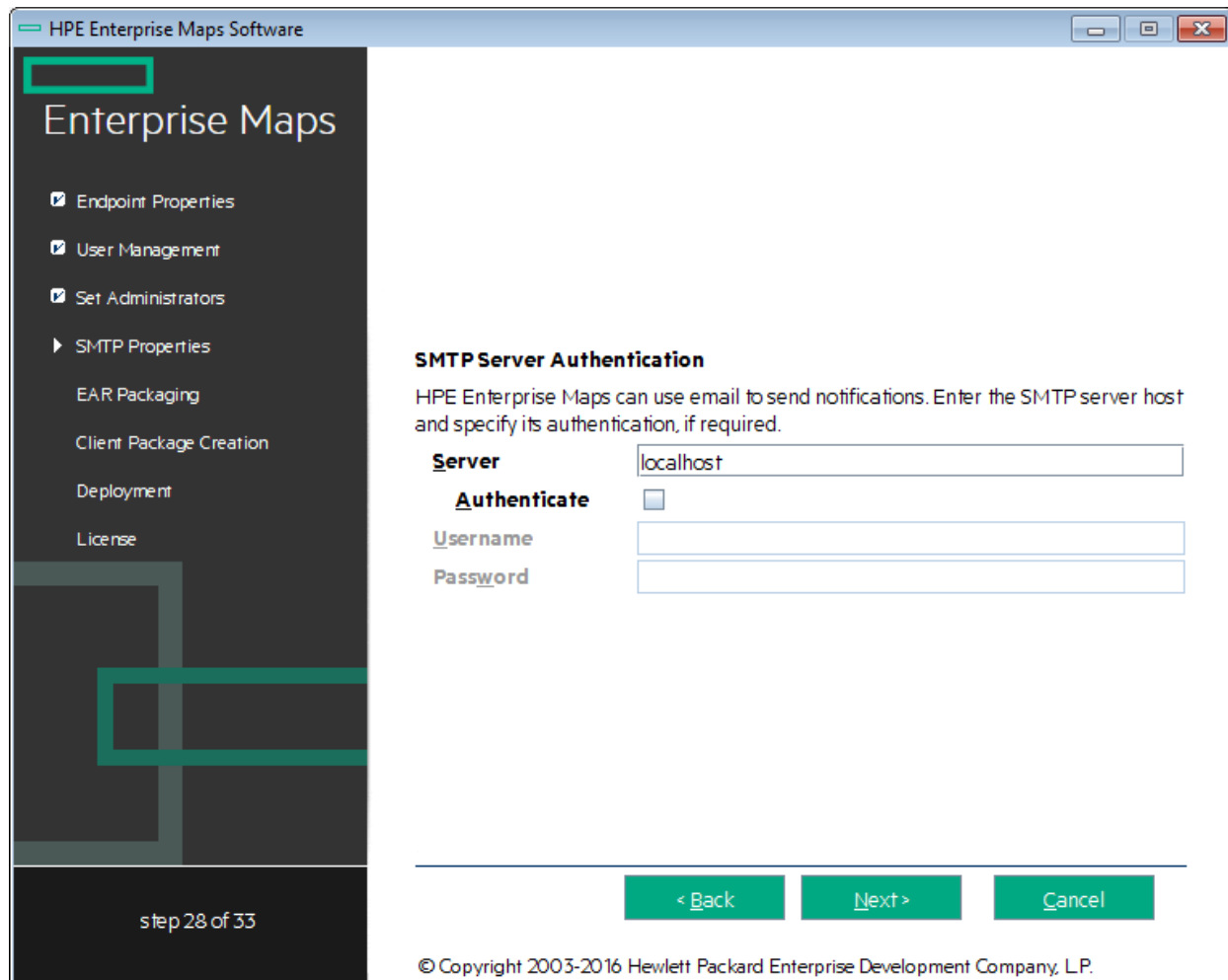
Note: The administrator login name must be valid for the selected application server instance. The user with the specified name becomes an HPE EM administrator. For JBoss the specified administrator account is automatically created.

2. Enter the **Administrator Password**.
3. Enter the **Confirm Password**.
4. Enter the **Administrator Email**.

Click **Next** to continue to "[Step 21 - SMTP Server Authentication](#)" below.

Step 21 - SMTP Server Authentication

If you want mail notifications, set the mail server host.

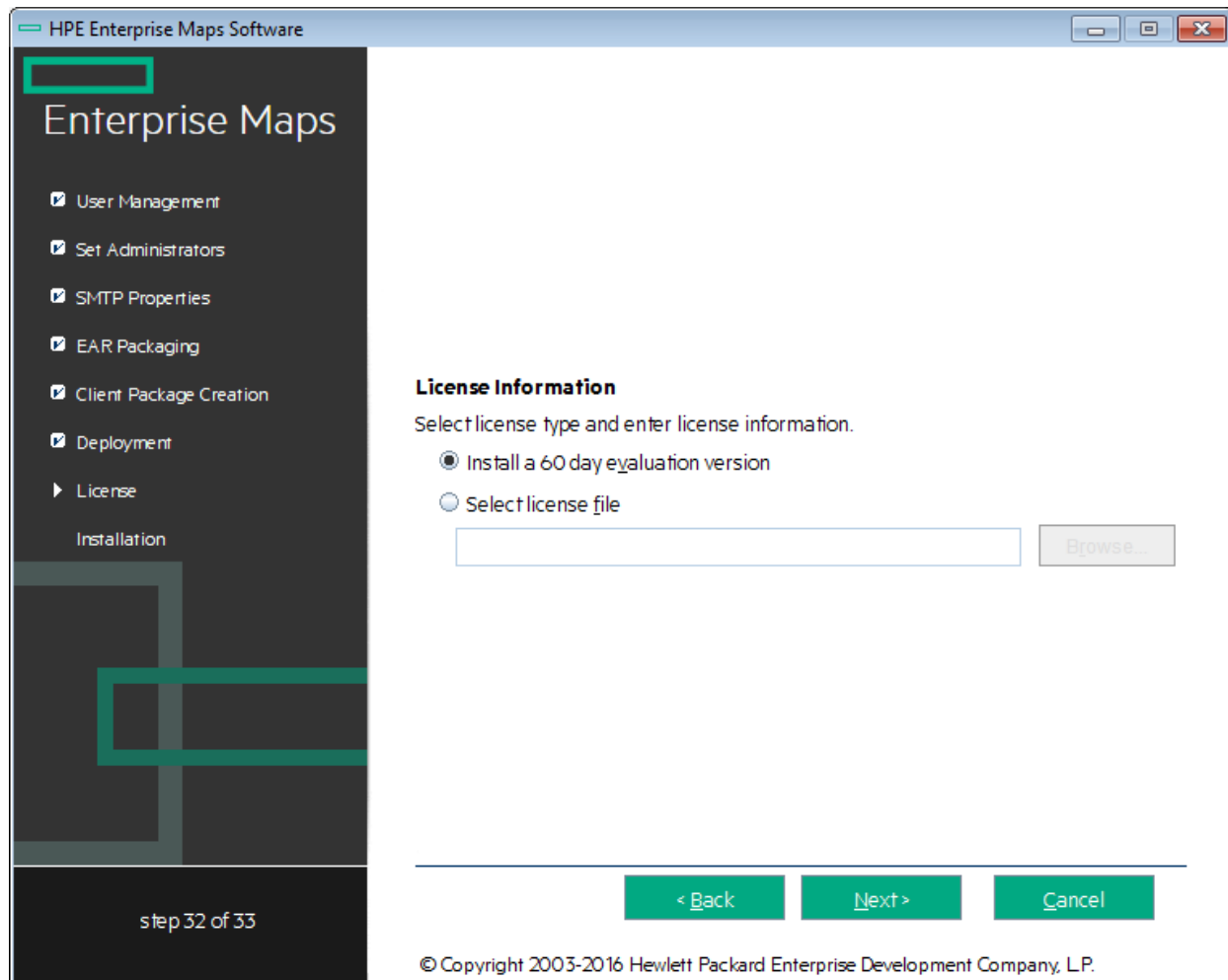


To authenticate, select **Authenticate** and enter the SMTP server credentials.

Click **Next** to create the client package and continue to "[Step 22 - License Information](#)" below.

Step 22 - License Information

In the License Information page set which license to use.



Do one of the following:

- Select **Install a 60 day evaluation license**.
- Select **Enter license details** and type the license details provided by your sales representative.

Note: The administrator can change the license at a later date. For details, see .

Click **Next** to continue to "[Step 23 - Confirmation](#)" below.

Step 23 - Confirmation

In the Confirmation page, click **Next** to start the installation process.

Continue to "[Step 24 - Installation Progress](#)" below.

Step 24 - Installation Progress

The Installation Progress page tracks each step of the installation.

For manual database deployment the installation stops after creating the database scripts.

When the installation is complete, click **Next** to open the Installation Finished page.
Click **Finish** to exit the Installation Wizard.

Chapter 8: Advanced HPE EM Installation

The install command has the following additional options:

- **-h, --help**
Display the available options or list the available scenarios or steps in the console.
- **-x, --extract *PATH***
Extract the installation archive to the specified location.
- **-i, --install-to *EM_HOME***
Install HPE EM in console mode to the specified location. Normally used in conjunction with **-u**.
- **-s, --save-config *FILE***
Execute the HPE EM Installation, but save the configuration to the specified file instead of installing HPE EM.
- **-a, --dbadmin-mode**
Run the installation in decoupled database mode.
- **-u, --use-config *FILE***
Use the properties in the specified XML file to override the default or current configuration properties.
- **--passphrase *PASSPHRASE***
If you want to use password encryption, specify the passphrase to use for encryption.
- **-d, --debug**
Execute the installation in debug mode. All properties, SQL statements, and installation details are output to `EM_HOME/log/install.log`.

You can also find them by running `java -jar hpe-em-3.10.jar --help`.

HPE EM supports the following installation scenarios for production environment:

- ["Manual Database Deployment" below](#)
- ["Silent Installation" on the next page](#)

Manual Database Deployment

The automatic database setup may not be suitable for production environment. In that case, HPE EM can be installed manually by a database administrator (database decoupled mode) in the following manner :

1. Execute the command `java -jar hpe-em-3.10.jar -a` to create database scripts.
2. Copy all files from `EM_HOME/sql` to database server and run `all.sql`.
3. Execute the command `EM_HOME/setup.bat | .sh -c` to finish the Enterprise Maps installation.

Silent Installation

Installation through HPE EM Wizard Installer may not be suitable for production environment. In such a scenario and also when Graphical User Interface (GUI) is not available, you can perform a silent installation in the following manner :

1. Execute the command `java -jar hpe-em-3.10.jar -s my-env-properties.xml` to create a silent mode properties file. Enter all the required information as you would while running HPE EM Installer Wizard.

Upon completion there will be a `my-env-properties.xml` file created in the working directory.

2. Copy the `.jar` file along with the `my-env-properties.xml` file on the server, where the silent mode installation is to take place.
3. Edit the `my-env-properties.xml` file to match your target environment.
4. Execute the command `java -jar hpe-em-3.10.jar -u my-env-properties.xml -i <EM_HOME>` (No GUI required) to start the silent installation.

Note: You may need to change the value `shared.as.jboss.location` in the `my-env-properties.xml` file to match the new **EM_HOME** directory. The **EM_HOME** directory must be empty.

Chapter 9: Configuring HPE EM

After installation, deployment environments may require additional configuration.

For details, see the following sections:

- ["Set Up CA Single Sign On Integration" below](#)
- ["Enable Full-Text Search in MSSQL" below](#)
- ["Enable Full-Text Search in Oracle" on page 69](#)
- ["Configure LDAP over SSL/TLS" on page 71](#)
- ["Configure HPE SSO Manually" on page 71](#)
- ["Configure HPE EM to access integration server via HTTPS" on page 72](#)
- ["Configure Transaction Timeout" on page 72](#)

Set Up CA Single Sign On Integration

You can configure HPE EM to accept authentication headers or cookies added to HTTP requests after a successful authentication performed by an authentication proxy. The changes affect the configuration properties stored in the database and the application EAR file.

To Integrate CA Single Sign On Using the Setup Tool:

1. Execute **EM_HOME/bin/setup**, and click **Next**.
2. In the Select Scenarios page, select **Advanced**, and click **Next**.
3. In the Custom Scenario Selection page, select **CA Single Sign On Setup**, and click **Next**.
4. In the CA Single Sign On Setup page, select **Enable CA Single Sign On Integration** and then click **Next**.
5. Do one of the following:
 - Select **Use Cookies** to accept authentication cookies.
 - Select **Use Headers** if the user login name is sent in the authentication header.
6. Set the Login Header or Cookie Name and then click **Next**.
7. After deployment validation, click **Next** to start the setup.
The Setup Tool updates your deployment and configuration.
8. After setup completes, click **Next** and click **Finish** to exit the Setup Tool.
9. Redeploy the HPE EM EAR file as described in the appropriate sections for each application server.

Enable Full-Text Search in MSSQL

To enable full text search you must enable the service and create a full text catalog and indexes. Use MSSQL

Server Management Studio or the sqlcmd command line tool.

Connect to the database using the same parameters used during HPE EM installation.

To Enable Full-Text search on MSSQL:

1. Make sure that the SQL Server Fulltext Search service is running, and that the database is full-text enabled.

By default, new databases are full-text enabled unless you create them with MSSQL Server Management Studio.

In this case, select the database in the Object Explorer window, and select **Properties>Files**, and then select **Use full-text indexing**.

2. To create a full-text catalog, execute the following command:

```
sqlcmd -U <user> -P <password> -d <database>  
CREATE FULLTEXT CATALOG ry_resource_ftsc  
go
```

Note: You must have CREATE FULLTEXT CATALOG permission.

It is possible to reuse an existing catalog, but HPE recommends creating a new one for independent management purposes.

For more details, see <http://msdn2.microsoft.com/en-us/library/ms189520.aspx>.

3. Do one of the following:

- To create a full-text index that is synchronized immediately after any data changes, execute the following command:

```
sqlcmd -U <user> -P <password> -d <database>  
CREATE FULLTEXT INDEX ON ry_resource(  
    m_extensions TYPE COLUMN m_extensions_fe LANGUAGE 0x0,  
    data TYPE COLUMN data_fe LANGUAGE 0x0)  
KEY INDEX pk_resource ON ry_resource_ftsc WITH CHANGE_TRACKING AUTO  
go
```

- To create a full-text index that is synchronized manually, execute the following command:

```
sqlcmd -U <user> -P <password> -d <database>  
CREATE FULLTEXT INDEX ON ry_resource(  
    m_extensions TYPE COLUMN m_extensions_fe LANGUAGE 0x0,  
    data TYPE COLUMN data_fe LANGUAGE 0x0)  
KEY INDEX pk_resource ON ry_resource_ftsc WITH CHANGE_TRACKING OFF, NO POPULATION  
go
```

For more details, see [https://msdn.microsoft.com/en-us/library/ms142507\(v=sql.110\).aspx](https://msdn.microsoft.com/en-us/library/ms142507(v=sql.110).aspx).

To synchronize the index manually, execute the following command:

```
sqlcmd -U <user> -P <password> -d <database>  
ALTER FULLTEXT INDEX ON ry_resource START FULL POPULATION  
go
```

The statement executes asynchronously, so the population may take some time.

To verify the population status, execute the command:

```
SELECT FULLTEXTCATALOGPROPERTY('ry_resource_ftsc','PopulateStatus')  
go
```

Index population is complete when the population status is 0.

For more details, see [https://msdn.microsoft.com/en-us/library/ms176076\(v=sql.110\).aspx](https://msdn.microsoft.com/en-us/library/ms176076(v=sql.110).aspx).

Searching Uploaded Documents with MSSQL

MSSQL supports only a limited set of document types after installation. Typically, it does support Microsoft ".doc" files, but does not support ".docx", ".xlsx" and ".pdf" files. The list of all supported document types can be obtained by the following SQL:

```
SELECT * FROM sys.fulltext_document_types
```

If the list does not contain a document type that you need to include in the full text search, ask your DBA to obtain and install an iFilter for the missing document type.

- Foxit provides a high performance PDF iFilter for 32-bit and x64 systems. For details, go to <http://www.foxitsoftware.com/pdf/ifilter>.
- Adobe provides a PDF iFilter for 32-bit and x64 systems. For details, go to <http://adobe.com>.
- Microsoft provides iFilters for MS-Office 2007/2010 document types including docx and xlsx. For details, go to <http://support.microsoft.com/default.aspx?scid=kb;en-us;945934>.

Enable Full-Text Search in Oracle

To enable full text search (FTS), you must create indexes and schedule their update. Use the Oracle **sqlplus** console. Connect to the database using the same credentials used during installation.

Caution: FTS does not work for Oracle XE.

The procedure in commands is shown below in "Preparing Oracle For Full Text Search using the Scheduling Mechanism". It also shows how to synchronize indexes every midnight.

Note: The database user does not have permission to create FTS indexes by default and must be given that permission.

Preparing Oracle For Full Text Search using the Scheduling Mechanism

```
sqlplus system/password@connect_identifier  
-- add permission to create indexes  
GRANT EXECUTE ON "CTXSYS"."CTX_DDL" TO user;  
-- add "create job" permission to <user>  
GRANT CREATE JOB TO user;  
exit;  
  
sqlplus user/password@connect_identifier  
CREATE INDEX idx_ry_resource_meta ON ry_resource(m_extensions)  
  INDEXTYPE IS CTXSYS.CONTEXT PARAMETERS  
  ('FILTER CTXSYS.NULL_FILTER SECTION  
   GROUP CTXSYS.NULL_SECTION_GROUP  
   SYNC (EVERY "TRUNC(SYSDATE)+1") TRANSACTIONAL');
```

```
CREATE INDEX idx_ry_resource_data ON ry_resource(data)
  INDEXTYPE IS CTXSYS.CONTEXT PARAMETERS
  ('FILTER CTXSYS.NULL_FILTER SECTION
   GROUP CTXSYS.NULL_SECTION_GROUP
   SYNC (EVERY "TRUNC(SYSDATE)+1") TRANSACTIONAL');
```

To enable full text search of pdf, doc, and other document types, use AUTO_FILTER in the definition of the idx_ry_resource_data index"

```
CREATE INDEX idx_ry_resource_data ON ry_resource(data)
  INDEXTYPE IS CTXSYS.CONTEXT PARAMETERS
  ('FILTER CTXSYS.AUTO_FILTER');
```

Warning: Do not implement index synchronization ON COMMIT. It can cause Oracle thread termination, returning the error message ORA-error stack (07445[ACCESS_VIOLATION]) logged in *filename.log*. (Tested on Oracle 10gR2 - 10.2.0.1). Use regular synchronization together with the TRANSACTIONAL parameter.

For more information about creating indexes, see the Oracle documentation at http://docs.oracle.com/cd/B28359_01/server.111/b28310/indexes003.htm#ADMIN11722.

Note: Not all document types can be indexed correctly. For details, see http://download.oracle.com/docs/cd/B19306_01/text.102/b14218/afilsupt.htm#i634493.

Synchronizing Indexes

Executing index synchronization manually is shown in the following example:

Synchronizing Indexes in Oracle Manually

```
sqlplus user/password@connect_identifier
CALL CTX_DDL.SYNC_INDEX('idx_ry_resource_meta', '2M');
CALL CTX_DDL.SYNC_INDEX('idx_ry_resource_data', '2M');
```

Creating an Indexing Stoplist

You can optionally manage a stoplist by removing words that could frequently appear in documents. By default, the Oracle index stoplist includes words such as "to". Full-text searches including these words return a false empty result. Alternatively, the database administrator should provide HPE EM users with the stoplist, and a warning not to use these terms in full-text searches.

An example of commands to set up a stoplist on Oracle is shown in the following example:

Creating an Oracle Indexing Stoplist

```
call CTX_DDL.CREATE_STOPLIST('MyStoplist');
call CTX_DDL.ADD_STOPWORD('MyStoplist', 'a');
... Add a word that should not be indexed. Repeat the command for each word to be
excluded.

-- Include the DROP INDEX commands only if an index already exists.
DROP INDEX idx_ry_resource_meta;
DROP INDEX idx_ry_resource_data;
CREATE INDEX idx_ry_resource_meta on ry_resource(m_extensions) indextype is
ctxsys.context parameters
```

```
('filter ctxsys.null_filter section group CTXSYS.NULL_SECTION_GROUP STOPLIST  
MyStoplist  
  SYNC (EVERY "TRUNC(SYSDATE)+1") TRANSACTIONAL') ;  
CREATE INDEX idx_ry_resource_data on ry_resource(data) indextype is ctxsys.context  
parameters  
( 'filter ctxsys.null_filter section group CTXSYS.NULL_SECTION_GROUP STOPLIST  
MyStoplist  
  SYNC (EVERY "TRUNC(SYSDATE)+1") TRANSACTIONAL');
```

Configure LDAP over SSL/TLS

You can configure LDAP over SSL (or TLS) with a directory server of your choice. HPE recommends that you first install HPE EM with a connection to LDAP that does not use SSL. You can then verify the configuration by logging in as a user defined in this directory before configuring use of SSL.

The configuration procedure assumes that you have already installed HPE EM with an LDAP account provider.

HPE EM must not be running.

- **LDAP over SSL Without Client Authentication**

In this case only LDAP server authentication is required. This is usually the case.

To change the LDAP configuration, run the Setup Tool and change Naming Provider URL to use the ldaps protocol and the port on which the directory server accepts SSL/TLS connections. An example of such a URL is, ldaps://ldap.test.com:636.

Make sure that the hostname specified in the java.naming.provider.urlproperty matches the name that is in the directory server certificate's subject common name (CN part of certificate's Subject). Otherwise you get an exception during startup of HPE EM. It informs you of a hostname verification error. The stacktrace contains the hostname that you must use.

- **LDAP over SSL With Mutual Authentication**

HPE EM does not support LDAP over SSL with mutual authentication.

- **Ensuring Trust with the LDAP Server**

The client that connects to the SSL/TLS server must trust the server certificate in order to establish communication with that server. The configuration of LDAP described in this section inherits the default rule for establishing trust from JSSE (the Java implementation of SSL/TLS). This is based on trust stores.

Configure HPE SSO Manually

Once you have installed the server with HPE SSO enabled, HPE EM is populated, and with default settings, which work with most HPE SSO masters (for example: HPE CSA with SSO enabled). For HPE EM to work with a customized HPE SSO master, you must change the default HPE SSO settings populated during HPE EM installation.

To manually change the settings of HPE SSO in Enterprise Maps :

1. Stop HPE EM.
2. Open the HPE SSO configuration file from the path EM_HOME/jboss/standalone/deployments/hp-soa-systinet.ear/ui-web-war.war/WEB-INF/hpsssoConfig.xml.

3. Change the values within <crypto> element to match those in the HPE SSO master.

```
<global>
  <lwssso>
    <crypto initString="h/hAjnovyrq1H6gZozDB0pKgMSswHpcva1XH7XwID9M="
cipherType="symmetricBlockCipher" engineName="AES" paddingMode="CBC"
keySize="256" encodingMode="Base64Url" algorithmPaddingName="PKCS7Padding"
checkIntegrity="disabled" cryptoSource="lw" directKeyEncoded="false"
directKeyEncoding="Hex" jcePbeAlgorithmName="PBEWithHmacSHA1"
jcePbeMacAlgorithmName="PBEWithHmacSHA1" macAlgorithmName="SHA1" macKeySize="256"
macPbeCount="20" macType="hmac" pbeCount="20" pbeDigestAlgorithm="SHA1"/>
  </lwssso>
</global>
```

4. Start HPE EM.

Configure HPE EM to access integration server via HTTPS

In order for the HPE EM server to connect with the integration server (BSM/UCMDB, PPM, etc.) via HTTPS protocol, you need to import the certificate of that server into HPE EM truststore.

To import the certificate of integration server into HPE EM:

1. Access the integration server URL (HTTPS protocol) via web browser. The web browser asks for import of the server certificate.
2. Export the certificate from the web browser (for example: export the certificate into bsm.cert).
3. Run the following command:

```
keytool -import -alias myBSMServer -file bsm.cert -keystore EM_
HOME/conf/client.truststore
```

4. Restart EM server.
5. Login to EM as administrator and create an integration server using HTTPS protocol.

Configure Transaction Timeout

A typical JTA transaction might be started by EJBs or a JMS Session in Enterprise Maps. So, if the duration of these transactions exceeds the specified timeout setting, the transaction service rolls back the transactions automatically.

For long running tasks, you can increase the transaction timeout by modifying the application server configuration at *EM_HOME/jboss/standalone/configuration/standalone-full.xml* (the default is 300 seconds).

```
<subsystem xmlns="urn:jboss:domain:transactions:1.5">
  <core-environment>
    <process-id>
```



```
        <uuid/>
    </process-id>
</core-environment>
<recovery-environment socket-binding="txn-recovery-environment" status-socket-
binding="txn-status-manager"/>
    <coordinator-environment default-timeout="1200"/>
</subsystem>
```

Chapter 10: Applying Custom Extensions

HPE EM 3.10 contains significant changes to the architecture model. If you have customized extensions from earlier versions, follow the steps below to apply them to HPE EM 3.10.

To Apply Custom Assertion Extension:

1. Install HPE EM Workbench 3.10.
2. Create a new assertion project from existing extension.
3. Build the new assertion extension.
4. Apply the new assertion extension to HPE EM 3.10.

For details, see the *Assertion Editor Guide*.

To Apply Custom Taxonomy Extension:

1. Install HPE EM Workbench 3.10.
2. Create a new taxonomy project from existing extension.
3. Build the new taxonomy extension.
4. Apply the new taxonomy extension to HPE EM 3.10.

For details, see the *Taxonomy Editor Guide*.

Caution: If your taxonomy extension contains customized system taxonomies (for example, `lifecycleStages` and `documentTypes`), they are merged with the corresponding system taxonomy in HPE EM 3.10. In the event of a conflict the old system taxonomy takes precedence.

To Apply Custom Model Extension:

1. Install HPE EM Workbench 3.10.
2. Create a new extension project from existing extension.
3. Build the new extension.
4. Apply the new extension to HPE EM 3.10.

For details, see the *Customization Editor Guide*.

Caution: Custom Java code in old extensions must be reviewed.

To Apply Custom Report Extension:

1. Install HPE EM Workbench 3.10.
2. Create a new report project from existing extension.
3. Build the new report extension.
4. Apply the new report extension to HPE EM 3.10.

For details, see the *Report Editor Guide*.

Chapter 11: Starting HPE EM

After deployment, you must start HPE EM and apply final configuration as follows:

- ["Starting HPE EM" below](#)
- ["Enable Full-Text Search in HPE EM" below](#)
- ["Turn on HPE EM Self-Test" below](#)
- ["Installing HPE EM License" below](#)

Starting HPE EM

To start HPE EM execute the following command: `EM_HOME/bin/serverstart.sh|.bat`

To access HPE EM UI, open the following URL in browser: `http(s)://host:port/context`

Enable Full-Text Search in HPE EM

To be able to use full-text searching it must be enabled in the HPE EM UI.

To enable FTS, see "How to Manage Basic Configuration Options" under "Configuration Management" in *Administration Guide*.

Turn on HPE EM Self-Test

The self-test is disabled by default.

To turn on, see "Self-Test" under "Configuration Management" in *Administration Guide*.

Installing HPE EM License

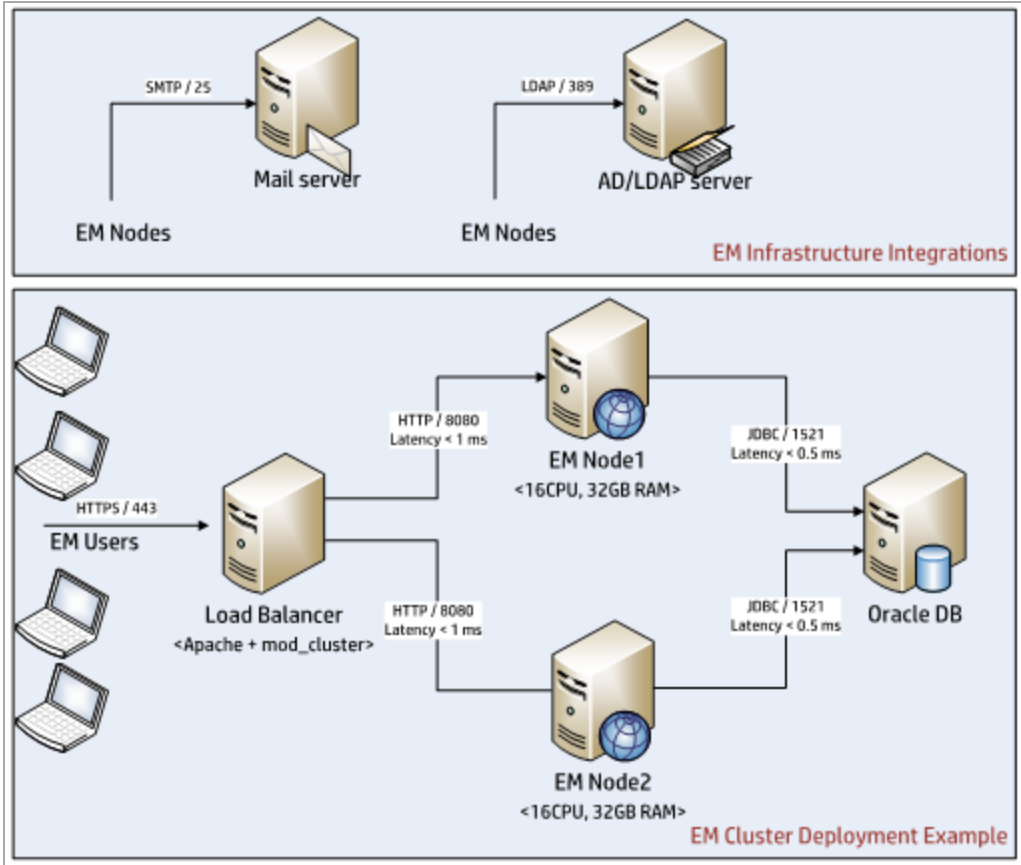
By default HPE EM includes a 60 day instant-on license.

To install or renew HPE EM license, see "License Management" in *Administration Guide*.

Chapter 12: Setting JBOSS Clustering

This section guides you how to setup EM in JBoss Cluster environment. A diagrammatic representation is given below of how the set up looks once configured. The number of JBoss Servers (clustered node) can be changed.

JBoss Cluster deployment with two JBoss servers and the load balancer



Prerequisites

- Physical machines or VMs
- EM installation file
- HP JBoss 6.4.0 GA or JBoss AS 7.1.1
- mod_cluster 1.2.0 or newer

Click "[Installation and Configuration](#)" on the next page for complete set up steps.

Installation and Configuration

To start the JBoss Cluster setup for EM follow the instructions given below :

Primary Node: Install & Configure EM on JBoss EAP 6.4.0 GA or JBoss AS 7.1.1 (Other JBoss nodes are created based on the primary node)

1. Install EM following the steps given initially in this guide. If installed already, then just change the endpoints and ports by running the setup tool. When installing EM ensure the following:
 - The hostname is the hostname of the Load Balancer and not of installed the EM/JBoss
 - The HTTP port is "80" (listen port of Load Balancer)
 - The HTTPS port is "443" (secure port of Load Balancer)
 - Enable Jboss cluster properties
2. In EM, make following change to *configuration-properties.xml*:

```
<!-- Let Jboss generate standalone-full-ha.xml instead of standalone-full.xml -->
<property name="shared.as.jboss.configuration" value="standalone-full-ha"/>
<property name="install.jboss7.apacheProxy.setup" value="true"/>
<property name="install.jboss7.web.instance-id" value="node1"/>
<property name="install.jboss7.web.ajp.install" value="true"/>
<!-- Load balancer name in the configuration of Load Balancer server
'ManagerBalancerName mycluster' (httpd.conf), default value is
'mycluster'
-->
<property name="install.jboss7.modcluster.balancer" value="mycluster"/>
<property name="install.jboss7.modcluster.advertise" value="false"/>
<!-- Load balancer address (IP:PORT) , default port is '6666' -->
<property name="install.jboss7.modcluster.proxy-list"
value="127.0.0.1:6666"/>
<property name="install.jboss7.modcluster.connector" value="ajp"/>
```

3. Build *start_cluster_node.bat* (Windows) or *start_cluster_node.sh* (Linux).
 - Copy the file *serverstart.sh/serverstart.bat* in *EM_HOME/bin* and rename to *start_cluster_node.bat/start_cluster_node.sh*.
 - Open the file *start_cluster_node.bat/start_cluster_node.sh*
 - Replace the line *CALL "%~dp0.\env.bat"* (Window) or *dimname "\${0}""/env.sh* (Linux) with the commands in the file *EM_HOME/bin/env.bat* or *env.sh*

Note: Doing this removes the dependency of the file on *env.bat/env.sh*. Now, *start_cluster_node.bat/start_cluster_node.sh* can be copied anywhere.

- Change the command to start JBoss server.
Window:

```
CALL "%JBOSS_HOME%\bin\standalone.bat" -Djboss.bind.address=0.0.0.0 --server-
config=standalone-full.xml -Djboss.server.log.dir="%SOA_LOG_DIR%" %*
```

To

```
CALL "%JBOSS_HOME%\bin\standalone.bat" -server-config= standalone-full-ha.xml -b
node_ip -Djboss.server.log.dir="%SOA_LOG_DIR%" %*
```

Linux:

```
exec "${JBOSS_HOME}"/bin/standalone.sh -Djboss.bind.address=0.0.0.0 -server-
config=standalone-full.xml -Djboss.server.log.dir="${SOA_LOG_DIR}" "$@"
```

To

```
exec "${JBOSS_HOME}"/bin/standalone.sh -server-config= standalone-full-ha.xml -b node_ip -
Djboss.server.log.dir="${SOA_LOG_DIR}" "$@"
```

Note: + node_ip is the IP address of the JBoss clustered node.

Installation JBoss clustered nodes

4. Build another JBoss clustered node.
 - Copy *JBOSS_HOME* folder and *start_cluster_node.bat/start_cluster_node.sh* from primary node to the target clustered node
 - If the path of *JBOSS_HOME* is changed in the new node, you must update *JBOSS_HOME* variable in the file *start_cluster_node.bat/start_cluster_node.sh*
 - Update node IP address (-b) to IP address of the new node.
 - If the new clustered node is on the same physical/virtual machine, you must add the parameter “-*Djboss.socket.binding.port-offset*” to change port number of the new JBoss instance.

For example:

- *Djboss.socket.binding.port-offset=100* for second node
- *Djboss.socket.binding.port-offset=200* for third node
- Open the file *JBOSS_HOME/standalone/configuration/standalone-full-ha.xml* and change the instance-id in the tag:

```
<subsystem xmlns="urn:jboss:domain:web:2.2" default-virtual-server="default-host"
native="false" instance-id="node2">
```

- Delete the following folders (if there) to avoid warning message about duplicate node ID and others.
 - *JBOSS_HOME/standalone/data*
 - *JBOSS_HOME/standalone/log*

- `JBOSS_HOME/standalone/tmp`

5. Repeat [step 4](#) if you want to setup more than two JBoss clustered nodes.

Installation & configuration apache + mod_cluster (Load Balancer)

6. This instructs you to install apache + mod_cluster on Linux. For other OSes, you need to do some research and execute accordingly.

- Download `mod_cluster 1.2.0 final` for Linux at http://downloads.jboss.org/mod_cluster/1.2.0.Final/mod_cluster-1.2.0.Final-linux2-x64-ssl.tar.gz.

For Windows 64 bit

- Go to http://downloads.jboss.org/mod_cluster/1.2.6.Final/windows/mod_cluster-1.2.6.Final-windows-x86-ssl.zip and unzip it to `LB_HOME` folder

7. Configure the file `httpd.conf` of mod_cluster

- Copy `httpd.conf.in` from `LB_HOME/conf/default` to `LB_HOME/conf` and rename it to `httpd.conf`
- Open the file, uncomment `Servername`, set it to the hostname of the Load Balancer. Keep the port as 80

Note: If you change this Server name and port, you have to change endpoint of EM. Refer [Step 1](#)

- Modify `mod_cluster` part as in the image below.

```

</IfModule>
# MOD_CLUSTER_ADDS
# Adjust to you hostname and subnet.
<IfModule manager module>
Listen 127.0.0.1:6666
ManagerBalancerName mycluster
<VirtualHost 127.0.0.1:6666>
  <Location />
    Order deny,allow
    Deny from all
    Allow from 127.0.0.0
  </Location>

  KeepAliveTimeout 300
  MaxKeepAliveRequests 0
  #ServerAdvertise on http://@IP@:6666
  ServerAdvertise off
  AdvertiseFrequency 5
  #AdvertiseSecurityKey secret
  #AdvertiseGroup @ADVIP@:23364
  EnableMCPMReceive

  <Location /mod_cluster_manager>
    SetHandler mod_cluster-manager
    Order deny,allow
    Deny from all
    Allow from 127.0.0.0
  </Location>
</VirtualHost>
</IfModule>

```

Change to the hostname of Load Balancer

Specify IP addresses of JBoss clustered nodes. For example, replace "Allow from 127.0.0.0" to the following
Allow from 10.10.10.10
Allow from 20.20.20.20

Specify IP addresses which are allowed to access mod_cluster management page. Change to "all" to allow all IP addresses

Starting and Stopping Systinet on Jboss Cluster nodes

8. To start and stop Systinet on Jboss Cluster nodes, simply run the created file *start_cluster_node.bat/start_cluster_node.sh*
9. To stop Systinet on JBoss clustered nodes, run the command below:
 - *JBOSS_HOME/bin/jboss-cli.sh --connect command=:shutdown \$** (Linux)
 - *JBOSS_HOME\bin\jboss-cli.bat --connect command=:shutdown %** (Windows)

Starting and Stopping mod_cluster (Load Balancer)

10. To start Load Balancer:
 - Linux:

```
cd /opt/jboss/httpd/sbin  
./apachectl start
```
 - Windows

```
LB_HOME/bin/httpd.exe
```
11. To stop Load Balancer:
Simply run the commands below:
 - ```
cd /opt/jboss/httpd/sbin
```
  - ```
./apachectl stop
```

Verification and Testing High Availability

12. Verification :
 - Start all JBoss clustered nodes and the Load Balancer
 - Open the web browser and access EM at http://load-balancer-hostname/EM_Context.
 - Open the web browser and access the *mod_cluster* management page http://load-balancer-hostname:6666/mod_cluster_manager.

Note: Chrome considers 6666 to be an unsafe port. Hence, if you are using this port, either use another web browser, or read the article [how-to-fix-err-unsafe-port-error-on-chrome](#) to fix it.

- If the instructions work well so far, you will see the following:

```

mod_cluster/1.2.6.Final

start of "httpd.conf" configuration
mod_proxy_cluster.c: OK
mod_sharedmem.c: OK
Protocol supported: http AJP
mod_advertise.c: OK
Server: tranhi1
Server: tranhi1 VirtualHost: 127.0.0.1:8080 Advertising on Group 224.0.1.105 Port 23364 for (null)/(null):0 every 5 seconds
end of "httpd.conf" configuration

Auto Refresh show DUMP output show INFO output

Node node1 (ajp://16.154.113.49:8009):

Enable Contexts Disable Contexts
Balancer: mycluster,LBGroup: ,Flushpackets: Off,Flushwait: 10000,Ping: 10000000,Smax: 65,Ttl: 60000000,Status: OK,Elected: 0,Read: 0,Transferred: 0,Connected: 0,Load: 100

Virtual Host 1:

Contexts:

/em/platform, Status: ENABLED Request: 0 Disable
/em/policymgr, Status: ENABLED Request: 0 Disable
/em/xemote, Status: ENABLED Request: 0 Disable
/em/xreporting, Status: ENABLED Request: 0 Disable
/em, Status: ENABLED Request: 0 Disable
/em/web, Status: ENABLED Request: 0 Disable
/hp-em-doc, Status: ENABLED Request: 0 Disable
/em/self-test, Status: ENABLED Request: 0 Disable

Aliases:

default-host
localhost
example.com

Node node2 (ajp://16.154.113.49:8109):

Enable Contexts Disable Contexts
Balancer: mycluster,LBGroup: ,Flushpackets: Off,Flushwait: 10000,Ping: 10000000,Smax: 65,Ttl: 60000000,Status: OK,Elected: 0,Read: 0,Transferred: 0,Connected: 0,Load: 100

Virtual Host 1:

Contexts:

/em/platform, Status: ENABLED Request: 0 Disable
/em/policymgr, Status: ENABLED Request: 0 Disable
/em/xemote, Status: ENABLED Request: 0 Disable
/em, Status: ENABLED Request: 0 Disable
/em/xreporting, Status: ENABLED Request: 0 Disable
/em/web, Status: ENABLED Request: 0 Disable
/hp-em-doc, Status: ENABLED Request: 0 Disable
/em/self-test, Status: ENABLED Request: 0 Disable

Aliases:

default-host
localhost
example.com

```

13. Testing High Availability

- Stop JBoss clustered node 1
- Open the web browser and access Systinet at http://load-balancer-hostname/EM_Context. EM server must be available as other clustered nodes are running.
- Open the web browser and access the mod_cluster management page to check running nodes. You will see the following result:

mod_cluster/1.2.6.Final

```
start of "httpd.conf" configuration
mod_proxy_cluster.c: OK
mod_shardmem.c: OK
Protocol supported: http AJP
mod_advertise.c: OK
Server: tranhil
Server: tranhil VirtualHost: 127.0.0.1:8080 Advertising on Group 224.0.1.105 Port 23364 for (null):/(null):0 every 5 seconds
end of "httpd.conf" configuration
```

[Auto Refresh](#) [show DUMP output](#) [show INFO output](#)

Node node2 (ajp://16.154.113.49:8109):

[Enable Contexts](#) [Disable Contexts](#)

Balancer: mycluster,LBGroup: ,Flushpackets: Off,Flushwait: 10000,Ping: 10000000,Smax: 65,Ttl: 60000000,Status: OK,Elected: 0,Read: 0,Transferred: 0,Connected: 0,Load: 100

Virtual Host 1:

Contexts:

```
/em/platform, Status: ENABLED Request: 0 Disable
/em/policymgr, Status: ENABLED Request: 0 Disable
/em/remote, Status: ENABLED Request: 0 Disable
/em, Status: ENABLED Request: 0 Disable
/em/reporting, Status: ENABLED Request: 0 Disable
/em/web, Status: ENABLED Request: 0 Disable
/hp-em-doc, Status: ENABLED Request: 0 Disable
/em/self-test, Status: ENABLED Request: 0 Disable
```

Aliases:

```
default-host
localhost
example.com
```

- Stop other clustered nodes and conduct further tests if required.