Overview

The ForgeRock Identity Platform is the only offering for access management, identity management, user-managed access, directory services, and an identity gateway, designed and built as a single, unified platform.

These topics show you how to set up the platform components without using ForgeRock Identity Cloud.

Start here

Learn about the two sample deployments.

Separate identity stores

Set up the ForgeRock Identity Platform with separate identity stores between AM and IDM.

Shared identity store

Set up the ForgeRock Identity Platform with a DS identity store that is shared between AM and IDM.

Platform UIs

Learn about the three Platform UIs and deploy them with either Deployment One or Deployment Two.

Protect the deployment

Use ForgeRock Identity Gateway to provide a single point of entry and

Migration and customization

Migrate from an old "full stack" deployment, customize the UIs, and secure communications with HTTPS.

add custom managed objects.

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.

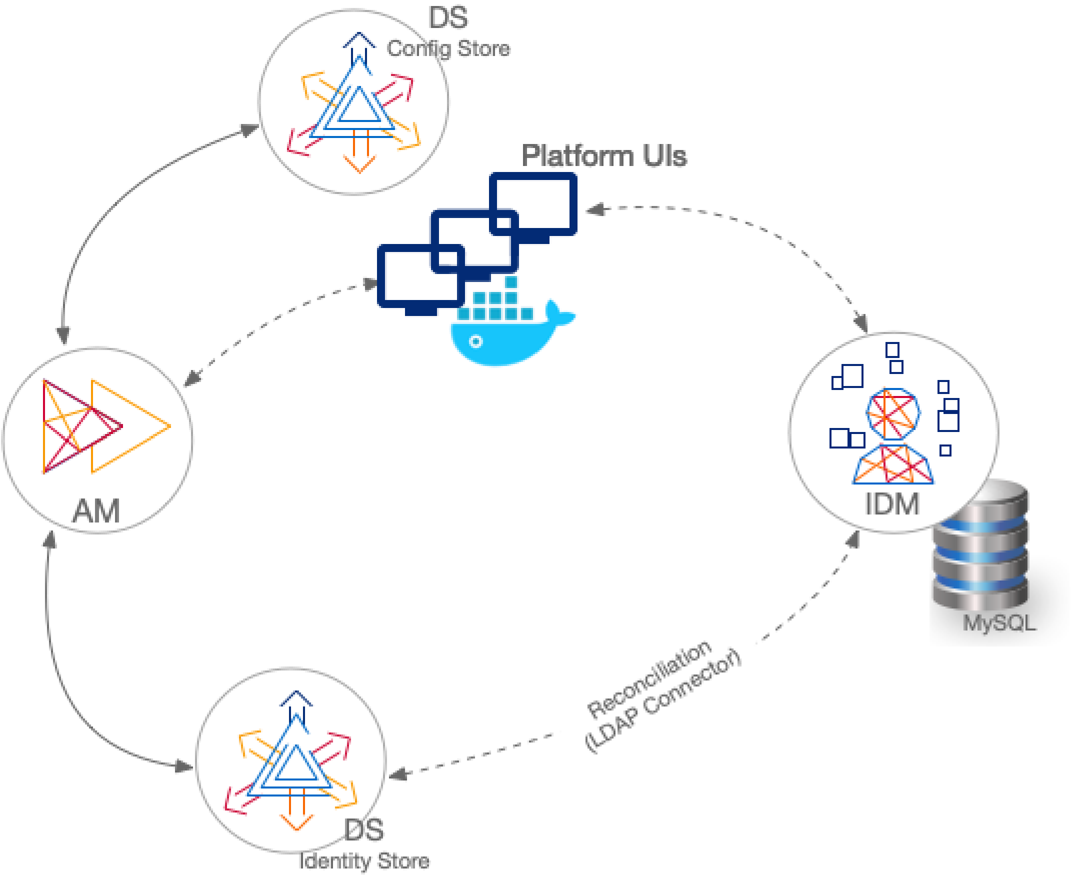
The ForgeRock® Common REST API works across the platform to provide common ways to access web resources and collections of resources.

Deployment overview

These instructions show two sample deployments:

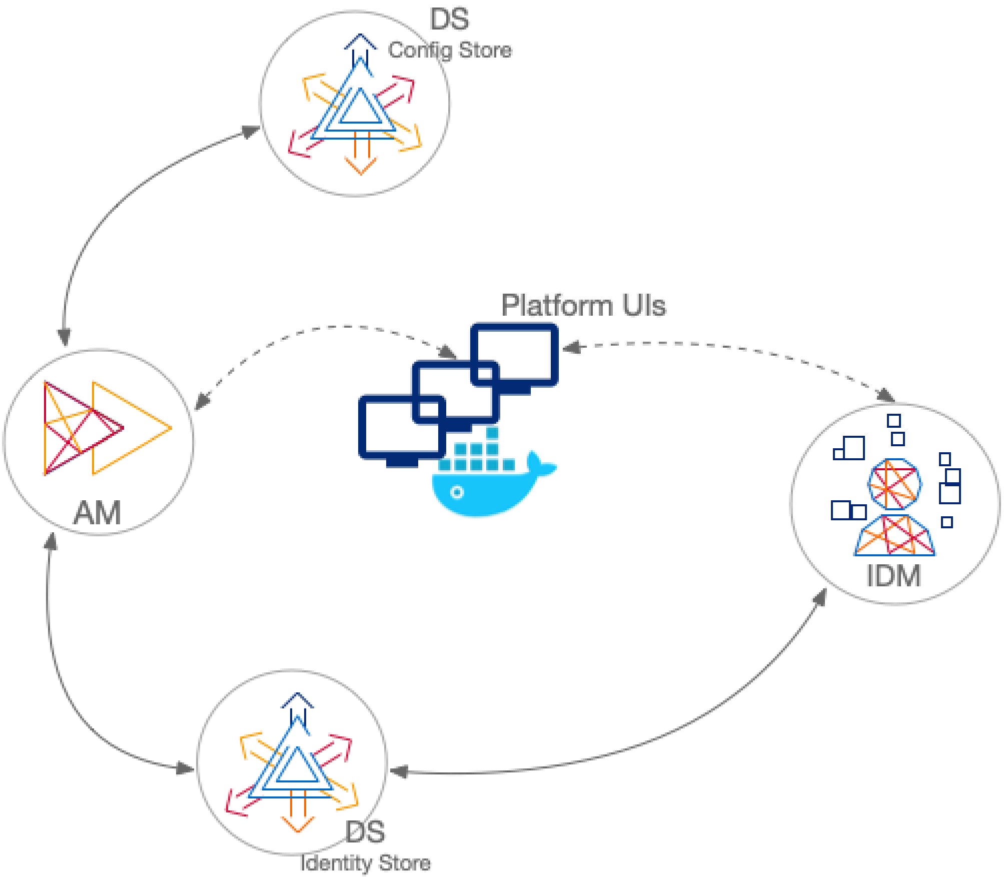
Separate identity stores

This deployment has an external DS instance configured as the AM configuration store, and a second external DS instance configured as the AM identity store. The IDM repository is an external JDBC database. The sample was tested with MySQL. The deployment uses an LDAP connector to synchronize the identities between IDM and AM:



Shared Identity Store

This deployment has an external DS instance configured as the AM configuration store. The AM and IDM servers share an external DS instance as the identity store, and no synchronization configuration is required:

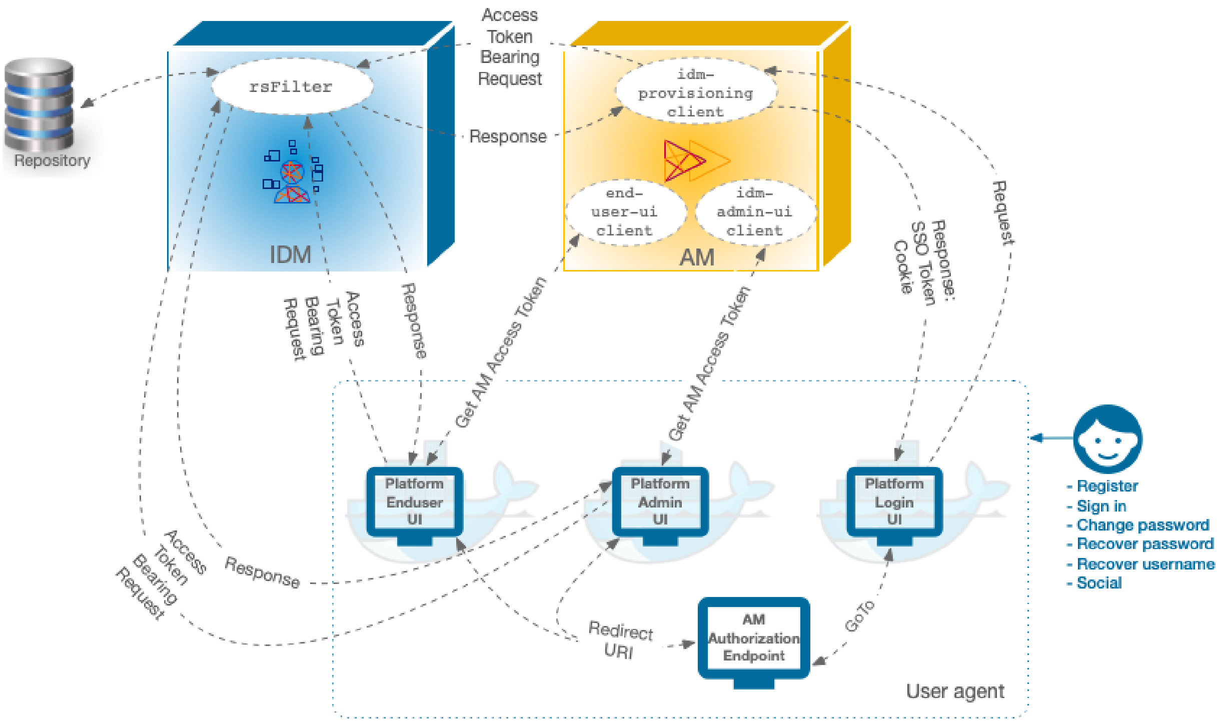


IMPORTANT

In both deployments, the Platform UIs can run in separate Docker containers. If you want to run the Platform UIs in containers, get Docker before you start.

Component interaction

A platform configuration relies on multiple components working together. The following image shows how the AM OAuth 2 clients interact with the IDM resource server filter (`rsFilter`) to grant access through the Platform UIs:



1. The Platform UIs send a request to the AM Authorization Endpoint.
2. If the end user is authenticated, the user agent is redirected back to the UI, according to the Redirection URI request parameter.
3. If the end user is not authenticated, the AM Authorization Endpoint redirects the user agent to the Platform Login UI.
4. After successful authentication, the Platform Login UI redirects the user agent back to the AM Authorization Endpoint, according to the GoTo request parameter.

IMPORTANT

IMPORTANT

- Do *not* use the IDM stand-alone end-user UI if you are deploying AM and IDM as a platform. This UI is delivered with IDM under `ui/enduser` . It is *not* the same as the `platform-enduser` UI and will not work in a platform deployment.
- By default, the IDM admin UI only supports users from the AM root realm. If you need to support users from other realms, adjust the `/oauth2/` references in the `/path/to/openidm/ui/admin/default/index.html` file:

```
commonSettings.authorizationEndpoint = calculatedAMUriLink.href +
'/oauth2/authorize';

AppAuthHelper.init({
    clientId: commonSettings.clientId,
    authorizationEndpoint: commonSettings.authorizationEndpoint,
    tokenEndpoint: calculatedAMUriLink.href + '/oauth2/access_token',
    revocationEndpoint: calculatedAMUriLink.href +
'/oauth2/token/revoke',
    endSessionEndpoint: calculatedAMUriLink.href +
'/oauth2/connect/endSession',
```

  For example, if your realm is named `alpha` , replace `/oauth2/` with `/oauth2/realms/root/realms/alpha/` .

Server settings

These instructions assume that all servers are deployed on their own hosts, with the following server settings. Adjust the settings to match your own deployment.

IMPORTANT

IMPORTANT

To deploy the entire platform on a single computer, the recommended alternative is to use the ForgeOps Cloud Developer’s Kit (CDK) on Minikube.

If you nevertheless choose to demonstrate these deployments on your computer, add aliases for the fully qualified domain names used for AM, IDM and platform UIs to your `/etc/hosts` file:

```
127.0.0.1    am.example.com
127.0.0.1    openidm.example.com
127.0.0.1    admin.example.com
127.0.0.1    enduser.example.com
127.0.0.1    login.example.com
```

Also, use a single DS server with all applicable DS setup profiles for your deployment. You can use `localhost` as the domain for the DS server for demonstration purposes. Adapt the instructions to configure AM and IDM accordingly.

- AM host: `am.example.com`
- AM port: `8081`
- External DS configuration store host: `config.example.com`
- External DS configuration store ports:

  ```
  adminConnectorPort 4444
  ldapPort 1389
  ldapsPort 1636
  ```

- External DS identity store host: `identities.example.com`

  These settings apply to both the separate and shared DS identity stores.

- External DS identity store ports:

  ```
  adminConnectorPort 4444
  ldapPort 1389
  ldapsPort 1636
  ```

- IDM host: `openidm.example.com`
- IDM ports: `HTTP 8080`, `HTTPS 8443`
- Platform Admin UI: `http://admin.example.com:8082`
- Platform Login UI: `http://login.example.com:8083`
- Platform End User UI: `http://enduser.example.com:8888`

Separate identity stores

This deployment assumes that you are using the following data stores:

- An external DS instance as the AM configuration store.
- A separate external DS instance as the AM identity store.
- A MySQL repository as the IDM data store.

NOTE

The IDM End User UI is not supported in a platform deployment, as it does not support authentication through AM.

You can use the Platform UIs with this deployment, or create your own UIs that support authentication through AM.

Download DS

Follow the instructions in the DS documentation to download DS, and prepare for installation.

The instructions that follow assume you download the cross-platform .zip distribution.

Set up your data stores

Configuration store

1. Unpack the DS files you downloaded.
2. Generate and save a unique DS deployment ID for external configuration data store servers:

   ```
   /path/to/opendj/bin/dskeymgr create-deployment-id --
   deploymentIdPassword password
   ```

   You will need the deployment ID and password to install DS, and to export the server certificate.

   Set the deployment ID in your environment:

   ```
   export DEPLOYMENT_ID=deployment-id
   ```

3. Set up a DS server as an external configuration data store, using the `am-config` setup profile.

This example also adds the `am-cts` setup profile to the external configuration data store. In production, consider using separate DS servers for the AM CTS store. For more information about AM CTS, see the AM Core token service (CTS) guide.

For more information about DS setup profiles, see setup profiles in the DS documentation.

This command sets up the config store with the parameters listed in Server settings.

```
/path/to/opendj/setup \
--deploymentId $DEPLOYMENT_ID \
--deploymentIdPassword password \
--rootUserDN uid=admin \
--rootUserPassword str0ngAdm1nPa55word \
--monitorUserPassword str0ngMon1torPa55word \
--hostname config.example.com \
--adminConnectorPort 4444 \
--ldapPort 1389 \
--enableStartTls \
--ldapsPort 1636 \
--profile am-config \
--set am-config/amConfigAdminPassword:5up35tr0ng \
--profile am-cts \
--set am-cts/amCtsAdminPassword:5up35tr0ng \
--set am-cts/tokenExpirationPolicy:am-sessions-only \
--acceptLicense
```

NOTE

For simplicity, this example uses a standalone directory server that does not replicate directory data (no `--replicationPort` or `--bootstrapReplicationServer` options). In production deployments, replicate directory data for availability and resilience. For details, see the DS installation documentation.

4. Start the DS server:

```
/path/to/opendj/bin/start-ds
```

Identity store

1. Unpack the DS files you downloaded.
2. Generate and save a unique DS deployment ID for identity store servers:

```
/path/to/opendj/bin/dskeymgr create-deployment-id --
deploymentIdPassword password
```

You will need the deployment ID and password to install DS, and to export the server certificate.

Set the deployment ID in your environment:

```
export DEPLOYMENT_ID=deployment-id
```

3. Set up a DS server as an identity store, using the `am-identity-store` setup profile.

   For more information about this step, see setup profiles in the DS documentation.

   This command sets up the identity store with the parameters listed in server settings:

```
/path/to/opendj/setup \
--deploymentId $DEPLOYMENT_ID \
--deploymentIdPassword password \
--rootUserDN uid=admin \
--rootUserPassword str0ngAdm1nPa55word \
--monitorUserPassword str0ngMon1torPa55word \
--hostname identities.example.com \
--adminConnectorPort 4444 \
--ldapPort 1389 \
--enableStartTls \
--ldapsPort 1636 \
--profile am-identity-store \
--set am-identity-
store/amIdentityStoreAdminPassword:5up35tr0ng \
--acceptLicense
```

NOTE

For simplicity, this example uses standalone directory servers that do not replicate directory data. (No `--replicationPort` or `--bootstrapReplicationServer` options.)

In production deployments, replicate directory data for availability and resilience. For details, see the DS installation documentation.

4. Start the DS server:

```
/path/to/opendj/bin/start-ds
```

Set up a container

Install a Java container to deploy AM.

These deployment examples assume that you are using Apache Tomcat:

1. Follow the instructions in the AM documentation to prepare your environment.
2. Use a supported version of Apache Tomcat as the web application container:
    a. Configure Tomcat to listen on port `8081`.

       This non-default port requires that you update Tomcat's `conf/server.xml` file. Instead of the default line, `<Connector port="8080" protocol="HTTP/1.1">`, use:

       ```
       <Connector port="8081" protocol="HTTP/1.1">
       ```

    b. Create a Tomcat `bin/setenv.sh` or `bin\setenv.bat` file to hold your environment variables.

    c. Follow the instructions in the AM documentation to prepare Tomcat as the web application container.

For complete instructions on setting up Tomcat, see Apache Tomcat in the AM documentation.

Secure connections

IMPORTANT

From DS 7 onwards, you *must* secure connections to DS servers.

1. Create a new directory that will house a dedicated truststore for AM:

   ```
   mkdir -p /path/to/openam-security/
   ```

2. *On each DS server*, export the DS server certificate.

   You must run these commands in the same terminal window where you set the `DEPLOYMENT_ID` variable:

   - On `config.example.com`:

     ```
     /path/to/opendj/bin/dskeymgr export-ca-cert \
     --deploymentId $DEPLOYMENT_ID \
     ```

```
--deploymentIdPassword password \
--outputFile config-ca-cert.pem
```

   - On `identities.example.com`:

     ```
     /path/to/opendj/bin/dskeymgr export-ca-cert \
     --deploymentId $DEPLOYMENT_ID \
     --deploymentIdPassword password \
     --outputFile identities-ca-cert.pem
     ```

3. Import each DS server certificate into the dedicated AM truststore.

   If you are not testing this example on a single host, you might need to copy each certificate file onto the AM host machine first:

   ```
   keytool \
   -importcert \
   -trustcacerts \
   -alias config-ca-cert \
   -file /path/to/config-ca-cert.pem \
   -keystore /path/to/openam-security/truststore \
   -storepass changeit \
   -storetype JKS
   Owner: CN=Deployment key, O=ForgeRock.com
   Issuer: CN=Deployment key, O=ForgeRock.com
   ...
   Trust this certificate? [no]:  yes
   Certificate was added to keystore

   keytool \
   -importcert \
   -trustcacerts \
   -alias identities-ca-cert \
   -file /path/to/identities-ca-cert.pem \
   -keystore /path/to/openam-security/truststore \
   -storepass changeit \
   -storetype JKS
   Owner: CN=Deployment key, O=ForgeRock.com
   Issuer: CN=Deployment key, O=ForgeRock.com
   ...
   Trust this certificate? [no]:  yes
   Certificate was added to keystore
   ```

4. List the certificates in the new truststore and verify that the two certificates you added are there:

```
keytool \
-list \
-keystore /path/to/openam-security/truststore \
-storepass changeit
```

5. Point Apache Tomcat to the path of the new truststore so that AM can access it.

   Append the truststore settings to the `CATALINA_OPTS` variable in the Tomcat `bin/setenv.sh` file; for example:

   ```
   CATALINA_OPTS="-Djavax.net.ssl.trustStore=/path/to/openam-
   security/truststore \
   -Djavax.net.ssl.trustStorePassword=changeit \
   -Djavax.net.ssl.trustStoreType=jks"
   ```

   Refer to your specific container's documentation for information on configuring truststores.

6. Check that you can use the dedicated AM accounts with the truststore to connect securely to each DS server:

   - On `config.example.com`:

     ```
     /path/to/opendj/bin/ldapsearch \
     --hostname config.example.com \
     --port 1636 \
     --useSsl \
     --useJavaTrustStore /path/to/openam-security/truststore \
     --trustStorePassword changeit \
     --bindDn uid=am-config,ou=admins,ou=am-config \
     --bindPassword 5up35tr0ng \
     --baseDn ou=am-config \
     "(&)" \
     1.1
     dn: ou=am-config

     dn: ou=admins,ou=am-config

     dn: uid=am-config,ou=admins,ou=am-config
     ```

   - On `identities.example.com`:

     ```
     /path/to/opendj/bin/ldapsearch \
     --hostname identities.example.com \
     --port 1636 \
     ```

```
--useSsl \
--useJavaTrustStore /path/to/openam-security/truststore \
--trustStorePassword changeit \
--bindDn uid=am-identity-bind-
account,ou=admins,ou=identities \
--bindPassword 5up35tr0ng \
--baseDn ou=identities \
"(&)" \
1.1
dn: ou=identities

dn: ou=people,ou=identities

dn: ou=groups,ou=identities

dn: ou=admins,ou=identities

dn: uid=am-identity-bind-account,ou=admins,ou=identities
```

Set up AM

When your external data stores are configured, follow these procedures to configure AM with the ForgeRock Identity Platform:

Install AM

1. Follow the instructions in the AM documentation to download AM. Make sure you download the `.zip` file, not just the `.war` file.
2. Copy the AM `.war` file to deploy in Apache Tomcat as `am.war`:

   ```
   cp AM-7.2.0.war /path/to/tomcat/webapps/am.war
   ```

3. Start Tomcat if it is not already running.
4. Navigate to the deployed AM application; for example, http://am.example.com:8081/am/.
5. Select **Create New Configuration** to create a custom configuration.
6. Accept the license agreement, and click **Continue**.
7. Set a password for the default user, `amAdmin`.

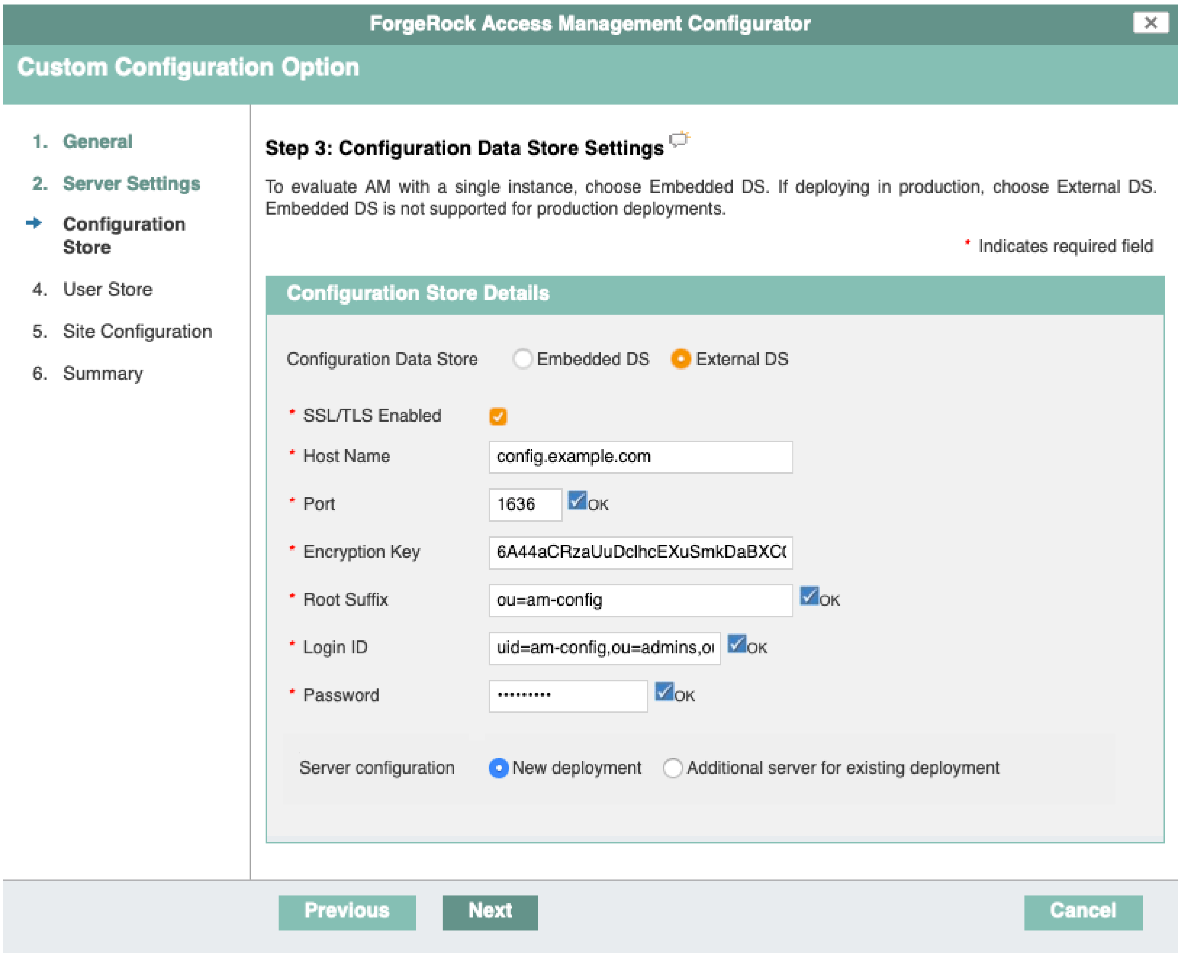
   These instructions assume that the `amAdmin` password is `Passw0rd`.
8. On the **Server Settings** screen, enter your AM server settings; for example:

- **Server URL**: `http://am.example.com:8081`
- **Cookie Domain**: `example.com`
- **Platform Locale**: `en_US`
- **Configuration Directory**: `/path/to/am`

9. On the **Configuration Data Store Settings** screen, select **External DS**, and enter the details for the DS instance that you set up as a configuration store.

   This list reflects the DS configuration store installed with the listed server settings.

   - **SSL/TLS**: `Enabled` (DS requires TLS.)
   - **Host Name**: `config.example.com`
   - **Port**: `1636`
   - **Encryption Key**: (generated encryption key)
   - **Root Suffix**: `ou=am-config`
   - **Login ID**: `uid=am-config,ou=admins,ou=am-config`
   - **Password**: `5up35tr0ng`
   - **Server configuration**: `New deployment`



ForgeRock Access Management Configurator

Custom Configuration Option

1. General
2. Server Settings
3. Configuration Store
4. User Store
5. Site Configuration
6. Summary

Step 3: Configuration Data Store Settings

To evaluate AM with a single instance, choose Embedded DS. If deploying in production, choose External DS. Embedded DS is not supported for production deployments.

* Indicates required field

Configuration Store Details

Configuration Data Store ○ Embedded DS ● External DS

* SSL/TLS Enabled ☑

* Host Name: config.example.com

* Port: 1636 ☑OK

* Encryption Key: 6A44aCRzaUuDclhcEXuSmkDaBXC(

* Root Suffix: ou=am-config ☑OK

* Login ID: uid=am-config,ou=admins,o ☑OK

* Password: ••••••••• ☑OK

Server configuration ● New deployment ○ Additional server for existing deployment

10. On the **User Data Store Settings** screen, select **External User Data Store**, and enter the details for the DS instance that you set up as an identity store.

NOTE

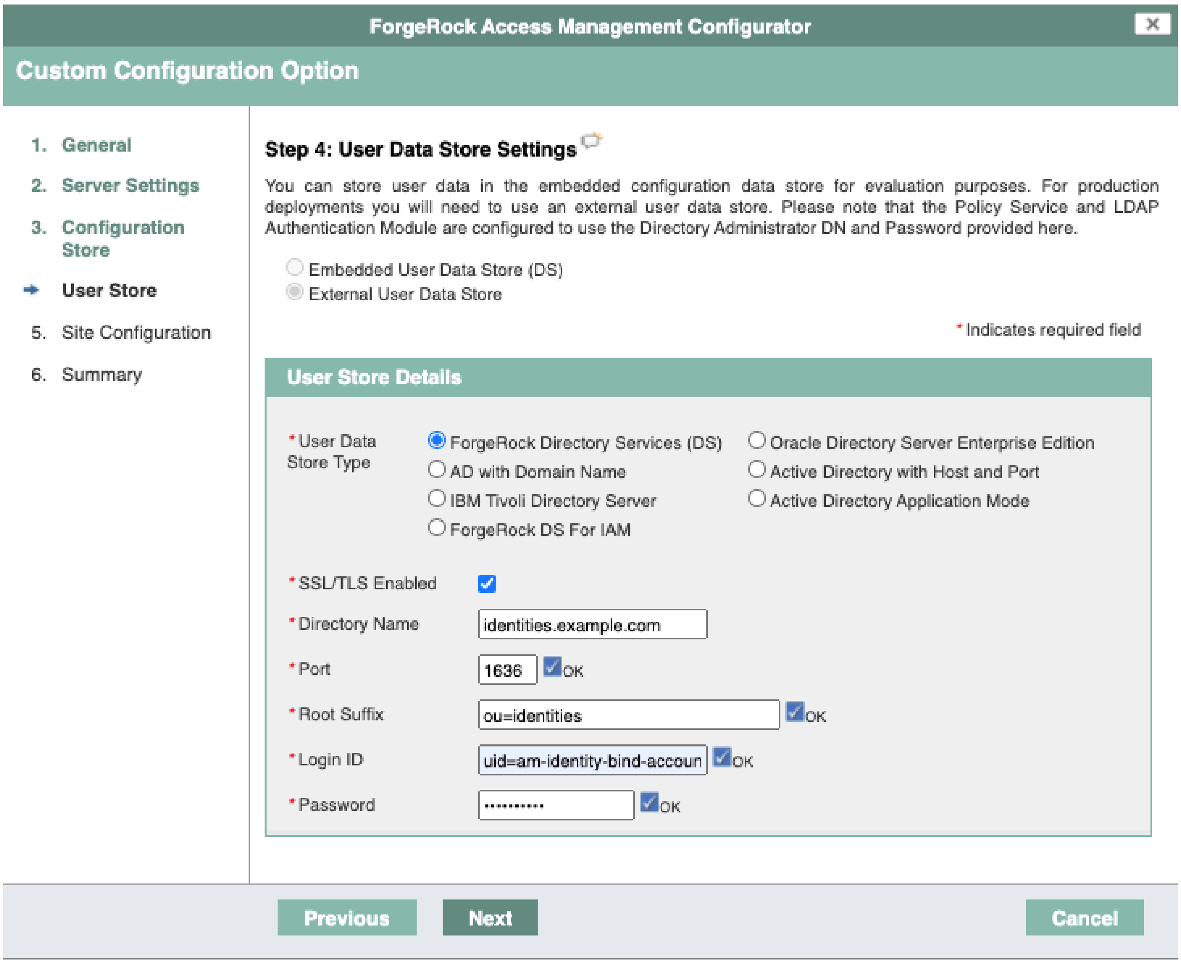
NOTE

The AM setup process requires that you configure an identity store.

You will use this store later in an `alpha` realm for non-administrative identities.

This list reflects the DS identity store installed with the listed server settings.

- **User Data Store Type**: `ForgeRock Directory Services (DS)`
- **SSL/TLS**: `Enabled` (DS requires TLS.)
- **Host Name**: `identities.example.com`
- **Port**: `1636`
- **Root Suffix**: `ou=identities`
- **Login ID**: `uid=am-identity-bind-account,ou=admins,ou=identities`
- **Password**: `5up35tr0ng`



ForgeRock Access Management Configurator

Custom Configuration Option

1. General
2. Server Settings
3. Configuration Store
→ User Store
5. Site Configuration
6. Summary

Step 4: User Data Store Settings

You can store user data in the embedded configuration data store for evaluation purposes. For production deployments you will need to use an external user data store. Please note that the Policy Service and LDAP Authentication Module are configured to use the Directory Administrator DN and Password provided here.

○ Embedded User Data Store (DS)
● External User Data Store

* Indicates required field

User Store Details

* User Data Store Type: ● ForgeRock Directory Services (DS) ○ Oracle Directory Server Enterprise Edition ○ AD with Domain Name ○ Active Directory with Host and Port ○ IBM Tivoli Directory Server ○ Active Directory Application Mode ○ ForgeRock DS For IAM

* SSL/TLS Enabled ☑

* Directory Name: identities.example.com

* Port: 1636 ☑ OK

* Root Suffix: ou=identities ☑ OK

* Login ID: uid=am-identity-bind-accoun ☑ OK

* Password: •••••••••• ☑ OK

11. On the **Site Configuration** screen, select **No**, then click **Next**.
12. Review the **Configurator Summary Details**, then click **Create Configuration**.

Create a realm

The AM Top Level Realm should serve administration purposes only.

These steps create an `alpha` realm for non-administrative identities:

1. Log in to the AM admin UI as the `amAdmin` user.
2. Click **+ New Realm**, and create the new realm with the following settings:
   - **Name**: `alpha`
   - Keep the defaults for all other settings.

For background information, see Realms in the AM documentation.

Configure OAuth clients

The deployment depends on the following OAuth 2.0 clients:

Client ID	Description	In Top Level Realm?	In subrealms?
`idm-resource-server`	IDM uses this confidential client to introspect access tokens through the `/oauth2/introspect` endpoint to obtain information about users. This client is not used for OAuth 2.0 flows, only to introspect tokens. It is not a *real* OAuth 2.0 client, in the traditional sense. Rather, it is an OAuth 2.0 Resource Server account, used exclusively for token introspection. As such, you do not need to specify redirect URIs or grant types. When you configure the client, AM adds the `Authorization Code` grant type to the client profile by default. This client does not use it, but there’s no requirement to remove it from the client profile.	✓	✕

Client ID	Description	In Top Level Realm?	In subrealms?
`idm-provisioning`	AM nodes in authentication journeys (trees) use this confidential client to authenticate through AM and provision identities through IDM. This client uses the client credentials flow, and does not authenticate resource owners other than itself.	✓	✓
`idm-admin-ui`	The Platform Admin UI uses this public client to access platform configuration features, such as identity management and journey (tree) editing. The client uses the implicit flow, and authenticates administrator users who are authorized to perform administrative operations.	✓	✓
`end-user-ui`	The End User UI uses this public client to access and present end user profile data. The client uses the implicit flow, and authenticates end users who are authorized to view and edit their profiles.	✓	✓

When configuring a client in more than one realm, make sure that the client configurations are identical.

Follow these steps to configure the OAuth 2.0 clients:

1. If you’re not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. In **the Top Level Realm**, configure an `idm-resource-server` client to introspect access tokens:
   - Select **Applications > OAuth 2.0 > Clients**, and click **Add Client**.
   - Enter the following details:

        - **Client ID**: `idm-resource-server`
        - **Client secret**: `password`

          The value of this field must match the `clientSecret` that you will set in the `rsFilter` module in the IDM authentication configuration (`/path/to/openidm/conf/authentication.json`) during your IDM setup.
        - **Scopes**:
          `am-introspect-all-tokens`
          `am-introspect-all-tokens-any-realm`
    - Click **Create**.
3. In **the Top Level Realm and the `alpha` realm**, configure identical `idm-provisioning` clients to make calls to IDM:
    - Select **Applications > OAuth 2.0 > Clients**, and click **Add Client**.
    - Enter the following details:
        - **Client ID**: `idm-provisioning`
        - **Client secret**: `openidm`
        - **Scopes**: `fr:idm:*`
    - Click **Create**.
    - On the **Advanced** tab:
        - **Response Types**: Check that `token` is present (it should be there by default).
        - **Grant Types**: Remove `Authorization Code` and add `Client Credentials`.
    - Click **Save Changes**.
4. In **the Top Level Realm and the `alpha` realm**, configure identical `idm-admin-ui` clients that will be used by the Platform Admin UI:
    - Select **Applications > OAuth 2.0 > Clients**, and click **Add Client**.
    - Enter the following details:
        - **Client ID**: `idm-admin-ui`
        - **Client Secret**: (no client secret is required)
        - **Redirection URIs**:

          `http://openidm.example.com:8080/platform/appAuthHelperRedirect.html`
          `http://openidm.example.com:8080/platform/sessionCheck.html`
          `http://openidm.example.com:8080/admin/appAuthHelperRedirect.html`
          `http://openidm.example.com:8080/admin/sessionCheck.html`

```
http://admin.example.com:8082/appAuthHelperRedirect.html
http://admin.example.com:8082/sessionCheck.html
```

    - **Scopes**:

```
openid
fr:idm:*
```

> NOTE
>
> At a minimum, the scopes that you set here must include the scopes that you will set in the `rsFilter` authentication configuration (`/path/to/openidm/conf/authentication.json`) during your IDM setup.

  - Click **Create**.
  - On the **Core** tab:
    - **Client type**: Select `Public` .
    - Click **Save Changes**.
  - On the **Advanced** tab:
    - **Grant Types**: Add `Implicit` .
    - **Token Endpoint Authentication Method**: Select `none` .
    - **Implied consent**: Enable.
    - Click **Save Changes**.

5. In **the Top Level Realm and the `alpha` realm**, configure identical `end-user-ui` clients that will be used by the Platform End User UI:
  - Select **Applications > OAuth 2.0 > Clients** , and click **Add Client**.
  - Enter the following details:
    - **Client ID**: `end-user-ui`
    - **Client Secret**: (no client secret is required)
    - **Redirection URIs**:

```
http://enduser.example.com:8888/appAuthHelperRedirect.html
http://enduser.example.com:8888/sessionCheck.html
```

    - **Scopes**:

```
openid
fr:idm:*
```

NOTE

NOTE

At a minimum, the scopes that you set here must include the scopes that you will set in the `rsFilter` authentication configuration (`/path/to/openidm/conf/authentication.json`) during your IDM setup.

- Click **Create**.
- On the **Core** tab:
  - **Client type**: Select `Public` .
  - Click **Save Changes**.
- On the **Advanced** tab:
  - **Grant Types**: Add `Implicit` .
  - **Token Endpoint Authentication Method**: Select `none` .
  - **Implied Consent**: Enable.
  - Click **Save Changes**.

Configure OAuth 2.0 providers

1. If you’re not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. Configure a provider for the Top Level Realm:
   a. In the Top Level Realm, select **Services**, and click **Add a Service**.
   b. Under **Choose a service type**, select **OAuth2 Provider**.
   c. For **Client Registration Scope Allowlist**, add the following scopes:
   ```
   am-introspect-all-tokens
   am-introspect-all-tokens-any-realm
   fr:idm:*
   openid
   ```
   d. Click **Create**.
   e. On the **Advanced** tab, make sure that **Response Type Plugins** includes the following values:
   ```
   id_token|org.forgerock.openidconnect.IdTokenResponseTypeHandler
   code|org.forgerock.oauth2.core.AuthorizationCodeResponseTypeHand
   ler
   ```
   f. Click **Save Changes**.
   g. On the **Consent** tab, enable **Allow Clients to Skip Consent**.
   h. Click **Save Changes**.
3. Configure a provider for the `alpha` realm:
   a. In the `alpha` realm, select **Services**, and click **Add a Service**.

b. Under **Choose a service type**, select **OAuth2 Provider**.

c. For **Client Registration Scope Allowlist**, add the following scopes:

```
fr:idm:*
openid
```

d. Click **Create**.

e. On the **Advanced** tab, make sure that **Response Type Plugins** includes the following values:

```
id_token|org.forgerock.openidconnect.IdTokenResponseTypeHandler
code|org.forgerock.oauth2.core.AuthorizationCodeResponseTypeHandler
```

f. Click **Save Changes**.

g. On the **Consent** tab, enable **Allow Clients to Skip Consent**.

h. Click **Save Changes**.

Configure an IDM provisioning service

1. If you’re not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. From the top menu, select **Configure** > **Global Services** > **IDM Provisioning**.

   The AM admin UI does not let you configure an IDM provisioning service in a realm.
3. Set the following fields:
   - **Enabled**
   - **Deployment URL**: `http://openidm.example.com:8080`
   - **Deployment Path**: `openidm`
   - **IDM Provisioning Client**: `idm-provisioning`
4. Click **Save Changes**.

TIP

TIP

If some resource strings in the AM admin UI do not resolve properly at setup time, the UI labels mentioned will show internal keys instead of the labels shown in the steps above. Use the following table to check that you have the correct service and fields:

UI label	Internal label
IDM Provisioning	`IdmIntegrationService`
Enabled	`enabled`
Deployment URL	`idmDeploymentUrl`
Deployment Path	`idmDeploymentPath`
IDM Provisioning Client	`idmProvisioningClient`

Configure a validation service

The Platform UIs need this validation service allow listing for `goto` redirection.

1. If you’re not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. In the `alpha` realm, select **Services**, and click **Add a Service**.
3. Under **Choose a service type**, select **Validation Service**.
4. For **Valid goto URL Resources**, add the URLs for the Platform UI:

```
http://admin.example.com:8082/*
http://admin.example.com:8082/*?*
http://login.example.com:8083/*
http://login.example.com:8083/*?*
http://enduser.example.com:8888/*
http://enduser.example.com:8888/*?*
```

5. Click **Create**.

Enable CORS support

Cross-origin resource sharing (CORS) lets user agents make requests across domains.

1. If you’re not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. From the top menu, select **Configure > Global Services > CORS Service**.
3. On the **Secondary Configurations** tab, click **Add a Secondary Configuration**.
4. On the **New Configuration** screen, enter the following values:

- **Name** : `Cors Configuration`
- **Accepted Origins** :

  ```
  http://login.example.com:8083
  http://admin.example.com:8082
  http://enduser.example.com:8888
  http://openidm.example.com:8080
  https://openidm.example.com:8443
  ```

  List only the origins that will be hosting OAuth 2.0 clients (such as the `platform-enduser` and IDM admin UIs).
- **Accepted Methods**:

  ```
  DELETE
  GET
  HEAD
  PATCH
  POST
  PUT
  ```
- **Accepted Headers**:

  ```
  accept-api-version
  authorization
  cache-control
  content-type
  if-match
  if-none-match
  user-agent
  x-forgerock-transactionid
  x-openidm-nosession
  x-openidm-password
  x-openidm-username
  x-requested-with
  ```
- **Exposed Headers**: `WWW-Authenticate`

5. Click **Create**.
6. On the **Cors Configuration** screen, set the following values:
   - **Enable the CORS filter**: Enable
   - **Max Age**: `600`
   - **Allow Credentials**: Enable
7. Click **Save Changes**.

Configure authentication trees

The platform deployment relies on three authentication trees to enable authentication through AM. When you extract the AM `.zip` file, you will get a `sample-trees-7.2.0.zip` file that contains a number of sample authentication trees, in JSON files. Use the Amster command-line utility to import the platform authentication trees into your AM configuration:

1. Extract the `sample-trees-7.2.0.zip` file, and list the sample trees in the `root/AuthTree` directory:

```
ls /path/to/openam-samples/root/AuthTree
Agent.json
PlatformForgottenUsername.json
Example.json                       PlatformLogin.json
Facebook-ProvisionIDMAccount.json
PlatformProgressiveProfile.json
Google-AnonymousUser.json          PlatformRegistration.json
Google-DynamicAccountCreation.json PlatformResetPassword.json
HmacOneTimePassword.json           PlatformUpdatePassword.json
PersistentCookie.json              RetryLimit.json
```

2. In all the sample tree files, replace `"realm" : "/"` with `"realm" : "/alpha"`.
3. Download and install Amster.
4. Start Amster, then connect to your AM instance:

```
./amster
Amster OpenAM Shell (version build build, JVM: version)
Type ':help' or ':h' for help.
--------------------------------------------------------------
-------------
am> connect --interactive http://am.example.com:8081/am
Sign in
User Name: amAdmin
Password: Passw0rd
amster am.example.com:8081> :exit
```

5. Import the sample authentication trees and nodes:

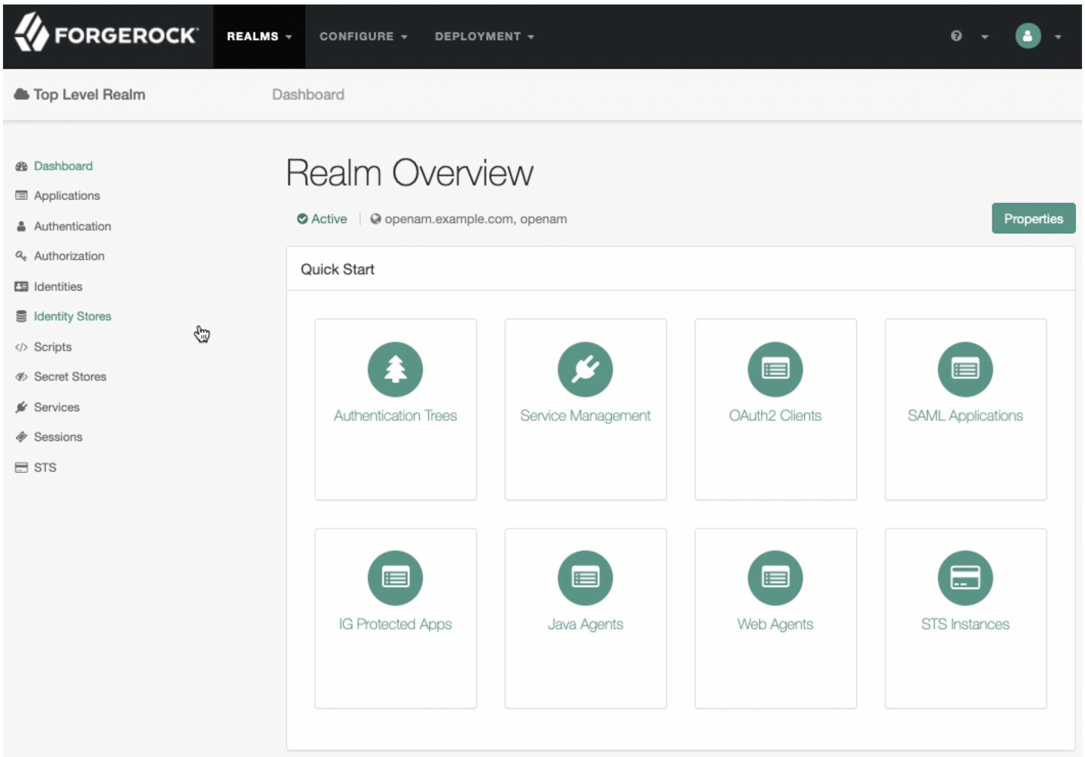
```
amster am.example.com:8081>import-config --path
/path/to/openam-samples/root
Importing directory /path/to/openam-
samples/root/AcceptTermsAndConditions
...
Import completed successfully
```

6. If you're not currently logged in to the AM admin UI as the `amAdmin` user, log in.

7. Configure the `PlatformRegistration` tree:

   - In the `alpha` realm, select **Authentication** > **Trees**, and click **PlatformRegistration**.
   - On the `PlatformRegistration` tree, add a `Success URL` node between `Increment Login Count` and `Success`, and set its value to `http://enduser.example.com:8888/?realm=alpha`.

     ▼ *Show me*

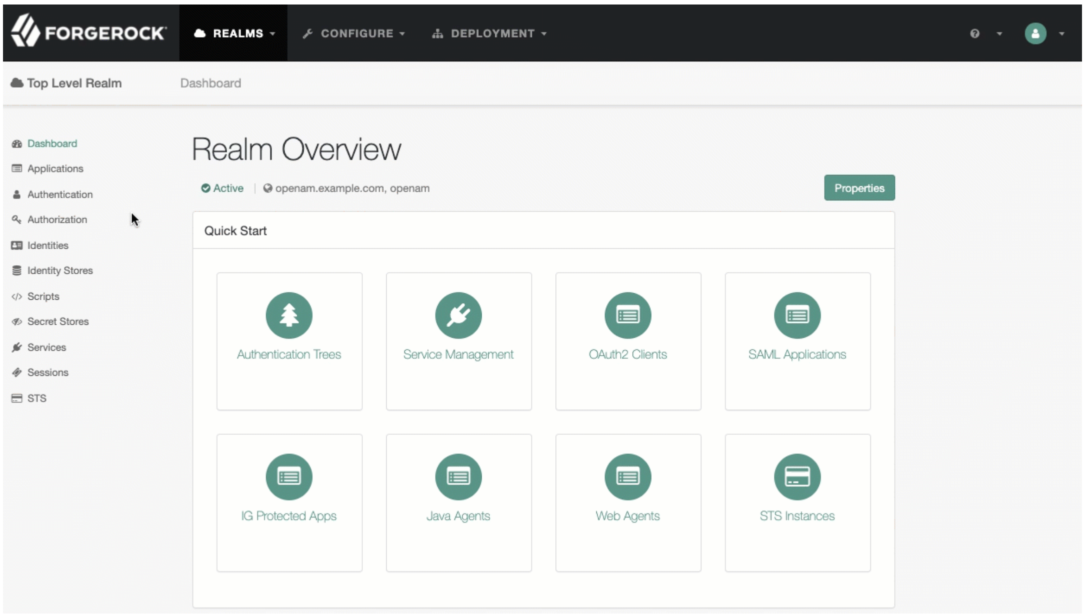
     

   - Click **Save**.

8. Configure the `PlatformLogin` tree:

   - In the `alpha` realm, select **Authentication** > **Trees**, and click **PlatformLogin**.
   - On the `PlatformLogin` tree, add a `Success URL` node between `Inner Tree Evaluator` and `Success`, and set its value to `http://enduser.example.com:8888/?realm=alpha`.

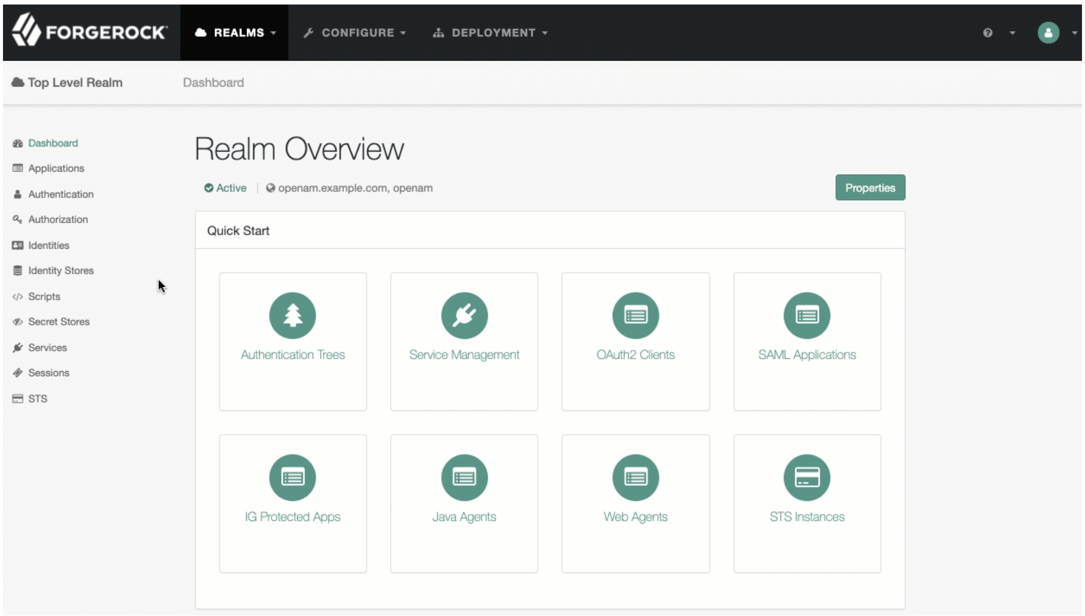
     ▼ *Show me*



- Click **Save**.

9. Configure the `PlatformResetPassword` tree:
   - In the `alpha` realm, select **Authentication** > **Trees**, and click **PlatformResetPassword**.
   - On the `PlatformResetPassword` tree, add a `Success URL` node between `Patch Object` and `Success`, and set its value to `http://enduser.example.com:8888/?realm=alpha`.

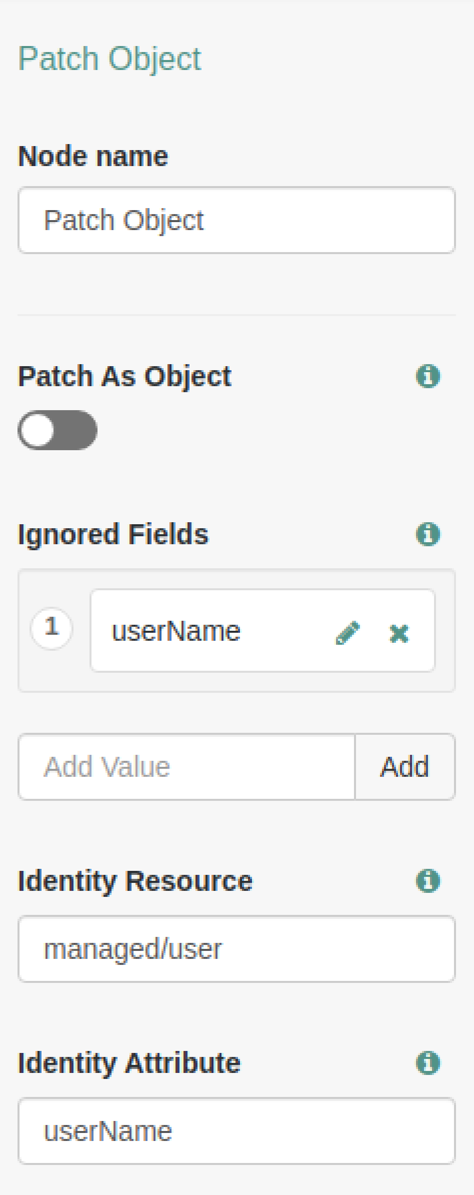
   ▼ *Show me*



   - Click **Save**.

10. Configure the `PlatformUpdatePassword` tree:
    - In the `alpha` realm, select **Authentication** > **Trees**, and click **PlatformUpdatePassword**.
    - On the `PlatformUpdatePassword` tree, select the `Patch Object` node, and make sure `Patch As Object` is disabled.

▼ Show me



Patch Object

Node name: Patch Object

Patch As Object: off

Ignored Fields:
1. userName

Identity Resource: managed/user

Identity Attribute: userName

- Click **Save**.

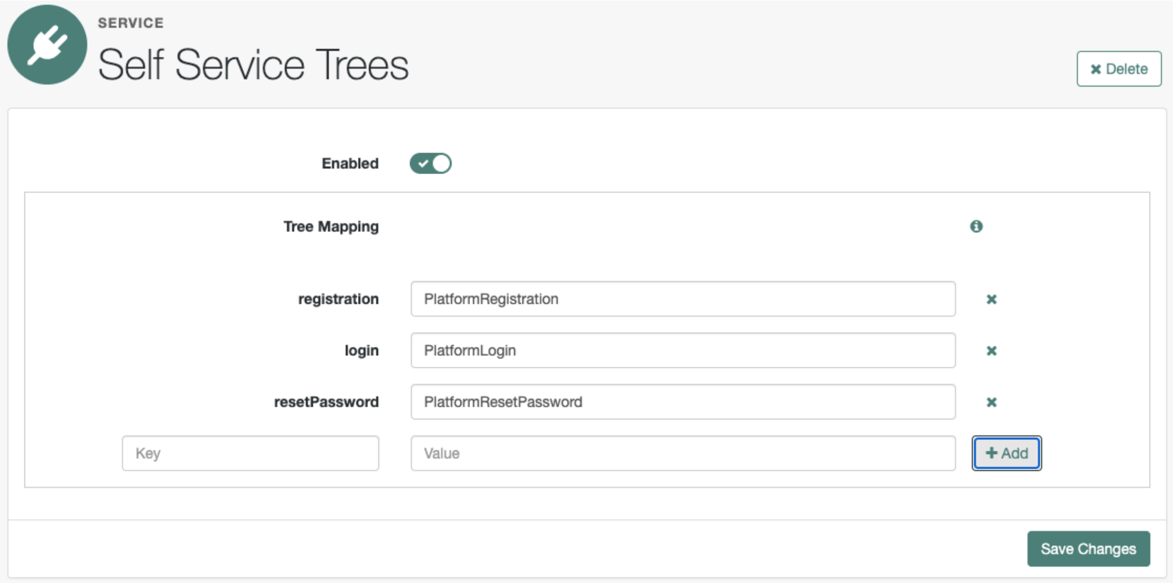
11. For the authentication trees that require email, set the **External Login Page URL**.
    - In the `alpha` realm, select **Authentication > Settings**, and click the **General** tab.
    - Set **External Login Page URL** to `http://login.example.com:8083`, then click **Save Changes**.

Map authentication trees

Map the platform authentication trees to the corresponding Self-Service endpoints. For more information about this step, see Configure self-service trees endpoints.

1. In the `alpha` realm, select **Services**, and click **Add a Service**.
2. Under **Choose a service type**, select **Self Service Trees**, and click **Create**.
3. Add the following tree mappings:

Key	Value
`registration`	`PlatformRegistration`
`login`	`PlatformLogin`
`resetPassword`	`PlatformResetPassword`



SERVICE

Self Service Trees

Enabled ☑

Tree Mapping

registration: PlatformRegistration

login: PlatformLogin

resetPassword: PlatformResetPassword

4. Click **Save Changes**.

Set up IDM

This procedure sets up IDM with an external MySQL repository. The procedure reflects the listed server settings for installing IDM.

1. Follow the instructions in the IDM documentation to download, install, and run IDM.

   Before running IDM, make sure you set the `JAVA_HOME` environment variable.

2. Edit the `/path/to/openidm/resolver/boot.properties` file to set the hostname:

```
openidm.host=openidm.example.com
```

3. Configure your IDM repository. This procedure was tested with a MySQL repository. Follow the instructions in the IDM documentation to set up a MySQL repository.
4. Configure social authentication.

   In your project's `conf/managed.json` file:

   - Add an `aliasList` property to the `user` object:

```
{
  "objects": [
    {
      "name": "user",
      ...
      "schema": {
        "properties": {
          ...
          "aliasList": {
            "title": "User Alias Names List",
            "description": "List of identity aliases used primarily to record social IdP subjects for this user",
            "type": "array",
            "items": {
              "type": "string",
              "title": "User Alias Names Items"
            },
            "viewable": false,
            "searchable": false,
            "userEditable": true,
            "returnByDefault": false,
            "isVirtual": false
          }
    ...
  ]
}
```

- Update the `password` property to ensure that users update their passwords through the self-service APIs, not directly:

  ```
  "userEditable" : false
  ```

5. Change the authentication mechanism to `rsFilter` only:

   - Replace the default `conf/authentication.json` file with this authentication.json file.
   - Check that the `clientSecret` matches the `Client secret` that you set for the `idm-resource-server` client in AM (see Configure OAuth Clients).
   - Check that the `rsFilter > subjectMapping > propertyMapping > sub` property is correctly configured.

     The `authentication.json` file aligns with the default AM configuration for subject claim uniqueness. AM refers to the subject by its unique identifier, and so IDM does, too.

    If AM has its advanced server property, `org.forgerock.security.oauth2.enforce.sub.claim.uniqueness`, set to `false`, for example, because you upgraded from a previous release of AM, use this property mapping instead:

    ```
    "propertyMapping": {
        "sub": "userName"
    }
    ```

    AM refers to the subject by its username in this case. For details, see the reference for the setting in the AM documentation.

   For more information about authenticating using the `rsFilter`, see Authenticate through AM in the IDM documentation.

6. Edit the IDM admin UI configuration so that you can still authenticate through the IDM admin UI:

    - In your `conf/ui-configuration.json` file, insert a `platformSettings` object into the `configuration` object:

      ```
      {
          "configuration" : {
              ...,
              "platformSettings" : {
                  "adminOauthClient" : "idm-admin-ui",
                  "adminOauthClientScopes" : "fr:idm:*",
                  "amUrl" : "http://am.example.com:8081/am",
                  "loginUrl" : ""
              }
          }
      }
      ```

      This object tells the IDM admin UI that it is operating in "platform mode" (that is, as an OAuth 2.0 client of AM).

    - In your `conf/ui.context-admin.json` file, check that `X-Frame-Options` is set to `SAMEORIGIN`:

      ▼ *Sample ui.context-admin.json*

      ```
      {
        "enabled" : true,
        "cacheEnabled" : true,
        "urlContextRoot" : "/admin",
        "defaultDir" : "&{idm.install.dir}/ui/admin/default",
        "extensionDir" : "&
      ```

```
{idm.install.dir}/ui/admin/extension",
  "responseHeaders" : {
      "X-Frame-Options" : "SAMEORIGIN"
  }
}
```

You should now be able to access the IDM admin UI at http://openidm.example.com:8080/admin. When you log in to the Admin UI, use the default AM administrative user (`amAdmin`), and not `openidm-admin` .

7. Configure the CORS servlet filter.

   Replace the default `conf/servletfilter-cors.json` file with this servletfilter-cors.json file.

8. Configure synchronization between the IDM repository and the AM identity store.

   - Add a configuration for the LDAP connector.

     Create a configuration file named `provisioner.openicf-ldap.json` in the `/path/to/openidm/conf` directory. Use this provisioner.openicf-ldap.json file as a template.

     Pay particular attention to the connection properties, `host` , `port` , `principal` , and `credentials` . These must match the configuration of the DS server that you set up as the identity store.

   - Add a mapping between IDM managed user objects, and AM identities stored in DS.

     Create a mapping file named `sync.json` in the `/path/to/openidm/conf` directory. Use this sync.json file as a template.

9. Secure the connection to the DS server.

   This step assumes that you have set up the identity store, and exported the DS CA certificate from `identities.example.com` (as shown in Step 4 of Secure connections).

   Import the DS CA certificate into the IDM truststore:

```
keytool \
-importcert \
-alias identities-ca-cert \
-file /path/to/identities-ca-cert.pem \
-keystore /path/to/openidm/security/truststore \
-storepass:file /path/to/openidm/security/storepass
Owner: CN=Deployment key, O=ForgeRock.com
Issuer: CN=Deployment key, O=ForgeRock.com
...
```

```
Trust this certificate? [no]:  yes
Certificate was added to keystore
```

10. If you want to use the `PlatformForgottenUsername` or `PlatformResetPassword` trees, configure outbound email.

    > NOTE
    >
    > After you have installed the Platform UI, you can configure email through the UI at `http://openidm.example.com:8080/admin` .

IDM is now configured for this deployment. Move on to setting up the Platform UIs.

Shared identity store

This deployment assumes that you are using the following data stores:

- An external DS instance as the AM configuration store.
- A separate external DS instance that is shared between AM and IDM as the identity store.

> NOTE
>
> The IDM End User UI is not supported in a platform deployment, as it does not support authentication through AM.
>
> You can use the Platform UIs with this deployment, or create your own UIs that support authentication through AM.

Download DS

Follow the instructions in the DS documentation to download DS, and prepare for installation.

The instructions that follow assume you download the cross-platform .zip distribution.

Set up your data stores

Configuration store

1. Unpack the DS files you downloaded.
2. Generate and save a unique DS deployment ID for external configuration data store servers:

```
/path/to/opendj/bin/dskeymgr create-deployment-id --
deploymentIdPassword password
```

You will need the deployment ID and password to install DS, and to export the server certificate.

Set the deployment ID in your environment:

```
export DEPLOYMENT_ID=deployment-id
```

3. Set up a DS server as an external configuration data store, using the `am-config` setup profile.

   This example also adds the `am-cts` setup profile to the external configuration data store. In production, consider using separate DS servers for the AM CTS store. For more information about AM CTS, see the AM Core token service (CTS) guide.

   For more information about DS setup profiles, see setup profiles in the DS documentation.

   This command sets up the config store with the parameters listed in Server settings.

```
/path/to/opendj/setup \
--deploymentId $DEPLOYMENT_ID \
--deploymentIdPassword password \
--rootUserDN uid=admin \
--rootUserPassword str0ngAdm1nPa55word \
--monitorUserPassword str0ngMon1torPa55word \
--hostname config.example.com \
--adminConnectorPort 4444 \
--ldapPort 1389 \
--enableStartTls \
--ldapsPort 1636 \
--profile am-config \
--set am-config/amConfigAdminPassword:5up35tr0ng \
--profile am-cts \
--set am-cts/amCtsAdminPassword:5up35tr0ng \
--set am-cts/tokenExpirationPolicy:am-sessions-only \
--acceptLicense
```

NOTE

> NOTE
>
> For simplicity, this example uses a standalone directory server that does not replicate directory data (no `--replicationPort` or `--bootstrapReplicationServer` options). In production deployments, replicate directory data for availability and resilience. For details, see the DS installation documentation.

4. Start the DS server:

```
/path/to/opendj/bin/start-ds
```

Identity store

1. Unpack the DS files you downloaded.
2. Generate and save a unique DS deployment ID for identity store servers:

```
/path/to/opendj/bin/dskeymgr create-deployment-id --
deploymentIdPassword password
```

   You will need the deployment ID and password to install DS, and to export the server certificate.

   Set the deployment ID in your environment:

```
export DEPLOYMENT_ID=deployment-id
```

3. Set up a DS server as an identity store, using the `am-identity-store` and `idm-repo` setup profiles.

   For more information about this step, see setup profiles in the DS documentation.

   This command sets up the identity store with the parameters listed in server settings:

```
/path/to/opendj/setup \
--deploymentId $DEPLOYMENT_ID \
--deploymentIdPassword password \
--rootUserDN uid=admin \
--rootUserPassword str0ngAdm1nPa55word \
--monitorUserPassword str0ngMon1torPa55word \
--hostname identities.example.com \
--adminConnectorPort 4444 \
--ldapPort 1389 \
--enableStartTls \
--ldapsPort 1636 \
--profile am-identity-store \
--set am-identity-
store/amIdentityStoreAdminPassword:5up35tr0ng \
--profile idm-repo \
--set idm-repo/domain:forgerock.io \
--acceptLicense
```

NOTE

For simplicity, this example uses standalone directory servers that do not replicate directory data. (No `--replicationPort` or `--bootstrapReplicationServer` options.)

In production deployments, replicate directory data for availability and resilience. For details, see the DS installation documentation.

4. Start the DS server:

```
/path/to/opendj/bin/start-ds
```

Set up a container

Install a Java container to deploy AM.

These deployment examples assume that you are using Apache Tomcat:

1. Follow the instructions in the AM documentation to prepare your environment.
2. Use a supported version of Apache Tomcat as the web application container:
   a. Configure Tomcat to listen on port `8081` .

      This non-default port requires that you update Tomcat's `conf/server.xml` file. Instead of the default line, `<Connector port="8080" protocol="HTTP/1.1">`, use:

      ```
      <Connector port="8081" protocol="HTTP/1.1">
      ```

   b. Create a Tomcat `bin/setenv.sh` or `bin\setenv.bat` file to hold your environment variables.
   c. Follow the instructions in the AM documentation to prepare Tomcat as the web application container.

For complete instructions on setting up Tomcat, see Apache Tomcat in the AM documentation.

Secure connections

IMPORTANT

From DS 7 onwards, you *must* secure connections to DS servers.

1. Create a new directory that will house a dedicated truststore for AM:

```
mkdir -p /path/to/openam-security/
```

2. *On each DS server*, export the DS server certificate.

   You must run these commands in the same terminal window where you set the `DEPLOYMENT_ID` variable:

   - On `config.example.com`:

```
/path/to/opendj/bin/dskeymgr export-ca-cert \
--deploymentId $DEPLOYMENT_ID \
--deploymentIdPassword password \
--outputFile config-ca-cert.pem
```

   - On `identities.example.com`:

```
/path/to/opendj/bin/dskeymgr export-ca-cert \
--deploymentId $DEPLOYMENT_ID \
--deploymentIdPassword password \
--outputFile identities-ca-cert.pem
```

3. Import each DS server certificate into the dedicated AM truststore.

   If you are not testing this example on a single host, you might need to copy each certificate file onto the AM host machine first:

```
keytool \
-importcert \
-trustcacerts \
-alias config-ca-cert \
-file /path/to/config-ca-cert.pem \
-keystore /path/to/openam-security/truststore \
-storepass changeit \
-storetype JKS
Owner: CN=Deployment key, O=ForgeRock.com
Issuer: CN=Deployment key, O=ForgeRock.com
...
Trust this certificate? [no]:  yes
```

```
Certificate was added to keystore

keytool \
-importcert \
-trustcacerts \
-alias identities-ca-cert \
-file /path/to/identities-ca-cert.pem \
-keystore /path/to/openam-security/truststore \
-storepass changeit \
-storetype JKS
Owner: CN=Deployment key, O=ForgeRock.com
Issuer: CN=Deployment key, O=ForgeRock.com
...
Trust this certificate? [no]:  yes
Certificate was added to keystore
```

4. List the certificates in the new truststore and verify that the two certificates you added are there:

```
keytool \
-list \
-keystore /path/to/openam-security/truststore \
-storepass changeit
```

5. Point Apache Tomcat to the path of the new truststore so that AM can access it.

   Append the truststore settings to the `CATALINA_OPTS` variable in the Tomcat `bin/setenv.sh` file; for example:

```
CATALINA_OPTS="-Djavax.net.ssl.trustStore=/path/to/openam-
security/truststore \
-Djavax.net.ssl.trustStorePassword=changeit \
-Djavax.net.ssl.trustStoreType=jks"
```

   Refer to your specific container's documentation for information on configuring truststores.

6. Check that you can use the dedicated AM accounts with the truststore to connect securely to each DS server:

   - On `config.example.com`:

```
/path/to/opendj/bin/ldapsearch \
--hostname config.example.com \
--port 1636 \
--useSsl \
--useJavaTrustStore /path/to/openam-security/truststore \
--trustStorePassword changeit \
--bindDn uid=am-config,ou=admins,ou=am-config \
--bindPassword 5up35tr0ng \
--baseDn ou=am-config \
"(&)" \
1.1
dn: ou=am-config

dn: ou=admins,ou=am-config

dn: uid=am-config,ou=admins,ou=am-config
```

- On `identities.example.com`:

```
/path/to/opendj/bin/ldapsearch \
--hostname identities.example.com \
--port 1636 \
--useSsl \
--useJavaTrustStore /path/to/openam-security/truststore \
--trustStorePassword changeit \
--bindDn uid=am-identity-bind-
account,ou=admins,ou=identities \
--bindPassword 5up35tr0ng \
--baseDn ou=identities \
"(&)" \
1.1
dn: ou=identities

dn: ou=people,ou=identities

dn: ou=groups,ou=identities

dn: ou=admins,ou=identities

dn: uid=am-identity-bind-account,ou=admins,ou=identities
```

Set up AM

When your external data stores are configured, follow these procedures to configure AM with the ForgeRock Identity Platform:

Install AM

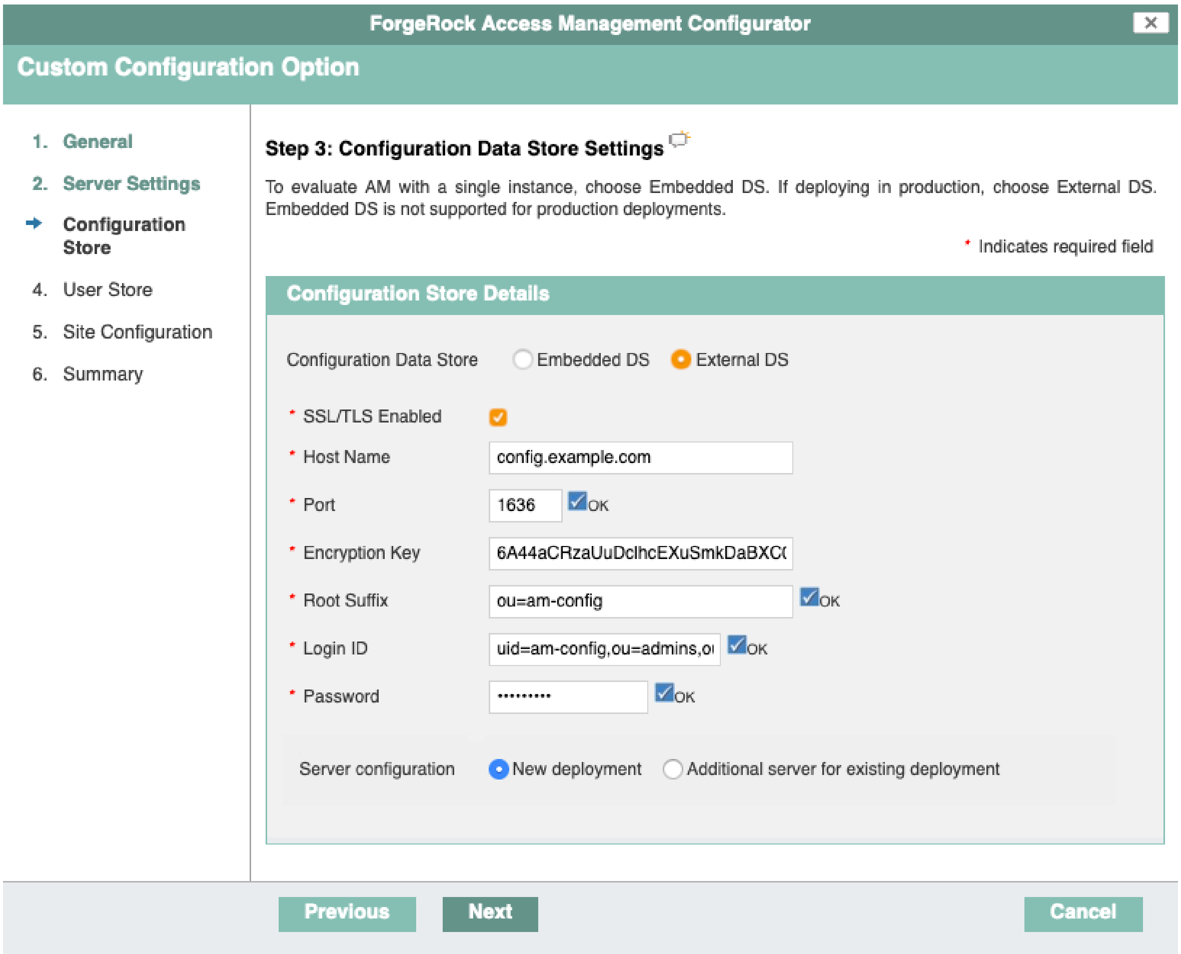
1. Follow the instructions in the AM documentation to download AM. Make sure you download the `.zip` file, not just the `.war` file.
2. Copy the AM `.war` file to deploy in Apache Tomcat as `am.war`:

   ```
   cp AM-7.2.0.war /path/to/tomcat/webapps/am.war
   ```

3. Start Tomcat if it is not already running.
4. Navigate to the deployed AM application; for example, http://am.example.com:8081/am/.
5. Select **Create New Configuration** to create a custom configuration.
6. Accept the license agreement, and click **Continue**.
7. Set a password for the default user, `amAdmin`.

   These instructions assume that the `amAdmin` password is `Passw0rd`.
8. On the **Server Settings** screen, enter your AM server settings; for example:
   - **Server URL**: `http://am.example.com:8081`
   - **Cookie Domain**: `example.com`
   - **Platform Locale**: `en_US`
   - **Configuration Directory**: `/path/to/am`
9. On the **Configuration Data Store Settings** screen, select **External DS**, and enter the details for the DS instance that you set up as a configuration store.

   This list reflects the DS configuration store installed with the listed server settings.
   - **SSL/TLS**: `Enabled` (DS requires TLS.)
   - **Host Name**: `config.example.com`
   - **Port**: `1636`
   - **Encryption Key**: (generated encryption key)
   - **Root Suffix**: `ou=am-config`
   - **Login ID**: `uid=am-config,ou=admins,ou=am-config`
   - **Password**: `5up35tr0ng`
   - **Server configuration**: `New deployment`


ForgeRock Access Management Configurator

Custom Configuration Option

1. General
2. Server Settings
3. Configuration Store
4. User Store
5. Site Configuration
6. Summary

Step 3: Configuration Data Store Settings

To evaluate AM with a single instance, choose Embedded DS. If deploying in production, choose External DS. Embedded DS is not supported for production deployments.

* Indicates required field

Configuration Store Details

Configuration Data Store ○ Embedded DS ● External DS

* SSL/TLS Enabled ☑

* Host Name: config.example.com

* Port: 1636 ☑OK

* Encryption Key: 6A44aCRzaUuDclhcEXuSmkDaBXC(

* Root Suffix: ou=am-config ☑OK

* Login ID: uid=am-config,ou=admins,o ☑OK

* Password: ••••••••• ☑OK

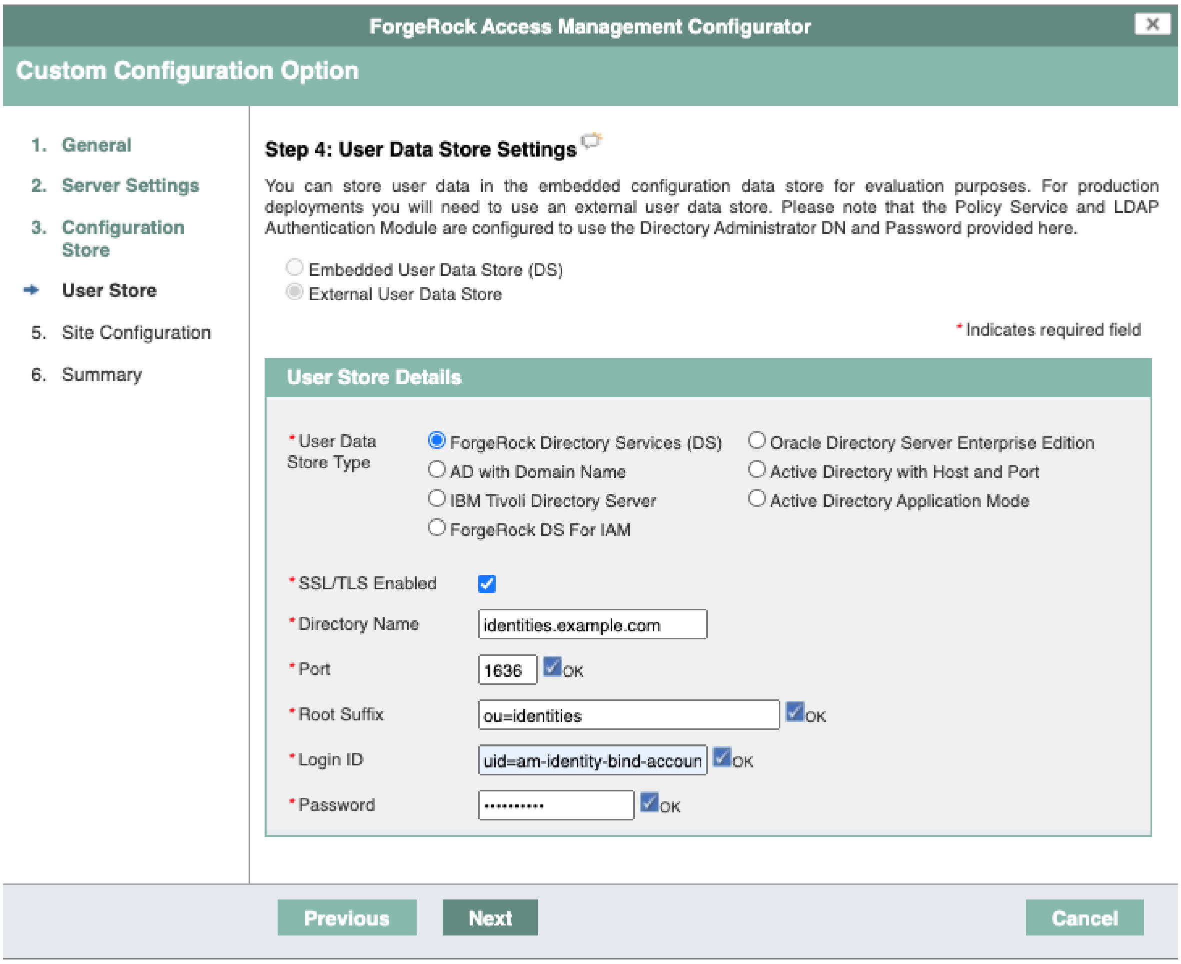
Server configuration ● New deployment ○ Additional server for existing deployment

10. On the **User Data Store Settings** screen, select **External User Data Store**, and enter the details for the DS instance that you set up as an identity store.

> NOTE
>
> The AM setup process requires that you configure an identity store.
>
> You will use this store later in an `alpha` realm for non-administrative identities.

This list reflects the DS identity store installed with the listed server settings.

- **User Data Store Type**: `ForgeRock Directory Services (DS)`
- **SSL/TLS**: `Enabled` (DS requires TLS.)
- **Host Name**: `identities.example.com`
- **Port**: `1636`
- **Root Suffix**: `ou=identities`
- **Login ID**: `uid=am-identity-bind-account,ou=admins,ou=identities`
- **Password**: `5up35tr0ng`



ForgeRock Access Management Configurator

Custom Configuration Option

1. General
2. Server Settings
3. Configuration Store
- User Store
5. Site Configuration
6. Summary

Step 4: User Data Store Settings

You can store user data in the embedded configuration data store for evaluation purposes. For production deployments you will need to use an external user data store. Please note that the Policy Service and LDAP Authentication Module are configured to use the Directory Administrator DN and Password provided here.

○ Embedded User Data Store (DS)
● External User Data Store

* Indicates required field

User Store Details

* User Data Store Type: ● ForgeRock Directory Services (DS) ○ Oracle Directory Server Enterprise Edition ○ AD with Domain Name ○ Active Directory with Host and Port ○ IBM Tivoli Directory Server ○ Active Directory Application Mode ○ ForgeRock DS For IAM

* SSL/TLS Enabled: ☑

* Directory Name: identities.example.com

* Port: 1636 ☑OK

* Root Suffix: ou=identities ☑OK

* Login ID: uid=am-identity-bind-accoun ☑OK

* Password: •••••••••• ☑OK

11. On the **Site Configuration** screen, select **No**, then click **Next**.
12. Review the **Configurator Summary Details**, then click **Create Configuration**.

Create a realm

The AM Top Level Realm should serve administration purposes only.

These steps create an `alpha` realm for non-administrative identities:

1. Log in to the AM admin UI as the `amAdmin` user.
2. Click **+ New Realm**, and create the new realm with the following settings:
   - **Name**: `alpha`
   - Keep the defaults for all other settings.

For background information, see Realms in the AM documentation.

Change the identity store configuration for IDM

1. In the `alpha` realm, select **Identity Stores** then click **OpenDJ**.
2. On the **Server Settings** tab, set **LDAPv3 Plug-in Search Scope** to `SCOPE_ONE`, then click **Save Changes**.

3. On the **User Configuration** tab, set **LDAP Users Search Attribute** to `fr-idm-uuid`, then click **Save Changes**.
4. On the **Authentication Configuration** tab, check that the **Authentication Naming Attribute** is set to `uid`, then click **Save Changes**.
5. In the Top Level Realm, under **Identity Stores**, delete the configuration for **OpenDJ**.

   The deployment will store non-administrative identities in the `alpha` realm.

Configure OAuth clients

The deployment depends on the following OAuth 2.0 clients:

Client ID	Description	In Top Level Realm?	In subrealms?
`idm-resource-server`	IDM uses this confidential client to introspect access tokens through the `/oauth2/introspect` endpoint to obtain information about users. This client is not used for OAuth 2.0 flows, only to introspect tokens. It is not a *real* OAuth 2.0 client, in the traditional sense. Rather, it is an OAuth 2.0 Resource Server account, used exclusively for token introspection. As such, you do not need to specify redirect URIs or grant types. When you configure the client, AM adds the `Authorization Code` grant type to the client profile by default. This client does not use it, but there's no requirement to remove it from the client profile.	✓	✕

Client ID	Description	In Top Level Realm?	In subrealms?
`idm-provisioning`	AM nodes in authentication journeys (trees) use this confidential client to authenticate through AM and provision identities through IDM. This client uses the client credentials flow, and does not authenticate resource owners other than itself.	✓	✓
`idm-admin-ui`	The Platform Admin UI uses this public client to access platform configuration features, such as identity management and journey (tree) editing. The client uses the implicit flow, and authenticates administrator users who are authorized to perform administrative operations.	✓	✓
`end-user-ui`	The End User UI uses this public client to access and present end user profile data. The client uses the implicit flow, and authenticates end users who are authorized to view and edit their profiles.	✓	✓

When configuring a client in more than one realm, make sure that the client configurations are identical.

Follow these steps to configure the OAuth 2.0 clients:

1. If you’re not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. In **the Top Level Realm**, configure an `idm-resource-server` client to introspect access tokens:
   - Select **Applications** > **OAuth 2.0** > **Clients**, and click **Add Client**.
   - Enter the following details:

    - **Client ID**: `idm-resource-server`
    - **Client secret**: `password`

      The value of this field must match the `clientSecret` that you will set in the `rsFilter` module in the IDM authentication configuration (`/path/to/openidm/conf/authentication.json`) during your IDM setup.
    - **Scopes**:
      `am-introspect-all-tokens`
      `am-introspect-all-tokens-any-realm`
  - Click **Create**.
3. In **the Top Level Realm and the `alpha` realm**, configure identical `idm-provisioning` clients to make calls to IDM:
  - Select **Applications > OAuth 2.0 > Clients**, and click **Add Client**.
  - Enter the following details:
    - **Client ID**: `idm-provisioning`
    - **Client secret**: `openidm`
    - **Scopes**: `fr:idm:*`
  - Click **Create**.
  - On the **Advanced** tab:
    - **Response Types**: Check that `token` is present (it should be there by default).
    - **Grant Types**: Remove `Authorization Code` and add `Client Credentials`.
  - Click **Save Changes**.
4. In **the Top Level Realm and the `alpha` realm**, configure identical `idm-admin-ui` clients that will be used by the Platform Admin UI:
  - Select **Applications > OAuth 2.0 > Clients**, and click **Add Client**.
  - Enter the following details:
    - **Client ID**: `idm-admin-ui`
    - **Client Secret**: (no client secret is required)
    - **Redirection URIs**:

      `http://openidm.example.com:8080/platform/appAuthHelperRedirect.html`
      `http://openidm.example.com:8080/platform/sessionCheck.html`
      `http://openidm.example.com:8080/admin/appAuthHelperRedirect.html`
      `http://openidm.example.com:8080/admin/sessionCheck.html`

```
http://admin.example.com:8082/appAuthHelperRedirect.html
http://admin.example.com:8082/sessionCheck.html
```

- **Scopes**:

  ```
  openid
  fr:idm:*
  ```

  > NOTE
  >
  > At a minimum, the scopes that you set here must include the scopes that you will set in the `rsFilter` authentication configuration (`/path/to/openidm/conf/authentication.json`) during your IDM setup.

- Click **Create**.
- On the **Core** tab:
  - **Client type**: Select `Public`.
  - Click **Save Changes**.
- On the **Advanced** tab:
  - **Grant Types**: Add `Implicit`.
  - **Token Endpoint Authentication Method**: Select `none`.
  - **Implied consent**: Enable.
  - Click **Save Changes**.

5. In **the Top Level Realm and the `alpha` realm**, configure identical `end-user-ui` clients that will be used by the Platform End User UI:
   - Select **Applications > OAuth 2.0 > Clients**, and click **Add Client**.
   - Enter the following details:
     - **Client ID**: `end-user-ui`
     - **Client Secret**: (no client secret is required)
     - **Redirection URIs**:

       ```
       http://enduser.example.com:8888/appAuthHelperRedirect.html
       http://enduser.example.com:8888/sessionCheck.html
       ```

     - **Scopes**:

       ```
       openid
       fr:idm:*
       ```

       NOTE

> NOTE
>
> At a minimum, the scopes that you set here must include the scopes that you will set in the `rsFilter` authentication configuration (`/path/to/openidm/conf/authentication.json`) during your IDM setup.

- Click **Create**.
- On the **Core** tab:
  - **Client type**: Select `Public`.
  - Click **Save Changes**.
- On the **Advanced** tab:
  - **Grant Types**: Add `Implicit`.
  - **Token Endpoint Authentication Method**: Select `none`.
  - **Implied Consent**: Enable.
  - Click **Save Changes**.

Configure OAuth 2.0 providers

1. If you’re not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. Configure a provider for the Top Level Realm:
   a. In the Top Level Realm, select **Services**, and click **Add a Service**.
   b. Under **Choose a service type**, select **OAuth2 Provider**.
   c. For **Client Registration Scope Allowlist**, add the following scopes:
   ```
   am-introspect-all-tokens
   am-introspect-all-tokens-any-realm
   fr:idm:*
   openid
   ```
   d. Click **Create**.
   e. On the **Advanced** tab, make sure that **Response Type Plugins** includes the following values:
   ```
   id_token|org.forgerock.openidconnect.IdTokenResponseTypeHandler
   code|org.forgerock.oauth2.core.AuthorizationCodeResponseTypeHandler
   ```
   f. Click **Save Changes**.
   g. On the **Consent** tab, enable **Allow Clients to Skip Consent**.
   h. Click **Save Changes**.
3. Configure a provider for the `alpha` realm:
   a. In the `alpha` realm, select **Services**, and click **Add a Service**.

b. Under **Choose a service type**, select **OAuth2 Provider**.

c. For **Client Registration Scope Allowlist**, add the following scopes:

```
fr:idm:*
openid
```

d. Click **Create**.

e. On the **Advanced** tab, make sure that **Response Type Plugins** includes the following values:

```
id_token|org.forgerock.openidconnect.IdTokenResponseTypeHandler
code|org.forgerock.oauth2.core.AuthorizationCodeResponseTypeHandler
```

f. Click **Save Changes**.

g. On the **Consent** tab, enable **Allow Clients to Skip Consent**.

h. Click **Save Changes**.

Configure an IDM provisioning service

1. If you're not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. From the top menu, select **Configure** > **Global Services** > **IDM Provisioning**.

   The AM admin UI does not let you configure an IDM provisioning service in a realm.
3. Set the following fields:
   - **Enabled**
   - **Deployment URL**: `http://openidm.example.com:8080`
   - **Deployment Path**: `openidm`
   - **IDM Provisioning Client**: `idm-provisioning`
4. Click **Save Changes**.

TIP

TIP

If some resource strings in the AM admin UI do not resolve properly at setup time, the UI labels mentioned will show internal keys instead of the labels shown in the steps above. Use the following table to check that you have the correct service and fields:

UI label	Internal label
IDM Provisioning	`IdmIntegrationService`
Enabled	`enabled`
Deployment URL	`idmDeploymentUrl`
Deployment Path	`idmDeploymentPath`
IDM Provisioning Client	`idmProvisioningClient`

Configure a validation service

The Platform UIs need this validation service allow listing for `goto` redirection.

1. If you're not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. In the `alpha` realm, select **Services**, and click **Add a Service**.
3. Under **Choose a service type**, select **Validation Service**.
4. For **Valid goto URL Resources**, add the URLs for the Platform UI:

   ```
   http://admin.example.com:8082/*
   http://admin.example.com:8082/*?*
   http://login.example.com:8083/*
   http://login.example.com:8083/*?*
   http://enduser.example.com:8888/*
   http://enduser.example.com:8888/*?*
   ```

5. Click **Create**.

Enable CORS support

Cross-origin resource sharing (CORS) lets user agents make requests across domains.

1. If you're not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. From the top menu, select **Configure > Global Services > CORS Service**.
3. On the **Secondary Configurations** tab, click **Add a Secondary Configuration**.
4. On the **New Configuration** screen, enter the following values:

   - **Name** : `Cors Configuration`
   - **Accepted Origins** :

     ```
     http://login.example.com:8083
     http://admin.example.com:8082
     http://enduser.example.com:8888
     http://openidm.example.com:8080
     https://openidm.example.com:8443
     ```

     List only the origins that will be hosting OAuth 2.0 clients (such as the `platform-enduser` and IDM admin UIs).
   - **Accepted Methods**:

     ```
     DELETE
     GET
     HEAD
     PATCH
     POST
     PUT
     ```
   - **Accepted Headers**:

     ```
     accept-api-version
     authorization
     cache-control
     content-type
     if-match
     if-none-match
     user-agent
     x-forgerock-transactionid
     x-openidm-nosession
     x-openidm-password
     x-openidm-username
     x-requested-with
     ```
   - **Exposed Headers**: `WWW-Authenticate`
5. Click **Create**.
6. On the **Cors Configuration** screen, set the following values:
   - **Enable the CORS filter**: Enable
   - **Max Age**: `600`
   - **Allow Credentials**: Enable
7. Click **Save Changes**.

Configure authentication trees

The platform deployment relies on three authentication trees to enable authentication through AM. When you extract the AM `.zip` file, you will get a `sample-trees-7.2.0.zip` file that contains a number of sample authentication trees, in JSON files. Use the Amster command-line utility to import the platform authentication trees into your AM configuration:

1. Extract the `sample-trees-7.2.0.zip` file, and list the sample trees in the `root/AuthTree` directory:

```
ls /path/to/openam-samples/root/AuthTree
Agent.json
PlatformForgottenUsername.json
Example.json                       PlatformLogin.json
Facebook-ProvisionIDMAccount.json
PlatformProgressiveProfile.json
Google-AnonymousUser.json          PlatformRegistration.json
Google-DynamicAccountCreation.json PlatformResetPassword.json
HmacOneTimePassword.json           PlatformUpdatePassword.json
PersistentCookie.json              RetryLimit.json
```

2. In all the sample tree files, replace `"realm" : "/"` with `"realm" : "/alpha"`.
3. Download and install Amster.
4. Start Amster, then connect to your AM instance:

```
./amster
Amster OpenAM Shell (version build build, JVM: version)
Type ':help' or ':h' for help.
--------------------------------------------------------------
-------------
am> connect --interactive http://am.example.com:8081/am
Sign in
User Name: amAdmin
Password: Passw0rd
amster am.example.com:8081> :exit
```

5. Import the sample authentication trees and nodes:

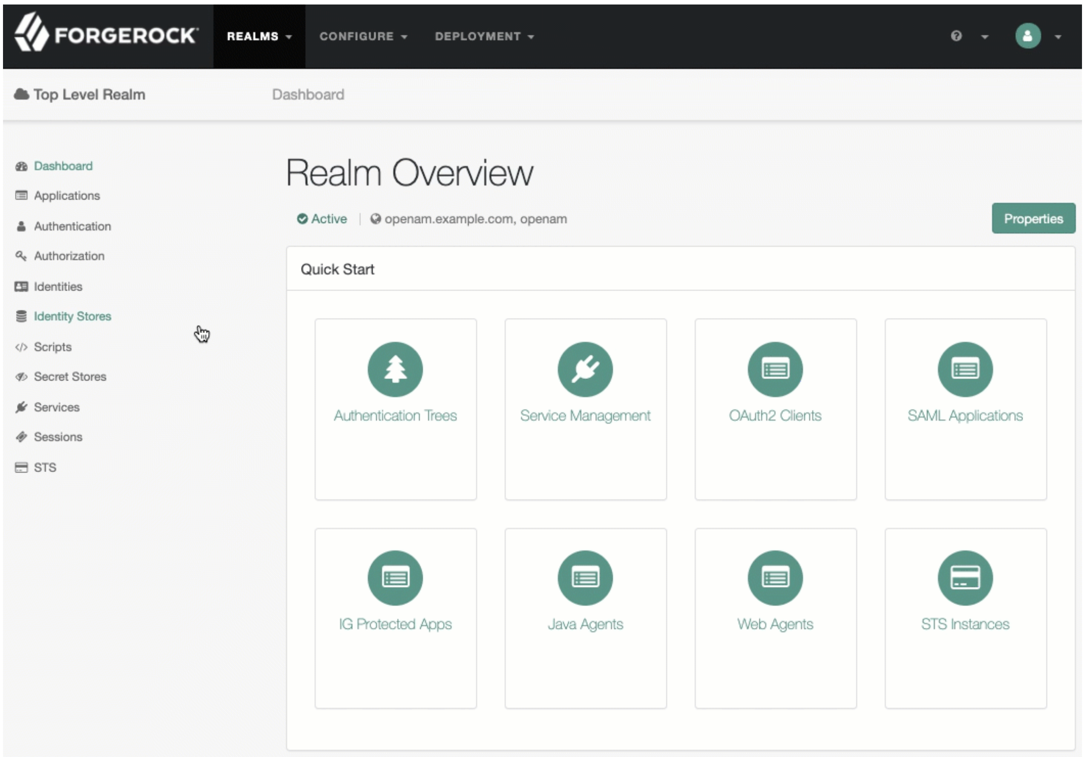
```
amster am.example.com:8081>import-config --path
/path/to/openam-samples/root
Importing directory /path/to/openam-
samples/root/AcceptTermsAndConditions
...
Import completed successfully
```

6. If you’re not currently logged in to the AM admin UI as the `amAdmin` user, log in.

7. Configure the `PlatformRegistration` tree:

   - In the `alpha` realm, select **Authentication** > **Trees**, and click **PlatformRegistration**.
   - On the `PlatformRegistration` tree, add a `Success URL` node between `Increment Login Count` and `Success`, and set its value to `http://enduser.example.com:8888/?realm=alpha`.

     ▼ Show me

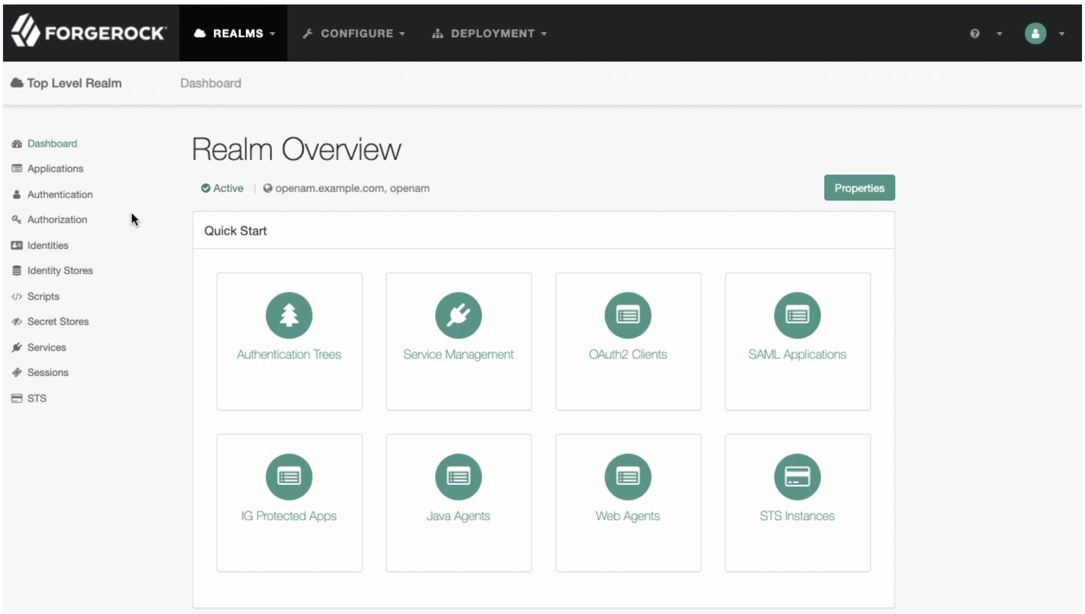
     

   - Click **Save**.

8. Configure the `PlatformLogin` tree:

   - In the `alpha` realm, select **Authentication** > **Trees**, and click **PlatformLogin**.
   - On the `PlatformLogin` tree, add a `Success URL` node between `Inner Tree Evaluator` and `Success`, and set its value to `http://enduser.example.com:8888/?realm=alpha`.

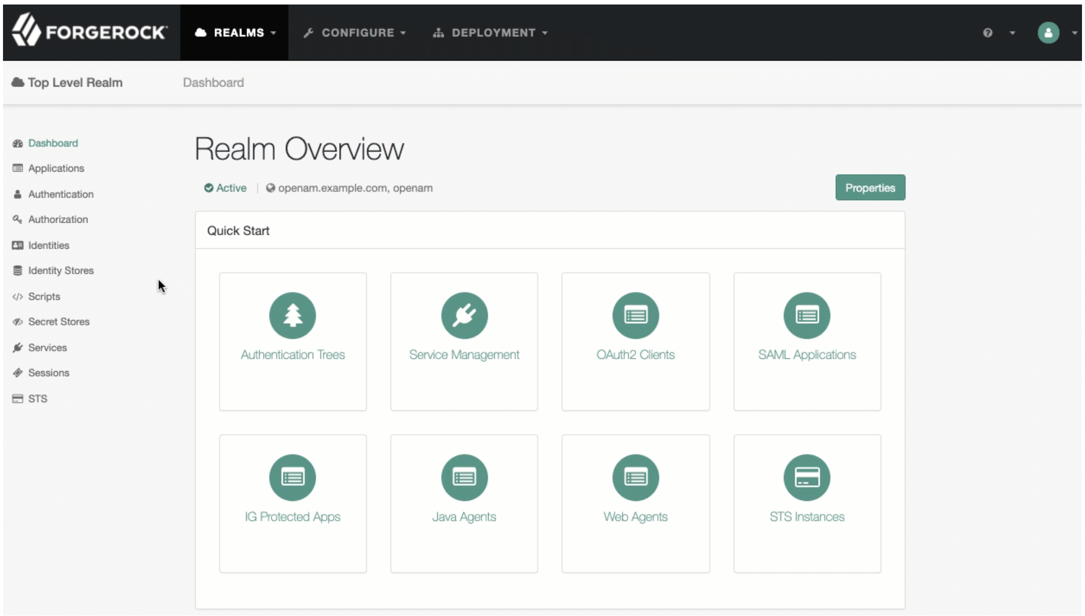
     ▼ Show me



- Click **Save**.

9. Configure the `PlatformResetPassword` tree:
   - In the `alpha` realm, select **Authentication** > **Trees**, and click **PlatformResetPassword**.
   - On the `PlatformResetPassword` tree, add a `Success URL` node between `Patch Object` and `Success`, and set its value to `http://enduser.example.com:8888/?realm=alpha`.

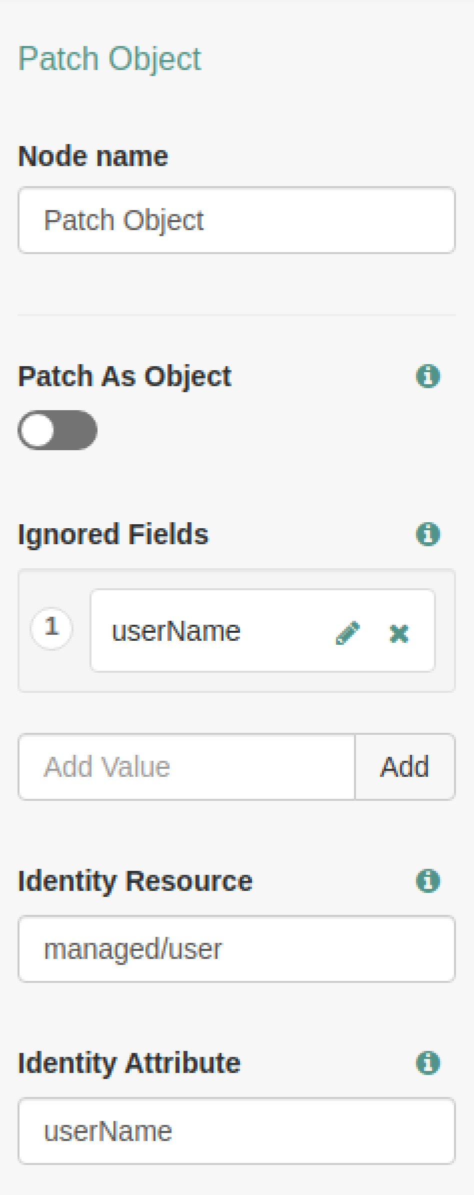
     ▼ *Show me*



   - Click **Save**.

10. Configure the `PlatformUpdatePassword` tree:
    - In the `alpha` realm, select **Authentication** > **Trees**, and click **PlatformUpdatePassword**.
    - On the `PlatformUpdatePassword` tree, select the `Patch Object` node, and make sure `Patch As Object` is disabled.

▼ *Show me*



Patch Object

Node name: Patch Object

Patch As Object: ○ (off)

Ignored Fields:
1. userName

Add Value | Add

Identity Resource: managed/user

Identity Attribute: userName

- Click **Save**.

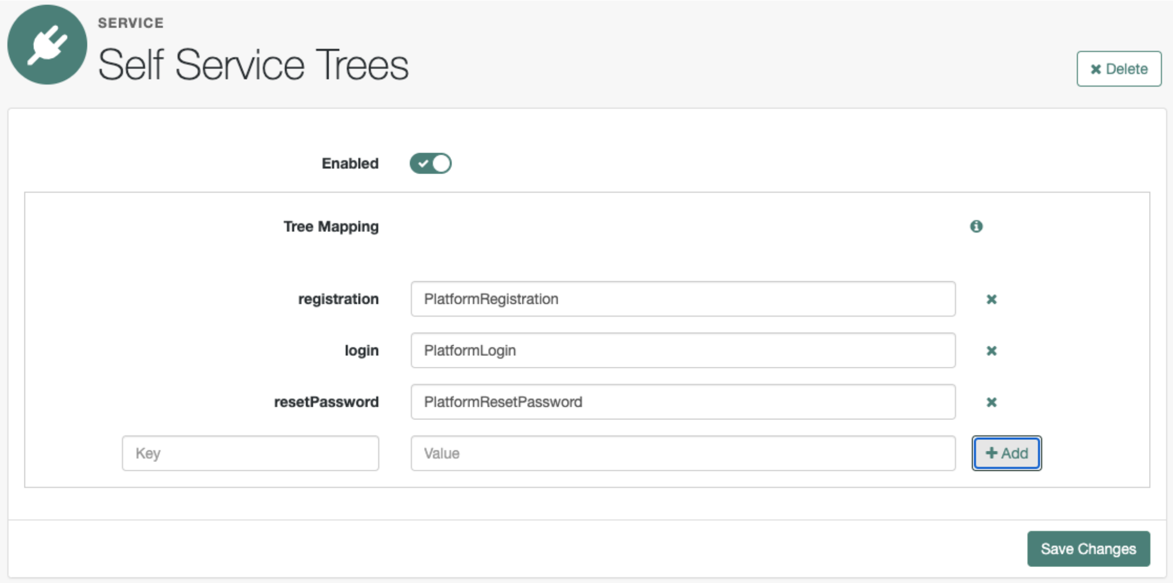
11. For the authentication trees that require email, set the **External Login Page URL**.
    - In the `alpha` realm, select **Authentication > Settings**, and click the **General** tab.
    - Set **External Login Page URL** to `http://login.example.com:8083` , then click **Save Changes**.

Map authentication trees

Map the platform authentication trees to the corresponding Self-Service endpoints. For more information about this step, see Configure self-service trees endpoints.

1. In the `alpha` realm, select **Services**, and click **Add a Service**.
2. Under **Choose a service type**, select **Self Service Trees**, and click **Create**.
3. Add the following tree mappings:

Key	Value
`registration`	`PlatformRegistration`
`login`	`PlatformLogin`
`resetPassword`	`PlatformResetPassword`



SERVICE

Self Service Trees

Enabled: ✓

Tree Mapping

registration	PlatformRegistration
login	PlatformLogin
resetPassword	PlatformResetPassword

4. Click **Save Changes**.

Set up IDM

This procedure sets up IDM with an external DS instance as the repository. The DS instance is shared with AM as the identity store. The procedure reflects the listed server settings for installing IDM and DS.

1. Follow the instructions in the IDM documentation to download and install IDM.
2. Edit the `/path/to/openidm/resolver/boot.properties` file to set the hostname:

```
openidm.host=openidm.example.com
```

3. Configure the shared IDM repository.

   This step assumes that you have set up the identity store, and exported the DS CA certificate from `identities.example.com` (as shown in Step 4 of Secure connections).

   - Import the DS CA certificate into the IDM truststore:

```
keytool \
-importcert \
-alias identities-ca-cert \
-file /path/to/identities-ca-cert.pem \
-keystore /path/to/openidm/security/truststore \
-storepass:file /path/to/openidm/security/storepass
Owner: CN=Deployment key, O=ForgeRock.com
Issuer: CN=Deployment key, O=ForgeRock.com
...
Trust this certificate? [no]:  yes
Certificate was added to keystore
```

- Replace the default `conf/repo.ds.json` file with this repo.ds.json file.

> IMPORTANT
>
> Replace the values of `fileBasedTrustManagerFile` and `fileBasedTrustManagerPasswordFile` with the path to your IDM truststore and truststore password file.
>
> Check that the properties under `ldapConnectionFactories` match the DS server that you set up as the identity store.

4. It is worth starting IDM at this point, to make sure that it can connect to the external DS repository.

   a. Set the `JAVA_HOME` environment variable.

   b. Start IDM, and wait until you see `OpenIDM ready` in the output:

```
/path/to/openidm/startup.sh
-> OpenIDM version "7.2.0" <build-info>
OpenIDM ready
```

5. Update the `user` object in your managed object configuration by making the following changes to your `conf/managed.json` file.

   All changes are made to the object `user > schema > properties`:

```
{
    "objects": [
        {
            "name": "user",
            ...
            "schema": {
            "properties": {
                ...
            }
            ...
        }
    ]
}
```

- Remove encryption from the `password` property. Remove:

  ```
  "encryption" : {
      "purpose": "idm.password.encryption"
  }
  ```

  Password *encryption* is not supported in a shared identity store setup. Instead, the shared identity store supports only *hashed* passwords, a format that both AM and IDM can use. This differs from Separate identity stores, where AM and IDM do not share the identity store, and so each service can store passwords in different formats.

- Update the `password` property to ensure that users update their passwords through the self-service APIs, not directly:

  ```
  "userEditable" : false
  ```

- Add a `cn` property to the `user` object:

  ```
  {
      "objects": [
          {
              "name": "user",
              ...
              "schema": {
                  "properties" : {
                      "_id" : {
                          ...
                      },
                      "cn": {
                          "title": "Common Name",
                          "description": "Common Name",
                          "type": "string",
                          "viewable": false,
                          "searchable": false,
                          "userEditable": false,
                          "scope": "private",
                          "isPersonal": true,
                          "isVirtual": true,
                          "onStore": {
  ```

```
                            "type": "text/javascript",
                            "source": "object.cn ||
(object.givenName + ' ' + object.sn)"
                        }
                    },
                    ...
            }
            ...
        }
    ]
}
```

- Configure social authentication.

  Add an `aliasList` property to the `user` object:

  ```
  "aliasList": {
      "title": "User Alias Names List",
      "description": "List of identity aliases used
  primarily to record social IdP subjects for this user",
      "type": "array",
      "items": {
          "type": "string",
          "title": "User Alias Names Items"
      },
      "viewable": false,
      "searchable": false,
      "userEditable": true,
      "returnByDefault": false,
      "isVirtual": false
  },
  ```

6. Change the authentication mechanism to `rsFilter` only:

   - Replace the default `conf/authentication.json` file with this authentication.json file.

   - Check that the `clientSecret` matches the `Client secret` that you set for the `idm-resource-server` client in AM (see Configure OAuth Clients).

   - Check that the `rsFilter > subjectMapping > propertyMapping > sub` property is correctly configured.

     The `authentication.json` file aligns with the default AM configuration for subject claim uniqueness. AM refers to the subject by its unique identifier, and so IDM does, too.

If AM has its advanced server property, `org.forgerock.security.oauth2.enforce.sub.claim.uniqueness`, set to `false`, for example, because you upgraded from a previous release of AM, use this property mapping instead:

```
"propertyMapping": {
    "sub": "userName"
}
```

AM refers to the subject by its username in this case. For details, see the reference for the setting in the AM documentation.

For more information about authenticating using the `rsFilter`, see Authenticate through AM in the IDM documentation.

7. Edit the IDM admin UI configuration so that you can still authenticate through the IDM admin UI:

   - In your `/path/to/openidm/conf/ui-configuration.json` file, insert a `platformSettings` object into the `configuration` object:

```
{
    "configuration" : {
        ...
        "platformSettings" : {
            "adminOauthClient" : "idm-admin-ui",
            "adminOauthClientScopes" : "fr:idm:*",
            "amUrl" : "http://am.example.com:8081/am",
            "loginUrl" : ""
        }
    }
}
```

   This object tells the IDM admin UI that it is operating in "platform mode" (that is, as an OAuth 2.0 client of AM).

   - In your `conf/ui.context-admin.json` file, check that `X-Frame-Options` is set to `SAMEORIGIN`:

▼ *Sample ui.context-admin.json*

```
{
    "enabled" : true,
    "cacheEnabled": true,
    "urlContextRoot" : "/admin",
    "defaultDir" : "&{idm.install.dir}/ui/admin/default",
    "extensionDir" : "&
{idm.install.dir}/ui/admin/extension",
    "responseHeaders" : {
        "X-Frame-Options" : "SAMEORIGIN"
    }
}
```

8. Configure the CORS servlet filter.

   Replace the default `conf/servletfilter-cors.json` file with this servletfilter-cors.json file.

9. If you have not already started IDM, start it now, and test that you can access the IDM admin UI at http://openidm.example.com:8080/admin.

   When you log in to the IDM admin UI, use the default AM administrative user (`amAdmin`), and not `openidm-admin` .

10. If you want to use the `PlatformForgottenUsername` or `PlatformResetPassword` trees, configure outbound email.

    > NOTE
    >
    > After you have installed the Platform UI, you can configure email through the UI at `http://openidm.example.com:8080/admin` .

IDM is now configured for this deployment. Move on to setting up the Platform UIs.

Platform UIs

The ForgeRock® Identity Platform includes three UIs:

Admin UI

Lets platform administrators manage applications, identities, end user journeys, and so on.

End User UI

An example UI that demonstrates profile maintenance, consent management, workflow, and delegated administration capabilities. This UI makes REST calls to IDM (using an OAuth 2 bearer token) and to AM (using an SSO cookie).

> IMPORTANT
>
> This UI is *not* the same as the standalone IDM End User UI.
>
> The platform End User UI is designed specifically for an integrated platform deployment.
>
> The IDM end user UI should be used only in a standalone IDM deployment.

Login UI

A unified Login UI that lets both administrators and end users log in to the platform.

This document describes two ways to deploy the UIs:

- By running Docker images
- By installing a `.zip` file in the AM web container

Run Docker images

In this deployment, the three UIs are deployed from three Docker images.

> IMPORTANT
>
> Either deploy the Platform UI by running Docker images or by installing a `.zip` file, but do not attempt to deploy the UI both ways.
>
> If you have already deployed the Platform UI by installing a `.zip` file, do not perform these steps.

1. Download the Docker images:
   - Download the Admin UI:

     ```
     docker pull gcr.io/forgerock-io/platform-admin-ui:7.2.0
     ```

   - Download the End User UI:

     ```
     docker pull gcr.io/forgerock-io/platform-enduser-ui:7.2.0
     ```

   - Download the Login UI:

     ```
     docker pull gcr.io/forgerock-io/platform-login-ui:7.2.0
     ```

2. Create an environment file named `platform_env` that will be passed to the `docker` command.

   The file should have the following contents:

   ```
   AM_URL=http://am.example.com:8081/am
   AM_ADMIN_URL=http://am.example.com:8081/am/ui-admin
   IDM_REST_URL=http://openidm.example.com:8080/openidm
   IDM_ADMIN_URL=http://openidm.example.com:8080/admin
   IDM_UPLOAD_URL=http://openidm.example.com:8080/upload
   IDM_EXPORT_URL=http://openidm.example.com:8080/export
   ENDUSER_UI_URL=http://enduser.example.com:8888
   PLATFORM_ADMIN_URL=http://admin.example.com:8082
   ```

```
ENDUSER_CLIENT_ID=end-user-ui
ADMIN_CLIENT_ID=idm-admin-ui
THEME=default
PLATFORM_UI_LOCALE=en
```

3. Start each Docker container, specifying the environment file:

- Change to the directory in which you saved the `platform_env` file, then start the Login UI:

```
docker run -t -i --rm -p 8083:8080 --env-file=platform_env \
gcr.io/forgerock-io/platform-login-ui:7.2.0
Replacing env vars in JS

Setting AM URL as http://am.example.com:8081/am
Setting AM ADMIN URL as http://am.example.com:8081/am/ui-admin
Setting IDM REST URL as
http://openidm.example.com:8080/openidm
Setting IDM ADMIN URL as http://openidm.example.com:8080/admin
...
```

NOTE

The `--rm` option causes the **`docker run`** command to remove the container on exit. Remove this option if you want to keep a container when it exits.

- In a new terminal, change to the directory in which you saved the `platform_env` file, then start the Admin UI:

```
docker run -t -i --rm -p 8082:8080 --env-file=platform_env \
gcr.io/forgerock-io/platform-admin-ui:7.2.0
Replacing env vars in JS

Setting AM URL as http://am.example.com:8081/am
Setting AM ADMIN URL as http://am.example.com:8081/am/ui-admin
Setting IDM REST URL as
http://openidm.example.com:8080/openidm
Setting IDM ADMIN URL as http://openidm.example.com:8080/admin
...
```

- In a new terminal, change to the directory in which you saved the `platform_env` file, then start the End User UI:

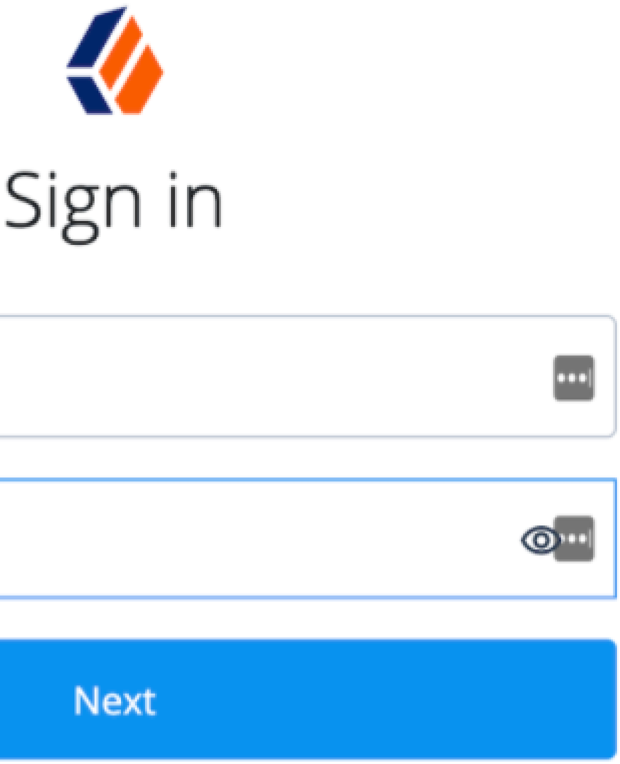
```
docker run -t -i --rm -p 8888:8080 --env-file=platform_env \
gcr.io/forgerock-io/platform-enduser-ui:7.2.0
```

```
Replacing env vars in JS

Setting AM URL as http://am.example.com:8081/am
Setting AM ADMIN URL as http://am.example.com:8081/am/ui-admin
Setting IDM REST URL as
http://openidm.example.com:8080/openidm
Setting IDM ADMIN URL as http://openidm.example.com:8080/admin
...
```

1. Test access to the Admin UI by logging in through the Login UI.

   Go to http://login.example.com:8083/?realm=/.

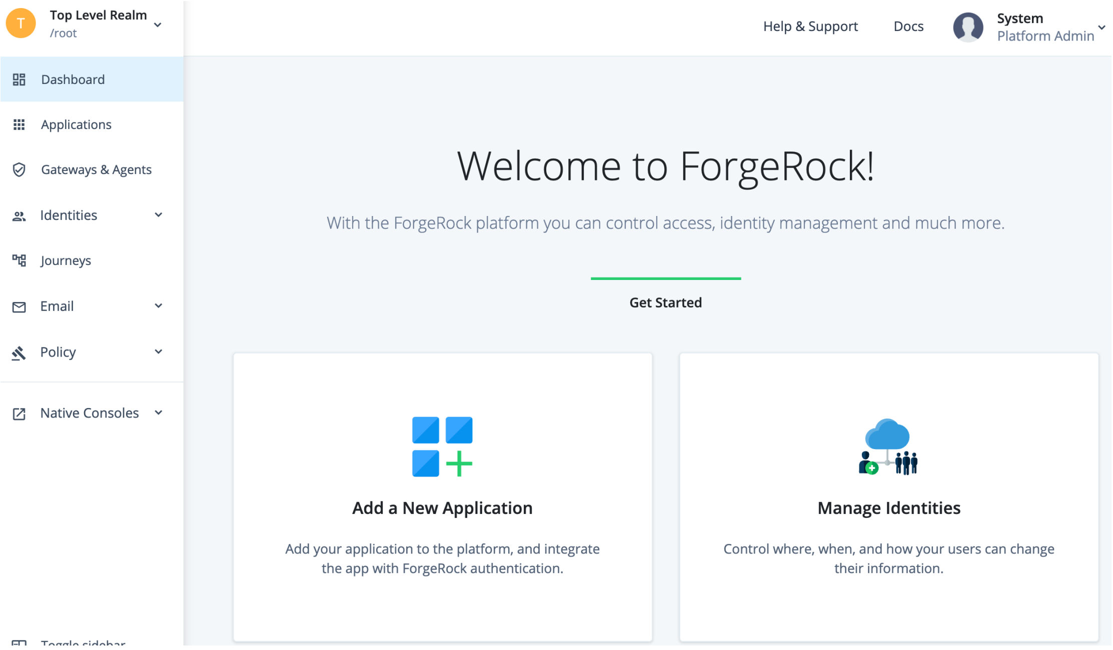


Sign in

User Name:
amAdmin

Password:
•••••••••

2. Sign in as `amAdmin` . You are redirected to the Admin UI:



Welcome to ForgeRock!

With the ForgeRock platform you can control access, identity management and much more.

Add a New Application

Add your application to the platform, and integrate the app with ForgeRock authentication.

Manage Identities

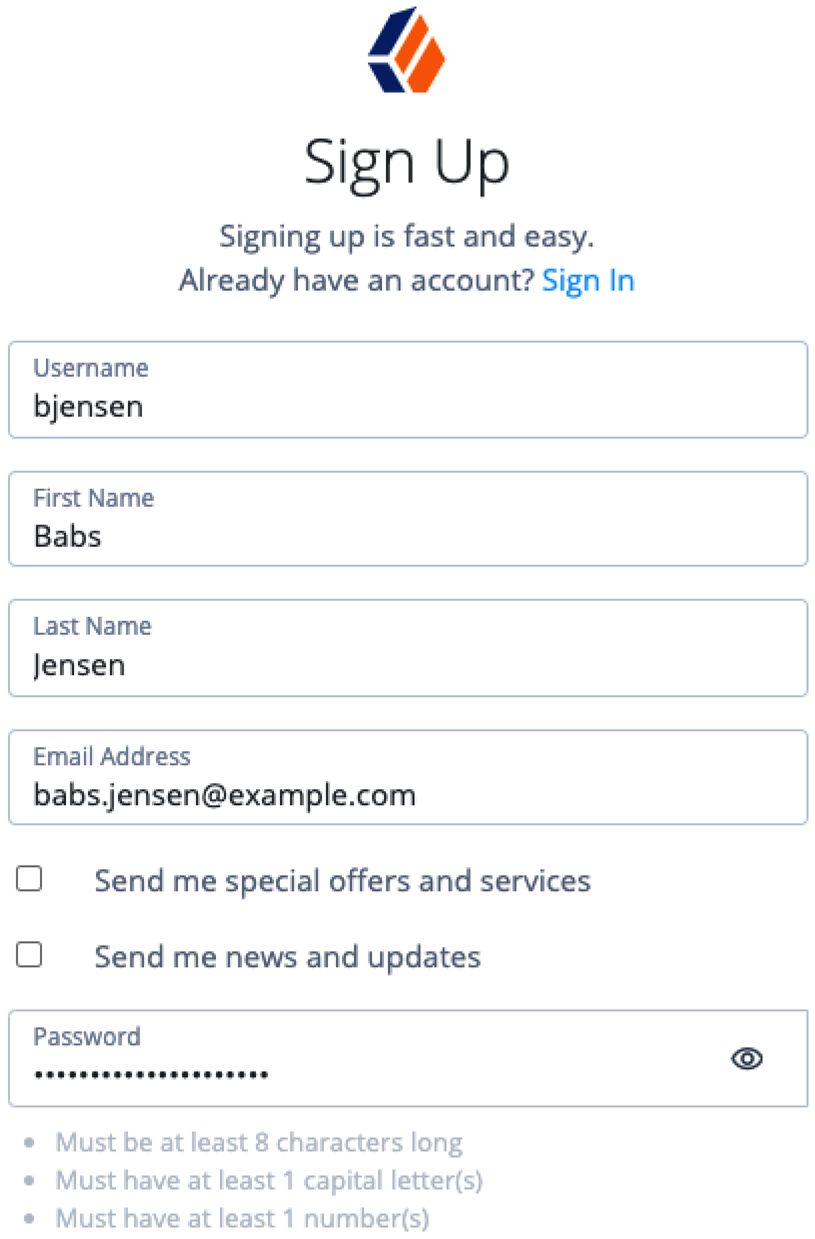
Control where, when, and how your users can change their information.

3. Sign out of the Admin UI.

4. To test the End User UI, self-register as a new user.

   Go to http://login.example.com:8083/?realm=/alpha#/service/PlatformLogin.

   Click **Create an account**.



Sign Up

Signing up is fast and easy.
Already have an account? Sign In

Username: bjensen

First Name: Babs

Last Name: Jensen

Email Address: babs.jensen@example.com

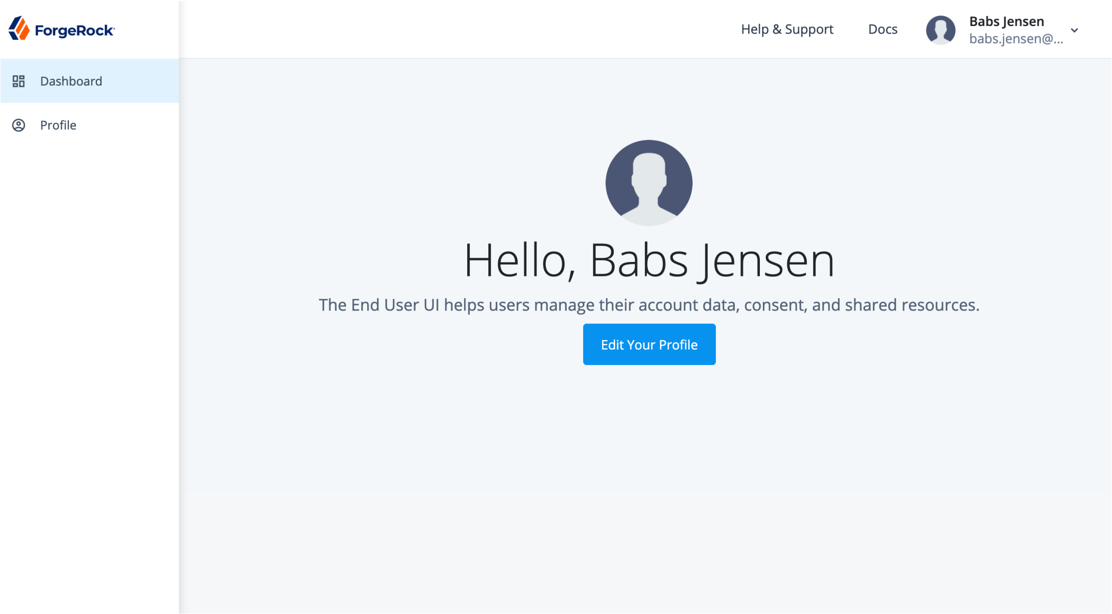
□ Send me special offers and services

□ Send me news and updates

Password: ••••••••••••••••••••••

- Must be at least 8 characters long
- Must have at least 1 capital letter(s)
- Must have at least 1 number(s)

5. When the required fields have been completed, you are logged into the End User UI, as that user:



Hello, Babs Jensen

The End User UI helps users manage their account data, consent, and shared resources.

Install a `.zip` file

In this deployment, you obtain the three UIs from a `.zip` file that you get from ForgeRock. Then, you install them in the AM web container. You also tweak the AM and IDM configurations so that they work with this UI installation.

> IMPORTANT
>
> Either deploy the Platform UI by running Docker images or by installing a `.zip` file, but do not attempt to deploy the UI both ways.
>
> If you have already deployed the Platform UI by running Docker images, do not perform these steps.

1. Get the UI `.zip` file, and unzip it into the `tmp` directory:
   a. Create the `/tmp/ui-zip` directory.
   b. Download the most recent version of the 7.2.x UI `.zip` file from the Platform section of the ForgeRock downloads site.
   c. Copy the UI `.zip` file into the `/tmp/ui-zip` directory.
   d. Unzip the UI `.zip` file.
2. Replace URLs in the UI application with URLs for your ForgeRock Identity Platform deployment:
   a. Change to the `/tmp/ui-zip/PlatformUI` directory.
   b. Run the following commands:

```
export AM_URL=http://am.example.com:8081/am
export AM_ADMIN_URL=http://am.example.com:8081/am/ui-admin
export
IDM_REST_URL=http://openidm.example.com:8080/openidm
```

```
export IDM_ADMIN_URL=http://openidm.example.com:8080/admin
export
IDM_UPLOAD_URL=http://openidm.example.com:8080/upload
export
IDM_EXPORT_URL=http://openidm.example.com:8080/export
export ENDUSER_UI_URL=http://am.example.com:8081/enduser
export
PLATFORM_ADMIN_URL=http://am.example.com:8081/platform
export ENDUSER_CLIENT_ID=end-user-ui
export ADMIN_CLIENT_ID=idm-admin-ui
export THEME=default
export PLATFORM_UI_LOCALE=en
```

c. Run the **`variable_replacement.sh`** script.

This script replaces variables in the `.zip` file's UI web application with the values of the environment variables that you set in the previous step:

```
./variable_replacement.sh www/platform/js/*.js
www/enduser/js/*.js www/login/js/*.js
Replacing env vars in JS

Setting AM URL as http://am.example.com:8081/am
Setting AM ADMIN URL as http://am.example.com:8081/am/ui-
admin
Setting IDM REST URL as
http://openidm.example.com:8080/openidm
...
```

3. Install the UI:

a. Install the `platform` and `enduser` web applications into AM's web container:

```
cd /path/to/tomcat/webapps
cp -r /tmp/ui-zip/PlatformUI/www/platform .
cp -r /tmp/ui-zip/PlatformUI/www/enduser .
```

b. Modify AM to use the new Login UI:

```
cd /path/to/tomcat/webapps/am/XUI
cp -r /tmp/ui-zip/PlatformUI/www/login/* .
```

4. Revise the AM and IDM configurations to work with the new UI installation:

a. If you're not currently logged in to the AM admin UI as the `amAdmin` user, log in.

b. Revise the success URL for three authentication trees, so that they refer to the End User UI:

   i. Change the success URL for the `Platform Regstration` tree.

      In the `alpha` realm, select **Authentication > Trees**, and click on **PlatformRegistration**. Select the **Success URL** node. Change the **Success URL** value to **http://am.example.com:8081/enduser**, and then click **Save**.

   ii. Use the same technique to change the **Success URL** value for the `PlatformLogin` tree to **http://am.example.com:8081/enduser**.

   iii. Use the same technique to change the **Success URL** value for the `PlatformResetPassword` tree to **http://am.example.com:8081/enduser**.

c. Clear the **External Login Page URL** value.

   In the `alpha` realm, select **Authentication > Settings**, and click the **General** tab. Set **External Login Page URL** to an empty string, and then click **Save Changes**.

d. Log out of the AM admin UI.

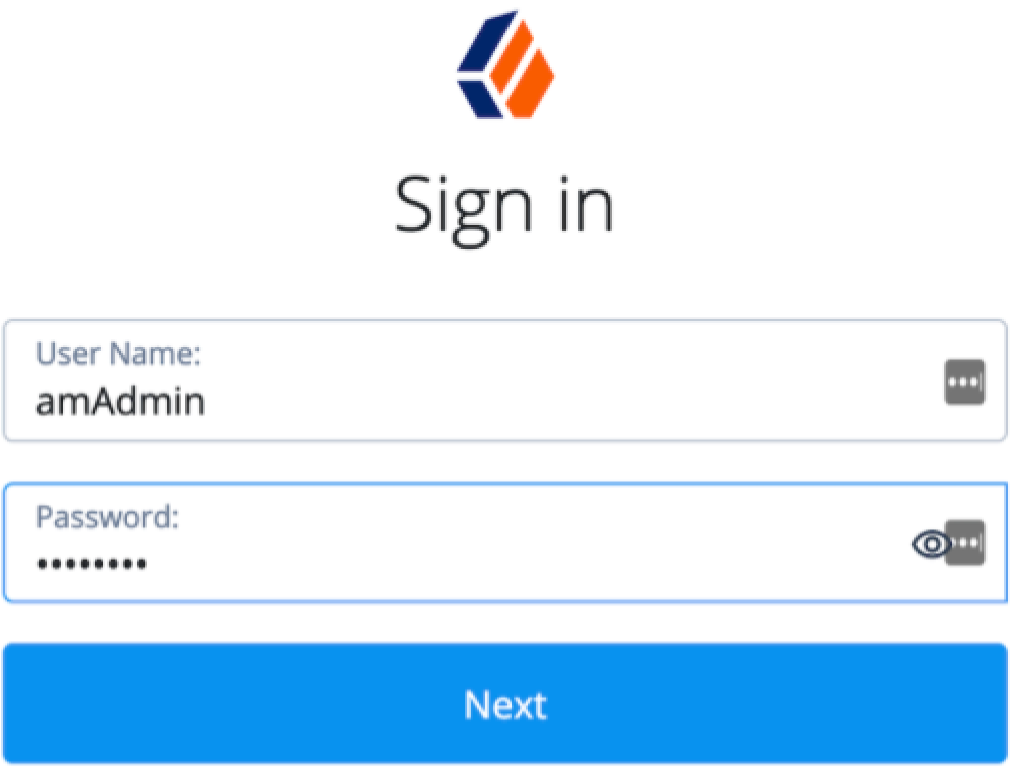
e. Create the `/path/to/openidm/conf/ui-themerealm.json` file with the following contents:

```
{
    "realm": {}
}
```

5. Test access to the Admin UI:

   a. Go to http://am.example.com:8081/platform.

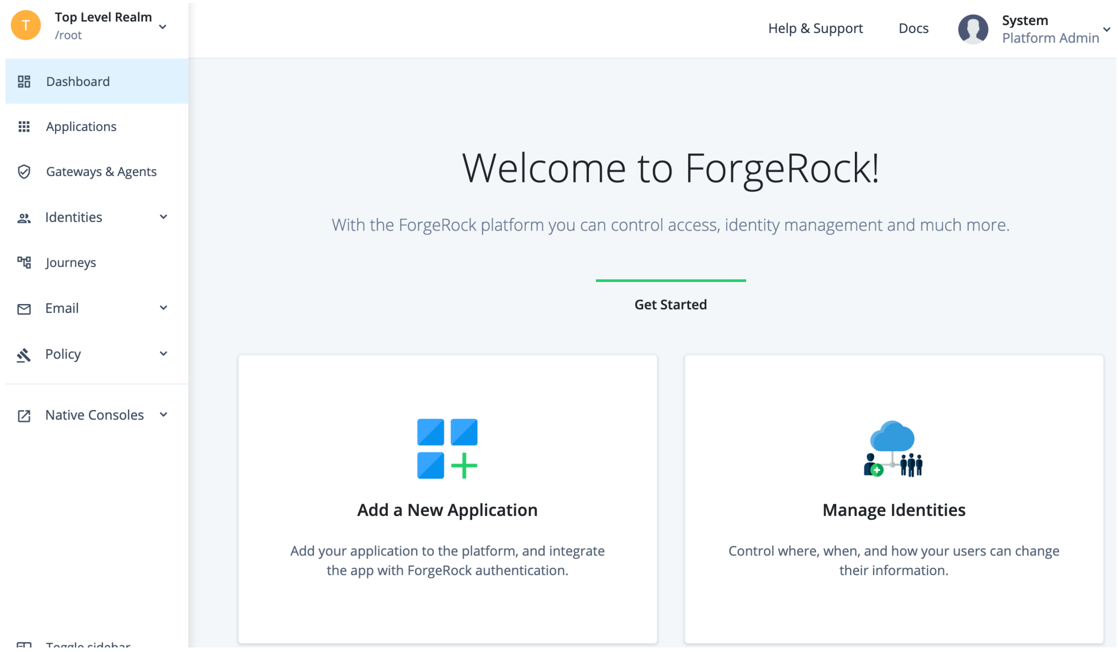
      The Sign in page appears:



User Name: amAdmin

Password: •••••••••

b. Sign in as the `amAdmin` user. You are redirected to the Admin UI:



Welcome to ForgeRock!

With the ForgeRock platform you can control access, identity management and much more.

Add your application to the platform, and integrate the app with ForgeRock authentication.

Control where, when, and how your users can change their information.

6. Test access to the End User UI:

   a. In the Admin UI, create a test user:

      i. Click **Identities > Manage**.

      ii. Click **+ New User**.

      iii. Fill in the user details.

      iv. Click **Save**.

   b. Sign out of the Admin UI.

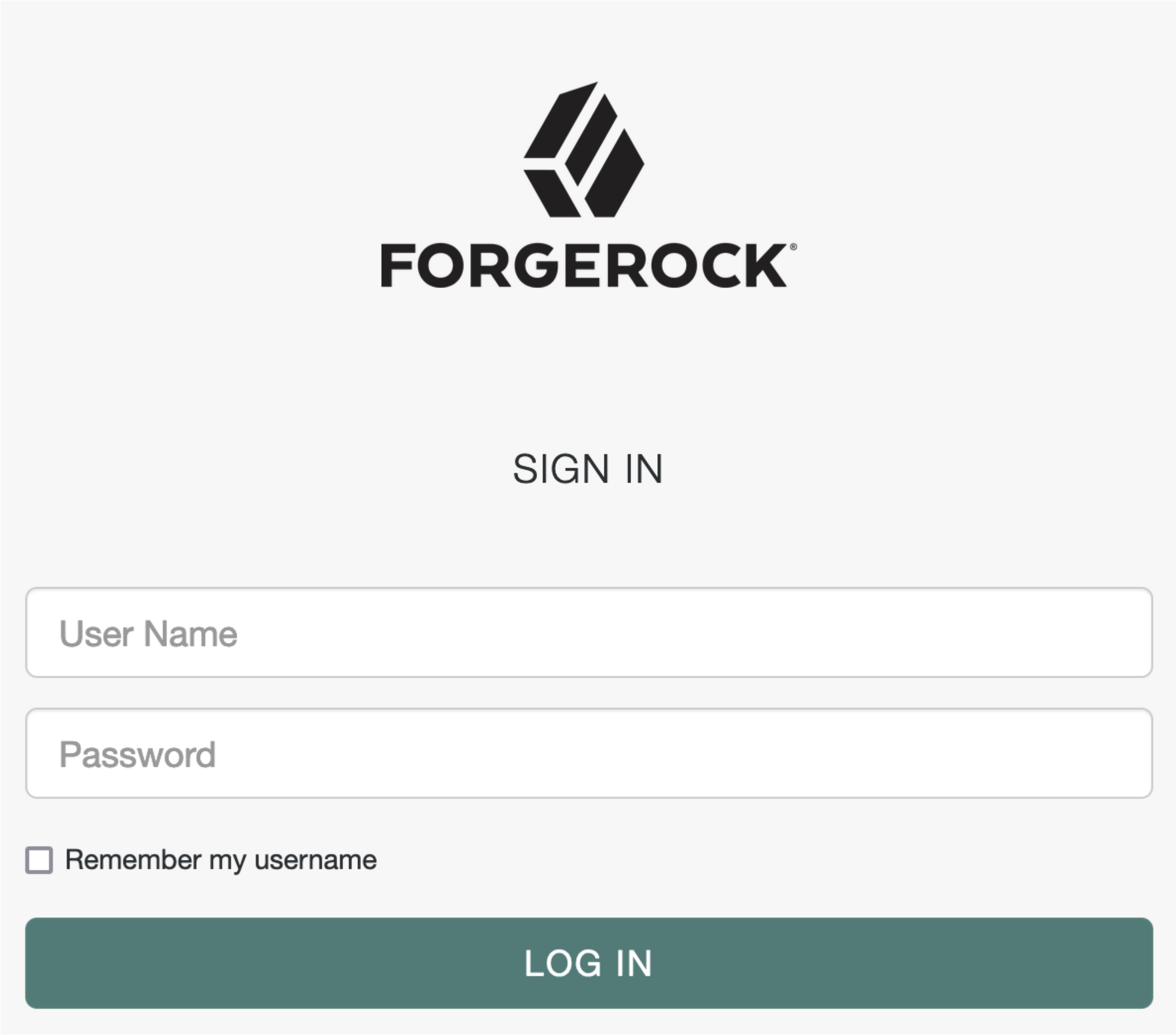
c. Go to http://am.example.com:8081/enduser.

   The Sign in page appears.

d. Sign in as the test user you just created. You should be redirected to the End User UI.

Redirect on signout

When the test user signs out of the End User UI, the browser redirects to the AM XUI login page:



You can change this behavior to redirect to your application. Options for managing redirection on sign out include:

- Use IG, as described in Protect the deployment, with a route to redirect the browser from the XUI to your application.

  If you choose this option, skip the steps that follow.

- Script a `post_logout_url` claim that AM returns to the End User UI through the user's ID token. When the user signs out, the End User UI redirects the browser to the URL specified in the claim.

Follow these steps to configure a `post_logout_url` claim:

1. If you're not currently logged in to the AM admin UI as the `amAdmin` user, log in.
2. Under **Scripts**, find the **OIDC Claims Script**, and click to view the script.

   This script lets you customize the OpenID Connect 1.0 claims in the user's ID token.
3. Add a `post_logout_url` claim method to the array of `claimAttributes`.

   The following Groovy example adds a final item to `claimAttributes` to return `https://forgerock.com` as the `post_logout_url` claim. Adapt the method used to return the appropriate URL for your application:

   ```
   claimAttributes = [
           //...,
           "post_logout_url": { claim, identity -> return
   [(claim.getName()): "https://forgerock.com"] }
   ]
   ```
4. Add the claim for the `fr:idm:*` scope as a final item in the `scopeClaimsMap`:

   ```
   scopeClaimsMap = [
           //...,
           "fr:idm:*": [ "post_logout_url" ]
   ]
   ```
5. Click **Validate**, correct any errors accidentally introduced, and then click **Save Changes**.
6. Under **Services** > **OAuth2 Provider**, search for `Always Return Claims in ID Tokens`, then enable the option, and click **Save Changes**.

   AM can now return the custom claim in the user's ID token.
7. Test the changes you have made:

   a. Log out of the AM admin UI.

   b. Sign in as a test user at http://login.example.com:8083/?realm=/alpha#/service/PlatformLogin.

   c. Sign out.

      The End User UI redirects the browser to the URL you configured for the `post_logout_url` claim, in this case the main ForgeRock site.

Protect the deployment

After you set up a sample deployment according to Separate identity stores or Shared identity store, you have a functionally complete ForgeRock Identity Platform installation.

Notice, however, that your deployment is lacking security. Except when connecting to the directory service, connections use HTTP, not HTTPS. Users send their login credentials in unprotected cleartext.

The instructions that follow show how to add ForgeRock Identity Gateway (IG) to your deployment, providing a single point of entry to ForgeRock Identity Platform, and securing communications from outside with HTTPS.

IMPORTANT

- The following examples deploy IG on `platform.example.com` using port 9443 for HTTPS. Adapt the examples as necessary for your deployment.

  For example, if you are demonstrating the deployment on your computer, add an alias for the fully qualified domain name to your `/etc/hosts` file:

  ```
  127.0.0.1    platform.example.com
  ```

- Before using IG to protect the deployment, make sure that AM uses `example.com` as the cookie domain.

  This setting ensures that your browser can share cookies across subdomains in `example.com`. If AM is using the default cookie domain, such as `am.example.com`, then users will not be able to sign in through IG.

  You can check by logging in to the AM admin UI as `amAdmin`, browsing to **Global Services** > **Platform**, and verifying that **Cookie Domains** is set to `example.com`.

The instructions that follow are sufficient to add IG to your sample deployment. For in-depth documentation on using IG, see the IG product documentation.

Prepare keys

HTTPS requires a server key pair for IG.

In a public deployment where IG is the entry point, get the IG server certificate signed by a well-known CA. A server certificate signed by a well-known CA will be trusted by other systems and browsers, because the CA certificate is distributed with the system or the browser.

NOTE

NOTE

The examples that follow do not use a well-known CA. Instead, they use an IG server certificate generated with one of the DS deployment ID and password combinations that you used to set up the deployment.

You will generate an IG server key pair using the DS **dskeymgr** command. You will export and trust the deployment ID CA certificate to demonstrate and test the deployment. As long as no one else knows the deployment ID and password combination, that is safe, because only you have the secrets to generate signed keys.

Generate the keys on a system where you installed DS:

1. Save a password file for the keystore:

   ```
   mkdir -p /path/to/security/
   touch /path/to/security/keystore.pin
   chmod 600 /path/to/security/keystore.pin
   echo -n password > /path/to/security/keystore.pin
   ```

   Be sure to use `echo -n`, as IG cannot use the secret if the file has a newline character at the end.

2. Set the deployment ID in an environment variable that you will use in **dskeymgr** commands:

   ```
   export DEPLOYMENT_ID=deployment-id
   ```

3. Generate a server key pair for IG to use for HTTPS:

   ```
   /path/to/opendj/bin/dskeymgr \
    create-tls-key-pair \
    --deploymentId $DEPLOYMENT_ID \
    --deploymentIdPassword password \
    --keyStoreFile /path/to/security/keystore \
    --keyStorePassword:file /path/to/security/keystore.pin \
    --hostname localhost \
    --hostname platform.example.com \
    --subjectDn CN=platform.example.com,O=ForgeRock
   ```

4. Inspect the contents of the keystore you just created to find the key alias is `ssl-key-pair`:

   ```
   keytool -list -keystore /path/to/security/keystore -
   storepass:file /path/to/security/keystore.pin
   ```

```
Keystore type: PKCS12
Keystore provider: SUN

Your keystore contains 1 entry

ssl-key-pair, <date>, PrivateKeyEntry,
Certificate fingerprint (SHA-256): <fingerprint>
```

5. Copy the keystore and password to the system where IG runs.
6. Export the deployment ID CA certificate to trust:

```
/path/to/opendj/bin/dskeymgr export-ca-cert \
--deploymentId $DEPLOYMENT_ID \
--deploymentIdPassword password \
--outputFile ca-cert.pem
```

   Use this `ca-cert.pem` file when you need to trust the IG server certificate. You can import it into your browser to trust the platform URLs in this example.

Install IG

This example uses IG in standalone mode. In standalone mode, IG runs in the web container provided in the .zip file.

1. Download IG-7.2.0.zip.
2. Unpack the files.

   This example shows the files unpacked in the `/path/to/identity-gateway/` directory.

3. Create a configuration directory for IG:

```
mkdir -p $HOME/.openig/config/
```

   The default IG configuration directory is `$HOME/.openig/config` on Linux and UNIX, and `%appdata%\OpenIG\config` on Windows.

4. Add an admin.json configuration file for HTTPS support at the root of the IG configuration directory.

   ▼ *Sample admin.json*

   This example expects the keystore and `keystore.pin` file in the `/path/to/security/` directory:

```
{
    "heap": [
        {
            "name": "TlsConf",
            "type": "ServerTlsOptions",
            "config": {
                "keyManager": {
                    "type": "SecretsKeyManager",
                    "config": {
                        "signingSecretId":
"key.manager.secret.id",
                        "secretsProvider":
"ServerIdentityStore"
                    }
                }
            }
        },
        {
            "name": "SecretsPasswords",
            "type": "FileSystemSecretStore",
            "config": {
                "directory": "/path/to/security/",
                "format": "PLAIN"
            }
        },
        {
            "name": "ServerIdentityStore",
            "type": "KeyStoreSecretStore",
            "config": {
                "file": "/path/to/security/keystore",
                "storePassword": "keystore.pin",
                "secretsProvider": "SecretsPasswords",
                "mappings": [
                    {
                        "secretId": "key.manager.secret.id",
                        "aliases": [
                            "ssl-key-pair"
                        ]
                    }
                ]
            }
        }
    ],
    "connectors": [
        {
            "port": 9080
        },
        {
            "port": 9443,
            "tls": "TlsConf"
        }
    ]
}
```

5. Start IG:

```
/path/to/identity-gateway/bin/start.sh
...
[main] INFO ... started in XXXXms on ports : [9080, 9443]
```

6. Test that you can use the IG "ping" endpoint over HTTP:

```
curl -v http://platform.example.com:9080/openig/ping
```

   The output should include an HTTP `200` status code indicating success, and an empty reply from IG.

7. When you can successfully ping IG over HTTP, try HTTPS using your CA certificate file:

```
curl -v --cacert ca-cert.pem
https://platform.example.com:9443/openig/ping
```

   The `ca-cert.pem` file is the one you exported with the **`dskeymgr`** command. If it is not in the current directory, include the path to the file.

   As before, you should receive an empty success response. This demonstrates that you successfully connected to IG over HTTPS.

   Now that you are sure the HTTPS connection works, you can edit `admin.json` to stop using port 9080 for HTTPS.

Trust the deployment ID certificate

IMPORTANT

You generated a deployment ID CA certificate used in this example with the **`dskeymgr`** command. Your browser does not recognize this private CA until you trust it by importing the CA certificate.

Make sure this certificate is trusted when negotiating SSL and HTTPS connections.

As long as no one else knows your deployment ID and password combination, this is safe, because only you have the secrets to generate this CA certificate, or to generate signed keys:

- Trust the deployment ID CA certificate by importing the `ca-cert.pem` file *as a certificate authority* trusted for SSL and HTTPS connections.

  Some browsers refer to "Authorities" in the browser settings. See the browser help for details.

Configure IG

IG terminates HTTPS for your deployment. All access to your deployment goes through IG.

You must therefore configure IG to route traffic through to the components of the deployment, and then back to clients of the platform:

1. Add a config.json configuration file at the root of the IG configuration directory.

   ▼ ***Sample config.json***

   This example configures the capture decorator, a router, and a default route:

```
{
    "heap": [
        {
            "name": "capture",
            "type": "CaptureDecorator"
        },
        {
            "type": "Router",
            "name": "_router"
        },
        {
            "name": "DefaultRoute",
            "type": "StaticResponseHandler",
            "config": {
                "status": 200,
                "headers": {
                    "Content-Type": [
                        "text/html"
                    ]
                },
                "entity": "<html><p><a href='/enduser-login/?realm=/alpha#/service/PlatformLogin'>End user access</a></p><p><a href='/platform-login/?realm=/#/'>Admin
access</a></p></html>"
            }
        }
    ],
    "handler": "_router",
    "audit": "global"
}
```

The default route in the sample file defines a simple static HTML page to present when a user accesses the platform before logging in, or after logging out.

In this example, the page includes a link for each of the two user flows:

a. An end user logs in to access their applications and profile page through the End User UI.

b. An admin logs in to configure the platform through the Platform Admin UI, AM admin UI, or IDM admin UI.

You can configure IG to redirect users to your site if desired. IG can also serve static pages, so you can add an entry point that matches your site.

2. Create a `routes` directory under the IG configuration file directory:

   ```
   mkdir $HOME/.openig/config/routes
   ```

3. Add a zz-default.json route file in the `routes` directory.

   The file name ensures this will be the last route:

   ▼ *Sample zz-default.json*

   ```
   {
       "handler": "DefaultRoute"
   }
   ```

4. Add a login.json route file in the `routes` directory.

   This route consumes the paths specified in the links on the default, static page to route users to the correct URL on the Login UI:

   ▼ *Sample login.json*

   ```
   {
       "name": "login",
       "condition": "${find(request.uri.path, '^/enduser-
   login|^/platform-login')}",
       "baseURI": "http://login.example.com:8083",
       "handler": {
   ```

```
        "type": "Chain",
        "config": {
            "filters": [
                {
                    "type": "UriPathRewriteFilter",
                    "config": {
                        "mappings": {
                            "/enduser-login": "/",
                            "/platform-login": "/"
                        },
                        "failureHandler": "DefaultRoute"
                    }
                }
            ],
            "handler": "ReverseProxyHandler"
        }
    }
}
```

5. Add an `enduser-ui.json` route file in the `routes` directory.

   This route sends end users to the End User UI:

   ▼ *Sample for End User UI from a Docker image*

```
{
    "name": "enduser-ui",
    "condition": "${find(request.uri.path, '^/enduser-
ui')}",
    "baseURI": "http://enduser.example.com:8888",
    "handler": {
        "type": "Chain",
        "config": {
            "filters": [
                {
                    "type": "UriPathRewriteFilter",
                    "config": {
                        "mappings": {
                            "/enduser-ui": "/"
                        },
                        "failureHandler": "DefaultRoute"
                    }
                }
            ],
            "handler": "ReverseProxyHandler"
        }
    }
}
```

▼ *Sample for End User UI from a .zip file*

```
{
    "name": "enduser-ui",
    "condition": "${find(request.uri.path, '^/enduser-
ui')}",
    "baseURI": "http://am.example.com:8081",
    "handler": {
        "type": "Chain",
        "config": {
            "filters": [
                {
                    "type": "UriPathRewriteFilter",
                    "config": {
                        "mappings": {
                            "/enduser-ui": "/enduser"
                        },
                        "failureHandler": "DefaultRoute"
                    }
                }
            ],
            "handler": "ReverseProxyHandler"
        }
    }
}
```

6. Add a `platform-ui.json` route file in the `routes` directory.

   This route sends administrators to the Admin UI:

▼ *Sample for Admin UI from Docker images*

```
{
    "name": "platform-ui",
    "condition": "${find(request.uri.path, '^/platform-
ui')}",
    "baseURI": "http://admin.example.com:8082",
    "handler": {
        "type": "Chain",
        "config": {
            "filters": [
                {
                    "type": "UriPathRewriteFilter",
                    "config": {
                        "mappings": {
                            "/platform-ui": "/"
                        },
                        "failureHandler": "DefaultRoute"
                    }
                }
            ],
            "handler": "ReverseProxyHandler"
        }
    }
}
```

▼ *Sample for Admin UI from a .zip file*

```
{
    "name": "platform-ui",
    "condition": "${find(request.uri.path, '^/platform-
ui')}",
    "baseURI": "http://am.example.com:8081",
    "handler": {
        "type": "Chain",
        "config": {
            "filters": [
                {
                    "type": "UriPathRewriteFilter",
                    "config": {
                        "mappings": {
                            "/platform-ui": "/platform"
                        },
                        "failureHandler": "DefaultRoute"
                    }
                }
            ],
            "handler": "ReverseProxyHandler"
        }
    }
}
```

7. Add an am.json route file in the `routes` directory.

   This route handles requests to AM, ensuring that the browser gets redirected through IG:

   ▼ *Sample am.json*

```
{
    "name": "am",
    "baseURI": "http://am.example.com:8081",
    "condition": "${find(request.uri.path,
'(?:^/am(?!/XUI))')}",
    "handler": {
        "type": "Chain",
        "config": {
            "filters": [
                {
                    "comment": "Always redirect to IG rather
than AM",
                    "type": "LocationHeaderFilter",
                    "config": {
                        "baseURI":
"https://platform.example.com:9443/"
                    }
                }
            ],
            "handler": "ReverseProxyHandler"
        }
    }
}
```

8. Add an idm.json route file in the `routes` directory.

   This route handles requests to IDM, ensuring that the browser gets redirected through IG:

   ▼ *Sample idm.json*

```
{
    "name": "idm",
    "baseURI": "http://openidm.example.com:8080",
    "condition": "${find(request.uri.path, '(?:^/openidm)|
(?:^/admin)|(?:^/upload)|(?:^/export)')}",
    "handler": {
        "type": "Chain",
        "config": {
            "filters": [
                {
                    "comment": "Always redirect to IG rather
than IDM",
                    "type": "LocationHeaderFilter",
                    "config": {
                        "baseURI":
```

```
"https://platform.example.com:9443/"
                    }
                }
            ],
            "handler": "ReverseProxyHandler"
        }
    }
}
```

9. Restart IG to take all your changes into account.

   Verify in the server output that all your routes load successfully.

When troubleshooting and developing routes, you can change an IG route configuration while IG is running, and IG will reload changed routes every 10 seconds by default.

The IG capture decorator is particularly useful when troubleshooting routes. To use it quickly, add `"capture": "all"` to an object in a route, and let IG reload the route before you try it. It logs messages in the server output about incoming requests at any point until IG sends the request, and outgoing responses at any point until IG delivers the response.

For more information, see the IG product documentation.

Adapt the AM configuration

A sample deployment configured according to Separate identity stores or Shared identity store does not route the traffic through IG. Adapt the AM and OAuth 2.0 client configurations to use IG.

The following minimal changes are sufficient to use the sample deployment. Add any additional changes necessary for your deployment:

1. If you’re not currently logged in to the AM admin UI as the `amAdmin` user, log in.

   The password used in the documentation to set up the platform is `Passw0rd`.

2. In **the Top Level Realm and the `alpha` realm**, add redirect URIs for the `end-user-ui` OAuth 2.0 client:

   ```
   https://platform.example.com:9443/enduser-ui/appAuthHelperRedirect.html
   https://platform.example.com:9443/enduser-ui/sessionCheck.html
   ```

3. In **the Top Level Realm and the `alpha` realm**, add redirect URIs for the `idm-admin-ui` OAuth 2.0 client:

   ```
   https://platform.example.com:9443/platform/appAuthHelperRedirect.html
   ```

```
https://platform.example.com:9443/platform/sessionCheck.html
https://platform.example.com:9443/admin/appAuthHelperRedirect.html
https://platform.example.com:9443/admin/sessionCheck.html
https://platform.example.com:9443/platform-ui/appAuthHelperRedirect.html
https://platform.example.com:9443/platform-ui/sessionCheck.html
```

4. In the `alpha` realm, edit **Success URLs** for the following AM trees:

   PlatformLogin
   Success URL: `https://platform.example.com:9443/enduser-ui/?realm=/alpha`

   PlatformRegistration
   Success URL: `https://platform.example.com:9443/enduser-ui/?realm=/alpha`

   PlatformResetPassword
   Success URL: `https://platform.example.com:9443/enduser-ui/?realm=/alpha`

5. Update these settings:

   Top Level Realm > Authentication > Settings > General
   External Login Page URL: `https://platform.example.com:9443/platform-login`

   Top Level Realm > Services

   - **+ Add a Service** > **Validation Service**.
   - In **Valid goto URL Resources**, set:

     ```
     https://platform.example.com:9443/*
     https://platform.example.com:9443/*?*
     ```

   `alpha` Realm > Authentication > Settings > General
   External Login Page URL: `https://platform.example.com:9443/enduser-login`

   `alpha` Realm > Services > Validation Service
   To **Valid goto URL Resources**, add:

   ```
   https://platform.example.com:9443/*
   https://platform.example.com:9443/*?*
   ```

   Configure > Global Services > CORS Service > Secondary Configurations > Cors Configuration
   To **Accepted Origins**, add: `https://platform.example.com:9443` .

Adapt the Platform UI configuration

Adapt the platform UI configuration to use IG.

> NOTE
>
> These steps show the configuration for the platform UI Docker containers. If you install from `.zip` files, adapt the steps accordingly.

1. Keep a copy of the current configuration for testing:

```
cp /path/to/platform_env /path/to/platform_env.bak
```

2. Replace the `/path/to/platform_env` content with settings that direct traffic through IG:

```
AM_URL=https://platform.example.com:9443/am
AM_ADMIN_URL=https://platform.example.com:9443/am/ui-admin
IDM_REST_URL=https://platform.example.com:9443/openidm
IDM_ADMIN_URL=https://platform.example.com:9443/admin
IDM_UPLOAD_URL=https://platform.example.com:9443/upload
IDM_EXPORT_URL=https://platform.example.com:9443/export
ENDUSER_UI_URL=https://platform.example.com:9443/enduser-ui
PLATFORM_ADMIN_URL=https://platform.example.com:9443/platform-
ui/
ENDUSER_CLIENT_ID=end-user-ui
ADMIN_CLIENT_ID=idm-admin-ui
THEME=default
PLATFORM_UI_LOCALE=en
```

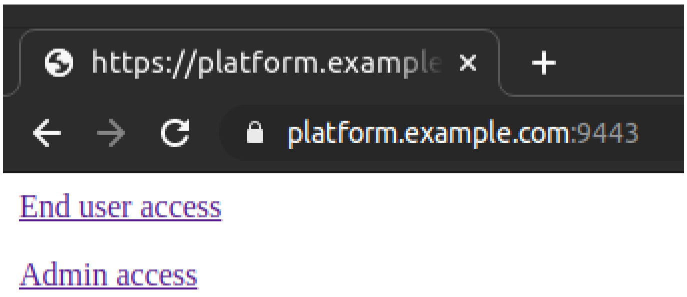
3. Restart the platform UI Docker containers to take the changes into account.

Test the deployment

Once you have finished changing the configuration to use IG, test your work:

1. Log out of any open platform applications.
2. Browse https://platform.example.com:9443/.

   You should see the default route page:



   If you see a page suggesting that your connection is not private, a warning about a security risk, or any other indication that your browser does not trust the IG server certificate, read Trust the deployment ID certificate again.

3. Test the flow for an end user:
   - Click the **End user access** link.
   - Sign in as an end user.

     If you have not yet created an end user account, follow the **Create an account** link, and register an end user with the platform.

     In the end, your browser should be directed to the end user page:

     ```
     https://platform.example.com:9443/enduser-ui/?
     realm=alpha#/dashboard
     ```
   - Sign out.

     Your browser should be directed to the platform default page.
4. Test the flow for an administrator:
   - Click the **Admin access** link.
   - Sign in as `amAdmin`.

     The password used in the documentation to set up the platform is `Passw0rd`.

     Your browser should be directed to the admin UI page:

     ```
     https://platform.example.com:9443/platform-ui/?
     realm=root#/dashboard
     ```
   - Browse around the platform admin UI, and open the AM admin UI and IDM admin UI.

     The browser address should show a secure connection through `https://platform.example.com:9443/` for all pages.
   - Sign out.

     Your browser should be directed to the platform default page.

You can now route traffic through IG to your platform deployment. If you get the IG server certificate signed by a well-known CA, instead of the private CA, other browsers and systems can connect through IG without additional configuration.

Migration and customization

Previous versions of the ForgeRock Identity Platform provided a sample deployment called the Full stack sample. This kind of deployment is not supported for new integrations between IDM and AM, and you should follow the steps outlined here to set up a new deployment. There is no automated migration facility for an existing deployment based on the *full stack sample*, but you can follow the tips in this chapter help you move to a new integrated deployment.

> NOTE
>
> This is not an exhaustive list and you will have additional configuration changes to make, based on how you deployed the full stack sample.

Self-service configuration

All self-service configuration is now done in the AM UI, with the exception of the following elements:

- KBA
- Terms & Conditions
- Policies
- Privacy & Consent
- Email templates and services

You can therefore delete all the IDM `selfservice*` files from your configuration, apart from `selfservice.kba.json` and `selfservice.terms.json`. These two files are still used by the new AM authentication trees.

You will need to rebuild all existing self-service processes as AM authentication trees. Note that tree nodes are more modular than the legacy IDM self-service stages. It might take more than one node to replace a self-service stage.

In a platform configuration, you can optionally customize the IDM admin UI to hide or remove all of the self-service functions that are no longer configured through IDM (such as registration and password reset).

Authentication

Integrated deployments now use a single `rsFilter` authentication module that allows authentication using AM bearer tokens. You must replace your project's `conf/authentication.json` file with this authentication.json file and customize it, according to your setup.

Configure OAuth clients and the IDM provisioning service in the AM UI.

UI customization

The UI retrieves access tokens from AM. If you have customized your Self-Service UI for a full-stack deployment, it is recommended that you start a new customization, based on the Platform UI. Your existing UI customizations will not work in a new platform deployment.

Migration for shared identities

As shown in Shared identity store,AM and IDM can share a DS identity store. Since version 7, this is a well-supported and recommended deployment pattern.

Previously, as shown in Separate identity stores and Reconciliation and AM in the IDM 6.5 documentation, AM used a DS-based identity store, IDM used a relational database for its repository, and IDM synchronized identities between them.

When you migrate shared identities to a shared DS identity store, follow these high-level steps:

- Add any custom identity attributes to the shared identity store and platform components.

  Many deployments define custom attributes that serve in profiles or security tokens, which are critical to authentication and authorization, such as OAuth 2.0 access tokens, OpenID Connect ID tokens, and SAML assertions.

  For detailed instructions, see Custom attributes.

- Use IDM to migrate identity data to the shared DS identity store.

  Make sure that any operations to modify managed objects, such as managed users, performed as part of the mapping (in `sync.json`), are reflected in the managed object schema (in `managed.json`).

  For more on the migration operation, see Migrate data in the IDM documentation.

UI customization

In version 7 of ForgeRock Identity Platform, the AM and IDM component products continue to provide their own, separate UIs, so you can deploy one independently of the other. Version 7 changes the model for deploying AM and IDM together in a ForgeRock Identity Platform configuration. Key changes to the platform deployment model concern OAuth 2.0 and platform UIs.

When you use AM and IDM together in a ForgeRock Identity Platform configuration:

- AM centralizes authentication and authorization services for the platform.

  IDM acts as an OAuth 2.0 client of AM. Even when you log in to administer IDM, you authenticate through AM.

  More generally, all new client applications are expected to obtain an access token from AM, and present it to IDM for authorization; for example, when calling IDM REST endpoints.

  This is why the authentication configuration for IDM includes an `rsFilter` (OAuth 2.0 ***r***esource ***s***erver) configuration.

- IDM centralizes identity management services.

  IDM relies on the platform UI, which calls AM trees that integrate with IDM for user self-service operations.

New platform UI components replace functions of the AM and IDM native UIs:

Platform UI	Characteristics
Admin UI	• Provides quick access to the configuration capabilities that platform administrators need every day. • Links to the AM admin UI and IDM admin UI for additional, less common configuration operations. • *Cannot be customized*, though you can write your own. • Runs as an administrator-facing service that you run in front of a platform deployment. • Operates as an OAuth 2.0 client of AM. • Uses the self-service tree endpoints to configure authentication trees, as described in Configure self-service trees endpoints, and documented in the AM API explorer, which you can access through the AM admin UI. If you write your own admin UI, use these endpoints to manage tree configurations.
End User UI	• Provides users with personalized pages to access their applications and update their profiles. • Replaces the IDM end user UI in a platform deployment. • Can be customized for your deployment. • Runs separately as a single-page application. • Operates as an OAuth 2.0 client of AM.

Platform UI	Characteristics
Login UI	• Replaces the AM login UI (XUI) in a platform deployment. • Can be customized for your deployment. • Runs separately as a single-page application. • Operates as a native AM client, not an OAuth 2.0 client.

High-level instructions for customizing the platform Enduser and Login UIs:

1. Clone the platform UI repository.
2. Carefully review the README.
3. Develop your customizations.
4. For each UI that you customize, adjust the variables found in the `.env.production` file to match your production deployment.
5. Build the customized UIs.

   You will find the resulting single-page application files in the `dist/` folder of each UI.
6. Deploy the files in your environment.

   For details, keep reading.

End User UI customization

The platform End User UI replaces the IDM end user UI in a platform deployment. IDM still includes the end user UI files, as they are useful in standalone deployments.

Choose how to deploy your customized version of the platform End User UI:

- Deploy your customized End User UI in a separate web server.

  In the AM OAuth 2.0 client profile for the End User UI, set the redirection URIs to reflect the URL to your End User UI.

  This approach is reflected in the sample deployments in this documentation.
- Copy the contents of the `dist/*` folder of your customized end user UI over the files in the expanded IDM `ui/enduser` folder, overwriting existing files.

  The End User UI is then in the same domain as IDM.

  If you use a path that is different from `ui/enduser` for the files, also update the `conf/ui.context-enduser.json` configuration to match.

Login UI customization

The platform Login UI replaces the AM login UI (XUI) in a platform deployment. AM still includes the login UI files, as they are useful in standalone deployments.

The Login UI operates as a native AM client, capable of working with authentication trees. It is not an OAuth 2.0 client, but instead a component used in OAuth 2.0 flows. AM, acting as an OAuth 2.0 authorization server, relies on the platform Login UI for resource owner authentication operations.

The Login UI leverages the AM authentication trees that are compatible with ForgeRock Identity Platform, as described in the self-service documentation. The Login UI translates the AM `/json/authenticate` challenges into web pages for users, and translates user responses back into REST calls.

Choose how to deploy your customized version of the platform Login UI:

If you...	How to deploy
Use only OAuth 2.0 clients of AM, not others such as SAML or same-domain policy agents.	Deploy your customized login UI in a separate web server. In AM admin UI, for each realm, browse to **Authentication** > **Settings**, and click the **General tab**. Set the **External Login Page URL** value to the URL of your customized Login UI. If necessary, update the AM **CORS** and **Validation Service** configurations. This approach is reflected in the sample deployments in this documentation.
Customize the AM .war file for your deployment.	Copy the contents of the `dist/*` folder of your customized Login UI over the files in the expanded AM `webapps/am/XUI` folder, overwriting XUI files.

If you...	How to deploy

Run AM behind a reverse proxy.	Deploy your customized Login UI `dist/*` files in a separate web server, and use the reverse proxy to direct requests for AM XUI to your customized Login UI instead.
	A few of the JavaScript files from the AM XUI serve to properly render OAuth 2.0 UI screens. Therefore, in addition, customize the AM .war file to move AM XUI files, and specify that location when starting AM.
	1. Expand the AM .war.
	2. Move the XUI files:
	`mv am/XUI am/OAuth2_XUI`
	3. Update runtime options so that they specify the location of the XUI files when AM starts.
	For example, if you run in Tomcat as described above, add this option alongside the others in the `setenv.sh` script:
	`-Dorg.forgerock.am.oauth2.consent.xui_path=/OAuth2_XUI`

Custom attributes

These sample deployments demonstrate using DS as a shared identity store for AM and IDM. The DS setup profile that configures DS as a shared identity store defines all the platform attributes required by AM and IDM.

Many deployments use additional custom attributes in identity profiles. The following examples show how to add a custom attribute, and how to configure AM and IDM to use it.

NOTE

This example adds a custom attribute that the platform can retrieve with a user profile. This custom attribute is not searchable, and therefore not indexed.

Before you start, create a `demo` account for test purposes in your sample deployment:

1. Browse to the platform end user UI page of the sample deployment, and click **Create an account**.
2. Create a user with user identifier `demo`, and whatever other attributes you like.
3. Find this user’s entry in the DS shared identity repository:

   ```
   /path/to/opendj/bin/ldapsearch \
   --hostname identities.example.com \
   --port 1636 \
   --useSsl \
   --usePkcs12TrustStore /path/to/opendj/config/keystore \
   --trustStorePassword:file /path/to/opendj/config/keystore.pin
   \
   --bindDn uid=admin \
   --bindPassword str0ngAdm1nPa55word \
   --baseDn ou=identities \
   "(uid=demo)"
   ```

   Notice that the user’s entry is named for its `fr-idm-uuid` attribute.

Define the attribute in DS

You define the attribute in DS as an attribute type in the LDAP schema. In LDAP, an entry’s object classes define which attributes it can have. You therefore also define an object class that lets the entry have the custom attribute.

The example custom attribute is a multi-valued directory string attribute named `customAttribute`. The auxiliary object class that lets the entry have the attribute is named `customAttributeOC`:

1. In DS, add LDAP schema for the new attribute and object class alongside other LDAP schema definitions:

   ```
   /path/to/opendj/bin/ldapmodify \
   --hostname identities.example.com \
   --port 1636 \
   --useSsl \
   --usePkcs12TrustStore /path/to/opendj/config/keystore \
   --trustStorePassword:file /path/to/opendj/config/keystore.pin
   \
   --bindDn uid=admin \
   --bindPassword str0ngAdm1nPa55word << EOF
   dn: cn=schema
   changetype: modify
   add: attributeTypes
   ```

```
attributeTypes: ( customAttribute-oid
  NAME 'customAttribute'
  EQUALITY caseIgnoreMatch
  ORDERING caseIgnoreOrderingMatch
  SUBSTR caseIgnoreSubstringsMatch
  SYNTAX 1.3.6.1.4.1.1466.115.121.1.15
  USAGE userApplications )
-
add: objectClasses
objectClasses: ( customAttributeOC-oid
  NAME 'customAttributeOC'
  SUP top
  AUXILIARY
  MAY customAttribute )
EOF
```

By default, DS writes these definitions to the file `/path/to/opendj/db/schema/99-user.ldif`.

2. Test that you can add a custom attribute to the `demo` user entry.

   Use the `fr-idm-uuid` that you got when searching for `uid=demo` in `ou=identities`:

```
/path/to/opendj/bin/ldapmodify \
--hostname identities.example.com \
--port 1636 \
--useSsl \
--usePkcs12TrustStore /path/to/opendj/config/keystore \
--trustStorePassword:file /path/to/opendj/config/keystore.pin
\
--bindDn uid=admin \
--bindPassword str0ngAdm1nPa55word << EOF
dn: fr-idm-uuid=<fr-idm-uuid-for-demo-
user>,ou=people,ou=identities
changetype: modify
add: objectClass
objectClass: customAttributeOC
-
add: customAttribute
customAttribute: Testing 1, 2...
EOF
```

3. Read the `demo` user entry to check your work:

```
/path/to/opendj/bin/ldapsearch \
--hostname identities.example.com \
--port 1636 \
--useSsl \
--usePkcs12TrustStore /path/to/opendj/config/keystore \
--trustStorePassword:file /path/to/opendj/config/keystore.pin
\
--bindDn uid=admin \
--bindPassword str0ngAdm1nPa55word \
--baseDn ou=identities \
"(uid=demo)" \
customAttribute
dn: fr-idm-uuid=<fr-idm-uuid-for-demo-
user>,ou=people,ou=identities
customAttribute: Testing 1, 2...
```

Notice that the value of `customAttribute` is set to `Testing 1, 2...`.

LDAP schema features are much richer than this simple example can demonstrate. For details about LDAP schema in DS, see LDAP schema.

Update AM to use the attribute

Update the AM configuration to make AM aware of the new object class and attribute:

1. Sign in to the platform admin UI as `amAdmin`.

   The password used in the documentation to set up the platform is `Passw0rd`.

2. Under **Native Consoles**, select **Access Management** to open the AM admin console.

3. In the `alpha` realm, under **Identity Stores** > **OpenDJ** > **User Configuration**, update these settings:

   LDAP User Object Class

   Add `customAttributeOC`.

   LDAP User Attributes

   Add `customAttribute`.

4. Save your work.

For additional details, see Adding user profile attributes.

Update IDM to use the attribute

Update the IDM configuration to make IDM aware of the attribute:

1. In the `conf/managed.json` file, under `user > schema > order`, add the custom attribute to the list:

   ```
   "customAttribute",
   ```

2. In the `conf/managed.json` file, under `user > schema > properties`, define a property corresponding to the custom attribute:

   ```
   "customAttribute" : {
    "title" : "Custom Attribute",
    "type" : "string",
    "viewable" : true,
    "searchable" : false,
    "userEditable" : true
   },
   ```

   Notice that this property is not searchable; meaning, it does not need to be indexed.

3. In the `conf/repo.ds.json` file, under `resourceMapping > explicitMapping > managed/user > objectClasses`, add the object class:

   ```
   "customAttributeOC",
   ```

4. In the `conf/repo.ds.json` file, under `resourceMapping > explicitMapping > managed/user > properties`, add a mapping for the attribute:

   ```
   "customAttribute" : {
    "type" : "simple",
    "ldapAttribute" : "customAttribute"
   },
   ```

5. Restart IDM to take the changes to the `conf/repo.ds.json` file into account.

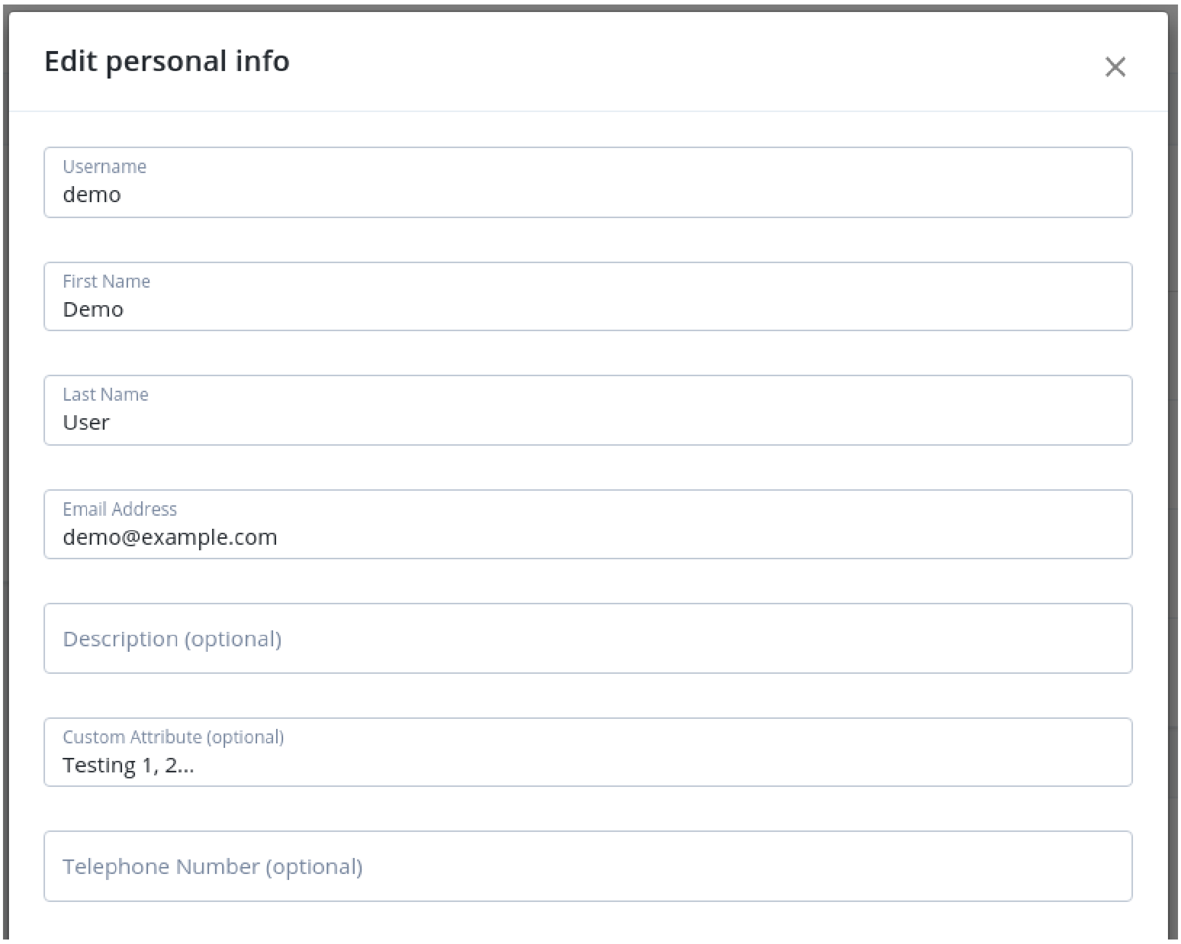
For additional details, see Create and modify object types, and Explicit mappings (DS).

View the results

After configuring DS, AM, and IDM to use the custom attribute:

1. Browse to the platform end user UI, and sign in as the `demo` user.
2. Click **Edit Your Profile**, and then click **Edit Personal Info**.

   Notice that your custom attribute is visible with the value you set:



Edit personal info

×

Username
demo

First Name
Demo

Last Name
User

Email Address
demo@example.com

Description (optional)

Custom Attribute (optional)
Testing 1, 2...

Telephone Number (optional)

Groups

Groups are an important tool for identity management. They greatly simplify managing collections of users, applying permissions and authorizations to all members of a group, rather than to individual users. These groups might follow an organization structure, but might instead be based on the needs and privileges for an otherwise arbitrary set of users.

The managed *group* object is an optional managed object type and is defined defined in `managed.json` like any other managed object type. Managed groups simplify management by using common groups across the entire platform.

Users are made members of groups through the relationships mechanism. You should understand how relationships work before you read about IDM groups.

Add groups as a managed object

To add groups as a managed object type, update `managed.json` and `repo.ds.json` in your IDM `conf/` directory:

In `managed.json`:

1. Add `groups` to the `order` property in the `user` managed object:

```
...
"stateProvince",
"roles",
"groups",
"manager",
...
```

2. Add a `groups` property to the `user` managed object type:

```
"groups" : {
    "description" : "Groups",
    "title" : "Group",
    "id" :
"urn:jsonschema:org:forgerock:openidm:managed:api:User:groups"
,
    "viewable" : true,
    "userEditable" : false,
    "returnByDefault" : false,
    "usageDescription" : "",
    "isPersonal" : false,
    "type" : "array",
    "relationshipGrantTemporalConstraintsEnforced" : false,
    "items" : {
        "type" : "relationship",
        "id" :
"urn:jsonschema:org:forgerock:openidm:managed:api:User:groups:
items",
        "title" : "Groups Items",
        "reverseRelationship" : true,
        "reversePropertyName" : "members",
        "notifySelf" : true,
        "validate" : true,
        "properties" : {
            "_ref" : {
                "description" : "References a relationship
from a managed object",
                "type" : "string"
            },
            "_refProperties" : {
                "description" : "Supports metadata within the
relationship",
                "type" : "object",
                "title" : "Groups Items _refProperties",
                "properties" : {
                    "_id" : {
                        "description" : "_refProperties object
ID",
                        "type" : "string"
                    },
                    "_grantType" : {
                        "description" : "Grant Type",
                        "type" : "string",
                        "label" : "Grant Type"
                    }
                }
            }
        },
        "resourceCollection" : [
            {
                "path" : "managed/group",
                "label" : "Group",
                "conditionalAssociationField" : "condition",
                "query" : {
                    "queryFilter" : "true",
                    "fields" : [
                        "name"
                    ],
                    "sortKeys" : [
                        "name"
                    ]
                }
            }
        ]
    }
},
```

3. Add the `group` managed object type:

```
{
    "name" : "group",
    "schema" : {
        "id" :
"urn:jsonschema:org:forgerock:openidm:managed:api:Group",
        "title" : "Group",
        "icon" : "fa-group",
        "mat-icon" : "group",
        "viewable" : true,
        "$schema" : "http://json-schema.org/draft-03/schema",
        "order" : [
            "_id",
            "name",
            "description",
            "condition",
            "members"
        ],
        "required" : [
            "name"
        ],
        "properties" : {
            "_id" : {
                "description" : "Group ID",
                "type" : "string",
                "viewable" : false,
                "searchable" : false,
                "userEditable" : false,
                "usageDescription" : "",
                "isPersonal" : false
            },
            "name" : {
                "title" : "Name",
                "description" : "Group Name",
                "type" : "string",
                "viewable" : true,
                "searchable" : true
            },
            "description" : {
                "title" : "Description",
                "description" : "Group Description",
                "type" : "string",
                "viewable" : true,
                "searchable" : true,
                "userEditable" : false
            },
            "condition" : {
                "description" : "A filter for conditionally
assigned members",
                "title" : "Condition",
                "viewable" : false,
                "searchable" : false,
                "isConditional" : true,
                "type" : "string"
            },
            "members" : {
                "description" : "Group Members",
                "title" : "Members",
                "viewable" : true,
                "searchable" : false,
                "userEditable" : false,
                "policies" : [ ],
                "returnByDefault" : false,
                "type" : "array",
                "items" : {
                    "type" : "relationship",
                    "id" :
"urn:jsonschema:org:forgerock:openidm:managed:api:Group:member
s:items",
                    "title" : "Group Members Items",
                    "reverseRelationship" : true,
                    "reversePropertyName" : "groups",
                    "validate" : true,
                    "properties" : {
                        "_ref" : {
                            "description" : "References a
relationship from a managed object",
                            "type" : "string"
                        },
                        "_refProperties" : {
                            "description" : "Supports metadata
within the relationship",
                            "type" : "object",
                            "title" : "Group Members Items
_refProperties",
                            "properties" : {
                                "_id" : {
                                    "description" :
"_refProperties object ID",
                                    "type" : "string"
                                },
                                "_grantType" : {
                                    "description" : "Grant
Type",
                                    "type" : "string",
                                    "label" : "Grant Type"
                                }
                            }
                        }
                    },
                    "resourceCollection" : [
                        {
                            "notify" : true,
                            "conditionalAssociation" : true,
                            "path" : "managed/user",
                            "label" : "User",
                            "query" : {
                                "queryFilter" : "true",
                                "fields" : [
                                    "userName",
                                    "givenName",
                                    "sn"
                                ]
                            }
                        }
                    ]
                }
            }
        }
    }
}
```

In ***`repo.ds.json`****:*

1. Add groups as a property for `managed/user`:

```
"managed/user" : {
    "dnTemplate" :
"ou=user,ou=managed,dc=openidm,dc=forgerock,dc=com",
    ...
    "properties" : {
        ...
        "groups" : {
            "type" : "reference",
            "ldapAttribute" : "fr-idm-managed-user-groups",
            "primaryKey" : "cn",
            "resourcePath" : "managed/group",
            "isMultiValued" : true
        },
...
```

2. Add the `managed/group` object type:

```
"managed/group" : {
    "dnTemplate" : "ou=groups,ou=identities",
    "namingStrategy" : {
        "type" : "clientDnNaming",
        "dnAttribute" : "cn"
    },
    "nativeId" : false,
    "objectClasses" : [
        "top",
        "groupOfURLs",
        "fr-idm-managed-group"
    ],
    "jsonAttribute" : "fr-idm-managed-group-json",
    "jsonQueryEqualityMatchingRule" :
"caseIgnoreJsonQueryMatch",
    "properties" : {
        "_id" : {
            "primaryKey" : true,
            "type" : "simple",
            "ldapAttribute" : "cn",
            "writability" : "createOnly"
        },
        "_rev" : {
            "type" : "simple",
            "ldapAttribute" : "etag"
        },
        "description" : {
            "type" : "simple",
            "ldapAttribute" : "description"
        },
        "condition" : {
            "type" : "simple",
            "ldapAttribute" : "fr-idm-managed-group-condition"
        },
        "memberURL" : {
            "type" : "simple",
            "ldapAttribute" : "memberURL",
            "isMultiValued" : true,
            "writability" : "createOnly"
        },
        "members" : {
            "type" : "reverseReference",
            "resourcePath" : "managed/user",
            "propertyName" : "groups",
            "isMultiValued" : true
        }
    }
},
```

User group attributes in use

A group can be assigned to a user manually, as a static value of the user's `groups` attribute, or dynamically, as a result of a condition or script. For example, a user might be assigned to a group such as `sales` dynamically, if that user is in the `sales` organization.

A user's `groups` attribute takes an array of *references* as a value, where the references point to the managed groups. For example, if user bjensen has been assigned to two groups (`employees` and `supervisors`), the value of bjensen's `groups` attribute would look something like the following:

```
"groups": [
    {
        "_ref": "managed/group/supervisors",
        "_refResourceCollection": "managed/group",
        "_refResourceId": "supervisors",
        "_refProperties": {
            "_id": "61315165-9269-4944-8db9-98f681c6b0a9",
            "_rev": "00000000586a94fd"
        }
    },
    {
        "_ref": "managed/group/employees",
        "_refResourceCollection": "managed/group",
        "_refResourceId": "employees",
        "_refProperties": {
            "_id": "2a965519-5788-428c-92d1-19fac497db8f",
            "_rev": "000000001e1793bc"
        }
    }
]
```

The `_refResourceCollection` is the container that holds the group. The `_refResourceId` is the ID of the group. The `_ref` property is a resource path that is derived from the `_refResourceCollection` and the URL-encoded `_refResourceId` . `_refProperties` provides more information about the relationship.

NOTE

In most cases, IDM uses UUIDs as the `_id` for managed objects. Managed groups are an exception: the `_id` and `name` properties should match.

While managed groups appear in the AM admin UI and can serve the same function as a static group created in AM, they are not the same. A managed group supports dynamic, conditional membership and can be leveraged in other parts of the platform. We recommend using managed objects for all data management in the platform.

Manage groups

The following sections show the REST calls to create, read, update, and delete groups, and to assign groups to users.

They are set up to use the default configuration for groups as a managed object type, discussed in Groups; if you made further customizations to your configuration, your calls may vary.

Authentication for REST

When you set up the platform as described in this documentation, you configure IDM to act as a resource server for AM OAuth 2.0 clients. The IDM OAuth 2.0 clients present a bearer access token to IDM when requesting an operation, and IDM makes the request to AM to introspect the token and reach an authorization decision.

To provision identities, use the `idm-provisioning` client, whose client secret shown in this documentation is `openidm`. The `idm-provisioning` client uses the client credentials grant to request an access token from AM:

```
curl \
--request POST \
--data "grant_type=client_credentials" \
--data "client_id=idm-provisioning" \
--data "client_secret=openidm" \
--data "scope=fr:idm:*" \
"http://am.example.com:8081/am/oauth2/realms/root/realms/alpha/access_token"
{
  "access_token": "<access_token>",
  "scope": "fr:idm:*",
  "token_type": "Bearer",
  "expires_in": 3599
}
```

Use the bearer *access_token* to authorize REST calls to IDM to provision identity data, such as groups.

Create a group

Using the Admin UI

1. From the navigation bar, click **Identities** > **Manage** > **Groups**.
2. On the **Groups** page, click **New Group**.
3. On the **New Group** page, enter a name and description, and click **Save**.

Using REST

To create a group, send a PUT or POST request to the `/openidm/managed/group` context path.

The following example creates a group named `employees`, with ID `employees`:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--header "Content-Type: application/json" \
--request POST \
--data '{
  "name": "employees",
  "description": "Group that includes temporary and permanent
employees"
}' \
"http://openidm.example.com:8080/openidm/managed/group?
_action=create"
{
  "_id": "employees",
  "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1028",
  "name": "employees",
  "condition": null,
  "description": "Group that includes temporary and permanent
employees"
}
```

To get an *access_token*, see Authentication for REST.

You can also omit `?_action=create` and achieve the same result:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--header "Content-Type: application/json" \
--request POST \
--data '{
  "name": "employees2",
  "description": "Second group that includes temporary and
permanent employees"
}' \
"http://openidm.example.com:8080/openidm/managed/group"
{
  "_id": "employees2",
  "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1053",
  "name": "employees2",
  "condition": null,
  "description": "Second group that includes temporary and
permanent employees"
}
```

List groups

To list groups over REST, query the `openidm/managed/group` endpoint. The following example shows the `employees` group that you created in the previous example:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--request GET \
"http://openidm.example.com:8080/openidm/managed/group?
_queryFilter=true"
{
  "result": [
    {
      "_id": "employees",
      "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1028",
      "name": "employees",
      "condition": null,
      "description": "Group that includes temporary and permanent
employees"
    },
    {
      "_id": "employees2",
      "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1053",
      "name": "employees2",
      "condition": null,
      "description": "Second group that includes temporary and
permanent employees"
    }
  ],
  "resultCount": 2,
  "pagedResultsCookie": null,
  "totalPagedResultsPolicy": "NONE",
  "totalPagedResults": -1,
  "remainingPagedResults": -1
}
```

To get an *access_token*, see Authentication for REST.

To list the managed groups in the Admin UI, select **Identities > Manage > Groups**.

If you have a large number of groups, use the search box to display only the groups you want.

Add users to a group

You add users to a group through the relationship mechanism. Relationships are essentially references from one managed object to another; in this case, from a user object to a group object. For more information about relationships, refer to Relationships between objects.

You can add group members *statically* or *dynamically*.

To add members statically, you must do one of the following:

- Update the value of the user’s `groups` property to reference the group.
- Update the value of the group’s `members` property to reference the user.

Dynamic groups use the result of a condition or script to update a user’s list of groups.

Add group members statically

Add a user to a group statically, using the REST interface or the Admin UI as follows:

Using REST

Use one of these methods to add group members over REST.

To get an *access_token*, see Authentication for REST:

- Add the user as a group member.

  The following example adds the user with ID `808cca7b-6c7f-40e5-b890-92b7b6eda08c` as a member of the group you created, `employees`:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--header "Content-Type: application/json" \
--request POST \
--data '{
  "_ref":"managed/user/808cca7b-6c7f-40e5-b890-92b7b6eda08c",
  "_refProperties":{}
}' \
"http://openidm.example.com:8080/openidm/managed/group/employe
es/members?_action=create"
{
  "_id": "393916e8-e43b-4e83-b372-7816b5e18fac",
  "_rev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-4792",
  "_ref": "managed/user/808cca7b-6c7f-40e5-b890-92b7b6eda08c",
  "_refResourceCollection": "managed/user",
  "_refResourceId": "808cca7b-6c7f-40e5-b890-92b7b6eda08c",
  "_refProperties": {
    "_id": "393916e8-e43b-4e83-b372-7816b5e18fac",
    "_rev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-4792"
  }
}
```

NOTE

This is the preferred method as it does not incur an unnecessary performance cost for groups with many members.

- Update the user's `groups` property.

  The following example adds the `employees2` group to the same user:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--header "Content-Type: application/json" \
--request PATCH \
--data '[
  {
    "operation": "add",
    "field": "/groups/-",
    "value": {"_ref" : "managed/group/employees2"}
  }
]' \
"http://localhost:8080/openidm/managed/user/808cca7b-6c7f-
```

```
40e5-b890-92b7b6eda08c"
{
  "_id": "808cca7b-6c7f-40e5-b890-92b7b6eda08c",
  "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1569",
  "country": null,
  "telephoneNumber": null,
  "mail": "scarter@example.com",
  "memberOfOrgIDs": [],
  "city": null,
  "displayName": null,
  "assignedDashboard": [],
  "effectiveAssignments": [],
  "postalCode": null,
  "description": null,
  "profileImage": null,
  "expireAccount": null,
  "accountStatus": "active",
  "aliasList": [],
  "kbaInfo": [],
  "inactiveDate": null,
  "activeDate": null,
  "consentedMappings": [],
  "sn": "Carter",
  "effectiveGroups": [
    {
      "_refResourceCollection": "managed/group",
      "_refResourceId": "employees",
      "_ref": "managed/group/employees"
    },
    {
      "_refResourceCollection": "managed/group",
      "_refResourceId": "employees2",
      "_ref": "managed/group/employees2"
    }
  ],
  "preferences": null,
  "organizationName": null,
  "givenName": "Sam",
  "stateProvince": null,
  "userName": "scarter",
  "postalAddress": null,
  "effectiveRoles": [],
  "activateAccount": null
}
```

When you update a user’s existing groups array, use the `-` special index to add the new value to the set. For more information, see *Set semantic arrays* in Patch operation: add.

- Update the group’s `members` property to refer to the user.

  The following sample command makes the user a member of the group you created:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--header "Content-Type: application/json" \
--request PATCH \
--data '[
  {
    "operation": "add",
    "field": "/members/-",
    "value": {"_ref" : "managed/user/808cca7b-6c7f-40e5-b890-
92b7b6eda08c"}
  }
]' \
"http://openidm.example.com:8080/openidm/managed/group/employe
es"
{
  "_id": "employees",
  "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1028",
  "name": "employees",
  "condition": null,
  "description": "Group that includes temporary and permanent
employees"
}
```

  The `members` property of a group is not returned by default in the output. To show all members of a group, you must specifically request the relationship properties (`*_ref`) in your query. The following example lists the members of the group you created:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--request GET \
"http://openidm.example.com:8080/openidm/managed/group/employe
es?_fields=name,members"
{
  "_id": "employees",
  "_rev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-4160",
  "name": "employees",
  "members": [{
    "_ref": "managed/user/808cca7b-6c7f-40e5-b890-
92b7b6eda08c",
    "_refResourceCollection": "managed/user",
    "_refResourceId": "808cca7b-6c7f-40e5-b890-92b7b6eda08c",
    "_refProperties": {
      "_id": "245c9009-a812-4d54-ae6c-02756243f7cb",
      "_rev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-4898"
    }
  }]
}
```

Using the UI

Use one of the following UI methods to add members to a group:

- Update the user entry:
  a. Select **Identities** > **Manage** > **Users** and select the user that you want to add.
  b. Select the **Group** tab and click **Add Groups**.
  c. Select the group from the dropdown list and click **Add**.
- Update the group entry:
  a. Select **Identities** > **Manage** > **Groups** and select the group to which you want to add members.
  b. Select the **Members** tab and click **Add Members**.
  c. Select the user from the dropdown list and click **Add**.

Add group members dynamically

To add a member to a group *dynamically*, use a *condition*, expressed as a query filter, in the group definition. If the condition is `true` for a particular member, that member is added to the group.

A group whose membership is based on a defined condition is called a *conditional group*. To create a conditional group, include a query filter in the group definition.

IMPORTANT

IMPORTANT

Properties that are used as the basis of a conditional group query *must* be configured as `searchable`, and must be indexed in the repository configuration. To configure a property as `searchable`, update its definition in your managed configuration.

For more information, see Create and modify object types.

To add a condition to a group using the admin UI, select **Set up** on the group **Settings** tab, then define the query filter that will be used to assess the condition.

To create a conditional group over REST, include the query filter as a value of the `condition` property in the group definition. The following example creates a group whose members are only users who live in France, meaning their `country` property is set to `FR`:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--header "Content-Type: application/json" \
--request POST \
--data '{
  "description": "Group for employees resident in France",
  "condition": "/country eq \"FR\""
}' \
"http://openidm.example.com:8080/openidm/managed/group?
_action=create"
{
  "_id": "fr-employees",
  "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1898",
  "name": "fr-employees",
  "condition": "/country eq \"FR\"",
  "description": "Group for employees resident in France"
}
```

To get an *access_token*, see Authentication for REST.

When a conditional group is created or updated, IDM assesses all managed users, and recalculates the value of their `groups` property, if they are members of that group. When a condition is removed from a group, that is, when the group becomes an unconditional group, all members are removed from the group. So, users who became members based on the condition, have that group removed from their `groups` property.

CAUTION

CAUTION

When a conditional group is defined in an existing data set, every user entry (including the mapped entries on remote systems) must be updated with the relationships implied by that conditional group. The time that it takes to create a new conditional group is impacted by the number of managed users affected by the condition.

In a data set with a very large number of users, creating a new conditional group can incur a significant performance cost when you create it. If possible, set up your conditional groups at the beginning of your deployment to avoid performance issues later.

Query a user’s group memberships

To list a user’s groups, query their `groups` property. The following example shows a user who is a member of two groups:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--request GET \
"http://openidm.example.com:8080/openidm/managed/user/808cca7b-6c7f-40e5-b890-92b7b6eda08c/groups?_queryFilter=true&_fields=_ref/*,name"
{
  "result": [
    {
      "_id": "38a23ddc-1345-48d6-b753-ad97f472a90e",
      "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1692",
      "_refResourceCollection": "managed/group",
      "_refResourceId": "employees",
      "_refResourceRev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1028",
      "name": "employees",
      "_ref": "managed/group/employees",
      "_refProperties": {
        "_id": "38a23ddc-1345-48d6-b753-ad97f472a90e",
        "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1692"
      }
    },
    {
      "_id": "0fabd212-f0c2-4d91-91f2-2b211bb58e89",
      "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1974",
      "_refResourceCollection": "managed/group",
      "_refResourceId": "supervisors",
      "_refResourceRev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-
1965",
      "name": "supervisors",
      "_ref": "managed/group/supervisors",
      "_refProperties": {
        "_id": "0fabd212-f0c2-4d91-91f2-2b211bb58e89",
        "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1974"
      }
    }
  ],
  "resultCount": 2,
  "pagedResultsCookie": null,
  "totalPagedResultsPolicy": "NONE",
  "totalPagedResults": -1,
  "remainingPagedResults": -1
}
```

To get an *access_token*, see Authentication for REST.

To view a user's group membership in the Admin UI:

1. Select **Identities** > **Manage** > **Users**, then select the user whose groups you want to see.
2. Select the **Groups** tab.

   If you have a large number of groups, use the search box to display only the groups you want.

Remove a member from a group

To remove a static group membership from a user entry, do one of the following:

- Update the value of the user's `groups` property to remove the reference to the role.
- Update the value of the group's `members` property to remove the reference to that user.

You can use both of these methods over REST, or use the Admin UI.

> IMPORTANT
>
> A delegated administrator must use PATCH to add or remove relationships.
>
> Conditional group membership can only be removed when the condition is changed or removed, or when the group itself is deleted.

Using REST

Use one of the following methods to remove a member from a group.

To get an *access_token*, see Authentication for REST:

- DELETE the group from the user's `groups` property, including the reference ID (the ID of the relationship between the user and the group) in the DELETE request.

  The following example removes a group from a user. Note that ID required in the DELETE request is not the ID of the group but the reference `_id` of the relationship:

  ```
  curl \
  --header "Authorization: Bearer <access_token>" \
  --header "Accept-API-Version: resource=1.0" \
  --request DELETE \
  "http://openidm.example.com:8080/openidm/managed/user/808cca7b
  -6c7f-40e5-b890-92b7b6eda08c/groups/e450a32c-e289-49e3-8de5-
  b0f84e07c740"
  {
    "_id": "e450a32c-e289-49e3-8de5-b0f84e07c740",
    "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-2122",
    "_ref": "managed/group/employees",
    "_refResourceCollection": "managed/group",
    "_refResourceId": "employees",
    "_refProperties": {
      "_id": "e450a32c-e289-49e3-8de5-b0f84e07c740",
      "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-2122"
    }
  }
  ```

- PATCH the user entry to remove the group from the array of groups, specifying the *value* of the group object in the JSON payload.

CAUTION

CAUTION

When you remove a group in this way, you must include the *entire object* in the value, as shown in the following example:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Content-type: application/json" \
--header "Accept-API-Version: resource=1.0" \
--request PATCH \
--data '[
  {
    "operation" : "remove",
    "field" : "/groups",
    "value" : {
      "_ref": "managed/group/0bf541d3-e7da-478a-abdd-41cdb74b2cbb",
      "_refResourceCollection": "managed/group",
      "_refResourceId": "0bf541d3-e7da-478a-abdd-41cdb74b2cbb",
      "_refProperties": {
        "_id": "8174332d-b448-4fe1-b507-b8e4751e08ba",
        "_rev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-5015"
      }
    }
  }
]' \
"http://openidm.example.com:8080/openidm/managed/user/808cca7b-6c7f-40e5-b890-92b7b6eda08c"
{
  "_id": "808cca7b-6c7f-40e5-b890-92b7b6eda08c",
  "_rev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-5245",
  "userName": "demo",
  "customAttribute": "Testing 1, 2…",
  "accountStatus": "active",
  "givenName": "Demo",
  "sn": "User",
  "mail": "demo@example.com"
}
```

- DELETE the user from the group's `members` property, including the reference ID (the ID of the relationship between the user and the role) in the delete request.

  The following example first queries the members of the group to obtain the ID of the relationship, then removes the user's membership from that group:

  ```
  curl \
  --header "Authorization: Bearer <access_token>" \
  --header "Accept-API-Version: resource=1.0" \
  --request GET \
  "http://openidm.example.com:8080/openidm/managed/group/employees/members?_queryFilter=true&_fields=_ref/*,name"
  {
  ```

```
  "result": [{
    "_id": "ef3261cd-a66f-4d3e-aad8-c0850e0b4a0e",
    "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-2430"
    "_refResourceCollection": "managed/user",
    "_refResourceId": "808cca7b-6c7f-40e5-b890-92b7b6eda08c",
    "_refResourceRev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-
5245",
    "_ref": "managed/user/808cca7b-6c7f-40e5-b890-
92b7b6eda08c",
    "_refProperties": {
      "_id": "245c9009-a812-4d54-ae6c-02756243f7cb",
      "_rev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-4898"
    }
  }],
  "resultCount": 1,
  "pagedResultsCookie": null,
  "totalPagedResultsPolicy": "NONE",
  "totalPagedResults": -1,
  "remainingPagedResults": -1
}

curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--request DELETE \
"http://openidm.example.com:8080/openidm/managed/group/employe
es/members/245c9009-a812-4d54-ae6c-02756243f7cb"
{
  "_id": "245c9009-a812-4d54-ae6c-02756243f7cb",
  "_rev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-4898",
  "_ref": "managed/user/808cca7b-6c7f-40e5-b890-92b7b6eda08c",
  "_refResourceCollection": "managed/user",
  "_refResourceId": "808cca7b-6c7f-40e5-b890-92b7b6eda08c",
  "_refProperties": {
    "_id": "245c9009-a812-4d54-ae6c-02756243f7cb",
    "_rev": "ce85fb00-1c27-47da-9d7a-8b6d4fcedb16-4898"
  }
}
```

Using the UI

Use one of the following methods to remove a group member:

- Select **Identities > Manage > Users** and select the user whose group or groups you want to remove.

Select the **Groups** tab, select the group that you want to remove, then select **Remove**.

- Select **Identities** > **Manage** > **Groups**, and select the group whose members you want to remove.

  Select the **Members** tab, select the member or members that you want to remove, then select **Remove**.

Delete a group

To delete a group over the REST interface, simply delete that managed object.

The following command deletes the group you created:

```
curl \
--header "Authorization: Bearer <access_token>" \
--header "Accept-API-Version: resource=1.0" \
--request DELETE \
"http://openidm.example.com:8080/openidm/managed/group/employees"
{
  "_id": "employees",
  "_rev": "ae6e63c4-94f5-463b-8bef-7a359b8e3004-1028",
  "name": "employees",
  "condition": null,
  "description": "Group that includes temporary and permanent
employees"
}
```

To get an *access_token*, see Authentication for REST.

To delete a group using the Admin UI, select **Identities** > **Manage** > **Groups**, select the group you want to remove, then **Delete Group**.

HSMs and ForgeRock software

This page covers how you can use a Hardware Security Module (HSM) to protect ForgeRock software private and secret keys.

On protecting secrets

You must protect private keys and secret keys that servers use for cryptographic operations:

Operating system protections

In many deployments, operating system protections are sufficient. Operating systems are always sufficient for public keys and keystores that do not require protection.

Isolate the server account on the operating system where it runs, and allow only that account to access the keys. If you store the keys with version control software, also control access to that.

This deployment option generally offers a better performance/cost ratio. You must take more care to prevent private and secret keys from being exposed, however.

HSM

For stronger protection, you can use an HSM.

An HSM is a secure device that holds the keys, and protects them from unauthorized access. With an HSM, no one gets direct access to the keys. If an attacker does manage to break into an HSM and theoretically get access to the keys, HSM are designed to make the tampering evident, so you can take action.

To put a private or secret key on an HSM, you have the HSM generate the key. The key never leaves the HSM. Instead, if you need the result of a cryptographic operation involving the key, you authenticate to the HSM and request the operation. The HSM performs the operation without ever exposing any private or secret keys. It only returns the result.

An HSM can be certified to comply with international standards, including FIPS-140 and Common Criteria. An HSM that is certified to comply with these standards can be part of your supported ForgeRock software solution.

ForgeRock software uses the HSM through standard PKCS#11 interfaces, and supports the use of compliant cryptographic algorithms.

An HSM generally offers higher security, but with a significant cost and impact on performance. Good HSMs and standards compliance come with their own monetary costs.

In terms of performance, each cryptographic operation incurs at minimum a round trip on a secure connection, compared with an operation in local memory for keys on the system. Even if the deployment may guarantee the same throughput, take the latency into account when deciding to deploy with HSMs.

Key management services

Key management services, such as Google Cloud KMS and others, offer similar advantages and tradeoffs as HSMs.

Latency for online key management services can be very high.

Performance

Throughput, the rate of operations completed, might or might not be impacted by your choice of protecting secrets.

Latency, how long individual operations take, will be impacted by your choice of protecting secrets.

Performance Example

For example, suppose you want a system that signs one million JWTs per second. As long as you can distribute the signing key across enough hardware, your system can sign one million JWTs a second. This is true even if each signing operation takes ten seconds. You simply need ten million systems, and the network hardware to use them in parallel. Throughput therefore depends mainly on how much you can spend.

Suppose, however, that each signing operation must take no longer than ten milliseconds. Furthermore, suppose you have an HSM that can perform a signing operation in one millisecond, but that the network round trip from the system to the HSM takes an average of eleven milliseconds. In this case, you cannot fix performance by buying a faster HSM, or by somehow speeding up the software. You must first reduce the network time if you want to meet your latency requirements.

Perhaps the same signing operation with a key stored on the operating system takes two milliseconds. Consider the options based on your cost and security requirements.

Performance also depends on the following:

- The impact of latency is greater when performing symmetric cryptographic operations (AES, HMAC) compared to public key cryptography (RSA, EC).
- For public key cryptography, only operations that use the private key must contact the HSM (signing, decryption).

  Operations using the public key (verifying a signature, encryption) retrieve the public key from the HSM once, and then use it locally.
- Most public key cryptography uses hybrid encryption, where only a small operation must be done on the HSM, and the rest can be done locally.

  For example, when decrypting a large message, typically, the HSM is only used to decrypt a per-message AES key that is then used to decrypt the rest of the message locally.

  Similarly, for signing, the message to sign is first hashed in-memory using a secure hash algorithm, and only the short hash value is sent to the HSM to be signed.

In contrast, when using symmetric key algorithms directly with an HSM, the entire message must be streamed to and from the HSM.

How ForgeRock services interact with HSMs

ForgeRock services built with Java interact with HSMs through Java PKCS#11 providers.

The PKCS#11 standard defines a cryptographic token interface, a platform-independent API for accessing an HSM, for example. ForgeRock services support the use of the Sun PKCS11 provider.

The Sun PKCS11 provider does not implement every operation and algorithm supported by every HSM. For details on the Sun PKCS11 provider's capabilities, refer to the JDK Providers Documentation, and the JDK PKCS#11 Reference Guide.

How you configure the JVM to use your HSM depends on the Java environment and on your HSM. ForgeRock services do not implement or manage this configuration, but they do depend on it. Before configuring ForgeRock services to use your HSM, you must therefore configure the JVM's Sun PKCS11 provider to access your HSM. For details on how to configure the Java Sun PKCS11 provider with your HSM, refer to the documentation for your HSM, and the JDK PKCS#11 Reference Guide.

Sun PKCS11 provider hints

The provider configuration depends on your provider.

Compare the following hints for ForgeRock software with the documentation for your HSM:

name = FooHsm

The name used to produce the Sun PKCS11 provider instance name for your HSM.

`FooHsm` is just an example.

CKA_TOKEN = false

Keys generated using the Java `keytool` command effectively have this set to `true`. They are permanent keys, to be shared across the deployment.

Set this to `false` to prevent temporary keys for RSA hybrid encryption used by some platform components from exhausting HSM storage.

CKA_PRIVATE = true

The key can only be accessed after authenticating to the HSM.

CKA_EXTRACTABLE = false
CKA_SENSITIVE = true

`CKA_EXTRACTABLE = false` means the key cannot be extracted *unless it is encrypted*.

`CKA_SENSITIVE = true` means do not let the secret key be extracted out of the HSM. Set this to `true` for long-term keys.

Only change these settings to back up keys to a different HSM, when you cannot use a proprietary solution. For example, you might change these settings if the HSMs are from different vendors.

`CKA_ENCRYPT = true`
The key can be used to encrypt data.

`CKA_DECRYPT = true`
The key can be used to decrypt data.

`CKA_SIGN = true`
The key can be used to sign data.

`CKA_VERIFY = true`
The key can be used to verify signatures.

`CKA_WRAP = true`
The key can be used to wrap another key.

`CKA_UNWRAP = true`
The key can be used to unwrap another key.

When using keytool

When using the Java `keytool` command to generate or access keys on the HSM, set the following options appropriately:

`-alias` ***alias***
If key pair generation fails, use a new *alias* for the next try. This prevents the conflicts where the previous attempt to create a key was only a partial failure, leaving part of key pair using the previous alias.

`-keystore none`
Required setting.

`-providername` ***providerName***
Required setting.

Prefix `SunPKCS11-` to the name in the configuration. If, in the Sun PKCS11 configuration, `name = FooHSM`, then the *providerName* is `SunPKCS11-FooHSM`.

`-storetype pkcs11`
Required setting.

If necessary, add the following settings:

-providerClass sun.security.pkcs11.SunPKCS11

Use this to install the provider dynamically.

-providerArg /path/to/config/file.conf

Use this to install the provider dynamically.

The exact configuration depends on your HSM.

When Java cannot find keys

When keys generated with one Java PKCS#11 provider are later accessed using the Sun PKCS11 provider, the providers may have different naming conventions.

Java's KeyStore abstraction requires that all private key objects have a corresponding Certificate object. SecretKey objects, such as AES or HMAC keys, are excluded from this requirement.

The Sun PKCS11 KeyStore provider loops through all defined private key entries in the HSM (class = private key), and tries to match them up with a corresponding certificate entry (class = certificate) by comparing the `CKA_ID` of the certificate entry to the `CKA_ID` of the private key entry. There may be multiple certificates using the same private key pair The matching process can take several seconds at startup time if you have many keys.

If keys are not found, it is likely that the private key entry `CKA_ID` does not match the certificate entry `CKA_ID`.

HSM features and ForgeRock services

This part outlines how some ForgeRock platform features support HSMs.

JWT encryption algorithms

JWT Encryption Algorithm	Java Algorithm Equivalent	Supported by Sun PKCS11 Provider?
RSA1_5	RSA/ECB/PKCS1Padding(1)	Yes
RSA-OAEP	RSA/ECB/OAEPWithSHA-1AndMGF1Padding	No
RSA-OAEP-256	RSA/ECB/OAEPWithSHA-256AndMGF1Padding	No
ECDH-ES (+A128KW, and so on)(2)	ECDH (KeyAgreement vs. Cipher)	Yes

JWT Encryption Algorithm	Java Algorithm Equivalent	Supported by Sun PKCS11 Provider?
dir with A128GCM, A192GCM, A256GCM	AES/GCM/NoPadding	Yes
dir with A128CBC-HS256, and so on	AES/CBC/PKCS5Padding + HmacSHA256, and so on	No
A128KW, A192KW, A256KW	AESWrap	No

[1] PKCS#1 version 1.5 padding has known vulnerabilities and should be avoided.

[2] The Sun PKCS11 implementation of ECDH KeyAgreement requires that the derived key be extractable. This is not a security issue, as the derived key is unique to each message, and therefore no more sensitive than the message it is protecting, due to the use of fresh ephemeral keys for each message (ECIES). To ensure that the derived keys are extractable, add the following to the PKCS11 configuration file:

```
attributes(*,CKO_PRIVATE_KEY,CKK_EC) = {
  CKA_SIGN = true
  CKA_DERIVE = true
  CKA_TOKEN = true
}

attributes(generate,CKO_SECRET_KEY,CKK_GENERIC_SECRET) = {
  CKA_SENSITIVE = false
  CKA_EXTRACTABLE = true
  CKA_TOKEN = false
}
```

This also ensures that EC keys generated with the `keytool` command are marked as allowing ECDH key derivation. The derived keys are also marked as `CKA_TOKEN = false`, which ensures that the derived keys are only created as session keys, and automatically deleted when the session ends to prevent filling up the HSM with temporary keys.

JWT signing algorithms

JWT Signing Algorithm	Java Algorithm Equivalent	Supported by Sun PKCS11 Provider?
HS256, HS384, HS512	HmacSHA256, HmacSHA384, HmacSHA512	Yes
RS256, RS384, RS512	SHA256WithRSA, SHA384WithRSA, SHA512WithRSA	Yes
PS256, PS384, PS512	RSASSA-PSS or SHA256WithRSAAndMGF1, and so on	No
ES256, ES384, ES512	SHA256WithECDSA, and so on	Yes
EdDSA	Under development	No

Configure ForgeRock services to use an HSM

Once you have configured the Java environment to use your HSM through the Sun PKCS11 Provider, you can configure ForgeRock software to use the HSM:

- AM: Refer to Configuring secrets, certificates, and keys.
- DS: Refer to PKCS#11 hardware security module.
- IDM: Refer to Configuring IDM for a hardware security module (HSM) device.
- IG: Refer to Secrets, and HsmSecretStore.