



# User Guide

/ Amster 6.5.5

Latest update: 6.5.5

ForgeRock AS  
201 Mission St., Suite 2900  
San Francisco, CA 94105, USA  
+1 415-599-1100 (US)  
[www.forgerock.com](http://www.forgerock.com)

---

Copyright © 2017-2018 ForgeRock AS.

## Abstract

### Guide to the ForgeRock® Access Management command-line interface, Amster.



This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.

To view a copy of this license, visit <https://creativecommons.org/licenses/by-nc-nd/3.0/> or send a letter to Creative Commons, 444 Castro Street, Suite 900, Mountain View, California, 94041, USA.

ForgeRock® and ForgeRock Identity Platform™ are trademarks of ForgeRock Inc. or its subsidiaries in the U.S. and in other countries. Trademarks are the property of their respective owners.

UNLESS OTHERWISE MUTUALLY AGREED BY THE PARTIES IN WRITING, LICENSOR OFFERS THE WORK AS-IS AND MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND CONCERNING THE WORK, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, OR THE ABSENCE OF LATENT OR OTHER DEFECTS, ACCURACY, OR THE PRESENCE OF ABSENCE OF ERRORS, WHETHER OR NOT DISCOVERABLE. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO SUCH EXCLUSION MAY NOT APPLY TO YOU.

EXCEPT TO THE EXTENT REQUIRED BY APPLICABLE LAW, IN NO EVENT WILL LICENSOR BE LIABLE TO YOU ON ANY LEGAL THEORY FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES ARISING OUT OF THIS LICENSE OR THE USE OF THE WORK, EVEN IF LICENSOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

DejaVu Fonts

Bitstream Vera Fonts Copyright

Copyright (c) 2003 by Bitstream, Inc. All Rights Reserved. Bitstream Vera is a trademark of Bitstream, Inc.

Permission is hereby granted, free of charge, to any person obtaining a copy of the fonts accompanying this license ("Fonts") and associated documentation files (the "Font Software"), to reproduce and distribute the Font Software, including without limitation the rights to use, copy, merge, publish, distribute, and/or sell copies of the Font Software, and to permit persons to whom the Font Software is furnished to do so, subject to the following conditions:

The above copyright and trademark notices and this permission notice shall be included in all copies of one or more of the Font Software typefaces.

The Font Software may be modified, altered, or added to, and in particular the designs of glyphs or characters in the Fonts may be modified and additional glyphs or characters may be added to the Fonts, only if the fonts are renamed to names not containing either the words "Bitstream" or the word "Vera".

This License becomes null and void to the extent applicable to Fonts or Font Software that has been modified and is distributed under the "Bitstream Vera" names.

The Font Software may be sold as part of a larger software package but no copy of one or more of the Font Software typefaces may be sold by itself.

THE FONT SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OF COPYRIGHT, PATENT, TRADEMARK, OR OTHER RIGHT. IN NO EVENT SHALL BITSTREAM OR THE GNOME FOUNDATION BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, INCLUDING ANY GENERAL, SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF THE USE OR INABILITY TO USE THE FONT SOFTWARE OR FROM OTHER DEALINGS IN THE FONT SOFTWARE.

Except as contained in this notice, the names of Gnome, the Gnome Foundation, and Bitstream Inc., shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Font Software without prior written authorization from the Gnome Foundation or Bitstream Inc., respectively. For further information, contact: [fonts at gnome dot org](mailto:fonts at gnome dot org).

Arev Fonts Copyright

Copyright (c) 2006 by Tavmjong Bah. All Rights Reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of the fonts accompanying this license ("Fonts") and associated documentation files (the "Font Software"), to reproduce and distribute the modifications to the Bitstream Vera Font Software, including without limitation the rights to use, copy, merge, publish, distribute, and/or sell copies of the Font Software, and to permit persons to whom the Font Software is furnished to do so, subject to the following conditions:

The above copyright and trademark notices and this permission notice shall be included in all copies of one or more of the Font Software typefaces.

The Font Software may be modified, altered, or added to, and in particular the designs of glyphs or characters in the Fonts may be modified and additional glyphs or characters may be added to the Fonts, only if the fonts are renamed to names not containing either the words "Tavmjong Bah" or the word "Arev".

This License becomes null and void to the extent applicable to Fonts or Font Software that has been modified and is distributed under the "Tavmjong Bah Arev" names.

The Font Software may be sold as part of a larger software package but no copy of one or more of the Font Software typefaces may be sold by itself.

THE FONT SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OF COPYRIGHT, PATENT, TRADEMARK, OR OTHER RIGHT. IN NO EVENT SHALL TAVMJONG BAH BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, INCLUDING ANY GENERAL, SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF THE USE OR INABILITY TO USE THE FONT SOFTWARE OR FROM OTHER DEALINGS IN THE FONT SOFTWARE.

Except as contained in this notice, the name of Tavmjong Bah shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Font Software without prior written authorization from Tavmjong Bah. For further information, contact: [tavmjong @ free . fr](mailto:tavmjong @ free . fr).

FontAwesome Copyright

Copyright (c) 2017 by Dave Gandy, <http://fontawesome.io>.

This Font Software is licensed under the SIL Open Font License, Version 1.1. This license is available with a FAQ at: <http://scripts.sil.org/OFL>.

---

# Table of Contents

Preface .....	iv
1. Introducing the Amster Command-line Interface .....	1
2. Getting Started with the Amster Command-line Interface .....	3
2.1. Prerequisites .....	3
2.2. Installing Amster .....	3
2.3. First Steps .....	4
2.4. Connecting to Access Management .....	6
3. Using the Amster Command-line Interface .....	10
3.1. Creating Transport Keys .....	10
3.2. Exporting Configuration Data .....	12
3.3. Importing Configuration Data .....	14
3.4. Installing Access Management with Amster .....	17
3.5. Integrating Amster in your Environment .....	28
3.6. Amster Usage Examples .....	40
4. Reference .....	43
4.1. Amster Authentication Module Properties .....	43
4.2. Command-Line Reference .....	43
A. Getting Support .....	50
A.1. Accessing Documentation Online .....	50
A.2. Using the ForgeRock.org Site .....	50
A.3. Getting Support and Contacting ForgeRock .....	51

# Preface

This guide shows you how to install Amster, and how to integrate with ForgeRock Access Management. Read the [Release Notes](#) before you get started.

This guide is written for anyone installing Amster to interface with supported ForgeRock Access Management deployments.

## About ForgeRock Identity Platform™ Software

ForgeRock Identity Platform™ serves as the basis for our simple and comprehensive Identity and Access Management solution. We help our customers deepen their relationships with their customers, and improve the productivity and connectivity of their employees and partners. For more information about ForgeRock and about the platform, see <https://www.forgerock.com>.

## Chapter 1

# Introducing the Amster Command-line Interface

Amster is a command-line interface built upon the ForgeRock Access Management REST interface. Use Amster in DevOps processes, such as continuous integration, command-line installations, and scripted cloud deployments.

Amster provides the following features:

- **Remote, Scripted Deployments.** Script AM deployments by using the Groovy scripting support within Amster.

For more information, see "Scripting" and "Installing Access Management with Amster".

- **AM Configuration Import and Export.** Amster can export all the configuration related to an AM instance, and import it back to the same, or a different instance.

Note that Amster only manages configuration data. User information in data stores is not imported or exported, or modified in any way.

For more information, see "Exporting Configuration Data" and "Importing Configuration Data".

- **Configuration Stored in JSON.** Amster exports configuration to a hierarchy of JSON format text files on the local filesystem.

Global defaults and configuration are exported to the `global` folder, and the configuration for realms is exported into subfolders of the `realms` folder.

The following is a simplified example of an exported hierarchy, including the top-level `root` realm:

```
|-- global
|   |-- ActiveDirectoryModule.json
|   |-- GlobalScripts
|   |   |-- 157298c0-7d31-4059-a95b-eeb08473b7e5.json
|   |   |-- 36863ffb-40ec-48b9-94b1-9a99f71cc3b5.json
|   |-- HotpModule.json
|   |-- Realms
|   |   |-- root.json
|   |-- Servers
|   |   |-- 01
|   |   |   |-- CtsDataStoreProperties.json
|   |   |   |-- SessionProperties.json
|   |   |-- 01.json
|   |-- Session.json
|-- realms
   |-- root
   |   |-- AmsterModule
   |   |   |-- amster.json
   |   |-- AuthenticationChains
   |   |   |-- amsterService.json
   |   |   |-- myScriptedChain.json
   |   |-- DataStoreModule
   |   |   |-- datastore.json
   |   |-- ScriptedModule
   |   |   |-- myScriptedAuthModule.json
   |   |-- Scripts
   |   |   |-- 9de3eb62-f131-4fac-a294-7bd170fd4acb.json
   |   |   |-- c827d2b4-3608-4693-868e-bbcf86bd87c7.json
```

Store these files in a version control system to manage and maintain AM configurations.

For a list of the available entities, see the [Entity Reference](#).

- **Encryption of Sensitive Data.** Amster can encrypt exported password and sensitive data in the configuration files that are stored on disk. Only a correctly configured AM instance with the required transport key installed is able to decrypt and import the values.

For more information, see "Creating Transport Keys".

## Chapter 2

# Getting Started with the Amster Command-line Interface

This chapter covers how to download and install Amster, and how to prepare your environment to connect to ForgeRock Access Management instances.

## 2.1. Prerequisites

Amster is a standalone client that does not require any other component from the ForgeRock Identity Platform to run. See the following list of prerequisites for installation:

- Amster requires a Java developer environment. Check the output of the **java -version** command to make sure your version is supported according to "Java Requirements" in the *Release Notes*.
- The `JAVA_HOME` environment variable must be set.

## 2.2. Installing Amster

The *ForgeRock BackStage* website hosts downloadable versions of Amster. For each release of AM you can download Amster as a `.zip` file.

After you download the `.zip` file, create a new directory for Amster and unzip the `.zip` file. For example:

```
$ mkdir /path/to/amster_6.5.5
$ unzip ~/Downloads/amster-6.5.5.zip -d amster_6.5.5
```

The following files and directories are extracted:

`bcprov-jdk15on-1.55.jar`

Third-party cryptography library, by Bouncy Castle.

`bcpkix-jdk15on-1.55.jar`

Third-party cryptography library, by Bouncy Castle.

`amster`

The **amster** command.

**README.md**

Amster readme file, with quick-start information.

**LICENSE**

ForgeRock's Amster terms of license.

**amster-6.5.5.jar**

The main Amster Java library.

**/legal-notices**

Directory containing legal notices relating to the Amster distribution.

**/samples**

Directory containing sample scripts for export, import, and others. For more information about this files, see "Amster Sample Scripts".

## 2.3. First Steps

Once Amster is extracted, run the **amster** command to start the client:

```
$ cd /path/to/amster
$ ./amster
Amster OpenAM Shell (6.5.5 build 24b5258daa, JVM: 1.8.0_131)
Type ':help' or ':h' for help
-----
am>
```

The version of Amster is included in the first line of output, as well as the version of the running JDK.

**Note**

If the **amster** command fails to load, make sure the **JAVA\_HOME** environment variable is set, and that your JDK version is supported as per "Java Requirements" in the *Release Notes*.

To exit the client, run the **:exit** or **:q** commands:

```
am> :exit
$
```

To get a list of the commands available to the client, run the **:help** command:



```
am> :help
For information about Groovy, visit:
  http://groovy-lang.org

Available commands:
connect      (am ) Connect to an OpenAM instance
create      (c  ) Create an OpenAM entity
read        (r  ) Read an OpenAM entity
update      (u  ) Update an OpenAM entity
delete      (d  ) Delete an OpenAM entity
query       (q  ) Query an OpenAM entity
action      (a  ) Perform action an OpenAM entity
import-config (i  ) Import configuration into OpenAM
export-config (x  ) Export configuration from OpenAM
replace     (rep) Replace all matching text
install-openam (inst) Install OpenAM
:help      (:h ) Display this help message
?          (:? ) Alias to: :help
:exit     (:x ) Exit the shell
:quit     (:q ) Alias to: :exit
:load     (:l ) Load a file or URL into the buffer
.         (\. ) Alias to: :load

For help on a specific command type:
:help command
```

To show help information available for a particular command, run **:help *command***. For example:

```
am> :help connect
usage: connect [options] <baseurl>
Options:

-i, --interactive
    If specified you will be prompted for credentials. Defaults to private
    key authentication.

-k, --private-key
    Path to a private key file or directory containing one of amster_rsa,
    id_rsa or id_ecdsa. Defaults to {USER_HOME}/.ssh.

-t, --connection-timeout
    The default timeout is 10 seconds. If specified, this parameter sets
    the timeout in seconds.

Connect to the OpenAM instance at the given URL.
Example:

connect -i https://am.example.com/openam

connect -i -t 30 https://am.example.com/openam
```

### Tip

When a command does not proceed as expected, it can sometimes be helpful to start the **amster** command in debug mode and try again. To activate debug mode, start the **amster** command using the **-d** flag. For example:

```
$ ./amster -d
Listening for transport dt_socket at address: 6006
DEBUG [org.codehaus.groovy.tools.shell.BufferManager] Created new buffer with index: 0
DEBUG [org.codehaus.groovy.tools.shell.BufferManager] Buffers reset
DEBUG [org.codehaus.groovy.tools.shell.Parser] Using parser flavor:
  rigid
...
```

While in debug mode, the **amster** command output shows additional information, such as connection handshakes and Groovy calls.

## 2.4. Connecting to Access Management

Amster can connect to an AM instance using interactive login or using RSA or ECDSA key files, either over HTTP or HTTPS protocols. If you use self-signed certificates for AM, you must either:

- Import the certificates into the JVM's `cacerts` keystore on the Amster client.
- Run the **amster** command specifying the truststore containing the certificates and its type. For example:

```
$ ./amster -D javax.net.ssl.trustStore=/path/to/keystore.jceks -D javax.net.ssl.trustStoreType=jceks
```

### 2.4.1. Interactive Login Connections

To establish an interactive connection with AM, Amster makes use of the default authentication chain for administrator users configured in the AM instance. To locate this property, log in to AM and navigate to Realms > Top Level Realm > Authentication > Settings > Core.

The `ldapService` authentication chain, configured by default after AM installation, requires a valid user in AM. Log in as an administrative user, for example `amadmin`, to perform operations such as export and import of the configuration.

#### *To Connect with Interactive Login*

This procedure assumes the use of the `ldapService` chain. Perform the following steps to connect to a local or remote AM instance using interactive login:

1. Start the Amster command-line interface.
2. Run the **connect** command with the `--interactive` or the `-i` options:

```
am> connect --interactive https://openam.example.com:8443/openam
```

#### **Tip**

When using the **amster** command to import or export a significant amount of data, the default timeout of 10 seconds may be insufficient.

To increase the default timeout, add the `--connection-timeout <seconds>` option. For example:

```
am> connect --connection-timeout 45 --interactive https://openam.example.com:8443/openam
```

### 3. Specify username and password to authenticate to AM:

```
Sign in to OpenAM
User Name: amadmin
Password: *****
amster openam.example.com:8443>
```

## 2.4.2. Private Key Connections

Amster can connect to an AM instance by using a private key pair and an authentication module and a chain in AM. The private key must be available to the Amster client, and the AM instance must trust the client IP address and have the public key in its `authorized_keys` file. Successful connections create an `amAdmin` session in AM.

An install or an upgrade of AM creates the following infrastructure for Amster:

- The `Forgerock Amster` authentication module in the Top Level Realm. The module is enabled by default in new AM installations and disabled by default when upgrading an existing AM. For more information on how to configure this module, see "Amster Authentication Module Properties".
- The `amsterService` authentication chain in the Top Level Realm. Changing or removing this chain may result into not being able to connect with Amster.
- The following RSA key pair files, in PKCS#1 PEM format:

### *Default Private Keypair Files*

File Name	Description
<code>/path/to/openam/secrets/encrypted/amster/authorized_keys</code>	<p>Holds the public keys of trusted Amster clients. AM check incoming Amster connections against these trusted keys. By default, contains a copy of the public key of a generated key pair that Amster can use.</p> <p>If this file exists in the configuration directory before a new install is performed, the file is not overwritten; the contents of the newly-created <code>amster_rsa.pub</code> file are appended to it instead.</p>
<code>/path/to/openam/secrets/encrypted/amster/amster_rsa</code>	Contains the private key of a generated key pair that Amster can use.
<code>/path/to/openam/secrets/encrypted/amster/amster_rsa.pub</code>	Contains the public key of a generated key pair that Amster can use.

### 2.4.2.1. Connecting Locally with Default Private Key Files

An Amster installation local to a new AM instance can connect without further configuration.

#### *To Connect Locally With the Default Key Pair*

Perform the following steps to connect to a local AM instance using the default key pair:

1. Start the Amster command-line interface.
2. Run the **connect** command with the `--private-key` or the `-k` options:

```
am> connect --private-key /path/to/openam/secrets/encrypted/amster/amster_rsa https://openam.example.com:8443/openam
amster openam.example.com:8443>
```

### 2.4.2.2. Connecting to a Remote AM Instance

To connect to a remote AM instance, create a private key pair for Amster and append the contents of the public key to the `authorized_keys` file of the instance.

#### *To Create and Configure a Private Key Pair*

To create a new key pair and append the public key to the AM instance perform the following steps:

1. Login to the Amster server.
2. Create a directory for the keys, for example, `$HOME/.ssh`.
3. Run the **ssh-keygen** command to generate a key pair without passphrase. You can create RSA or ECDSA key pairs:

- To create an RSA key pair, run the **ssh-keygen** command with the `-t rsa` option:

```
$ ssh-keygen -t rsa -N "" -f $HOME/.ssh/id_rsa -b 2048
Generating public/private rsa key pair.
Your identification has been saved in id_rsa.
Your public key has been saved in id_rsa.pub.
The key fingerprint is:
78:ca:43:bc:0a:84:b0:ab:ac:40:96:49:48:84:80:63 root@amster_server
```

- To create a ECDSA keypair, run the **ssh-keygen** command with the `-t ecdsa` option. You can create key pairs of 256, 384, or 521 curve sizes. For example:

```
$ ssh-keygen -t ecdsa -N "" -f $HOME/.ssh/id_ecdsa -b 521
Generating public/private ecdsa key pair.
Your identification has been saved in id_ecdsa.
Your public key has been saved in id_ecdsa.pub.
The key fingerprint is:
6b:b9:75:cb:42:07:91:25:a7:bf:d6:d0:bc:6f:5a:d7 root@amster_server
```

**Note**

AM requires the private key to be in PKCS#1 PEM format. Recent versions of the OpenSSH **ssh-keygen** tool creates keys in its own format, which AM cannot process.

If your generated private key (`id_rsa`) begins with `-----BEGIN OPENSSH PRIVATE KEY-----`, you will need to recreate your keypair in PKCS#1 PEM format.

Append the `-m pem` option to the **ssh-keygen** commands above to create a new pair in the supported PKCS#1 PEM format.

For example:

```
$ ssh-keygen -m pem -t rsa -N "" -f $HOME/.ssh/id_rsa -b 2048
```

The commands generate two files, `id_rsa.pub` or `id_ecdsa.pub` containing the public key, and `id_rsa` or `id_ecdsa` containing the private key.

4. Append the contents of the `id_rsa.pub` or `id_ecdsa.pub` files into the `authorized_keys` file in your AM instance(s); for example, into `/path/to/openam/secrets/encrypted/amster/authorized_keys`.
5. Start the Amster command-line interface.
6. To connect to AM using a specific private key file, run the **connect** command with the `--private-key` or the `-k` options, specifying the path to the private key file. For example:

```
am> connect --private-key $HOME/.ssh/id_rsa https://openam.example.com:8443/openam
amster openam.example.com:8443>
```

## Chapter 3

# Using the Amster Command-line Interface

This chapter covers how to use Amster to import and export configurations, and how to install a stand-alone AM instance.

Also covered is how to export and encrypt password values, how to script Amster usage, and how to use variables to customize imported configuration data.

## 3.1. Creating Transport Keys

To import and export encrypted password values in the configuration files you must generate a *transport key*, and install it in the keystore of each AM instance that you will be transporting passwords between.

The transport key must be stored in the default AM keystore, located at `/path/to/openam/openam/keystore.jceks`, and should have a key alias of `sms.transport.key`.

The presence of the transport key causes additional fields containing encrypted password values to appear in the exported configuration files. These additional fields have a `-encrypted` suffix, as shown below:

```
"authenticatorPushDeviceSettingsEncryptionKeystorePassword" : null,
"authenticatorPushDeviceSettingsEncryptionKeystorePassword-encrypted" :
"AAAAA0FFUwIQ1WDDMsxGoZMiRHhDQ+ywUfTMdGtYqEsvZLV9W8ygfHi/5kBWjMpyg=="
```

Encrypted password fields will only be added to REST calls made by administrative users, such as `amAdmin`.

Performance of an AM instance with a transport key present will be significantly impacted. You **MUST** delete the transport key when imports and exports have been completed.

Without a transport key present, all password fields are set to `null` in the exported configuration files, regardless of their actual value in the configuration.

### *To Generate and Install a New Transport Key*

Use the **keytool** command to generate the transport key by performing the following steps:

1. Run the **keytool** command, specifying the location of the `.storepass` file as the password to use for the keystore and the location of the `.keypass` file as the password to use for the key aliases:

```
$ keytool -genseckey -alias "sms.transport.key" -keyalg AES -keysize 128 \
-storetype jceks -keystore "/path/to/openam/openam/keystore.jceks" \
-storepass:file "/path/to/openam/openam/.storepass" \
-keypass:file "/path/to/openam/openam/.keypass"
```

2. You must restart AM for the transport key change to take effect.

The instance will now be able to include encrypted passwords in the exported configuration files.

To decrypt and import configuration files that contain encrypted passwords, you must install the same transport key used to encrypt it into the keystore of the target AM instance.

### To Duplicate and Install a Transport Key

Use the **keytool** command to export the transport key from the source instance keystore, and then install the result on the target instance keystore, by performing the following steps:

1. On the source instance, export the transport key into a keystore that can be transported to another instance by executing the following **keytool** command:

```
$ keytool -importkeystore -srcstoretype jceks -srcalias "sms.transport.key" \
-deststoretype jceks -destalias "sms.transport.key" \
-srckeystore "/path/to/openam/openam/keystore.jceks" \
-destkeystore "/path/to/openam/openam/transport_keystore.jceks" \
-srckeypass:file "/path/to/openam/openam/.keypass" \
-srcstorepass:file "/path/to/openam/openam/.storepass" \
-destkeypass "myTransp0rtK3yP4ssword" \
-deststorepass "myTransp0rtK3yP4ssword"
```

This command exports the transport key to a temporary keystore file `/path/to/openam/openam/transport_keystore.jceks`, and set a store and key password of `myTransp0rtK3yP4ssword`. You need to use these temporary passwords when importing to the target instance.

2. Move the keystore file created in the previous step, in this example `transport_keystore.jceks`, to the filesystem of the target server.
3. On the target server, import the transport key into the AM keystore by executing the following **keytool** command:

```
$ keytool -importkeystore -srcstoretype jceks -srcalias "sms.transport.key" \
-deststoretype jceks -destalias "sms.transport.key" \
-srckeystore "/path/to/openam/openam/transport_keystore.jceks" \
-destkeystore "/path/to/openam/openam/keystore.jceks" \
-srckeypass "myTransp0rtK3yP4ssword" \
-srcstorepass "myTransp0rtK3yP4ssword" \
-destkeypass:file "/path/to/openam/openam/.keypass" \
-deststorepass:file "/path/to/openam/openam/.storepass"
```

This command imports the transport key from the temporary keystore file `/path/to/openam/openam/transport_keystore.jceks` into the AM keystore, and set the transport key password to match the password used by the target keystore.

4. You must restart the target AM instance for the transport key change to take effect.

The target instance will now be able to correctly decrypt passwords stored in the imported configuration files.

#### Important

The presence of the transport key includes encrypted passwords in requests made by an administrative user, causing significant performance degradation. You **MUST** delete the transport key when imports and exports have been completed.

### To Delete a Transport Key

1. Run the following **keytool** command:

```
$ keytool -delete -alias "sms.transport.key" -storetype jceks \  
-storepass:file "/path/to/openam/openam/.storepass" \  
-keystore "/path/to/openam/openam/keystore.jceks"
```

2. You must restart the target AM instance for the transport key change to take effect.

The target instance will no longer include encrypted passwords nor be able to correctly decrypt passwords stored in configuration files.

## 3.2. Exporting Configuration Data

Amster can export configuration data from an AM instance. Export configuration data by using the **export-config** command.

The exported configuration data is written to a number of JSON-formatted files. The files are arranged in a hierarchy of global and realm configuration data.

To export encrypted password values in the configuration files you must generate and install a *transport key*. See "Creating Transport Keys".

#### Usage:

```
am> export-config --path Path [options]
```

#### **--path Path**

The path into which exported configuration files are placed.

Existing files will be overwritten if they exist. The path is created if it does not exist.

#### Options:

#### **--realms Realm [...]**

Space-separated list of realms from which to export. Specify the full path of each realm to export. Use a single forward-slash (/) to represent the top-level root realm.



Example: `/ /subRealm/subSubRealm`

Default: all

#### `--realmEntities Entity [...]`

Space-separated list of realm-based entities to export.

Use a space character in single-quotes ( `' '` ) to specify that no realm-based entities should be exported.

For a list of the available entities, see the [Entity Reference](#).

Default: all

#### `--globalEntities Entity [...]`

Space-separated list of global entities to export.

Use a space character in single-quotes ( `' '` ) to specify that no global entities should be exported.

For a list of the available entities, see the [Entity Reference](#).

Default: all

#### `--failOnError [true|false]`

If specified, the export process halts if an error occurs.

Default: `false`

#### `--listPasswords [true|false]`

If specified, the export process creates a listing of entities that contain password data. The listing is stored in a file in the root of the specified export directory.

Default: `false`

### 3.2.1. Exporting Configuration Data Examples

Before trying the following examples, start the Amster command-line interface, and connect to the AM instance from which to export data.

For information on connecting to instances, see "Connecting to Access Management".

#### Example 1

This example exports all configuration data, and will fail immediately if an error occurs.

```
am> export-config --path /tmp/myExportedConfigFiles --failOnError true
Export completed successfully
```

## Example 2

This example exports the configuration for the `DataStoreModule`, `Scripts`, and `OAuth2Provider` entities in a subrealm of the root realm named `mySubRealm`.

Configuration data for global entities is not exported.

```
am> export-config --path /tmp/myExportedConfigFiles --realms '/mySubRealm' --realmEntities
'DataStoreModule Scripts OAuth2Provider' --globalEntities ' '
Export completed successfully
```

## 3.3. Importing Configuration Data

Amster can import configuration data to an AM instance. Import configuration data by using the **import-config** command.

### Caution

A successful import overwrites any configuration that already exists in the target AM instance.

Before importing configuration data to an AM instance, consider the following points:

- You must connect to the AM instance where you will import the configuration data after starting the Amster command-line interface. For information, see "Connecting to Access Management".
- You must ensure that the configuration data you are trying to import is compatible with the version of AM you have deployed.

For example, do not try to import configuration data exported from an AM 5 instance into an AM 6.5 instance.

- AM validates that external data stores are configured and available when creating connections to them, including when importing using Amster.

You must ensure that each external datastore configured in the source instance has an equivalent datastore available and running before importing Amster configuration into the destination AM instance.

- When importing a full set of configuration data from an instance of AM, specify the `--clean` option to remove configuration settings from the target instance.

The `--clean` option removes the following items from the target AM instance:

- Realms, other than the Top Level Realm.
- Authentication chains and modules.

- Server and site settings, other than the current server.
- Services.
- Secret ID Mappings and secret definitions.
- Scripts.
- Audit settings.
- Policies, policy sets and resource types.
- Identity store configuration.
- Agents, and agent groups.

### Important

Do not use the `--clean` option if you are only importing a partial Amster export.

The target AM instance may not have the settings required to start up and operate if you do not replace the deleted settings by importing a complete set of configuration.

- By default, Amster configures the value of the `com.ipplanet.am.lbcookie.value` property as the value of the server ID.

To override the default during import, prefix the new value with `override-server-id:` in the configuration files. For example:

```
"com.ipplanet.am.lbcookie.value" : "override-server-id:myLBCookieValue"
```

- To import encrypted password values in the configuration files you must install the *transport key* used to encrypt the data. For more information, see "Creating Transport Keys".
- You must ensure that any special characters in names and passwords in Amster shell variables are escaped as required by the Groovy language.

For example, the dollar `$` character is a special character in Groovy. The following are two possible ways of escaping the `$` character:

```
variable.name="/pa$$word/"  
variable.name='pa\\$\\$word'
```

Note that you cannot use variables, such as `${varname}`, or configuration expressions, such as `&${varname}` if you convert a double-quoted string into a single-quoted string.

Refer to the Groovy documentation for more information on escaping special characters in strings.

### Usage:

```
am> import-config --path Path [options]
```

### --path Path

The path containing configuration files to import.

Specify a directory to import from all correctly-formatted JSON files within that directory and recurse through each sub-directory, or specify an individual JSON file.

### Options:

#### --failOnError [true|false]

If specified, the import process halts if an error occurs.

Default: `false`

#### --clean [true|false]

If specified, all configuration data is removed from the target AM instance before the import is performed.

Only set this option to `true` when importing a **full** set of configuration files into a new AM instance. Otherwise, the target instance may not function correctly.

Default: `false`

## 3.3.1. Importing Configuration Data Examples

Before trying the following examples, start the Amster command-line interface, and connect to the AM instance where you will import the configuration data.

For information on connecting to instances, see "Connecting to Access Management".

### Example

This example cleans all configuration from the target AM instance before importing a full set of configuration data, but will not halt the import if an error occurs.

```
am> import-config --path /tmp/myExportedConfigFiles --clean true --failOnError false
Cleaning global settings
Deleting JSON: Global JSON Handler
Deleting Scripting: 9de3eb62-f131-4fac-a294-7bd170fd4acb
Deleting Scripting: 7e3d7067-d50f-4674-8c76-a3e13a810c33
Deleting Scripting: c827d2b4-3608-4693-868e-bbcf86bd87c7
Global settings cleaned
Importing directory /tmp/
myExportedConfigFiles
...
Import completed successfully
```

## 3.4. Installing Access Management with Amster

Amster can configure a deployed AM as a single, stand-alone instance, or as an instance that is part of a site.

Amster can configure AM to use an embedded DS server as the configuration and identity store, for evaluation purposes.

For production environments, you can specify an external configuration store. Configuring AM to use an external configuration store also requires an external identity store, which will use the specified configuration store by default, unless otherwise specified.

Install AM configuration with Amster by using the **install-openam** command:

### Usage:

```
am> install-openam \  
  --serverUrl protocol://FQDN:port/URI \  
  --adminPwd amAdmin_password \  
  [options]
```

#### **--adminPwd amAdmin\_password**

Specifies the password of the `amAdmin` user. If the `--cfgStoreDirMgrPwd` option is not specified, this value is also the password of the configuration store's directory manager user.

The password must be at least 8 characters in length.

#### **--serverUrl protocol://FQDN:port/URI**

Specifies the protocol, URL, port, and deployment URI of the AM instance. For example, `https://openam.example.com:8443/openam`.

### Options:

#### **[options]**

Specifies optional parameters to configure properties such as the cookie domain, ports and passwords for the configuration store, and others.

For more information about the possible options, run the **:help install-openam** command or see the `install-openam` reference section.

### 3.4.1. Examples

Before trying the following examples, make sure the AM instance is deployed and running but not yet configured. For more information, see the *ForgeRock Access Management Installation Guide*.

For more information about options available to the **install-openam** command, see the **install-openam** reference section.

### Tip

Amster also supports scripting the installation process. For more information, see "Scripting".

You can find the following examples in this section:

- Installing AM Instances for Evaluation (Embedded Configuration Store)
- Installing AM Instances (External Configuration Store)

### Installing AM Instances for Evaluation (Embedded Configuration Store)

The following examples show you how to install AM for evaluation, demo, or test purposes. The embedded configuration store is not supported for production environments.

#### Example 1

This example installs a single AM instance with the default values:

```
am> install-openam \
> --serverUrl https://openam.example.com:8443/openam \
> --adminPwd forgerock \
> --acceptLicense

02/22/2017 05:16:20:932 AM GMT: Checking license acceptance...
02/22/2017 05:16:20:934 AM GMT: License terms accepted.
02/22/2017 05:16:20:936 AM GMT: Checking configuration directory /tomcat/openam.
02/22/2017 05:16:20:936 AM GMT: ...Success.
02/22/2017 05:16:20:936 AM GMT: Extracting OpenDJ, please wait...
02/22/2017 05:16:21:265 AM GMT: Complete
02/22/2017 05:16:21:265 AM GMT: Running OpenDJ setup
02/22/2017 05:16:21:265 AM GMT: Setup command: --cli --adminConnectorPort
4444
--baseDN dc=openam,dc=forgerock,dc=org --rootUserDN cn=Directory
Manager
--ldapPort 50389 --skipPortCheck --rootUserPassword xxxxxxx --jmxPort
1689
--no-prompt --doNotStart --hostname openam.example.com --
noPropertiesFile
--backendType je
%0AConfiguring+Directory+Server+....+Done.
0A%0ATo+see+basic+server+configuration+status+and+configuration%2C+you+can+launch%
0A%2Ftomcat_b%2Fopenam%2Fopends%2Fbin%2Fstatus%0A%0A02/22/2017 05:16:24:531 AM GMT: ...Success.
02/22/2017 05:16:24:531 AM GMT: ...Success
02/22/2017 05:16:24:531 AM GMT: Installing OpenAM configuration store in /tomcat/openam/
opends
...
02/22/2017 05:16:53:123 AM GMT: Configuring server instance.
02/22/2017 05:16:53:176 AM GMT: ...Done
02/22/2017 05:16:55:918 AM GMT: Creating demo user.
02/22/2017 05:16:55:942 AM GMT: ...Done
02/22/2017 05:16:55:943 AM GMT: Setting up monitoring authentication file.
Configuration complete!
```

*Notes:*

- If only the required parameters are supplied, Amster installs AM in a similar way the web configurator does when using the defaults.
- This example installs a single AM instance with an embedded configuration store.
- When installing AM locally to Amster, Amster stores AM's configuration in the home directory of the user that is running the **amster** command. For example, for the **tomcat** user, the configuration is stored in `/path/to/tomcat_home/openam`.

To modify this behavior, use the `--cfgDir` option.

- If the default ports for the configuration store are already in use, the installer uses the next available free ports.
- The **demo** user is created in the embedded store.

**Example 2**

This example installs a single AM instance and specifies the configuration directory:

```
am> install-openam \  
> --serverUrl https://openam.example.com:8443/openam \  
> --adminPwd forgerock \  
> --acceptLicense \  
> --cfgDir /tomcat/openam2  
  
02/22/2017 05:34:32:007 AM GMT: Checking license acceptance...  
02/22/2017 05:34:32:007 AM GMT: License terms accepted.  
02/22/2017 05:34:32:009 AM GMT: Checking configuration directory /tomcat/openam2.  
02/22/2017 05:34:32:010 AM GMT: ...Success.  
02/22/2017 05:34:32:010 AM GMT: Extracting OpenDJ, please wait...  
02/22/2017 05:34:32:280 AM GMT: Complete  
02/22/2017 05:34:32:280 AM GMT: Running OpenDJ setup  
02/22/2017 05:34:32:265 AM GMT: Setup command: --cli --adminConnectorPort  
4444  
--baseDN dc=openam,dc=forgerock,dc=org --rootUserDN cn=Directory  
Manager  
--ldapPort 389 --skipPortCheck --rootUserPassword xxxxxxxx --jmxPort  
1689  
--no-prompt --doNotStart --hostname openam.example.com --  
noPropertiesFile  
--backendType je  
%0AConfiguring+Directory+Server+....+Done  
.  
...  
02/22/2017 05:35:03:509 AM GMT: ...Done  
02/22/2017 05:35:03:509 AM GMT: Setting up monitoring authentication file.  
Configuration complete!
```

*Notes:*

- This example installs a single AM instance with an embedded configuration store.

- Amster will create the directory specified in the `--cfgDir` option.
- The `demo` user is created in the embedded store.

### Example 3

This example installs two AM instances within a site that use embedded configuration stores.

First instance:

```

am> install-openam \
> --serverUrl https://openam1.example.com:8443/openam \
> --adminPwd forgerock \
> --acceptLicense \
> --cookieDomain example.com \
> --cfgDir /tomcat/openam1 \
> --lbSiteName TestSite01 \
> --lbPrimaryUrl http://site.example.com:80/openam

11/01/2018 14:20:20:932 PM GMT: Checking license acceptance...
11/01/2018 14:20:10:440 PM GMT: License terms accepted.
11/01/2018 14:20:10:440 PM GMT: Checking configuration directory /tomcat/openam1.
11/01/2018 14:20:10:440 PM GMT: ...Success.
11/01/2018 14:20:10:440 PM GMT: Extracting OpenDJ, please wait...
11/01/2018 14:20:11:631 PM GMT: Complete
11/01/2018 14:20:11:631 PM GMT: Running OpenDJ setup
11/01/2018 14:20:11:631 PM GMT: Setup command: --cli --adminConnectorPort
4444
--baseDN dc=openam,dc=forgerock,dc=org --rootUserDN cn=Directory
Manager
--ldapPort 50389 --skipPortCheck --rootUserPassword xxxxxxx --jmxPort
1689
--no-prompt --doNotStart --hostname openam.example.com --
noPropertiesFile
--backendType je
%0AConfiguring+Directory+Server+....+Done.
0A%0ATo+see+basic+server+configuration+status+and+configuration%2C+you+can+launch%
0A%2Ftomcat_b%2Fopenam%2Fopends%2Fbin%2Fstatus%0A%0A02/22/2017 05:16:24:531 AM GMT: ...Success.
11/01/2018 14:20:14:323 PM GMT: ...Success
11/01/2018 14:20:14:333 PM GMT: Installing OpenAM configuration store in /tomcat/openam1/
opends
...
11/01/2018 14:20:43:217 PM GMT: Configuring server instance.
11/01/2018 14:20:43:705 PM GMT: ...Done
11/01/2018 14:20:45:118 PM GMT: Creating demo user.
11/01/2018 14:20:45:242 PM GMT: ...Done
11/01/2018 14:20:45:243 PM GMT: Setting up monitoring authentication file.
Configuration complete!
    
```

### Notes:

- Amster will create the directory specified in the `--cfgDir` option.
- The `demo` user is created in the embedded user store.
- Amster will create a site with the name specified in the `--lbSiteName` option, which can be accessed using the URL specified in the `--lbPrimaryUrl` option.



- The cookie domain is specified in the `--cookieDomain`. If not specified, Amster sets the cookie domain to the URL of the AM instance, which is not optimal when having multiple instances in a site.
- The example does not specify the configuration store's ports. To specify them, see the `install-openam` reference section.

Second instance:

```
am> install-openam \  
> --serverUrl https://openam2.example.com:8443/openam \  
> --adminPwd forgerock \  
> --acceptLicense \  
> --cfgDir /tomcat/openam2 \  
> --cookieDomain example.com \  
> --lbSiteName TestSite01 \  
> --lbPrimaryUrl http://site.example.com:80/openam \  
> --existingServerId https://openam1.example.com:8443/openam \  
> --dsEmbReplReplPort1 50989 \  
> --dsEmbReplReplPort2 50989 \  
> --dsEmbReplFlag embReplFlag \  
> --dsEmbReplHost2 https://openam1.example.com:8443/openam \  
> --dsEmbReplAdminPort2 4444 \  
> --pwdEncKey MneLwkk0okJx58znp7QyvGmiawmc2vL4  
  
11/01/2018 14:24:20:932 PM GMT: Checking license acceptance...  
11/01/2018 14:24:23:440 PM GMT: License terms accepted.  
11/01/2018 14:24:23:440 PM GMT: Checking configuration directory /tomcat/openam2.  
11/01/2018 14:24:23:440 PM GMT: ...Success.  
11/01/2018 14:24:23:440 PM GMT: Extracting OpenDJ, please wait...  
11/01/2018 14:24:24:631 PM GMT: Complete  
11/01/2018 14:24:24:631 PM GMT: Running OpenDJ  
setup  
...  
11/01/2018 14:24:26:385 PM GMT: Creating embedded DS configuration store  
replica  
...  
11/01/2018 14:24:27:400 PM GMT: Updating remote references on server openam1.example.com:4444 .....  
Done  
11/01/2018 14:24:27:401 PM GMT: Configuring Replication port on server openam2.example.com:4444 ....  
.Done  
Updating replication configuration for baseDN dc=openam,dc=forgerock,dc=org  
on  
...  
11/01/2018 14:24:28:206 PM GMT: Reinitializing system properties.  
11/01/2018 14:24:28:394 PM GMT: ...Done  
11/01/2018 14:24:28:406 PM GMT: Configuring server instance.  
11/01/2018 14:24:28:460 PM GMT: ...Done  
11/01/2018 14:24:28:770 PM GMT: Installing new plugins...  
11/01/2018 14:24:28:846 PM GMT: Plugin installation complete.  
11/01/2018 14:24:28:890 PM GMT: Setting up monitoring authentication file.  
Configuration complete!
```

Notes:

- This example installs an AM instance with an embedded configuration store as part of the `TestSite01` site.

As part of the site installation with embedded configuration store, Amster configures the new configuration store to replicate the data from the configuration store defined in the `dsEmbReplHost2` option.

- The password specified in the `--adminPwd` option must be the same password used across the site.
- Amster will create the directory specified in the `--cfgDir` option.
- The `demo` user is created in the embedded user store.
- The cookie domain is specified in the `--cookieDomain` option. When unspecified, Amster sets the cookie domain to the URL of the AM instance, which will cause issues when having multiple instances in a site.
- The example does not specify the configuration store's ports. To specify them, see the `install-openam` reference section.
- The `--pwdEncKey` specifies the encryption key used by the servers already in the site. To locate the encryption key value, navigate to Deployment > Servers > Server Name > Security > Encryption.

Failure to set this option to the appropriate value will cause the original encryption key to be overwritten, which will render the site unable to read the configuration and the user stores.

## Installing AM Instances (External Configuration Store)

Installing AM with an external configuration store requires manual configuration of the directory server. This is also true when specifying a separate identity store.

Note that you cannot install AM with an external configuration store that already contains configuration data, unless you are adding an instance to the existing site.

### Example 1

This example installs AM with an external configuration store, which is also used as the identity store.

- Prepare the external configuration data store as detailed in the [ForgeRock Access Management Installation Guide](#).

```
am> install-openam \  
> --serverUrl https://openam.example.com:8443/openam \  
> --adminPwd forgerock \  
> --acceptLicense \  
> --cfgStoreDirMgrPwd mypassword \  
> --cfgStore dirServer \  
> --cfgStoreHost opendj.example.com \  
> --cfgStoreAdminPort 4444 \  
> --cfgStorePort 1389 \  
> --cfgStoreRootSuffix dc=example,dc=com  
  
09/27/2017 03:37:29:345 PM BST: Checking license acceptance...  
09/27/2017 03:37:29:989 PM BST: License terms accepted.  
09/27/2017 03:37:29:991 PM BST: Checking configuration directory /Users/forgerock/openam.  
09/27/2017 03:37:29:991 PM BST: ...Success.  
09/27/2017 03:37:30:997 PM BST: Tag swapping schema files.  
09/27/2017 03:37:30:002 PM BST: ...Success.  
09/27/2017 03:37:30:004 PM BST: Loading Schema odsee_config_schema.ldif  
09/27/2017 03:37:30:040 PM BST: ...Success  
.  
...  
09/27/2017 03:37:38:520 PM BST: Loading Schema /Users/forgerock/openam/opendj_pushdevices.ldif  
09/27/2017 03:37:38:703 PM BST: ...Success.  
09/27/2017 03:37:38:811 PM BST: Installing new plugins...  
09/27/2017 03:37:39:401 PM BST: Plugin installation complete.  
09/27/2017 03:37:43:252 PM BST: Setting up monitoring authentication file.  
Configuration complete!
```

### Notes:

This example installs the configuration store and the identity store in the `opendj.example.com` host. Both the configuration and identity data use the same DS instance.

- When installing AM locally to Amster, Amster stores AM's configuration in the home directory of the user that is running the **amster** command. For example, for the `tomcat` user, the configuration is stored in `/path/to/tomcat_home/openam`.

To modify this behavior, use the `--cfgDir` option.

- If there is any problem setting up the configuration store, the installation process will exit with an error, and navigating to the AM will open the configuration page.
- The `demo` user is not created in the identity store.

### Example 2

This example installs AM with external configuration and identity stores.

- Prepare the external configuration data store as detailed in the [ForgeRock Access Management Installation Guide](#).
- Ensure your user store does not have user data. If the user store has user data, you must prepare it as detailed in the [ForgeRock Access Management Installation Guide](#).

```
am> install-openam \  
> --serverUrl https://openam.example.com:8443/openam \  
> --adminPwd forgerock \  
> --acceptLicense \  
> --cfgStoreDirMgrPwd mypassword \  
> --cfgStore dirServer \  
> --cfgStoreHost opendj.example.com \  
> --cfgStoreAdminPort 4444 \  
> --cfgStorePort 1389 \  
> --cfgStoreRootSuffix dc=example,dc=com \  
> --userStoreDirMgrPwd mypassword2 \  
> --userStoreHost ldap.example.com \  
> --userStoreType LDAPv3ForOpenDS \  
> --userStorePort 1390 \  
> --userStoreRootSuffix dc=example,dc=com  
  
09/27/2017 03:33:47:989 PM BST: Checking license acceptance...  
09/27/2017 03:33:47:989 PM BST: License terms accepted.  
09/27/2017 03:33:47:991 PM BST: Checking configuration directory /Users/forgerock/openam.  
09/27/2017 03:33:47:991 PM BST: ...Success.  
09/27/2017 03:33:47:994 PM BST: Tag swapping schema files.  
09/27/2017 03:33:48:006 PM BST: ...Success.  
09/27/2017 03:33:48:006 PM BST: Loading Schema odsee_config_schema.ldif  
09/27/2017 03:33:48:050 PM BST: ...Success  
.  
...  
09/27/2017 03:33:54:691 PM BST: Loading Schema /Users/forgerock/openam/opendj_pushdevices.ldif  
09/27/2017 03:33:54:800 PM BST: ...Success.  
09/27/2017 03:33:54:847 PM BST: Installing new plugins...  
09/27/2017 03:33:55:535 PM BST: Plugin installation complete.  
09/27/2017 03:33:56:330 PM BST: Setting up monitoring authentication file.  
Configuration complete!
```

### Notes:

- When installing AM locally to Amster, Amster stores AM's configuration in the home directory of the user that is running the **amster** command. For example, for the **tomcat** user, the configuration is stored in `/path/to/tomcat_home/openam`.

To modify this behavior, use the `--cfgDir` option.

- The DS instances in the example require secure connections; therefore, the **amster** command specifies the **1636** port for both stores, and **SSL**.

For different options, see the `install-openam` reference section.

Failure to create a truststore and configuring it in the container where AM runs will cause the install process to fail.

- If there is any problem setting up the configuration store, the installation process will exit with an error, and navigating to the AM will open the configuration page.
- The **demo** user is not created in the identity store.

### Example 3

This example installs two AM instances within a site that use an external configuration store, which is also used as the identity store.

- Prepare the external configuration data store as detailed in the [ForgeRock Access Management Installation Guide](#).

First instance:

```
am> install-openam \  
> --serverUrl https://openam1.example.com:8443/openam \  
> --adminPwd forgerock \  
> --acceptLicense \  
> --cookieDomain example.com \  
> --lbSiteName TestSite01 \  
> --cfgDir /tomcat/openam1 \  
> --lbPrimaryUrl http://site.example.com:80/openam \  
> --cfgStore dirServer \  
> --cfgStoreHost opendj.example.com \  
> --cfgStoreAdminPort 3444 \  
> --cfgStoreJmxPort 3689 \  
> --cfgStorePort 3389 \  
> --cfgStoreRootSuffix dc=examplecfg1,dc=com \  
> --cfgStoreDirMgr "cn=Directory Manager" \  
> --cfgStoreDirMgrPwd mySecretPassword  
  
11/01/2018 14:37:40:221 AM GMT: Checking license acceptance...  
11/01/2018 14:37:40:221 AM GMT: License terms accepted.  
11/01/2018 14:37:40:221 AM GMT: Checking configuration directory /tomcat/openam1.  
11/01/2018 14:37:40:221 AM GMT: ...Success  
.  
...  
11/01/2018 14:38:46:070 PM BST: ...Success.  
11/01/2018 14:38:46:070 PM BST: Loading Schema odsee_config_schema.ldif  
11/01/2018 14:38:46:079 PM BST: ...Success  
.  
...  
11/01/2018 14:41:36:387 PM BST: ...Success.  
11/01/2018 14:41:36:388 PM BST: Installing new plugins...  
11/01/2018 14:41:38:390 PM BST: Plugin installation complete.  
11/01/2018 14:41:43:392 PM BST: Setting up monitoring authentication file.  
Configuration complete!
```

*Notes:*

- Amster will create the directory specified in the `--cfgDir` option.
- Since an identity store is not specified, Amster reuses the configuration store for identities.
- Amster will create a site with the name specified in the `--lbSiteName` option, which can be accessed using the URL specified in the `--lbPrimaryUrl` option.
- The cookie domain is specified in the `--cookieDomain`. If not specified, Amster sets the cookie domain to the URL of the AM instance, which is not optimal when having multiple instances in a site.

Second instance:

```
am> install-openam \  
> --serverUrl https://openam2.example.com:8443/openam \  
> --adminPwd forgerock \  
> --acceptLicense \  
> --cookieDomain example.com \  
> --lbSiteName TestSite01 \  
> --cfgDir /tomcat/openam2 \  
> --lbPrimaryUrl http://site.example.com:80/openam \  
> --cfgStore dirServer\  
> --cfgStoreHost opendj.example.com \  
> --cfgStoreAdminPort 3444 \  
> --cfgStoreJmxPort 3689\  
> --cfgStorePort 3389\  
> --cfgStoreRootSuffix dc=examplecfg1,dc=com \  
> --cfgStoreDirMgr "cn=Directory Manager" \  
> --cfgStoreDirMgrPwd mySecretPassword \  
> --pwdEncKey MneLwkk0okJx58znp7QyvGmiawmc2vL4  
  
11/01/2018 14:53:22:773 PM: Checking license acceptance...  
11/01/2018 14:53:22:773 PM GMT: License terms accepted.  
11/01/2018 14:53:22:773 PM GMT: Checking configuration directory /tomcat/openam2.  
11/01/2018 14:53:22:773 PM GMT: ..Success.  
11/01/2018 14:53:22:773 PM GMT:Reinitializing system properties.  
11/01/2018 14:53:22:773 PM GMT:...Done  
11/01/2018 14:54:04:773 PM GMT:Configuring server instance.  
11/01/2018 14:54:04:773 PM GMT: ..Done  
11/01/2018 14:54:04:123 PM BST: Installing new plugins...  
11/01/2018 14:54:04:124 PM BST: Plugin installation complete.  
11/01/2018 14:54:10:322 PM BST: Setting up monitoring authentication file.  
Configuration complete!
```

### Important

To complete the installation of the second instance, follow the steps in "Post-Installation Steps for Site Deployments".

### Notes:

- This example installs an AM instance with as part of the `TestSite01` site. Note that the configuration store details are the same as those used for the first server, since they are sharing the same DS instance.
- The password specified in the `--adminPwd` option must be the same password used across the site.
- Since an identity store is not specified, Amster reuses the configuration store for identities.
- Amster will create the directory specified in the `--cfgDir` option.
- The DS instance in the example requires secure connections; therefore, the `amster` command specifies the `1636` port to connect to the store, and `SSL`.

For different options, see the `install-openam` reference section.

Failure to create a truststore and configuring it in the container where AM runs will cause the install process to fail.

- The cookie domain is specified in the `--cookieDomain` option. The cookie domain must be the same as the one used when installing the first instance, in this case, `example.com`. When unspecified, Amster sets the cookie domain to the URL of the AM instance, which is not optimal when having multiple instances in a site.

Failure to set this option correctly may result in login failure to the new instance.

- The `--pwdEncKey` specifies the encryption key used by the servers already in the site. To locate the encryption key value, navigate to Deployment > Servers > Server Name > Security > Encryption.

Failure to set this option to the appropriate value will cause the original encryption key to be overwritten, which will render the site unable to read the configuration and identity stores.

### 3.4.2. Post-Installation Steps for Site Deployments

Keystore and secret store infrastructure is shared across all the AM instances in the site. This is so that every instance in the site can encrypt, decrypt, and verify messages, JWTs, and others, with the same keys.

The install process creates the required keystores and secret stores on the first instance in the site only. You must configure the keystore and secret store infrastructure in the rest of the instances manually.

The following steps assume you have an AM site composed of one or more instances, and that you installed a new instance and added it to the site using Amster:

1. Make the site keystore infrastructure available to the new instance:
  - a. Back up the new instance's default keystore and password files. By default, they are located in the `/path/to/openam/openam` directory.
  - b. Ensure that the existing keystores in the site are available in the same location to the new instance. This may mean copying the keystores and their password files, mounting a volume, or others.
  - c. Ensure that the keystore files configured in the `/path/to/openam/openam/boot.json` file are available to the new instance.
2. Make the secret store infrastructure in the site available to the new instance:
  - a. Log in to the AM console of an existing instance in the site and navigate to Configure > Secret Stores.
  - b. Review the list of secret stores configured globally and make sure to provide the relevant stores to the new instance. For example:

- For keystore-type secret stores, copy the keystores to the same path on the new instance.
  - For filesystem-type secret stores, copy the contents of the directories to the same path, or make the filesystem available on the same mount point on the new instance.
  - For HSM-type stores, ensure the new instance can access it.
  - For secrets configured as environment variables accessible by the container where AM runs, ensure they are also accessible by the container of the new instance.
- c. Navigate to Realms > *Realm Name* > Secret Stores.
  - d. Review the list of secret stores configured per realm and make sure to provide the relevant stores to the new instance.
3. Restart the new instance.

The instance is now configured for the site.

### 3.4.3. Troubleshooting Access Management Installations

The following table describes possible errors when installing AM with the `install-openam` command:

Error	Solution
Invalid Suffix for directory server ds.example.com:1389. No Base Entity dc=incorrectsuffix,dc=com found.	Review that the suffix you are trying to use exists in DS.
Cannot connect to Directory Server. Invalid Credentials.	Review the credentials to connect to DS.
Cannot connect to Directory Server. Connect Error: Connection refused.	Review DS's host and/or connection port.
Unexpected LDAP exception occurred.	Review DS logs. DS may be stopped, or may have become unreachable during install.
Cannot connect to Directory Server. Connect Error: The LDAP connection has failed because an error occurred during the SSL handshake...	Review that the container where AM will be installed trusts DS's SSL certificates.

## 3.5. Integrating Amster in your Environment

Amster allows you to export the configuration of an AM instance and customize it ready for import into any other AM instance in your environment. For example, you can export the configuration from the development environment, customize the passwords and keystore values, and import it in your QA or integration environment for testing.



To make this process easier, Amster allows you to configure variables inside the exported configuration files and also, to script a series of commands and Amster tasks so they can be easily included in your processes or pipelines.

For more information, see "Scripting" and "Using Configuration Expressions in Exported Configuration Files".

### 3.5.1. Using Configuration Expressions in Exported Configuration Files

Amster supports the use of configuration expressions as the values of configuration properties in the exported configuration files. Amster substitutes the expressions with values obtained from the Amster shell, expression files, environment variables, and others, when importing the configuration files into an AM instance. Property value substitution enables you to achieve the following:

- Define a configuration that is specific to a single instance. For example, setting the location of the keystore on a particular host.
- Define a configuration whose parameters vary between different environments. For example, the URLs and passwords for test, development, and production environments.
- Disable certain capabilities on specific AM instances. For example, you might want to disable a particular instance from sending notifications to agents.

Property value substitution uses expressions to introduce variables into the server configuration. You set expressions as the values of configuration properties. The effective property values can be evaluated in a number of ways.

#### 3.5.1.1. Working With Expressions

Expressions share their syntax and underlying implementation with other ForgeRock Identity Platform components. Expressions have the following characteristics:

- To distinguish them from static values, configuration expressions are preceded by an ampersand (&) and enclosed in braces ({}). Use the dot (.) character as a separator character for the *expression token*. For example, `&{smtp.port}`.
- You can use a default value in a configuration expression by including it after a vertical bar (|) character following the token. For example, the following SMTP port expression sets the default value of the SMTP port to 1349: `&{smtp.port|1349}`.
- A configuration property can include a mix of static values and expressions.

For example, suppose `hostname` is set to `openam`. Then `&{hostname}.example.com` evaluates to `openam.example.com`.

You can also use expressions in conjunction with Unix environment variables once these are made available to the Amster shell. For more information, see "Scripting".

- You can define *nested* properties (that is, a property definition within another property definition).

For example, suppose `listen.port` is set to `&{port.prefix}389`, and `port.prefix` is set to `2`. Then `&{listen.port}` evaluates to `2389`.

Amster defines the following expressions by default:

#### `&{amster.import.dir}`

This expression is resolved in the following ways:

- As the directory containing the configuration files being imported into AM when using the **import-config --path *directory*** command.
- As the parent directory of the configuration file being imported into AM when using the **import-config --path *file*** command.

#### `&{amster.import.url}`

This expression is resolved in the same way as `&{amster.import.dir}`, but in URL format. For example, `file://path/to/directory`.

### 3.5.1.2. Expression Evaluation and Order of Precedence

You must define expression values before importing the configuration into AM. When evaluated, an expression must return the appropriate type for the configuration property. For example, the `smtp.port` property takes an integer. If you set the property using an expression, the result of the evaluated expression must be an integer. If the type is wrong, AM may fail to start after a configuration import, with unexpected errors. For more information about data type coercion, see "Transforming Data Types".

Amster can obtain expressions from the following sources:

- **Environment variables**

You set an environment variable in your operating system shell. For example, `export SMTP_PORT=1342`

The environment variable name must be composed of uppercase characters and underscores. The name maps to the expression token as follows:

- Uppercase characters are converted into lower case characters.
- Underscores (`_`) are replaced with dot (`.`) characters.

In other words, the value of `SMTP_PORT` replaces `&{smtp.port}` in the AM configuration files.

- **Java system properties**

You set a Java system property to hold the value when you call the **amster** command with parameters. For example:

```
"-Dsmtp.port=3306"
```

## • Amster shell variables

You set an Amster shell variable to hold the value.

To define expressions as Amster shell variables, remove the the dot (.) character and use the standard camel case notation for naming variables in Groovy.

For example, the `&{smtp.port}` expression would be defined as:

```
am> smtpPort = "1342"  
====> 1342
```

In the configuration file, however, you still define the expression as `&{smtp.port}`.

### Tip

For more information about how to convert Java system properties and environment variables into Amster shell variables, see "Using Variables in Amster Scripts".

## • Expression files

You set a key in a `.json` or `.properties` file to hold the value.

Keys in `.properties` files must match expression tokens exactly. In other words, the value of the `smtp.port` key replaces `&{smtp.port}` in the server configuration.

The following is an example properties expression file:

```
smtp.port=1342  
smtp.user=Greg  
stateless.tokens.enabled=true
```

JSON expression files can contain nested objects.

JSON field names map to expression tokens as follows:

- The JSON path name matches the expression token.
- The `.` character serves as the JSON path separator character.

The following is an example of a JSON expression file:

```
{
  "smtp" : {
    "port" : 1342,
    "user" : "Greg"
  },
  "stateless" : {
    "tokens" : {
      "enabled" : "true"
    }
  },
  "blacklist" : {
    "java" : {
      "classes" : [
        "java.lang.Class",
        "java.security.AccessController",
        "java.lang.reflect.*"
      ]
    }
  }
}
```

You can set multiple configuration files to store your properties. For example, you could have a file to store authentication tree values and another file to store policy-related values.

Note the following constraints when using expression files:

- Amster scans the files in the provided directory in a non-deterministic order.
- Amster reads all files with `.json` and `.properties` extensions.
- Amster does not have a predictable order of precedence for handling multiple configuration tokens with the same name. You are responsible for ensuring name uniqueness of configuration tokens across multiple expression files.

To provide expression files to Amster, use the **envconfig** command followed by the full path to a directory or a file. For example:

```
am> envconfig /path/to/expressionfiles/
```

Expressions are evaluated and replaced with the expected values when importing a configuration into an AM instance. Attempting to import AM JSON configuration files containing expressions that are not defined causes an error message similar to the following:

```
amster openam.example.com:8443> import-config --path /tmp/myExportedConfigFiles/realms/root/EmailService
.json
Importing file /tmp/myExportedConfigFiles/realms/root/EmailService
.json
-----
IMPORT ERRORS
-----
Failed to import /tmp/myExportedConfigFiles/realms/root/EmailService.json :
Can't substitute source vale: unresolved variables ([email.service.port]) or cycles detected ([])
```

The following list reflects the order of precedence:

- Environment variables override default expressions, Amster variables, Java system properties and settings in expression files.
- Amster variables override Java system properties, tokens found in expression files, and default expressions.
- Java system properties override tokens found in expression files and the default expression tokens.

### 3.5.1.3. Transforming Data Types

By default, when configuration tokens are resolved, the result is always a string. However, when evaluated, an expression must return the appropriate type for the configuration property. For example, the `smtp.port` property takes an integer. If you set the property using an expression, the result of the evaluated expression must be an integer. If the type is wrong, AM may fail to start after a configuration import, with unexpected errors.

You can transform the output type of the evaluated token to match the type that is required by the property. Amster can coerce expressions to resolve as the following types:

- `$int`. Coerce to an integer.
- `$number`. Coerce to integers, doubles, longs, and floats.
- `$bool`. Coerce to a boolean. For example, `true`.
- `$array`. Coerce to a JSON array. For example, `["a","b","c"]`.
- `$list`. Coerce to a JSON list. For example, `1,2,3`.
- `$object`. Coerce to a JSON object. For example, `{"a","b"}`.
- `$base64-encode` and `$base64-decode`. Encode or decode the string to or from Base64

To convert the value of a property into a different type in the exported configuration file, specify the new type as follows:

```
"port" : {
  "$int" : "&{smtp.port}"
}
```

You can also replace configuration values with the contents of a file by using the `$inline` coercion function. You can specify the path to the file, or replace it with an expression. For example:

```
{
  "message" : {
    "$inline" : "&{config.path}/emailcontent.txt"
  },
  "message2" : {
    "$inline" : "/path/to/emailcontent.txt"
  }
}
```

Consider the following points when using the `$inline` coercion function:

- When the file contains a script, such as an authentication script, you must transform its value to Base-64. For example:

```
"script": {
  "$base64:encode": {
    "$inline": "/path/to/scripted-decision.groovy"
  }
}
```

- When the file contains a value of a type that is different from the configuration value type, you must transform its value. For example:

```
"port": {
  "$int": {
    "$inline": "myfile.txt"
  }
}
```

### Tip

Recognizing the type of a particular configuration property in the JSON files may not always be straightforward. When in doubt, try the following approaches:

- Check the property in the AM console.
- Configure the property in the AM console, then export the configuration with Amster for an example.

### 3.5.1.4. Expression Example Files

This section contains an example expression file and some excerpts of exported configuration files with expressions inserted in them.

#### Expression File

```
{
  "env" : {
    "name" : "DEV"
  },
  "oauth" : {
    "authmodule" : {
      "issuer" : "dev-oathissuer.example.com",
      "authlevel" : 2,
      "checksum" : "true"
    },
    "devprof" : {
      "kstore" : {
        "path" : "&{product.install.dir}/&{env.name}/keystore.jceks",
        "type" : "JCEKS",
        "encpas" : "AAAAA0FFUwIQ1WDDMsxGoZMiRHhDQ+ywUfTmDgTqEsVZLV9W8ygfHi/5kBWjMpyg=="
      }
    }
  }
}
```

As well as configuration details, such as hostnames and ports, passwords and secrets are likely to differ between AM instances.

The previous example demonstrates an expression file tailored for the development environment. Note how the `&{devprof.kstore.encpas}` expression holds the value of the encrypted keystore password for the OAuth device profile keystore configuration.

For security reasons, Amster only exports passwords in configuration files if the transport key exists in AM's keystore.

If your environments have different passwords, you could manage passwords using expressions as follows:

1. Configure AM with the desired password values for each of your environments.
2. Export the configurations *using the same transport key*.

Using this technique ensures that the passwords for all the environments are properly encrypted. You can safely create expression files by environment with the appropriate values.

### Configuration File Excerpts

```
{
  "data":{
    "_id": "",
    "defaults":{
      "oathIssuerName": "&{oath.authmodule.issuer}",
      "totpTimeStepsInWindow": 2,
      "authenticationLevel": {
        "$int": "&{oath.authmodule.authlevel}"
      }
    },
    "passwordLength": "6",
    "addChecksumToOtpEnabled": {
      "$bool": "&{oath.authmodule.checksum}"
    }
  },
  "data":{
    "_id": "",
    "defaults":{
      "oathAttrName": "oathDeviceProfiles",
      "authenticatorOATHDeviceSettingsEncryptionKeystorePrivateKeyPassword": null,
      "authenticatorOATHDeviceSettingsEncryptionScheme": "NONE",
      "authenticatorOATHDeviceSettingsEncryptionKeystore": "&{oath.devprof.kstore.path}",
      "authenticatorOATHDeviceSettingsEncryptionKeystoreType": "&{oath.devprof.kstore.type}",
      "authenticatorOATHDeviceSettingsEncryptionKeystorePassword": null,
      "authenticatorPushDeviceSettingsEncryptionKeystorePassword-
encrypted": "&{oath.devprof.kstore.encpas}",
      "authenticatorOATHDeviceSettingsEncryptionKeystoreKeyPairAlias": null,
      "authenticatorOATHSkippableName": "oath2faEnabled"
    }
  },
  "data":{
    "_id": "01e1a3c0-038b-4c16-956a-6c9d89328cff",
    "name": "Authentication Tree Decision Node Script &{env.name}",
  }
}
```

```

    "description": "&{product.install.dir}/&{env.name}/authdecisionnode_desc.txt",
    "script": {
      "$base64:encode": {
        "$inline": "&{product.install.dir}/&{env.name}/scripted-decision.groovy"
      }
    }
  }
}

```

Note how the files used by the `$inline` coercion function are stored under a directory that is referenced by the `&{env.name}` expression. For example:

```
"$inline": "&{product.install.dir}/&{env.name}/scripted-decision.groovy"
```

This is just an example of how you can separate your configuration files by environment.

### 3.5.2. Scripting

You can create script files containing a series of commands and variable declarations, which can be loaded and executed within Amster.

Start each separate command or variable declaration on a new line. Use the backslash (`\`) character to represent line continuations.

For example, the following script installs an AM instance, and then exits the Amster command-line interface:

```

install-openam \
--serverUrl https://openam.example.com:8443/openam \
--authorizedKey /var/amster/authorized_keys \
--cookieDomain .example.com \
--adminPwd forgerock \
--cfgStoreHost opendj.example.com \
--cfgStoreDirMgrPwd password \
--cfgStoreAdminPort 1389 \
--cfgStore dirServer \
--cfgDir /root/openam \
--userStoreDirMgrPwd password \
--userStoreHost opendj.example.com \
--userStoreType LDAPv3ForOpenDS \
--userStorePort 1389 \
--userStoreRootSuffix dc=openam,dc=forgerock,dc=org \
--acceptLicense
:exit

```

To load and execute the commands within a script, use the `:load` command, as follows:

```
am> :load myScript.amster
```

You can specify more than one script to load. Scripts are loaded and executed in the order they are specified. If a command in a script fails, execution continues with the next command.

You can also invoke scripts by passing them as a parameter to the `amster` command. For example:



```
$ vi samples/myScript.amster
connect http://openam.example.com:8080/openam -k /home/forgerock/am/amster_rsa
:exit

$ ./amster samples/myScript.amster
Amster OpenAM Shell (6.5.5 build 95de0e129b, JVM: 1.8.0_151)
Type ':help' or ':h' for help
.
-----
am>:load samples/myScript.amster
====> true
```

**Tip**

The Amster shell supports an `eval(String)` function, which evaluates any Amster command expressed as a string. For example, the function is required within looping structures:

```
for (i = 0; i < 4; i++) {
    eval("create DataStoreModule --realm / --body '{\"_id\": \"myDataStore$i}\"")
}
```

You must also use the `eval(String)` function when using Amster commands in conditional structures:

```
dbStatus = databaseName ? 'Found' : eval("create DataStoreModule --realm / --body '{\"_id\": \"myDataStore\"}'")
```

**Note**

Amster includes a number of example scripts in the `/path/to/amster/samples` directory. For more information, see "Amster Sample Scripts".

### 3.5.2.1. Using Variables in Amster Scripts

When scripting Amster tasks, it is often useful to use variables. An example would be storing the AM connection string in a variable, the value of which is swapped among environments.

You can define variables in the Amster Groovy shell directly, or you can import them to the shell if they are defined as Java properties or as operating system environment variables:

**• Amster shell variables**

Define Amster shell variables using the standard camel case notation for naming variables in Groovy. For example:

```
am> smtpPort = "1342"
====> 1342
```

You can define maps as shell variables, but Amster commands cannot access the contents of the map directly. Assign key values to Amster shell variables so that commands can use them. For example:

```

am> myMap= [ AM_URL: "https://openam.example.com:8443/openam", AMSTER_KEY: "/opt/openam/id_rsa" ]
====> [AM_URL:https://openam.example.com:8443/openam, AMSTER_KEY:/opt/openam/id_rsa]

am> myAM= myMap.AM_URL
====> https://openam.example.com:8443/openam

am> myKey= myMap.AMSTER_KEY
====> /opt/openam/id_rsa

am> connect -k myKey myAM
    
```

## • Operating system environment variables

Import environment variables into the Amster shell using Groovy syntax.

The following commands are examples of operations you can perform in a Groovy shell. For more information, refer to the Groovy documentation.

To see all the environment variables available for import from a Unix shell, run the following command:

```

am> System.getenv()
====> [PATH:/Library/Frameworks/Python.framework/Versions/3.6/bin:/usr/local/bin:/usr/bin:/bin:/usr/sbin:/sbin:/usr/local/munki:/opt/X11/bin:/Users/ForgeRock/tools/maven/bin, SHELL:/bin/bash, JAVA_HOME:/Library/Java/JavaVirtualMachines/jdk1.8.0_92.jdk/Contents/Home/, TERM:xterm-256color, USER:ForgeRock, LANG:en_GB.UTF-8, PWD:/Users/ForgeRock/amster.....]
    
```

To assign the value of an environment variable to an Amster shell variable, run the following command:

```

am> myShell=System.getenv("SHELL")
====> /bin/bash
    
```

To assign all the environment variables to a map and then list them, run the following commands:

```

am> ENV=System.getenv()
====> [SHELL:/bin/bash, USER:ForgeRock, LANG:en_GB.UTF-8, PWD:/Users/ForgeRock/amster, AMURL:https://openam.example.com:8443/openam, CFGDIR:/opt/openam.....]
am> ENV.each { println it }
SHELL:/bin/bash
USER:ForgeRock
LANG:en_GB.UTF-8
PWD:/Users/ForgeRock/amster
AMURL:https://openam.example.com:8443/openam
CFGDIR:/opt/
openam
.....
    
```

Amster commands cannot access the contents of a map directly; you must assign key values to Amster shell variables before commands can use them. For example:

```

am> myAM = ENV.AMURL
====> https://openam.example.com:8443/openam

am> myCfgDir = ENV.CFGDIR
====> /opt/openam

am> install-openam --serverURL myAM --adminPwd forgerock --cfgDir myCfgDir --acceptLicense

```

The following is an example of an Amster script that assigns the value of environment variables to Amster shell variables:

```

myAM = System.getenv("AMURL")
myCfgDir = System.getenv("CFGDIR")
install-openam --serverURL myAM --adminPwd forgerock --cfgDir myCfgDir --acceptLicense
:exit

```

## • Java system properties

You can pass environment variables to the Amster shell when executing the **amster** command with the **-D** parameter.

For example, you could create the following bash script to call the **amster** command:

```

#!/bin/bash
amUrl="https://openam.example.com:8443/openam"
amsterKey="/root/openam/amster_rsa"
configPath="/root/am-config"
./amster export-config.amster -D AM_URL=${amUrl} -D AMSTER_KEY=${amsterKey} \
-D AM_CONFIG_PATH=${configPath}

```

To see all properties available from the Java runtime, run the following command:

```

am> System.getProperties()
====> [java.runtime.name:Java(TM) SE Runtime Environment, AM_URL:http://openam.example.com:8080/openam,
sun.boot.library.path:/Library/Java/JavaVirtualMachines/jdk1.8.0_92.jdk/Contents/Home/jre/lib, java.vm
.version:25.92-b14, gopherProxySet:false, java.vm.vendor:Oracle Corporation, java.vendor.url:http://java
.oracle.com/, path.separator:: .....]

```

To import the Java variables into the Groovy shell, run the following command:

```

am> amUrl = System.getProperty("AM_URL")
====> https://openam.example.com:8443/openam

am> amsterKey = System.getProperty("AMSTER_KEY")
====> /root/openam/amster_rsa

am> exportPath = System.getProperty("AM_CONFIG_PATH")
====> /root/am-config

```

You can use the variables in an Amster script by importing them in Groovy first. For example:

```
amUrl = System.getProperty("AM_URL")
amsterKey = System.getProperty("AMSTER_KEY")
exportPath = System.getProperty("AM_CONFIG_PATH")

connect amUrl -k amsterKey
export-config --path exportPath --failOnError
:exit
```

To see all the environment variables defined in the Amster shell, run the following command:

```
am> binding.variables.each{ println it.key println it.value }
eval
org.codehaus.groovy.runtime.MethodClosure@3f270e0a

/bin/bash
amUrl
http://openam.example.com:8080/openam
smtpPort
1342
amsterKey
/root/openam/amster_rsa
exportPath
/root/am-config
myShell
/bin/bash
====> [eval:org.codehaus.groovy.runtime.MethodClosure@3f270e0a, _:/bin/bash, amUrl:http://openam.example.com:8080/openam, smtpPort:1342, amsterKey:/root/openam/amster_rsa, exportPath:/root/am-config, myShell:/bin/bash]
```

## 3.6. Amster Usage Examples

In this section, you can find examples of tasks you can do with Amster.

### Tip

For Amster examples in Docker and Kubernetes deployments, see the *ForgeRock DevOps Guide*.

### 3.6.1. Cloning an Access Management Instance

This example shows the high-level steps required to clone an AM instance, from exporting the configuration of the original instance, to installing the new instance and importing the configuration into it.

#### *To Clone an AM Instance*

Perform the following steps to clone an AM instance using Amster:

1. Create a transport key in the original AM instance, if one does not exist already. For more information, see "Creating Transport Keys".

2. Keep the transport key safe by exporting it to another keystore. The key is required to import the configuration into the new AM instance. For more information, see "To Duplicate and Install a Transport Key".
3. Connect to the original AM instance using the **amster** command. For more information, see "Connecting to Access Management".
4. Export all the configuration of the original AM instance using the **export-config** command. For more information, see "Exporting Configuration Data".
5. Take note of the value of the Password Encryption Key field on the original AM, for example, `06QWwHP04os+zEz3Nqn/2daAYWyIFE32`.

To locate it, log in to the original AM instance and navigate to Deployment > Servers > *Server Name* > Security > Encryption.

6. In the new server, deploy the AM `.war` file in a web container, but do not configure it.
7. Install the new AM instance using the **install-openam** command, specifying the original AM password encryption key with the `--pwdEncKey` option. For example:

```
am> install-openam \  
> --serverUrl https://openam.example.com:8443/openam \  
> --adminPwd forgerock \  
> --pwdEncKey 06QWwHP04os+zEz3Nqn/2daAYWyIFE32 \  
> --acceptLicense
```

For more information, see "Installing Access Management with Amster".

8. Import the transport key of the original AM instance into the keystore of the new AM instance. For more information, see "To Duplicate and Install a Transport Key".
9. Connect to the new AM instance using the **amster** command. For more information, see "Connecting to Access Management".
10. Import the configuration of the original AM instance using the **import-config** command. For more information, see "Importing Configuration Data".

### 3.6.2. Amster Sample Scripts

This section covers sample scripts and files found in the `/path/to/amster/samples` directory:

#### `transport-key.sh`

Shell script to help managing transport keys. You can use it as a template for your own scripts to create, delete, and export the key to another keystore.

Invoke the script's help for a list of possible actions:

```
$ ./transport-key.sh help
```

For more information about the transport key, see "Creating Transport Keys".

#### `realm.amster`

Amster script containing an example of different operations that can be done at realm level, such as creating a data store, displaying its configuration, modifying it, and deleting it.

For more information about writing scripts for Amster, see "Scripting".

#### `import-example.amster`

Amster script containing an example of the `import-config` command.

For more information about writing scripts for Amster, see "Scripting".

#### `export-example.amster`

Amster script containing an example of the `export-config` command.

## Chapter 4

# Reference

This chapter contains Amster reference.

## 4.1. Amster Authentication Module Properties

**amster** service name: `AmsterModule`

**ssoadm** service name: `iPlanetAMAuthAmsterService`

### Authorized Keys

Specifies the location of the `authorized_keys` file that contains the private and public keys used to validate remote **amster** client connections.

The default location for the `authorized_keys` file is the `/path/to/openam/` path. Its content is similar to an OpenSSH `authorized_keys` file.

**amster** attribute: `forgerock-am-auth-amster-authorized-keys`

### Enabled

When enabled, allows **amster** clients to authenticate using PKI. When disabled, allows **amster** clients to authenticate using interactive login only.

**amster** attribute: `forgerock-am-auth-amster-enabled`

### Authentication Level

Sets the authentication level used to indicate the level of security associated with the module. The value can range from 0 to any positive integer.

**amster** attribute: `forgerock-am-auth-amster-auth-level`

## 4.2. Command-Line Reference

## Name

install-openam — Install Access Management

## Synopsis

```
install-openam [options]
```

## Description

Command to install and setup an AM instance.

The following parameters are required:

**--adminPwd *amAdmin\_password***

Specifies the password of the `amAdmin` user. If the `--cfgStoreDirMgrPwd` option is not specified, this value is also the password of the configuration store's directory manager user.

The password must be at least 8 characters in length.

**--serverUrl *protocol://FQDN:port/URI***

Specifies the protocol, URL, port, and deployment URI of the AM instance. For example, `https://openam.example.com:8443/openam`.

The following options are available:

**--acceptLicense**

Specifies that the user accepts Amster usage terms and conditions.

**--authorizedKey *path***

Specifies the path to an SSH public key file. The content of this file is appended to the `authorized_keys` file of the newly-installed AM instance, allowing users to connect to it with Amster after the install completes.

For more information about connecting to AM with Amster, see "Connecting to Access Management".

**--cfgDir *path***

Specifies the configuration directory where AM stores files. It also stores the embedded directory server, when applicable.

Default: `$HOME/openam`

**--cfgStore [*embedded|dirServer*]**

Specifies the type of the configuration data store. Possible values are:



- `embedded`: Amster installs AM with an embedded DS server to act as the configuration, user, and CTS stores.
- `dirServer`: Amster installs AM on an external DS server to act as the configuration store.

When you install AM with an external configuration store, you must also use an external user store. By default, the external user store is the same directory server instance as the external configuration store.

Default: `embedded`

#### `--cfgStoreAdminPort` **port**

Specifies the administration port number for the configuration store.

Default: `4444`

#### `--cfgStoreDirMgr` **username**

Specifies the distinguished name of the directory manager user for the configuration store.

Default: `cn=Directory Manager`

#### `--cfgStoreDirMgrPwd` **password**

Specifies the password of the directory manager user for the configuration store.

Default: If not set, it takes the password defined for the `--adminPwd` option.

#### `--cfgStoreHost` **FQDN**

Specifies the FQDN of the configuration store, for example, `opendj.example.com`

Default: `localhost`

#### `--cfgStoreJmxPort` **port**

Specifies the Java Management eXtension port number for the configuration store.

Default: `1689`

#### `--cfgStorePort` **port**

Specifies the LDAP or LDAPS port number for the configuration store.

Default: `50389`

#### `--cfgStoreRootSuffix` **DN**

Specifies the root suffix DN for the configuration store.

Default: `dc=openam,dc=forgerock,dc=org`

**--cfgStoreSsl [SIMPLE|SSL]**

Specifies whether AM should connect to the configuration store over SSL. Possible values are **SIMPLE**, for non-secure connections, and **SSL**, for secure connections.

Default: **SIMPLE**

**--cookieDomain *domain***

Specifies the name of the trusted DNS domain AM returns to a browser when it grants a session ID to a user.

Default: FQDN used in the **--serverUrl** option

**--dsEmbReplAdminPort2 *port***

Specifies the administration port number for the embedded configuration store defined in the **--dsEmbReplHost2** parameter. For example, **4444**.

Use this parameter when the **--cfgStore** parameter is set to **embedded**, and only when adding a new server to a site.

**--dsEmbReplFlag *embReplFlag***

Specifies that the new server should install an embedded DS server as the configuration store. Setting this parameter causes Amster to configure the new embedded DS instance for data replication.

Use this parameter when the **--cfgStore** parameter is set to **embedded**, and only when adding a new server to a site.

**--dsEmbReplHost2 *URI***

Specifies the URI of the embedded configuration store used by one of the instances of the AM site. For example, **https://openam1.example.com:8443/openam**.

You can choose any of the servers configured in your site.

The new AM server will replicate the configuration from this DS instance.

Use this parameter when the **--cfgStore** parameter is set to **embedded**, and only when adding a new server to a site.

**--dsEmbReplReplPort1 *port***

Specifies the replication port number for the embedded configuration store of the new AM instance. For example, **50899**.

Use this parameter when the **--cfgStore** parameter is set to **embedded**, and only when adding a new server to a site.

**--dsEmbReplReplPort2 port**

Specifies the replication port number for the embedded configuration store defined in the `--dsEmbReplHost2` parameter. For example, `50899`.

Use this parameter when the `--cfgStore` parameter is set to `embedded`, and only when adding a new server to a site.

**--existingServerId URI**

Specifies the URI of an existing AM instance in the site. This URI can match the one defined in the `--dsEmbReplHost2` parameter, but it is not mandatory. For example, `https://openam1.example.com:8443/openam`.

Use this parameter when the `--cfgStore` parameter is set to `embedded`, and only when adding a new server to a site.

**--installLocale locale**

Specifies the locale to use during the install process.

Default: `en_US`

**--lbPrimaryUrl URL**

Specifies the load balancer URL of the site, such as `https://lb.example.com:443/openam`

**--lbSiteName name**

Specifies the name of the site to create, if any.

**--platformLocale locale**

Specifies the default locale for the AM installation.

Default: `en_US`

**--pwdEncKey key**

Specifies the encryption key value that is used to encrypt passwords in the AM instance. For example `06QWwHP04os+zEz3Nqn/2daAYWyiFE32`.

If you are installing an AM instance that will be making use of existing data in a data store, you must provide the same encryption key value originally used to encrypt the passwords in those stores.

To locate the encryption key value in an AM instance, navigate to Deployment > Servers > *Server Name* > Security > Encryption.

If you are installing a new AM instance that will not be using existing data in a data store, you can leave this property empty. AM will generate a random encryption key during installation to encrypt the data that will be added to the data store.

This option is *required* when configuring an AM instance into a site, and must be set to the encryption key configured for the rest of the servers in the site. Failure to set this option to the appropriate value will cause the original encryption key to be overwritten, which will render the site unable to read the configuration and the user stores.

Default: No value; a random encryption key is generated during installation

**--userStoreDirMgr *username***

Specifies the distinguished name of the directory manager user for the user store, for example, `cn=Directory Manager`.

Default: Not set

**--userStoreDirMgrPwd *password***

Specifies the password of the directory manager user for the user store.

Default: Not set

**--userStoreDomainName *FQDN***

Specifies the Active Directory Domain Name, such as `ad.example.com`, when the `--userStoreType` option is set to `LDAPv3ForADDC`.

Default: Not set

**--userStoreHost *FQDN***

Specifies the FQDN of the configuration store, for example, `opendj.example.com`

Default: Not set

**--userStorePort *port***

Specifies the LDAP or LDAPS port number for the configuration store.

Default: Not set

**userStoreRootSuffix *DN***

Specifies the root suffix DN for the user store.

Default: Not set

**userStoreSsl [SIMPLE|SSL]**

Specifies whether AM should connect to the user store over SSL. Possible values are `SIMPLE`, for non-secure connections, and `SSL`, for secure connections.

Default: Not set

`--userStoreType \ [LDAPv3ForOpenDS|LDAPv3ForAD|LDAPv3ForADDC|LDAPv3ForADAM|LDAPv3ForDSEE|LDAPv3ForTivoli]`

Specifies the type of user store to use when installing AM with an external configuration store. Possible values are:

- `LDAPv3ForOpenDS`, for DS stores.
- `LDAPv3ForAD`, for Active Directory with host and port settings.
- `LDAPv3ForADDC`, for Active Directory with domain name setting.
- `LDAPv3ForADAM`, for Active Directory Application Mode.
- `LDAPv3ForDSEE`, for Sun/Oracle DSEE.
- `LDAPv3ForTivoli`, for IBM Tivoli Directory Server.

When using the `LDAPv3ForADDC` store type, set up the `--userStoreDomainName` option to the Active Directory Domain Name, for example `ad.example.com`

Default: Not set

# Appendix A. Getting Support

For more information or resources about OpenAM and ForgeRock Support, see the following sections:

## A.1. Accessing Documentation Online

ForgeRock publishes comprehensive documentation online:

- The ForgeRock Knowledge Base offers a large and increasing number of up-to-date, practical articles that help you deploy and manage ForgeRock software.

While many articles are visible to community members, ForgeRock customers have access to much more, including advanced information for customers using ForgeRock software in a mission-critical capacity.

- ForgeRock product documentation, such as this document, aims to be technically accurate and complete with respect to the software documented. It is visible to everyone and covers all product features and examples of how to use them.

## A.2. Using the ForgeRock.org Site

The [ForgeRock.org](https://forgerock.org) site has links to source code for ForgeRock open source software, as well as links to the ForgeRock forums and technical blogs.

If you are a *ForgeRock customer*, raise a support ticket instead of using the forums. ForgeRock support professionals will get in touch to help you.

## A.3. Getting Support and Contacting ForgeRock

ForgeRock provides support services, professional services, training through ForgeRock University, and partner services to assist you in setting up and maintaining your deployments. For a general overview of these services, see <https://www.forgerock.com>.

ForgeRock has staff members around the globe who support our international customers and partners. For details, visit <https://www.forgerock.com>, or send an email to ForgeRock at [info@forgerock.com](mailto:info@forgerock.com).