Abstract

Guide showing you how to use ForgeRock® Access Management with OpenID Connect 1.0.
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Preface

This guide covers concepts, configuration, and usage procedures for working with OpenID Connect 1.0 and ForgeRock Access Management.

This guide is written for anyone using OpenID Connect 1.0 with Access Management to manage and federate access to web applications and web-based resources.

About ForgeRock Identity Platform™ Software

ForgeRock Identity Platform™ serves as the basis for our simple and comprehensive Identity and Access Management solution. We help our customers deepen their relationships with their customers, and improve the productivity and connectivity of their employees and partners. For more information about ForgeRock and about the platform, see https://www.forgerock.com.
Chapter 1
Introducing OpenID Connect 1.0

This chapter covers AM support for OpenID Connect 1.0.

OpenID Connect 1.0 is an authentication layer built on OAuth 2.0. OpenID Connect 1.0 is a specific implementation of OAuth 2.0 where the identity provider that runs the authorization server also holds the protected resource that the third-party application aims to access. This resource is the UserInfo, information about the authenticated end user expressed in a standard format. In this way, OpenID Connect 1.0 allows relying parties both to verify the identity of the end user and also to obtain user information using REST. This contrasts with OAuth 2.0, which only defines the authorization mechanism.

The names used in OpenID Connect 1.0 differ from those used in OAuth 2.0. In OpenID Connect 1.0, the key entities are the following:

- The end user (OAuth 2.0 resource owner) whose user information the application needs to access.

  The end user wants to use an application through existing identity provider account without signing up to and creating credentials for yet another web service.

- The Relying Party (RP) (OAuth 2.0 client) needs access to the end user's protected user information.

  For example, an online mail application needs to know which end user is accessing the application in order to present the correct inbox.

  As another example, an online shopping site needs to know which end user is accessing the site in order to present the right offerings, account, and shopping cart.

- The OpenID Provider (OP) (OAuth 2.0 authorization server and also resource server) that holds the user information and grants access.

  AM can play this role in an OpenID Connect deployment.

  The OP effectively has the end user's consent to providing the RP with access to some of its user information. As OpenID Connect 1.0 defines unique identification for an account (subject identifier + issuer identifier), the RP can use this as a key to its own user profile.

  In the case of the online mail application, this key could be used to access the mailboxes and related account information. In the case of the online shopping site, this key could be used to access the offerings, account, shopping cart and so forth. The key makes it possible to serve users as if they had local accounts.
In OpenID Connect, the relying party can verify claims about the identity of the end user, and log the user out at the end of a session. OpenID Connect also makes it possible to discover the OpenID Provider for an end user, and to register relying party client applications dynamically. OpenID connect services are built on OAuth 2.0, JSON Web Token (JWT), WebFinger and Well-Known URIs.

In its role as OpenID Provider, AM lets OpenID Connect relying parties (clients) discover its capabilities, handles both dynamic and static registration of OpenID Connect relying parties, responds to relying party requests with authorization codes, access tokens, and user information according to the Authorization Code and Implicit flows of OpenID Connect, and manages sessions.

This section describes how AM fits into the OpenID Connect picture in terms of the roles that it plays in the authorization code and implicit flows, provider discovery, client registration, and session management.

1.1. OpenID Connect Scopes and Claims

This section explains how scopes and claims can be used when AM is acting as an OpenID Connect provider.

When AM is configured as an OAuth 2.0 provider, a scope is considered to be a concept, rather than directly relating to a piece of data in the user profile. For example, Facebook has an OAuth 2.0 scope named `read_stream`. AM returns whether the scope is allowed or not, with no associated data.

When AM is configured as an OpenID Connect provider, scopes can relate to data in a user profile by making use of one or more claims. Each claim maps directly to an attribute in the user profile.

For example, AM supports a scope named `profile` when configured as an OpenID Connect provider, which by default is made up of the following claims:

<table>
<thead>
<tr>
<th>Claim</th>
<th>User profile attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>given_name</td>
<td>givenname</td>
</tr>
<tr>
<td>zoneinfo</td>
<td>preferredtimezone</td>
</tr>
<tr>
<td>family_name</td>
<td>sn</td>
</tr>
<tr>
<td>locale</td>
<td>preferredlocale</td>
</tr>
<tr>
<td>name</td>
<td>cn</td>
</tr>
</tbody>
</table>

The mappings between scopes, claims, and user profile attributes are controlled by the OIDC Claims Script specified in the OAuth 2.0 provider. For more information, see "Scripting OpenID Connect 1.0 Claims" and "OAuth2 Provider".

As each claim represents a piece of information from the user profile, AM displays the actual data the relying party is given if the user clicks Allow:
You can configure AM to support requests for individual claims as query parameters, as described in section 5.5 of the OpenID Connect specification, by enabling the `claims_parameter_supported` option.

In section 5.6 of the specification, AM supports *Normal Claims*. The optional *Aggregated Claims* and *Distributed Claims* representations are not supported by AM.

For more information, see "OAuth2 Provider".

### 1.2. OpenID Connect Authorization Code Flow

The OpenID Connect authorization code flow illustrates how the relying party interacts with the OpenID provider, AM, when requesting an authorization code.

The authorization code flow ensures that the client application, not the end user's browser, handles the tokens.

The following sequence diagram shows successful processing from the authorization request through grant of the authorization code, which is returned from the authorization endpoint. The authorization code is then exchanged for an ID token, access token, and refresh token from the token endpoint. The
authorization code flow also defines how the relying party can validate claims about the end user and get additional information about the end user from the `userinfo` endpoint using the access token:

**OpenID Connect Authorization Code Flow**
1.3. OpenID Connect Implicit Flow

The OpenID Connect implicit flow illustrates how the relying party interacts with the OpenID provider, AM, when requesting an implicit grant.

The implicit flow allows clients, such as mobile applications, to interact directly with the OpenID provider, AM, and receive tokens directly from the authorization endpoint and not from the token endpoint.

The following sequence diagram shows successful processing from the authorization request through grant of the access and ID tokens from the authorization endpoint, and optional use of the access token to get information about the end user from the userinfo endpoint:
1.4. OpenID Connect Hybrid Flow

The OpenID Connect hybrid flow illustrates how the relying party interacts with the OpenID provider, AM, when using the hybrid flow, a combination of the authorization code flow and the implicit flow.
The hybrid flow allows the end user's browser to gain access to short-lived tokens, such as ID tokens, and to use the authorization code to obtain long-lived tokens, such as refresh tokens.

The following sequence diagram shows successful processing from the authorization request, through grant of the authorization code, access and/or ID tokens depending on the resource type, and optional use of the access token to get information about the end user:
OpenID Connect Hybrid Flow

1. Prepare authentication request
2. Validate client_id
3. Redirect User Agent to Auth Server
   - Request access using fragment encoded redirect or form post
   - and authenticate with client_id, redirect_uri, scope=openid profile email, response_type=code id_token||code token||code id_token token
4. (Optional) Ask for consent
5. (Optional) Grant consent
6. Return authorization code and ID token and redirect to ...
7. Request access token and refresh token with authorization code
8. Request additional claims
9. Validate ID token
10. Request additional claims
11. Validate access token
12. Return access token and refresh token
13. Validate ID token
14. Validate access token
15. Request additional claims
16. Validate access token
17. Request additional claims
18. Return additional claims
19. Send access request for resources with access token
20. Validate access token
21. Request additional claims
22. Validate access token
23. Request additional claims
24. Return additional claims
25. Return resource
26. Access resource
1.5. OpenID Connect Discovery

OpenID Connect defines how a relying party can discover the OpenID Provider and corresponding OpenID Connect configuration for an end user. The discovery mechanism relies on WebFinger to get the information based on the end user's identifier. The server returns the information in JSON Resource Descriptor (JRD) format.

1.6. OpenID Connect Relying Party Registration

OpenID Connect relying parties register OAuth 2.0 client profiles with AM. Relying parties can register with AM as a provider both statically, as for other OAuth 2.0 clients, and also dynamically, as specified by OpenID Connect Discovery. To allow dynamic registration, you register an initial OAuth 2.0 client that other relying parties can use to get access tokens for registration.

You can also enable OpenID Connect relying parties to register dynamically without having to provide an access token. For details, see the documentation on the advanced server property, org.forgerock.openam.openidconnect.allow.open.dynamic.registration, in "Advanced Properties" in the Reference. Take care to limit or throttle dynamic registration if you enable this capability on production systems.

1.7. OpenID Connect Session Management

OpenID Connect lets the relying party track whether the end user is logged in at the provider, and also initiate end user logout at the provider. The specification has the relying party monitor session state using an invisible iframe and communicate status using the HTML 5 postMessage API.

AM currently supports draft 10 of the OpenID Connect Session Management 1.0 specification.

1.8. Security Considerations

AM provides security mechanisms to ensure that OpenID Connect 1.0 ID tokens are properly protected against malicious attackers: TLS, digital signatures, and token encryption.

While designing a security mechanism, you can also take into account the points developed in the section on Security Considerations in the OpenID Connect Core 1.0 incorporating errata set 1 specification.

OpenID Connect 1.0 requires the protection of network messages with Transport Layer Security (TLS). For information about protecting traffic to and from the web container in which AM runs, see "Setting Up Keys and Keystores" in the Setup and Maintenance Guide.

AM supports digital signatures for OAuth 2.0 and OpenID Connect 1.0 tokens. To configure the signatures, see "Configuring Digital Signatures".
Chapter 2
Implementing OpenID Connect 1.0

This chapter covers implementing and configuring AM support for OpenID Connect 1.0.

2.1. Configuring as an OpenID Connect Provider

You can configure AM’s OAuth 2.0 provider service to double as an OpenID Connect provider service.

To Set Up the OAuth 2.0 Provider Service for OpenID Connect

Follow the steps in this procedure to set up the OAuth2 provider service with OpenID Connect defaults by using the Configure OAuth Provider wizard:

When you create the service with the Configure OAuth Provider wizard, the wizard also creates a standard policy in the Top Level Realm (/) to protect the authorization endpoint. In this configuration, AM serves the resources to protect, and no separate application is involved. AM therefore acts both as the policy decision point and policy enforcement point that protects the OAuth 2.0 authorization endpoint used by OpenID Connect.

There is no requirement to use the wizard or to create the policy in the Top Level Realm. However, if you create the OAuth 2.0 provider service without the wizard, then you must set up the policy independently, if required. The policy must appear in a policy set of type iPlanetAMWebAgentService. When configuring the policy, allow all authenticated users to perform HTTP GET and POST requests on the authorization endpoint. The authorization endpoint is described in "OAuth 2.0 Client and Resource Server Endpoints" in the OAuth 2.0 Guide. For details on creating policies, see "Implementing Authorization" in the Authorization Guide.

1. In the AM console, select Realms > Realm Name > Dashboard > Configure OAuth Provider > Configure OpenID Connect.

2. On the Configure OAuth2/OpenID Connect Service page, select the Realm for the provider service.

3. (Optional) If necessary, adjust the lifetimes for authorization codes, access tokens, and refresh tokens.

4. (Optional) Select Issue Refresh Tokens unless you do not want the authorization service to supply a refresh token when returning an access token.

5. (Optional) Select Issue Refresh Tokens on Refreshing Access Tokens if you want the authorization service to supply a new refresh token when refreshing an access token.
6. (Optional) If you have a custom scope validator implementation, put it on the AM classpath, for example /path/to/tomcat/webapps/openam/WEB-INF/lib/, and specify the class name in the Scope Implementation Class field. For an example, see "Customizing OAuth 2.0 Scope Handling" in the OAuth 2.0 Guide.

7. Click Create to save your changes.

AM creates an OAuth2 provider service, with OpenID Connect default parameter values, and a policy to protect the OAuth2 authorization endpoints.

Warning
If an OAuth2 provider service already exists, it will be overwritten with the new OpenID Connect parameter values.

8. To access the provider service configuration in the AM console, browse to Realms > Realm Name > Services, and then click OAuth2 Provider.

For OpenID Connect providers you may want to configure the following settings:

- To configure the OAuth 2.0 service provider to interact with AM's Authorization service to dynamically providing scopes, enable Use Policy Engine for Scope decisions.


- The optional Remote JSON Web Key URL field allows you to set a URL to a JSON web key set with the public key(s) for the provider.

  If this setting is not configured, then AM provides a local URL to access the public key of the private key used to sign ID tokens.

- The Subject Types supported map allows you to support pairwise subject types as described in the OpenID Connect core specification section concerning Subject Identifier Types.

- The ID Token Signing Algorithms supported list allows you to change the list of algorithms used to sign ID Tokens.

- The Supported Claims list allows you to restrict the claims supported by AM's userinfo endpoint.

  For more information, see "OpenID Connect Scopes and Claims".

- The Alias of ID Token Signing Key alias allows you to set the key pair alias for the key used to sign ID Tokens when using a signing algorithm that involves asymmetric keys.
For instructions on changing the key pair, see "Changing Default Key Aliases" in the Setup and Maintenance Guide.

- The Allow Open Dynamic Client Registration checkbox enables relying parties to register without using an access token.

- The Generate Registration Access Tokens checkbox has AM generate Registration Access Tokens for dynamic client registration when Allow Open Dynamic Client Registration is enabled. This allows the client to view and update its registration.

- The request parameter signing and encryption properties specify the methods and algorithms available for handling signed or encrypted JWTs in authorization request parameters.

For more information, see Passing Request Parameters as JWTs in the OpenID Connect Core 1.0 incorporating errata set 1 specification.

9. Save your changes.

If your provider is part of a GSMA Mobile Connect deployment, see "Configuring as an OP for Mobile Connect".

### 2.2. Configuring for OpenID Connect Discovery

In order to allow relying parties to discover the OpenID Connect Provider for an end user, AM supports OpenID Connect Discovery 1.0. In addition to discovering the OpenID Provider for an end user, the relying party can also request the OpenID Provider configuration.

AM exposes REST endpoints for discovering information about the provider configuration, and about the provider for a given end user.

The following REST endpoints are available:

- `/oauth2/.well-known/openid-configuration` allows clients to retrieve OpenID Provider configuration by HTTP GET as specified by OpenID Connect Discovery 1.0.

  When the OpenID Connect provider is configured in a subrealm, relying parties can get the configuration by passing in the full path to the realm in the URL. For example, if the OpenID Connect provider is configured in a subrealm named `subrealm1`, which is a child of the top-level realm, the URL would resemble the following: `https://openam.example.com:8443/openam/oauth2/realms/root/realms/subrealm1/.well-known/openid-configuration`.

- `/well-known/webfinger` allows clients to retrieve the provider URL for an end user by HTTP GET as specified by OpenID Connect Discovery 1.0.

  This endpoint does not support specifying a realm in the path, and is always located after the deployment URI. For example, `https://openam.example.com:8443/openam/.well-known/webfinger`.
A relying party needs to be able to discover the OpenID Connect provider for an end user. In this case you should consider redirecting requests to URIs at the server root, such as `http://www.example.com/.well-known/webfinger` and `http://www.example.com/.well-known/openid-configuration`, to these Well-Known URIs in AM’s space.

Discovery relies on WebFinger, a protocol to discover information about people and other entities using standard HTTP methods. WebFinger uses Well-Known URIs, which defines the path prefix `/ .well-known/` for the URLs defined by OpenID Connect Discovery.

Unless you deploy AM in the root context of a container listening on port 80 on the primary host for your domain, relying parties need to find the right `host:port/deployment-uri` combination to locate the well-known endpoints. Therefore you must manage the redirection to AM. If you are using WebFinger for something else than OpenID Connect Discovery, then you probably also need proxy logic to route the requests.

OpenID Connect Discovery requires an OAuth 2.0 provider service to be configured within AM. The service must have `openid` as a supported scope in order to use the `/oauth2/.well-known/openid-configuration` endpoint. For information on configuring an OAuth 2.0 provider service for OpenID Connect in AM, see "Configuring as an OpenID Connect Provider".

To retrieve the OpenID Connect provider for an end user, the relying party needs the following:

**host**

The server where the relying party can access the WebFinger service.

Notice that this is a host name rather than a URL to the endpoint, which is why you might need to redirect relying parties appropriately as described above.

**resource**

Identifies the end user that is the subject of the request. The relying party must percent-encode the resource value when using it in the query string of the request, so when using the `acct` URI scheme and the resource is `acct:user@example.com`, then the value to use is `acct%3Auser%40example.com`.

**rel**

URI identifying the type of service whose location is requested.

In this case `http://openid.net/specs/connect/1.0/issuer`, which is `http%3A%2F%2Fopenid.net%2Fspects%2Fconnect%2F1.0%2Fissuer`.

---

**Note**

AM supports a provider service that allows the realm to have a configured option for obtaining the base URL (including protocol) for components that need to return a URL to the client. This service is used to provide the URL base that is used in the `.well-known` endpoints used in OpenID Connect 1.0 and UMA.

For more information, see "Configuring the Base URL Source Service".
If you have not set up the redirection to the root of the domain yet, you can test the endpoint for the demo user account with the following curl:

```bash
$ curl \
    "https://openam.example.com:8443/openam/.well-known/webfinger \
    ?resource=acct%3Ademo%40example.com\ 
    &rel=http%3A%2F%2Fopenid.net%2Fspecs%2Fconnect%2F1.0%2Fiss"
```

This example shows that the OpenID Connect provider for the AM demo user is indeed the AM server.

The relying party can also discover the OpenID Connect provider configuration. If you have not set up the redirection to the root of the domain yet, you can test this with the following curl command:

```bash
$ curl https://openam.example.com:8443/openam/oauth2/.well-known/openid-configuration
{
    "request_parameter_supported":true,
    "claims_parameter_supported":false,
    "introspection_endpoint":"https://openam.example.com:8443/openam/oauth2/introspect",
    "check_session_iframe":"https://openam.example.com:8443/openam/oauth2/connect/checkSession",
    "scopes_supported": ["address",
                        "phone",
                        "openid",
                        "profile",
                        "email"],
    "issuer":"https://openam.example.com:8443/openam/oauth2",
    "id_token_encryption_enc_values_supported": ["A256GCM",
                                                  "A192GCM",
                                                  "A128GCM",
                                                  "A128CBC-HS256",
                                                  "A192CBC-HS384",
                                                  "A256CBC-HS512"],
    "acr_values_supported": [
    ],
    "authorization_endpoint":"https://openam.example.com:8443/openam/oauth2/authorize",
    "request_object_encryption_enc_values_supported": ["A256GCM",
                                                       "A192GCM",
                                                       "A128GCM",
                                                       "A128CBC-HS256",
                                                       "A192CBC-HS384",
                                                       "A256CBC-HS512"],
    "rcs_request_encryption_alg_values_supported": ["RSA-OAE"P",
                                                    "RSA-OAE-256",
                                                    "A128KW",
                                                    "RSA1_5",
                                                    "A256KW",
                                                    "dir",
                                                    "A192KW"],
}
"claims_supported": ["zoneinfo", "address", "profile", "name", "phone_number", "given_name", "locale", "family_name", "email"],
"rcs_request_signing_alg_values_supported": [
"ES384",
"HS256",
"HS512",
"ES256",
"RS256",
"HS384",
"ES512"
],
"token_endpoint_auth_methods_supported": [
"client_secret_post",
"private_key_jwt",
"client_secret_basic"
],
"token_endpoint": "https://openam.example.com:8443/openam/oauth2/access_token",
"response_types_supported": [
"code token id_token",
"code",
"code id_token",
"device_code",
"id_token",
"code token",
"token",
"token id_token"
],
"request_uri_parameter_supported": true,
"rcs_response_encryption_enc_values_supported": [
"A256GCM",
"A192GCM",
"A128GCM",
"A128CBC-HS256",
"A192CBC-HS384",
"A256CBC-HS512"
],
"end_session_endpoint": "https://openam.example.com:8443/openam/oauth2/connect/endSession",
"rcs_request_encryption_enc_values_supported": [
"A256GCM",
"A192GCM",
"A128GCM",
"A128CBC-HS256",
"A192CBC-HS384",
"A256CBC-HS512"
],
"version": "3.0",
"rcs_response_encryption_alg_values_supported": [
"RSA-OAEP",
"RSA-OAEP-256",
"A128KW",
"A256GCM",
"A192GCM",
"A128GCM",
"A128CBC-HS256",
"A192CBC-HS384",
"A256CBC-HS512"
],
"request_uri_parameter_supported": true,
"A256Kw",
"RSA1_5",
"dir",
"A192Kw"
],
"userinfo_endpoint":"https://openam.example.com:8443/openam/oauth2/userinfo",
"id_token_encryption_alg_values_supported":[
"RSA-OAEP",
"RSA-OAEP-256",
"A128Kw",
"A256Kw",
"RSA1_5",
"dir",
"A192Kw"
],
"jwks_uri":"https://openam.example.com:8443/openam/oauth2/connect/jwk_uri",
"subject_types_supported":[
  "public"
],
"id_token_signing_alg_values_supported":[
  "ES384",
  "HS256",
  "HS512",
  "ES256",
  "RS256",
  "HS384",
  "ES512"
],
"registration_endpoint":"https://openam.example.com:8443/openam/oauth2/register",
"request_object_signing_alg_values_supported":[
  "ES384",
  "HS256",
  "HS512",
  "ES256",
  "RS256",
  "HS384",
  "ES512"
],
"request_object_encryption_alg_values_supported":[
  "RSA-OAEP",
  "RSA-OAEP-256",
  "A128Kw",
  "RSA1_5",
  "A256Kw",
  "dir",
  "A192Kw"
],
"rcs_response_signing_alg_values_supported":[
  "ES384",
  "HS256",
  "HS512",
  "ES256",
  "RS256",
  "HS384",
  "ES512"
]
When the OpenID Connect provider is configured in a subrealm, then relying parties can get the configuration by passing in the realm in the URL.

When making a REST API call, specify the realm in the path component of the endpoint. You must specify the entire hierarchy of the realm, starting at the top-level realm. Prefix each realm in the hierarchy with the realms/ keyword. For example /realms/root/realms/customers/realms/europe.

For example, if the OpenID Connect provider is configured in a subrealm named subrealm1 which is a child of the top-level realm, the URL would resemble the following: https://openam.example.com:8443/openam/oauth2/realms/root/realms/subrealm1/.well-known/openid-configuration.

2.3. Configuring the Base URL Source Service

In many deployments, AM determines the base URL of a provider using the incoming HTTP request. However, there are often cases when the base URL of a provider cannot be determined from the incoming request alone, especially if the provider is behind some proxying application. For example, if an AM instance is part of a site where the external connection is over SSL but the request to the AM instance is over plain HTTP, then AM would have difficulty in reconstructing the base URL of the provider.

In these cases, AM supports a provider service that allows a realm to have a configured option for obtaining the base URL including protocol for components that need to return a URL to the client.

**To Configure the Base URL Source Service**

1. Log in to the AM console as an administrative user, such as amAdmin, and then navigate to Realms > Realm Name > Services.
2. Click Add a Service, select Base URL Source, and then click Create, leaving the fields empty.
3. For Base URL Source, select one of the following options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension class</td>
<td>Click the Extension class to return a base URL from a provided HttpServletRequest object. In the Extension class name field, enter org.forgerock.openam.services.baseurl.BaseURLProvider.</td>
</tr>
<tr>
<td>Fixed value</td>
<td>Click Fixed value to enter a specific base URL value. In the Fixed value base URL field, enter the base URL.</td>
</tr>
<tr>
<td>Forwarded header</td>
<td>Click Forwarded header to retrieve the base URL from the Forwarded header field in the HTTP request. The Forwarded HTTP header field is standardized and specified in RFC 7239.</td>
</tr>
<tr>
<td>Host/protocol from incoming request (default)</td>
<td>Click Host/protocol from incoming request to get the hostname, server name, and port from the HTTP request.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>X-Forwarded-* headers</td>
<td>Click X-Forwarded-* headers to use non-standard header fields, such as X-Forwarded-For, X-Forwarded-By, and X-Forwarded-Proto.</td>
</tr>
</tbody>
</table>

4. In the Context path, enter the context path for the base URL. If provided, the base URL includes the deployment context path appended to the calculated URL. For example, /openam.

5. Click Finish to save your configuration.

### 2.4. Registering OpenID Connect Relying Parties

OpenID Connect relying parties can register with AM both statically through an OAuth 2.0 client profile created with the AM console, and also dynamically using OpenID Connect 1.0 Dynamic Registration.

**Note**

OpenID Connect 1.0 is an authentication layer built on OAuth 2.0. Registering OpenID Connect 1.0 clients in AM uses an OAuth 2.0 client profile with a required `openid` scope to indicate use of OpenID Connect 1.0.

---

**To Create an OAuth 2.0 Client Profile**

Use the following procedure to create an OAuth 2.0 client profile:

- In the AM console, navigate to Realms > Realm Name > Applications > OAuth 2.0. Click Add Client, and then provide the Client ID, client secret, redirection URIs, scope(s), and default scope(s). Finally, click Create to create the profile.

  To configure the client, see "To Configure an OAuth 2.0 Client Profile".

**To Configure an OAuth 2.0 Client Profile**

1. In the AM console, navigate to Realms > Realm Name > Applications > OAuth 2.0 > Client Name to open the OAuth 2.0 Client page.

2. Adjust the configuration as needed using the inline help for hints, and also the documentation section "OAuth 2.0 and OpenID Connect 1.0 Client Settings".

Examine the client type option. An important decision to make at this point is whether your client is a confidential client or a public client. This depends on whether your client can keep its credentials confidential, or whether its credentials can be exposed to the resource owner or other parties. If your client is a web-based application running on a server, such as the AM OAuth 2.0 client, then you can keep its credentials confidential. If your client is a user-agent based client, such as a JavaScript client running in a browser, or a native application installed on a device...
used by the resource owner, then the credentials can be exposed to the resource owner or other parties.

3. When finished, save your work.

To Configure an OAuth 2.0 Client Profile Group

1. In the AM console, navigate to Realms > Realm Name > Applications > OAuth 2.0.
   - To create a new OAuth 2.0 client profile group:
     On the Groups tab, select Add Group, and then provide the Group ID. Finally, select Create.
   - To configure a OAuth 2.0 client profile group:
     On the Groups tab, select the group to configure.

2. Adjust the configuration as needed using the inline help for hints, and also the documentation section "OAuth 2.0 and OpenID Connect 1.0 Client Settings".

3. When finished, save your work.

If the group is assigned to one or more OAuth 2.0 client profiles, changes to inherited properties in the group are also applied to the client profile.

To assign a group to an OAuth 2.0 client profile, see "To Assign a Group to an OAuth 2.0 Client Profile and Inherit Properties".

To Assign a Group to an OAuth 2.0 Client Profile and Inherit Properties

1. In the AM console, navigate to Realms > Realm Name > Applications > OAuth 2.0. On the Clients tab, select the client ID to which a group is to be assigned.

2. On the Core tab, select the group to assign to the client from the Group drop-down.

   Warning
   Adding or changing an assigned group will refresh the settings page. Unsaved property values will be lost.

   The inheritance (padlock) icons appear next to properties that support inheriting their value from the assigned group. Not all properties can inherit their value, for example, the Client secret property.
3. Inherit a property value from the group by selecting the inheritance button (the open padlock icon) next to the property.

The value will be inherited from the group and the field will be locked.

**Note**

If you change the group, properties with inheritance enabled will inherit the value from the new group.
4. When finished, save your work.

**To Register a Relying Party Dynamically**

For dynamic registration you need the relying party profile data, and an access token to write the configuration to AM by HTTP POST. To obtain the access token, register an initial client statically after creating the provider, as described in "To Create an OAuth 2.0 Client Profile". Relying parties can then use that client to obtain the access token needed to perform dynamic registration.

**Tip**

As described in "OpenID Connect Relying Party Registration", you can allow relying parties to register without having an access token by setting the advanced server property, `org.forgerock.openam.openidconnect.allow.open.dynamic.registration`, to `true`. When using that setting in production systems, take care to limit or throttle dynamic registration.

On successful registration, AM responds with information including an access token to allow the relying party subsequently to read and edit its profile.

1. Create an OAuth 2.0 provider service in the relevant realm, by following the steps in "To Set Up the OAuth 2.0 Provider Service for OpenID Connect".

2. Register an initial OAuth 2.0 client statically with a client ID, such as `masterClient` and client secret like `password`.

   Add at least one scope to the list of supported scopes, for example `cn`.

3. Obtain an access token using the client you registered.

   For example, if you created the client as described in the previous step, and AM administrator `amadmin` has password `password`, you can use the OAuth 2.0 Resource Owner Password Credentials grant type as in the following example:

   ```
   $ curl 
   --request POST
   --user "masterClient:password"
   --data "grant_type=password&username=amadmin&password=password&scope=cn"
   https://openam.example.com:8443/openam/oauth2/realms/root/access_token
   {
   "expires_in": 59,
   "token_type": "Bearer",
   "refresh_token": "26938cd0-6870-4e31-ade9-df31afc37ee1",
   "access_token": "515d6551-4512-4279-98b6-c0ef3f03a722"
   }
   ```

4. HTTP POST the relying party registration profile to the `/oauth2/register` endpoint, using bearer token authorization with the access token you obtained from AM.
Ensure that you provide the following values:

- **client_name**. Without the client_name value, the auto-generated client_id is used on consent screens. The client ID is a UUID string and may not be desirable on an end-user facing page.

- **scope**. The scope must be set as openid, to specify this is an OIDC client.

For an example written in JavaScript, see the registration page in the OpenID Connect examples. Successful registration shows a response that includes the client ID and client secret. Lines are folded in the following example:

```json
{
    "issued_at": 1392364349,
    "expires_at": 0,
    "client_secret": "7f446ca9-3f1f-48fb-bf8c-150b0e643f29",
    "client_name": "Example.com OpenID Connect Client",
    "redirect_uri": [
        "https://openam.example.com:8443/openid/cb-basic.html",
        "https://openam.example.com:8443/openid/cb-implicit.html"
    ],
    "registration_access_token": "515d6551-4512-4279-98b6-c0ef3f03a722",
    "client_id": "6e4abd50-3f03-41dc-b807-c6705c3e45d7",
    "registration_client_uri": "https://openam.example.com:8443/openam/oauth2/realms/root/connect/register?client_id=6e4abd50-3f03-41dc-b807-c6705c3e45d7"
}
```

### 2.5. Managing OpenID Connect User Sessions

OpenID Connect Session Management 1.0 allows the relying party to manage OpenID Connect sessions, making it possible to know when the end user should be logged out.

Registered clients can use OpenID Connect Session Management 1.0 to handle end user logout actions.

- **/oauth2/connect/checkSession** allows clients to retrieve session status notifications.
- **/oauth2/connect/endSession** allows clients to terminate end user sessions.

As described in the OpenID Connect Session Management 1.0 - Draft 10 specification, AM's OpenID Provider exposes both a check_session_iframe URL that allows the relying party to receive notifications when the end user's session state changes at the provider, and also an end_session_endpoint URL to which to redirect an end user for logout.

When registering your relying party that uses session management, you set the OAuth 2.0 client agent profile properties Post Logout Redirect URI and Client Session URI, described in "OAuth 2.0 and OpenID Connect 1.0 Client Settings". The Post Logout Redirect URI is used to redirect the end user user-agent after logout. The Client Session URI is the relying party URI where AM sends notifications when the end user's session state changes.
Tip

To store OpenID Connect user sessions, navigate to Realms > Realm Name > Services > OAuth2 Provider > Advanced OpenID Connect, and enable the Store Ops Tokens switch.

2.6. Stateless OpenID Connect 1.0 Access and Refresh Tokens

AM supports *stateless* access, refresh, and ID tokens for OpenID Connect 1.0 (OIDC). Stateless tokens allow clients to directly validate the tokens by storing session information within the token itself and bypassing storage in an external CTS data store. This feature also allows any AM instance in the issuing cluster to validate an OIDC tokens without cross-server communication.

To Configure Stateless OpenID Connect 1.0 Access and Refresh

1. Open the AM console.
2. Under Realms, select the realm that you are working with.
3. Click Services, and then select OAuth2 Provider.
5. Enable Issue Refresh Tokens.
7. Generate some OIDC tokens using the REST API. Notice how each token is larger than a non-stateless example:

```
$ curl --request POST --user "MyClient:password" \
 --data "grant_type=password&username=demo&password=changeit&scope=cn%20openid%20profile" \
 http://openam.example.com:8080/openam/oauth2/realms/root/access_token
{
   "scope":"cn openid profile",
   "expires_in":5998,
   "token_type":"Bearer",
   "refresh_token":"eyJ0eXAiOiJKV1QiLCJhbGciOiJSU0QlMkUxLiJ9.fHwDHj7Kud5T0cXmB4kJ7JzgTcL9w9QCnLbC1kDjQ",
   "id_token":"eyJ0eXAiOiJKV1QiLCJhbGciOiJSU0QlMkUxLiJ9.
```

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8. Decode the stateless access token to view its contents:

```
$ curl http://openam.example.com:8080/openam/oauth2/realms/root/tokeninfo?access_token=eyJhbGciOiAiSFMyNTYiI...1knJDss
```

```
"tokenName":"access_token",
"sub":"demo",
"scope":["cn","openid","profile"],
"iss":"http://openam.example.com:8080/openam/oauth2",
"nbf":1465418979,
"authGrantId":"56ceac36-6c52-4d65-918b-68ff718b9033",
"expires_in":6000000,
"iat":1465418979,
"exp":1465424979,
"auditTrackingId":"6e26308d-9c66-4d64-816f-be7fa7207618",
"cn":"demo",
"realm":"/",
"aud":"http://openam.example.com:8080/openam/oauth2/access_token",
"openid":"
```

2.6.1. Validating OpenID Connect 1.0 ID Tokens

Clients can use an OpenID Connect 1.0 endpoint on AM to quickly validate a stateless OIDC ID token and optionally retrieve any claims within the token. The endpoint is used globally and not within a realm.

- `/openid/oauth2/idtokeninfo`
Note

The endpoint does not support the validation of encrypted OIDC ID tokens.

The endpoint validates an OIDC ID token based on rules 1-10 in section 3.1.3.7 of the OpenID Connect Core and runs the following steps:

1. Extracts the first `aud` (audience) claim from the ID token. The `client_id`, which is passed in as authentication of the request, will be used as the client and validated against the `aud` claim.

2. Extracts the `realm` claim, if present, default to the root realm if the token was not issued by AM.

3. Looks up the client in the given realm, producing an error if it does not exist.

4. Verifies the signature of the ID token, according to the settings for the client (ID token signed response algorithm, public key selector).

5. Verifies the `issuer`, `audience`, `expiry`, `not-before`, and `issued-at` claims as per the specification.

To invoke the endpoint, the client sends an HTTP POST request to `/openam/oauth2/idtokeninfo` using the following parameters in the POST body in application/x-www-form-urlencoded format or as query parameters:

- `id_token` - OIDC ID token to validate (required)
- `claims` - optional comma-separated list of claims to return from the ID token

For example, you can run the following command:

```
$ curl -X POST -u MyClient:password -d "id_token=<replaceable>$IDTOKEN</replaceable>" \ 
   http://openam.example.com:8080/openam/oauth2/realms/root/idtokeninfo
```

where `$IDTOKEN` is an OIDC ID token.

If the ID token validates successfully, the endpoint unpacks the claims from the ID token and returns them as JSON. You can also use an optional `claims` parameter in the request to return those specific claims. If a claim is requested that does not exist, no error occurs; it will simply not be present in the response.

For example, you can run the following command to retrieve the claims in an OIDC ID token:

```
$ curl -i -X POST -u MyClient:password -d "id_token=<replaceable>$IDTOKEN</replaceable>" \ 
   'http://openam.example.com:8080/openam/oauth2/realms/root/idtokeninfo?claims=sub,exp,realm'
```

HTTP/1.1 200
X-Frame-Options: SAMEORIGIN
Date: Thu, 21 Sep 2017 15:23:59 GMT
Accept-Ranges: bytes
Server: Restlet-Framework/2.3.4
Vary: Accept-Charset, Accept-Encoding, Accept-Language, Accept
Content-Type: application/json; charset=UTF-8
Content-Length: 43

{"sub":"demo","exp":1506010746,"realm":"/"}
For invalid requests, the endpoint returns a 400 HTTP code with a JSON error response:

```
HTTP/1.1 400
X-Frame-Options: SAMEORIGIN
Date: Thu, 21 Sep 2017 15:25:06 GMT
Accept-Ranges: bytes
Server: Restlet-Framework/2.3.4
Vary: Accept-Charset, Accept-Encoding, Accept-Language, Accept
Content-Type: application/json
Transfer-Encoding: chunked
Connection: close
"error_description":"no id_token in request","error":"bad_request"
```

2.7. Configuring for GSMA Mobile Connect

GSMA Mobile Connect is an application of OpenID Connect (OIDC). Mobile Connect builds on OIDC to facilitate use of mobile phones as authentication devices independently of the service provided and independently of the device used to consume the service. Mobile Connect thus offers a standard way for Mobile Network Operators to act as general-purpose identity providers, providing a range of levels of assurance and profile data to Mobile Connect-compliant Service Providers.

This section includes an overview, as well as the following:

- "Authorization Request Parameters"
- "ID Token Properties"
- "Configuring as an OP for Mobile Connect"

In a Mobile Connect deployment, AM can play the OpenID Provider role, implementing the Mobile Connect Profile as part of the Service Provider - Identity Gateway interface.

AM can also play the Authenticator role as part of the Identity Gateway - Authenticators interface. In this role, AM serves to authenticate users at the appropriate Level of Assurance (LoA). In Mobile Connect, LoAs represent the authentication level achieved. A Service Provider can request LoAs without regard to the implementation, and the Identity Gateway includes a claim in the ID Token that indicates the LoA achieved.

In AM, Mobile Connect LoAs map to an authentication mechanism. Service Providers acting as OpenID Relying Parties (RP) request an LoA by using the `acr_values` field in an OIDC authentication request. In OIDC, `acr_values` specifies Authentication Context Class Reference values. The RP sets `acr_values` as part of the OIDC Authentication Request. AM returns the corresponding `acr` claim in the Authentication Response as the value of the ID Token `acr` field.

AM as OP supports LoAs 1 (low - little or no confidence), 2 (medium - some confidence, as in single-factor authentication), and 3 (high - high confidence, as in multi-factor authentication), though out of the box it does not include support for 4, which involves digital signatures.
As Mobile Connect OP, AM supports mandatory request parameters, and a number of optional request parameters:

### Authorization Request Parameters

<table>
<thead>
<tr>
<th>Request Parameter</th>
<th>Support</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>response_type</td>
<td>Supported</td>
<td>OAuth 2.0 grant type to use. Set this to <code>code</code> for the authorization grant.</td>
</tr>
<tr>
<td>client_id</td>
<td>Supported</td>
<td>Set this to the client identifier.</td>
</tr>
<tr>
<td>scope</td>
<td>Supported</td>
<td>Space delimited OAuth 2.0 scope values. Required: <code>openid</code></td>
</tr>
<tr>
<td>redirect_uri</td>
<td>Supported</td>
<td>OAuth 2.0 URI where the authorization request callback should go. Must match the <code>redirect_uri</code> in the client profile that you registered with AM.</td>
</tr>
<tr>
<td>state</td>
<td>Supported</td>
<td>Value to maintain state between the request and the callback. Required for Mobile Connect.</td>
</tr>
<tr>
<td>nonce</td>
<td>Supported</td>
<td>String value to associate the client session with the ID Token. Optional in OIDC, but required for Mobile Connect.</td>
</tr>
<tr>
<td>display</td>
<td>Supported</td>
<td>String value to specify the user interface display.</td>
</tr>
<tr>
<td>login_hint</td>
<td>Supported</td>
<td>String value indicating the the ID to use for login.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When provided as part of the OIDC Authentication Request, the <code>login_hint</code> is set as the value of a cookie named <code>oidcLoginHint</code>, which is an HttpOnly cookie (only sent over HTTPS). Authentication modules can then retrieve the cookie’s value.</td>
</tr>
<tr>
<td>acr_values</td>
<td>Supported</td>
<td>Authentication Context class Reference values used to communicate acceptable LoAs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When the OIDC relying party on the server provider supplies <code>acr_values</code> in the authorization request, AM uses the OP configuration to map the values to authentication chains. It runs through the list of <code>acr_values</code> in order, attempting to use the first authentication chain that matches. AM then returns the authentication chain used as the value of the ID token <code>acr</code> claims property. In this way the relying part on the service provider can determine the LoA achieved during authentication.</td>
</tr>
<tr>
<td>dtbs</td>
<td>Not supported</td>
<td>Data To Be Signed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>At present AM does not support LoA 4.</td>
</tr>
</tbody>
</table>
As Mobile Connect OP, AM responds to a successful authorization request with a response containing all the required fields, and also the optional \texttt{expires_in} field. AM supports the mandatory ID Token properties, though the relying party is expected to use the \texttt{expires_in} value, rather than specifying \texttt{max_age} as a request parameter:

### ID Token Properties

<table>
<thead>
<tr>
<th>Request Parameter</th>
<th>Support</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\texttt{iss}</td>
<td>Supported</td>
<td>Issuer identifier</td>
</tr>
<tr>
<td>\texttt{sub}</td>
<td>Supported</td>
<td>Subject identifier</td>
</tr>
<tr>
<td></td>
<td></td>
<td>By default AM returns the identifier from the user profile.</td>
</tr>
<tr>
<td>\texttt{aud}</td>
<td>Supported</td>
<td>Audience, an array including the token endpoint URL.</td>
</tr>
<tr>
<td>\texttt{exp}</td>
<td>Supported</td>
<td>Expiration time in seconds since the epoch.</td>
</tr>
<tr>
<td>\texttt{iat}</td>
<td>Supported</td>
<td>Issued at time in seconds since the epoch.</td>
</tr>
<tr>
<td>\texttt{nonce}</td>
<td>Supported</td>
<td>The nonce supplied in the request.</td>
</tr>
<tr>
<td>\texttt{at_hash}</td>
<td>Supported</td>
<td>Base64url-encoding of the SHA-256 hash of the &quot;access_token&quot; value.</td>
</tr>
<tr>
<td>\texttt{acr}</td>
<td>Supported</td>
<td>Authentication Context class Reference for the LoA achieved.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For example, if the request specifies \texttt{acr_values=loa-3 loa-2} and AM achieves LoA 2, then the ID token includes &quot;acr&quot;: &quot;loa-2&quot;.</td>
</tr>
<tr>
<td>\texttt{amr}</td>
<td>Supported</td>
<td>Authentication Methods Reference to indicate the authentication method.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AM maps these to authentication modules.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suggested values include the following: \texttt{OK, DEV_PIN, SIM_PIN, UID_Pwd, BIOM, HDR, OTP}.</td>
</tr>
<tr>
<td>\texttt{azp}</td>
<td>Supported</td>
<td>Authorized party identifier, which is the \texttt{client_id}.</td>
</tr>
</tbody>
</table>

In addition to the standard OIDC user information returned with \texttt{userinfo}, AM as OP for Mobile Connect returns the \texttt{updated_at} property, representing the time last updated as seconds since the epoch.

### Configuring as an OP for Mobile Connect

You configure AM as an OpenID Connect provider for Mobile Connect by changing the OAuth2 Provider configuration.

Follow the steps in this procedure to set up the OAuth2 provider service with Mobile Connect defaults by using the Configure OAuth Provider wizard.
When you create the OAuth2 provider service with the Configure OAuth Provider wizard, the wizard also creates a standard policy in the Top Level Realm (/) to protect the authorization endpoint. In this configuration, AM serves the resources to protect, and no separate application is involved. AM therefore acts both as the policy decision point and policy enforcement point that protects the OAuth 2.0 authorization endpoint used by OpenID Connect.

There is no requirement to use the wizard or to create the policy in the Top Level Realm. However, if you create the OAuth 2.0 provider service without the wizard, then you must set up the policy independently as well. The policy must appear in a policy set of type iPlanetAMWebAgentService. When configuring the policy, allow all authenticated users to perform HTTP GET and POST requests on the authorization endpoint. The authorization endpoint is described in “OAuth 2.0 Client and Resource Server Endpoints” in the OAuth 2.0 Guide. For details on creating policies, see "Implementing Authorization" in the Authorization Guide.

1. In the AM console, select Realms > Realm Name > Dashboard > Configure OAuth Provider > Configure Mobile Connect.
2. On the Configure Mobile Connect page, select the Realm for the provider service.
3. (Optional) If necessary, adjust the lifetimes for authorization codes, access tokens, and refresh tokens.
4. (Optional) Select Issue Refresh Tokens unless you do not want the authorization service to supply a refresh token when returning an access token.
5. (Optional) Select Issue Refresh Tokens on Refreshing Access Tokens if you want the authorization service to supply a refresh token when refreshing an access token.
6. (Optional) If you have a custom scope validator implementation, put it on the AM classpath, for example /path/to/tomcat/webapps/openam/WEB-INF/lib/, and specify the class name in the Scope Implementation Class field. For an example, see "Customizing OAuth 2.0 Scope Handling" in the OAuth 2.0 Guide.
7. Click Create to save your changes.

AM creates an OAuth2 provider service with Mobile Connect default parameter values, as well as a policy to protect the OAuth2 authorization endpoints.

**Warning**

If an OAuth2 provider service already exists, it will be overwritten with the new Mobile Connect parameter values.

8. To access the provider service configuration in the AM console, browse to Realms > Realm Name > Services, and then click OAuth2 Provider.

   For Mobile Connect providers you may want to configure the following settings:
a. For the OpenID Connect acr_values to Auth Chain Mapping, configure the mapping between acr_values in the authorization request and AM authentication chains.

For example, if the relying party request includes acr_values=loa-3 loa-2 and the map includes [loa-2]=ldapService, and [loa-3]=msisdnAndHotpChain, then the authentication chain for the request is msisdnPlusHotpChain.

The ssoadm attribute is forgerock-oauth2-provider-loa-mapping.

b. For the OpenID Connect default acr claim, set the "acr" claim value to return in the ID Token when falling back to the default authentication chain.

The ssoadm attribute is forgerock-oauth2-provider-default-acr.

c. For the OpenID Connect id_token amr values to Auth Module mappings, set the "amr" values to return in the ID Token after successfully authenticating with specified authentication modules.

For example, you could set [UID_PWD]=LDAP to return "amr": [ "UID_PWD" ] in the ID Token after authenticating with the LDAP module.

The ssoadm attribute is forgerock-oauth2-provider-amr-mappings.

d. Configure the identity Data Store attributes used to return updated_at values in the ID Token.

For Mobile Connect clients, the user info endpoint returns updated_at values in the ID Token. If the user profile has never been updated updated_at reflects creation time.

The updated_at values are read from the profile attributes you specify. When using DS as an identity data store, the value is read from the modifyTimestamp attribute, or the createTimestamp attribute for a profile that has never been modified.

The ssoadm attribute for Modified Timestamp attribute name is forgerock-oauth2-provider-modified-attribute-name.

The ssoadm attribute is for Created Timestamp attribute name is forgerock-oauth2-provider-created-attribute-name.

In addition, you must also add these attributes to the list of LDAP User Attributes for the data store. Otherwise, the attributes are not returned when AM reads the user profile. To edit the list in the AM console, browse to Realms > Realm Name > Data Stores > Data Store Name > User Configuration > LDAP User Attributes.

9. Click Save to complete the process.

A simple, non-secure GSMA Mobile Connect relying party example is available online.
2.8. Encrypting OpenID Connect ID Tokens

AM supports the ability to encrypt OpenID Connect 1.0 ID tokens, which are Java Web Tokens (JWTs).

The following encryption algorithms are supported:

- **RSA1_5**. RSA with PKCS#1 v1.5 padding
- **RSA-OAEP**. RSA with OAEP padding and SHA-1
- **RSA-OAEP-256**. RSA with OAEP padding and SHA-256
- **A128KW**. AES key wrap using 128-bit key
- **A192KW**. AES key wrap using 192-bit key
- **A256KW**. AES key wrap using 256-bit key
- **dir**. Direct encryption with a shared symmetric key

The following encryption methods are supported:

- **A128CBC-HS256**. AES 128-bit in CBC mode using HMAC-SHA-256-128 hash (HS256 truncated to 128 bits)
- **A192CBC-HS384**. AES 192-bit in CBC mode using HMAC-SHA-384-192 hash (HS384 truncated to 192 bits)
- **A256CBC-HS512**. AES 256-bit in CBC mode using HMAC-SHA-512-256 hash (HS512 truncated to 256 bits)
- **A128GCM**. AES 128-bit in GCM mode
- **A192GCM**. AES 192-bit in GCM mode
- **A256GCM**. AES 256-bit in GCM mode

To Configure OpenID Connect ID Token Encryption

1. Start the AM console, and select the realm that you are working with.
2. Navigate to Dashboard > Configure OAuth > Configure OpenID, and then select Create.
3. Navigate to Applications > OAuth 2.0.
4. Under Clients, select Add Client, configure the Client ID and Client secret fields for the profile, and then select Create.
5. On the Core tab, add `openid` to the Scope(s) property.
7. Run Java code to generate an encoded public client encryption key. An example snippet is presented below:

```java
KeyPairGenerator keyPairGenerator = KeyPairGenerator.getInstance("RSA");
keyPairGenerator.initialize(1024);
StringWriter writer = new StringWriter();
PEMWriter pemWriter = new PEMWriter(writer);
pemWriter.writeObject(keyPairGenerator.generateKeyPair().getPublic());
pemWriter.flush();
return writer.toString();
```
8. Copy and paste the encoded public client key generated in the previous step into the Client ID Token Public Encryption Key field, on the Signing and Encryption tab. This encoded public key will be used to encrypt ID tokens.

9. Run through the authorization OpenID Connect code flow to generate the encrypted ID token. For more information, see "OpenID Connect Authorization Code Flow".

### 2.9. Configuring Digital Signatures

AM supports digital signature algorithms that secure the integrity of its JSON payload, which is outlined in the JSON Web Algorithm specification (RFC 7518).

AM supports signing algorithms listed in JSON Web Algorithms (JWA): "alg" (Algorithm) Header Parameter Values for JWS:

- HS256 - HMAC with SHA-256
- HS384 - HMAC with SHA-384
- HS512 - HMAC with SHA-512
- RS256 - RSA using SHA-256
- ES256 - ECDSA with SHA-256 and NIST standard P-256 elliptic curve
- ES384 - ECDSA with SHA-384 and NIST standard P-384 elliptic curve
- ES512 - ECDSA with SHA-512 and NIST standard P-521 elliptic curve

If you intend to use an ECDSA signing algorithm, you must generate a public/private key pair for use with ECDSA. To generate the public and private key pair, see step 1 in "Configuring Elliptic Curve Digital Signature Algorithms" in the Authentication and Single Sign-On Guide.

#### To Configure Digital Signatures

1. In the AM console navigate to Realms > Realm Name > Services, and then click OAuth2 Provider.

   **Tip**
   
   If you have not yet configured an OAuth 2.0 provider, follow the steps in "To Set Up the OAuth 2.0 Authorization Service" in the OAuth 2.0 Guide.

2. On the Advanced tab, in the OAuth2 Token Signing Algorithm drop-down list, select the signing algorithm to use for your digital signatures.

3. Take one of the following actions depending on the token signing algorithm:

   a. If you are using an HMAC signing algorithm, enter the Base64-encoded key used by HS256, HS384 and HS512 in the Token Signing HMAC Shared Secret field.

   b. If you are using RS256, enter the public/private key pair used by RS256 in the Token Signing RSA public/private key pair field. The public/private key pair will be retrieved from the keystore referenced by the property com.sun.identity.saml.xmlsig.keystore.
c. If you are using an ECDSA signing algorithm, enter the list of public/private key pairs used for the elliptic curve algorithms (ES256/ES384/ES512) in the Token Signing ECDSA public/private key pair alias field. For example, ES256|es256test. Each of the public/private key pairs will be retrieved from the keystore referenced by the property com.sun.identity.saml.xmlsig.keystore.

d. Click Save Changes.

4. Next, update the OpenID Connect client:
   a. Under Agent, click New, enter a Name and Password for the agent, and then click Create.
   b. In the ID Token Signing Algorithm field, enter the signing algorithm that the ID token for this client must be signed with. Default: RS256.
      
      • HS256 (HMAC with SHA-256)
      • HS384 (HMAC with SHA-384)
      • HS512 (HMAC with SHA-512)
      • RS256 (RSA using SHA-256)
      • ES256 (ECDSA with SHA-256 and NIST standard P-256 elliptic curve)
      • ES384 (ECDSA with SHA-384 and NIST standard P-384 elliptic curve)
      • ES512 (ECDSA with SHA-512 and NIST standard P-521 elliptic curve)
   c. Click Save.

To Obtain the OAuth 2.0/OpenID Connect 1.0 Public Signing Key

AM exposes the public keys used to digitally sign OAuth 2.0 and OpenID Connect 1.0 access and refresh tokens at a JSON web key (JWK) URI endpoint, which is exposed from all realms for an OAuth2 provider. The following steps show how to access the public keys:

1. To find the JWK URI, perform an HTTP GET at /oauth2/realms/root/.well-known/openid-configuration:

   ```bash
   {
     "id_token_encryption_alg_values_supported": ["RSA1_5"],
     "response_types_supported": ["token id_token",
      "code token",
      "code token id_token",
      "token",
      "code id_token",
      "code",
      "id_token"
    ],
    "registration_endpoint": "http://openam.example.com:8080/openam/oauth2/realms/root/connect/register",
    "token_endpoint": "http://openam.example.com:8080/openam/oauth2/realms/root/access_token",
    "end_session_endpoint": "http://openam.example.com:8080/openam/oauth2/realms/root/connect/endSession",
   }```
"scopes_supported": [
  "phone",
  "address",
  "email",
  "openid",
  "profile"
],
"acr_values_supported": [
],
"version": "3.0",
"userinfo_endpoint": "http://openam.example.com:8080/openam/oauth2/realms/root/userinfo",
"token_endpoint_auth_methods_supported": [
  "client_secret_post",
  "private_key_jwt",
  "client_secret_basic"
],
"subject_types_supported": [
  "public"
],
"issuer": "http://openam.example.com:8080/openam/oauth2/realms/root",
"id_token_encryption_enc_values_supported": [
  "A256CBC-HS512",
  "A128CBC-HS256"
],
"claims_parameter_supported": true,
"id_token_signing_alg_values_supported": [
  "ES384",
  "ES256",
  "ES512",
  "HS256",
  "HS512",
  "RS256",
  "HS384"
],
"check_session_iframe": "http://openam.example.com:8080/openam/oauth2/realms/root/connect/checkSession",
"claims_supported": [
  "zoneinfo",
  "phone_number",
  "address",
  "email",
  "locale",
  "name",
  "family_name",
  "given_name",
  "profile"
],
"authorization_endpoint": "http://openam.example.com:8080/openam/oauth2/realms/root/authorize"
}

2. Perform an HTTP GET at the JWKS URI to get the public signing key:
$ curl http://openam.example.com:8080/openam/oauth2/realms/root/connect/jwk_uri
{
  "keys":
  [
    {
      "kty":"RSA",
      "kid":"SyIjLC6Njt1KGQktD9Mt+0zce6SU=",
      "use":"sig",
      "alg":"RS256",
      "n":"AK0kHP10-RqdgLSokhwaYoi5Jic6hLKeuKw8WzCfsQ68ntBDf6tV0Tn_kZ07Gj5f4oJ
      AL1dXllxEY-kZWnxT3FF-0Mq4WQyGBfaW8LM4uAOLLvYZ8IiVEXxJh3sSlvaiTWrBoNf
      iIII8bhFp4551Y07NfpquUGEw0x0maci",
      "e":"AQAB"
    }
  ]
}
Chapter 3
Using OpenID Connect 1.0

This chapter covers examples and usage of AM with OpenID Connect 1.0.

3.1. Authorizing OpenID Connect 1.0 Relying Parties

Registered clients can request authorization through AM.

OpenID Connect 1.0 supports both a Basic Client Profile using the OAuth 2.0 authorization code grant, and an Implicit Client Profile using the OAuth 2.0 implicit grant. These client profiles rely on the OAuth 2.0 endpoints for authorization. Those endpoints are described in "OAuth 2.0 Client and Resource Server Endpoints" in the OAuth 2.0 Guide.

OpenID Connect Authorization Code Flow and Implicit Flow define how clients interact with the provider to obtain end user authorization and profile information. Although you can run the simple example relying parties that are mentioned in this section without setting up Transport Layer Security, do not deploy relying parties in production without securing the transport.

Code for the relying party examples shown here is available online. Clone the example project to deploy it in the same web container as AM. Edit the configuration at the outset of the .js files in the project, register a corresponding profile for the example relying party as described in "Registering OpenID Connect Relying Parties", and browse the deployment URL to see the initial page.
OpenID Connect Client Profiles

OpenID Connect 1.0 defines two client profiles.

Basic Client Profile

The Basic Client Profile is designed for web-based relying parties that use the OAuth 2.0 Authorization Code grant type, such as server-side clients that can protect their client credentials.

Try the Basic Client Profile.

Implicit Client Profile

The Implicit Client Profile is designed for relying parties that use the OAuth 2.0 Implicit grant type, such as browser-based clients written in JavaScript.

Try the Implicit Client Profile.

The examples provided here are both written in JavaScript. Neither aims to protect anything, but instead to show you the steps that each kind of client follows, and the responses from OpenAM as OpenID Connect Provider.

OpenID Connect Dynamic Registration

OpenID Connect 1.0 defines mechanisms both to discover the provider configuration, and also to register client applications dynamically.

See the example registration page for details.

GSMA Mobile Connect

Try OpenAM 12 and later as an OpenID Provider and Authenticator for GSMA Mobile Connect.

See the Mobile Connect page for details.

In addition, authorized clients can access end user information through the OpenID Connect 1.0 specific endpoint /oauth2/userinfo.

3.1.1. Authorization Code Flow Example

OpenID Connect Authorization Code Flow is designed for web-based relying parties that use the OAuth 2.0 Authorization Code grant type. This grant type makes it possible for the relying party to get the access code by using the authorization code directly, without passing through the end user’s browser. To protect its client secret (password), part of the relying party must run on a server.
In the example, the Basic Client Profile Start Page describes the prerequisite configuration, which must be part of the relying party profile that is stored in the AM realm where you set up the OpenID Provider. In the AM console, check that the OAuth 2.0 client profile matches the settings described.

**OpenID Connect Basic Client Profile Start Page**

Log out of AM, and click the link at the bottom of the page to request authorization. The link sends an HTTP GET request asking for `openid profile` scopes to the OpenID Provider authorization URI.

If everything is configured correctly, AM’s OpenID Provider has you authenticate as an end user, such as the demo user with username `demo` and password `changeit`, and grant (Allow) the relying party access to your profile.
If you successfully authenticate and allow the example relying party access to your profile, AM returns an authorization code to the example relying party. The example relying party then uses the authorization code to request an access token and an ID token. It shows the response to that request. It also validates the ID token signature using the default (HS256) algorithm, and decodes the ID token to validate its content and show it in the output. Finally, it uses the access token to request information about the end user who authenticated, and displays the result.

OpenID Connect Basic Client Profile Response Page

Notice that in addition to the standard payload, the ID token indicates the end user's AM realm, in this case \"realm\": "/\"."
3.1.2. Implicit Flow Example

OpenID Connect Implicit Flow is designed for relying parties that use the OAuth 2.0 Implicit grant type. This grant type is designed for relying parties implemented in a browser. Rather than protect a client secret, the client profile must register a protected redirect URI in advance with the OpenID Provider.

In the example, the Implicit Client Profile Start Page describes the prerequisite configuration, which must be part of the relying party profile that is stored in the AM realm where you set up the OpenID Provider. In the AM console, check that the OAuth 2.0 client profile matches the settings described. If you have already configured the agent profile for the Authorization Code Flow example, then you still need to add the redirect URI for the Implicit Flow.

**OpenID Connect Implicit Client Profile Start Page**
Log out of AM, and click the link at the bottom of the page to request authorization. The link sends an HTTP GET request asking for `id_token` token response types and `openid profile` scopes to the OpenID Provider authorization URI.

If everything is configured correctly, AM's OpenID Provider has you authenticate as an end user, such as the demo user with username `demo` and password `changeit`, and grant (Allow) the relying party access to your profile.

If you successfully authenticate and allow the example relying party access to your profile, AM returns the access token and ID token directly in the fragment (after `#`) of the redirect URI. The relying party does not get an authorization code. The relying party shows the response to the request. It also validates the ID token signature using the default (HS256) algorithm, and decodes the ID token to validate its content and show it in the output. Finally, the relying party uses the access token to request information about the end user who authenticated, and displays the result.
As for the Authorization Code Flow example, the ID Token indicates the end user’s AM realm and AM token ID in addition to the standard information.

3.2. AM As an Identity Provider to Another AM Example

The following example shows how to set up an AM instance to act as an OAuth2/OpenID Connect provider to another AM instance.
Prerequisites

- Two AM instances configured in different cookie domains. For example, https://server.example.com:8443/openam and https://client.example.net:8443/openam.

- An identity, for example, test, must exist in https://server.example.com:8443/openam.

Perform the steps in the following procedure to configure the AM instances:

To Set Up an OpenID Connect Flow Between AM Instances


2. On the Common Tasks Dashboard, select Configure OAuth Provider. Then, select Configure OpenID Connect.

3. On the configuration wizard, keep the default values and select Create.

4. Navigate to Realms > Realm Name > Applications > OAuth 2.0 and select Add Client.

5. Configure the client with the following settings:
   - **Client ID**: myClient
   - **Client secret**: forgerock
   - **Scope(s)**: openid profile email


7. On the Common Tasks dashboard, select Configure Social Authentication. Then, select Configure Other Authentication.

8. Configure the social authentication provider with the following settings:
   - **OpenID Discovery URL**: https://server.example.com:8443/openam/oauth2/.well-known/openid-configuration
   - **Provider Name**: amServer
   - **Image URL/Path**: http://tinyurl.com/openam-logo
   - **Client ID**: myClient
   - **Client Secret and Confirm Client Secret**: forgerock

   Keep the default value of the Redirect URL field, for example, https://client.example.net:8443/openam/oauth2c/OAuthProxy.jsp, and copy it to the clipboard.

10. On the Account Provisioning tab, enable Create account if it does not exist.

11. Navigate to Realms > Realm Name > Applications > OAuth 2.0 > myClient.

12. Configure the following settings on the client:

   - **Redirect URIs**: Paste the value of the Redirect URL field from the client. For example, `https://client.example.net:8443/openam/oauth2c/OAuthProxy.jsp`.
   - **Client Name**: AM2
   - **Display Name**: AM2
   - **Display Description**: AM2 Instance Client

13. Logout from `https://client.example.net:8443/openam` and return to the login page.

   You should be able to log in to `https://client.example.net:8443/openam` with the `test` user by using the AM logo to start the OpenID Connect flow.
This chapter covers customizing AM's support for OpenID Connect 1.0.

4.1. Scripting OpenID Connect 1.0 Claims

This section demonstrates how to use the default OIDC claims script to return the profile attributes of a user in response to an OpenID Connect request for the profile scope.

The default OIDC claims script maps the following claims to the profile scope:

- zoneinfo
- family_name
- locale
- name

To examine the contents of the default OIDC claims script in the AM console browse to Realms > Top Level Realm > Scripts, and then click OIDC Claims Script.

For general information about scripting in AM, see "About Scripting".

For information about APIs available for use when scripting OpenID Connect 1.0 claims, see the following sections:

- "Global Scripting API Functionality"
- "OpenID Connect 1.0 Claims API Functionality"

4.1.1. Preparing

AM requires a small amount of configuration before trying the example OIDC claims script. You must first create an OAuth2 provider with OpenID Connect settings, and register an OpenID Connect client, before you can authenticate to the client using a web browser.

The procedures in this section are:

- "To Create an OpenID Connect Provider Service"
• "To Register an OpenID Connect Client"

To Create an OpenID Connect Provider Service

Follow the steps in this procedure to create an OpenID Connect provider service by using the wizard.

1. Log in to AM as an administrator, for example amadmin.

2. Click Realms > Top Level Realm > Configure OAuth Provider > Configure OpenID Connect.

3. On the Configure OpenID Connect page, accept the default values and then click Create.

4. Navigate to Realms > Top Level Realm > Services, click OAuth2 Provider, and verify that the value for OIDC Claims Script is the default script, OIDC Claims Script.

For a more detailed explanation and example of creating an OpenID Connect provider service, see "Configuring as an OpenID Connect Provider".

To Register an OpenID Connect Client

Follow the steps in this procedure to create an OpenID Connect client profile.

1. Log in to AM as an administrator, for example amadmin.

2. Navigate to Realms > Realm Name > Applications > OAuth 2.0.

3. On the Clients tab, select Add Client.

4. Enter an ID for the client, such as oidcTest, provide a secret, and then click Create.

5. On the OAuth 2.0 client page:
   a. On the Core tab, in Scope(s), enter both profile and openid.

      The profile scope will return details about the subject such as given name and timezone. The openid scope indicates this is an OpenID Connect client.

   b. On the Advanced tab, in Redirection URIs, enter an example URI such as http://www.example.com.

   c. In Display name, enter the name of the client as it will be displayed on the consent page, for example OIDC Claims Script Client.

6. Save your work.

For a more detailed explanation and examples of registering an OpenID Connect client, see "Registering OpenID Connect Relying Parties" and "OAuth 2.0 and OpenID Connect 1.0 Client Settings".
4.1.2. Trying the Default OIDC Claims Script

This section shows how to authenticate to a registered OpenID Connect client and request scopes from AM, which in turn uses the default OIDC Claims script to populate the scope with claims and profile values.

To Authenticate to an OIDC Client and use the Default OIDC Claims Script

1. Log out of AM.

2. In an Internet browser, navigate to the AM OAuth 2.0 authorization endpoint, `/oauth2/authorize`, and specify the following query parameters, with the values you configured in the agent profile:

   **Query parameters for OpenID Connect Authorization to an Agent Profile**

<table>
<thead>
<tr>
<th>Query Parameter</th>
<th>Agent Profile Property Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>client_id</td>
<td>Name of the agent, for example <code>oidcTest</code>.</td>
</tr>
<tr>
<td>redirect_uri</td>
<td>Redirection URIs, for example <code>http://www.example.com</code>.</td>
</tr>
<tr>
<td>response_type</td>
<td>Response Types, for example <code>code</code>.</td>
</tr>
<tr>
<td>scope</td>
<td>Scope(s), for example <code>openid profile</code>.</td>
</tr>
</tbody>
</table>


3. Log in to AM as `demo`, with password `changeit`.

4. On the consent page, expand the panel labelled Your personal information to see the claim values the default OIDC script has populated into the requested `profile` scope.
5. Click Allow to be redirected to the Redirection URI specified in the agent profile. The authorization code is appended to the redirection URI as the value of the `code` query parameter.
Chapter 5
Reference

This reference section covers settings and other information relating to OpenID Connect 1.0 support in AM.

5.1. OpenID Connect 1.0 Standards

AM implements the following RFCs, Internet-Drafts, and standards relating to OpenID Connect 1.0:

**OpenID Connect 1.0**

AM can be configured to play the role of OpenID provider. The OpenID Connect specifications depend on OAuth 2.0, JSON Web Token, Simple Web Discovery and related specifications. The following specifications make up OpenID Connect 1.0:

- **OpenID Connect Core 1.0** defines core OpenID Connect 1.0 features.

  Note

  In section 5.6 of the specification, AM supports *Normal Claims*. The optional *Aggregated Claims* and *Distributed Claims* representations are not supported by AM.

- **OpenID Connect Discovery 1.0** defines how clients can dynamically recover information about OpenID providers.

- **OpenID Connect Dynamic Client Registration 1.0** defines how clients can dynamically register with OpenID providers.

- **OpenID Connect Session Management 1.0- Draft 10** describes how to manage OpenID Connect sessions, including logout.

- **OAuth 2.0 Multiple Response Type Encoding Practices** defines additional OAuth 2.0 response types used in OpenID Connect.

- **OAuth 2.0 Form Post Response Mode** defines how OpenID providers return OAuth 2.0 Authorization Response parameters in auto-submitting forms.

OpenID Connect 1.0 also provides implementer's guides for client developers.
• OpenID Connect Basic Client Implementer's Guide 1.0
• OpenID Connect Implicit Client Implementer's Guide 1.0

5.2. OpenID Connect 1.0 Claims API Functionality

This section covers functionality available when scripting OIDC claim handling using the OIDC claims script context type.

5.2.1. Accessing OpenID Connect Requests

Server-side scripts can access the OpenID Connect request through the following objects:

**OIDC Request Objects**

<table>
<thead>
<tr>
<th>Object</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>scopes</td>
<td>Set&lt;String&gt;</td>
<td>Contains a set of the requested scopes. For example:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[&quot;profile&quot;, &quot;openid&quot;]</td>
</tr>
<tr>
<td>identity</td>
<td>Class</td>
<td>Contains a representation of the identity of the resource owner. For more details, see the com.sun.identity.idm.AMIdentity class in the ForgeRock Access Management Javadoc.</td>
</tr>
<tr>
<td>session</td>
<td>Class</td>
<td>Contains a representation of the user's session object if the request contained a session cookie. For more details, see the com.iplanet.sso.SSOToken class in the ForgeRock Access Management Javadoc.</td>
</tr>
<tr>
<td>claims</td>
<td>Map&lt;String, Object&gt;</td>
<td>Contains a map of the claims the server provides by default. For example:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>{ &quot;sub&quot;: &quot;248289761001&quot;, &quot;updated_at&quot;: &quot;1450368765&quot; }</td>
</tr>
<tr>
<td>requestedClaims</td>
<td>Map&lt;String, Set&lt;String&gt;&gt;</td>
<td>Contains requested claims if the claims query parameter is used in the request and Enable &quot;claims_parameter_supported&quot; is checked in the OAuth2 provider service configuration, otherwise is empty.</td>
</tr>
</tbody>
</table>
### 5.3. OAuth2 Provider

**amster service name:** [oauth-oidc](#)

#### 5.3.1. Global Attributes

The following settings appear on the **Global Attributes** tab:

- **Token Blacklist Cache Size**

  Number of blacklisted tokens to cache in memory to speed up blacklist checks and reduce load on the CTS.

  Default value: **10000**

  **amster attribute:** `blacklistCacheSize`

- **Blacklist Poll Interval (seconds)**

  How frequently to poll for token blacklist changes from other servers, in seconds.

  How often each server will poll the CTS for token blacklist changes from other servers. This is used to maintain a highly compressed view of the overall current token blacklist improving performance. A lower number will reduce the delay for blacklisted tokens to propagate to all servers at the cost of increased CTS load. Set to 0 to disable this feature completely.

  Default value: **60**

  **amster attribute:** `blacklistPollInterval`
Blacklist Purge Delay (minutes)

Length of time to blacklist tokens beyond their expiry time.

Allows additional time to account for clock skew to ensure that a token has expired before it is removed from the blacklist.

Default value: 1

`amster` attribute: `blacklistPurgeDelay`

Authenticity Secret

A secret to use when signing data that will be sent back to AM so that authenticity can be assured when they are presented back to OpenAM.

`amster` attribute: `idTokenAuthenticitySecret`

ID Token Signing Key Alias for Agent Clients

The alias for the RSA key that should be used signing ID tokens for Agent OAuth2 Clients

Default value: `test`

`amster` attribute: `agentIdTokenSigningKeyAlias`

Stateless Grant Token Upgrade Compatibility Mode

Enable OpenAM to consume and create stateless OAuth 2.0 tokens in two different formats simultaneously.

Enable this option when upgrading OpenAM to allow the new instance to create and consume stateless OAuth 2.0 tokens in both the previous format, and the new format. Disable this option once all OpenAM instances in the cluster have been upgraded.

Default value: `false`

`amster` attribute: `statelessGrantTokenUpgradeCompatibilityMode`

5.3.2. Core

The following settings appear on the Core tab:

Use Stateless Access & Refresh Tokens

When enabled, OpenAM issues access and refresh tokens that can be inspected by resource servers.

Default value: `false`
amster attribute: `statelessTokensEnabled`

**Authorization Code Lifetime (seconds)**

The time an authorization code is valid for, in seconds.

Default value: **120**

amster attribute: `codeLifetime`

**Refresh Token Lifetime (seconds)**

The time in seconds a refresh token is valid for. If this field is set to `-1`, the token will never expire.

Default value: **604800**

amster attribute: `refreshTokenLifetime`

**Access Token Lifetime (seconds)**

The time an access token is valid for, in seconds.

Default value: **3600**

amster attribute: `accessTokenLifetime`

**Issue Refresh Tokens**

Whether to issue a refresh token when returning an access token.

Default value: **true**

amster attribute: `issueRefreshToken`

**Issue Refresh Tokens on Refreshing Access Tokens**

Whether to issue a refresh token when refreshing an access token.

Default value: **true**

amster attribute: `issueRefreshTokenOnRefreshedToken`

**Use Policy Engine for Scope decisions**

With this setting enabled, the policy engine is consulted for each scope value that is requested.

If a policy returns an action of GRANT=true, the scope is consented automatically, and the user is not consulted in a user-interaction flow. If a policy returns an action of GRANT=false, the scope is not added to any resulting token, and the user will not see it in a user-interaction flow. If no policy returns a value for the GRANT action, then if the grant type is user-facing (i.e. authorization or device code flows), the user is asked for consent (or saved consent is used), and
if the grant type is not user-facing (password or client credentials), the scope is not added to any resulting token.

Default value: false

**amster** attribute: `usePolicyEngineForScope`

### 5.3.3. Advanced

The following settings appear on the **Advanced** tab:

**Custom Login URL Template**

Custom URL for handling login, to override the default OpenAM login page.

Supports Freemarker syntax, with the following variables:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>gotoUrl</code></td>
<td>The URL to redirect to after login.</td>
</tr>
<tr>
<td><code>acrValues</code></td>
<td>The Authentication Context Class Reference (acr) values for the authorization request.</td>
</tr>
<tr>
<td><code>realm</code></td>
<td>The OpenAM realm the authorization request was made on.</td>
</tr>
<tr>
<td><code>module</code></td>
<td>The name of the OpenAM authentication module requested to perform resource owner authentication.</td>
</tr>
<tr>
<td><code>service</code></td>
<td>The name of the OpenAM authentication chain requested to perform resource owner authentication.</td>
</tr>
<tr>
<td><code>locale</code></td>
<td>A space-separated list of locales, ordered by preference.</td>
</tr>
</tbody>
</table>

The following example template redirects users to a non-OpenAM front end to handle login, which will then redirect back to the `/oauth2/authorize` endpoint with any required parameters:

```html
http://mylogin.com/login?goto=${goto}&acr_values=${acrValues}&realm=${realm}&module=${module}&service=${service}&locale=${locale}
```

**NOTE**: Default OpenAM login page is constructed using "Base URL Source" service.

**amster** attribute: `customLoginUrlTemplate`

**Scope Implementation Class**

The class that contains the required scope implementation, must implement the `org.forgerock.oauth2.core.ScopeValidator` interface.
Default value: org.forgerock.openam.oauth2.OpenAMScopeValidator

**amster** attribute: scopeImplementationClass

### Response Type Plugins

List of plugins that handle the valid `response_type` values.

OAuth 2.0 clients pass response types as parameters to the OAuth 2.0 Authorization endpoint (/oauth2/authorize) to indicate which grant type is requested from the provider. For example, the client passes `code` when requesting an authorization code, and `token` when requesting an access token.

Values in this list take the form `response-type|plugin-class-name`.

Default value:

```
code|org.forgerock.oauth2.core.AuthorizationCodeResponseTypeHandler
device_code|org.forgerock.oauth2.core.TokenResponseTypeHandler
token|org.forgerock.oauth2.core.TokenResponseTypeHandler
```

**amster** attribute: responseTypeClasses

### User Profile Attribute(s) the Resource Owner is Authenticated On

Names of profile attributes that resource owners use to log in. You can add others to the default, for example `mail`.

Default value: `uid`

**amster** attribute: authenticationAttributes

### User Display Name attribute

The profile attribute that contains the name to be displayed for the user on the consent page.

Default value: `cn`

**amster** attribute: displayNameAttribute

### Supported Scopes

The set of supported scopes, with translations.

Scopes may be entered as simple strings or pipe-separated strings representing the internal scope name, locale, and localized description.

For example: `read|en|Permission to view email messages in your account`

Locale strings are in the format: `language_country_variant`, for example `en`, `en_GB`, or `en_US_WIN`. 
If the locale and pipe is omitted, the description is displayed to all users that have undefined locales.

If the description is also omitted, nothing is displayed on the consent page for the scope. For example specifying `read` would allow the scope read to be used by the client, but would not display it to the user on the consent page when requested.

**amster** attribute: supportedScopes

### Subject Types supported

List of subject types supported. Valid values are:

- **public** - Each client receives the same subject (`sub`) value.
- **pairwise** - Each client receives a different subject (`sub`) value, to prevent correlation between clients.

Default value: `public`

**amster** attribute: supportedSubjectTypes

### Default Client Scopes

List of scopes a client will be granted if they request registration without specifying which scopes they want. Default scopes are NOT auto-granted to clients created through the OpenAM console.

**amster** attribute: defaultScopes

### OAuth2 Token Signing Algorithm

Algorithm used to sign stateless OAuth 2.0 tokens in order to detect tampering.

OpenAM supports signing algorithms listed in JSON Web Algorithms (JWA): "alg" (Algorithm) Header Parameter Values for JWS:

- **HS256** - HMAC with SHA-256.
- **HS384** - HMAC with SHA-384.
- **HS512** - HMAC with SHA-512.
- **ES256** - ECDSA with SHA-256 and NIST standard P-256 elliptic curve.
- **ES384** - ECDSA with SHA-384 and NIST standard P-384 elliptic curve.
- **ES512** - ECDSA with SHA-512 and NIST standard P-521 elliptic curve.
- **RS256** - RSASSA-PKCS-v1_5 using SHA-256.
The possible values for this property are:

- HS256
- HS384
- HS512
- RS256
- RS384
- RS512
- ES256
- ES384
- ES512
- PS256
- PS384
- PS512

Default value: **HS256**

**amster attribute:** `tokenSigningAlgorithm`

**Stateless Token Compression**

Whether stateless access and refresh tokens should be compressed.

**amster attribute:** `tokenCompressionEnabled`

**Token Signing HMAC Shared Secret**

Base64-encoded key used by HS256, HS384 and HS512.

**amster attribute:** `tokenSigningHmacSharedSecret`

**Token Signing RSA Public/Private Key Pair**

The public/private key pair used by RS256.

The public/private key pair will be retrieved from the keystore referenced by the property `com.sun.identity.saml.xmlsig.keystore`.

Default value: **test**
**amster** attribute: *keypairName*

**Token Signing ECDSA Public/Private Key Pair Alias**

The list of public/private key pairs used for the elliptic curve algorithms (ES256/ES384/ES512). Add an entry to specify an alias for a specific elliptic curve algorithm, for example `ES256|es256Alias`.

Each of the public/private key pairs will be retrieved from the keystore referenced by the property `com.sun.identity.saml.xmlsig.keystore`.

Default value:

<table>
<thead>
<tr>
<th>Key Pair Alias</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES512</td>
</tr>
<tr>
<td>ES384</td>
</tr>
<tr>
<td>ES256</td>
</tr>
</tbody>
</table>

**amster** attribute: *tokenSigningECDSAKeyAlias*

**Enable Stateless Token Encryption**

Whether stateless access and refresh tokens should be encrypted.

Enabling token encryption will disable token signing as encryption is performed using direct symmetric encryption.

Default value: `false`

**amster** attribute: *tokenEncryptionEnabled*

**Token Encryption Secret Key Alias**

The secret key used for encryption.

The secret key will be retrieved from the keystore referenced by the property `com.sun.identity.saml.xmlsig.keystore`.

Default value: `directenctest`

**amster** attribute: *tokenEncryptionKeyAlias*

**Subject Identifier Hash Salt**

If `pairwise` subject types are supported, it is **STRONGLY RECOMMENDED** to change this value. It is used in the salting of hashes for returning specific `sub` claims to individuals using the same `request_uri` or `sector_identifier_uri`.

For example, you might set this property to: `changeme`

**amster** attribute: *hashSalt*
Code Verifier Parameter Required

If enabled, requests using the authorization code grant require a `code_challenge` attribute.

For more information, read the draft specification for this feature.

Default value: `false`

attribute: `codeVerifierEnforced`

Modified Timestamp Attribute Name

The identity Data Store attribute used to return modified timestamp values.

This attribute is paired together with the *Created Timestamp Attribute Name* attribute (`createdTimestampAttribute`). You can leave both attributes unset (default) or set them both. If you set only one attribute and leave the other blank, the access token fails with a 500 error.

For example, when you configure AM as an OpenID Connect Provider in a Mobile Connect application and use DS as an Identity data store, the client accesses the `userinfo` endpoint to obtain the `updated_at` claim value in the ID token. The `updated_at` claim obtains its value from the `modifiedTimestampAttribute` attribute in the user profile. If the profile has never been modified, `updated_at` claim uses the `createdTimestampAttribute` attribute. For more information, see "Configuring as an OP for Mobile Connect".

attribute: `modifiedTimestampAttribute`

Created Timestamp Attribute Name

The identity Data Store attribute used to return created timestamp values.

This attribute is paired together with the *Modified Timestamp Attribute Name* (`modifyTimestampAttribute`). You can leave both attributes unset (default) or set them both. If you set only one attribute and leave the other blank, the access token fails with a 500 error.

For example, when you configure AM as an OpenID Connect Provider in a Mobile Connect application and use DS as an Identity data store, the client accesses the `userinfo` endpoint to obtain the `updated_at` claim value in the ID token. The `updated_at` claim obtains its value from the `modifiedTimestampAttribute` attribute in the user profile. If the profile has never been modified, `updated_at` claim uses the `createdTimestampAttribute` attribute. For more information, see "Configuring as an OP for Mobile Connect".

attribute: `createdTimestampAttribute`

Enable Auth Module Messages for Password Credentials Grant

If enabled, authentication module failure messages are used to create Resource Owner Password Credentials Grant failure messages. If disabled, a standard authentication failed message is used.

The Resource Owner Password Credentials grant type requires the `grant_type=password` parameter.
Default value: `false`

**moduleMessageEnabledInPasswordGrant**

### 5.3.4. Client Dynamic Registration

The following settings appear on the **Client Dynamic Registration** tab:

**Require Software Statement for Dynamic Client Registration**

When enabled, a software statement JWT containing at least the `iss` (issuer) claim must be provided when registering an OAuth 2.0 client dynamically.

Default value: `false`

**dynamicClientRegistrationSoftwareStatementRequired**

**Required Software Statement Attested Attributes**

The client attributes that are required to be present in the software statement JWT when registering an OAuth 2.0 client dynamically. Only applies if Require Software Statements for Dynamic Client Registration is enabled.

Leave blank to allow any attributes to be present.

Default value: `redirect_uris`

**requiredSoftwareStatementAttestedAttributes**

**Allow Open Dynamic Client Registration**

Allow clients to register without an access token. If enabled, you should consider adding some form of rate limiting. For more information, see Client Registration in the OpenID Connect specification.

Default value: `false`

**allowDynamicRegistration**

**Generate Registration Access Tokens**

Whether to generate Registration Access Tokens for clients that register by using open dynamic client registration. Such tokens allow the client to access the Client Configuration Endpoint as per the OpenID Connect specification. This setting has no effect if Allow Open Dynamic Client Registration is disabled.

Default value: `true`

**generateRegistrationAccessTokens**
**Scope to give access to dynamic client registration**

Mandatory scope required when registering a new OAuth2 client.

Default value: `dynamic_client_registration`

**amster attribute**: `dynamicClientRegistrationScope`

---

**5.3.5. OpenID Connect**

The following settings appear on the **OpenID Connect** tab:

**OIDC Claims Script**

The script that is run when issuing an ID token or making a request to the `userinfo` endpoint during OpenID requests.

The script gathers the scopes and populates claims, and has access to the access token, the user's identity and, if available, the user's session.

The possible values for this property are:

- OIDC Claims Script

Default value: `OIDC Claims Script`

**amster attribute**: `oidcClaimsScript`

**ID Token Signing Algorithms supported**

Algorithms supported to sign OpenID Connect `id_tokens`.

OpenAM supports signing algorithms listed in JSON Web Algorithms (JWA): "alg" (Algorithm)

**Header Parameter Values for JWS:**

- **HS256** - HMAC with SHA-256.
- **HS384** - HMAC with SHA-384.
- **HS512** - HMAC with SHA-512.
- **ES256** - ECDSA with SHA-256 and NIST standard P-256 elliptic curve.
- **ES384** - ECDSA with SHA-384 and NIST standard P-384 elliptic curve.
- **ES512** - ECDSA with SHA-512 and NIST standard P-521 elliptic curve.
- **RS256** - RSASSA-PKCS-v1_5 using SHA-256.

Default value:
ID Token Encryption Algorithms supported

Encryption algorithms supported to encrypt OpenID Connect ID tokens in order to hide its contents.

OpenAM supports the following ID token encryption algorithms:

- **RSA-OAEP** - RSA with Optimal Asymmetric Encryption Padding (OAEP) with SHA-1 and MGF-1.
- **RSA-OAEP-256** - RSA with OAEP with SHA-256 and MGF-1.
- **A128KW** - AES Key Wrapping with 128-bit key derived from the client secret.
- **RSA1_5** - RSA with PKCS#1 v1.5 padding.
- **A256KW** - AES Key Wrapping with 256-bit key derived from the client secret.
- **dir** - Direct encryption with AES using the hashed client secret.
- **A192KW** - AES Key Wrapping with 192-bit key derived from the client secret.

Default value:

<table>
<thead>
<tr>
<th>Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA-OAEP</td>
</tr>
<tr>
<td>RSA-OAEP-256</td>
</tr>
<tr>
<td>A128KW</td>
</tr>
<tr>
<td>RSA1_5</td>
</tr>
<tr>
<td>A256KW</td>
</tr>
<tr>
<td>dir</td>
</tr>
<tr>
<td>A192KW</td>
</tr>
</tbody>
</table>

ID Token Encryption Methods supported

Encryption methods supported to encrypt OpenID Connect ID tokens in order to hide its contents.

OpenAM supports the following ID token encryption algorithms:
• **A128GCM, A192GCM, and A256GCM** - AES in Galois Counter Mode (GCM) authenticated encryption mode.

• **A128CBC-HS256, A192CBC-HS384, and A256CBC-HS512** - AES encryption in CBC mode, with HMAC-SHA-2 for integrity.

Default value:

<table>
<thead>
<tr>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>A256GCM</td>
</tr>
<tr>
<td>A192GCM</td>
</tr>
<tr>
<td>A128GCM</td>
</tr>
<tr>
<td>A128CBC-HS256</td>
</tr>
<tr>
<td>A192CBC-HS384</td>
</tr>
<tr>
<td>A256CBC-HS512</td>
</tr>
</tbody>
</table>

**amster** attribute: `supportedIDTokenEncryptionMethods`

**Supported Claims**

Set of claims supported by the OpenID Connect `/oauth2/userinfo` endpoint, with translations.

Claims may be entered as simple strings or pipe separated strings representing the internal claim name, locale, and localized description.

For example: `name|en|Your full name.`

Locale strings are in the format: `language + "_" + country + "_" + variant`, for example `en, en_GB`, or `en_US_WIN`. If the locale and pipe is omitted, the description is displayed to all users that have undefined locales.

If the description is also omitted, nothing is displayed on the consent page for the claim. For example specifying `family_name` would allow the claim `family_name` to be used by the client, but would not display it to the user on the consent page when requested.

**amster** attribute: `supportedClaims`

**OpenID Connect JWT Token Lifetime (seconds)**

The amount of time the JWT will be valid for, in seconds.

Default value: 3600

**amster** attribute: `jwtTokenLifetime`

**Token Encryption RSA Public/Private Key Pair Alias**

The list of public/private key pairs used for the RSA algorithms (RSA1_5/RSA-OAEP/RSA-OAEP-256). Add an entry to specify an alias for a specific RSA algorithm, for example `RSA1_5|rsal_5Alias`.

Each of the public/private key pairs will be retrieved from the keystore referenced by the property `com.sun.identity.saml.xmlsig.keystore`.
Default value:

| RSA_1_5| test  
|RSA-OAEP| test  
|RSA-OAEP-256| test  

**amster attribute**: `tokenEncryptionSigningKeyAlias`

### 5.3.6. Advanced OpenID Connect

The following settings appear on the **Advanced OpenID Connect** tab:

**Remote JSON Web Key URL**

The Remote URL where the providers JSON Web Key can be retrieved.

If this setting is not configured, then OpenAM provides a local URL to access the public key of the private key used to sign ID tokens.

**amster attribute**: `jksURI`

**Idtokeninfo Endpoint Requires Client Authentication**

When enabled, the `/oauth2/idtokeninfo` endpoint requires client authentication if the signing algorithm is set to `HS256`, `HS384`, or `HS512`.

Default value: `true`

**amster attribute**: `idTokenInfoClientAuthenticationEnabled`

**Enable "claims_parameter_supported"**

If enabled, clients will be able to request individual claims using the `claims` request parameter, as per section 5.5 of the OpenID Connect specification.

Default value: `false`

**amster attribute**: `claimsParameterSupported`

**OpenID Connect acr_values to Auth Chain Mapping**

Maps OpenID Connect ACR values to authentication chains. For more details, see the `acr_values parameter` in the OpenID Connect authentication request specification.

**amster attribute**: `loaMapping`

**Default ACR values**

Default requested Authentication Context Class Reference values.
List of strings that specifies the default acr values that the OP is being requested to use for processing requests from this Client, with the values appearing in order of preference. The Authentication Context Class satisfied by the authentication performed is returned as the acr Claim Value in the issued ID Token. The acr Claim is requested as a Voluntary Claim by this parameter. The acr_values_supported discovery element contains a list of the acr values supported by this server. Values specified in the acr_values request parameter or an individual acr Claim request override these default values.

**amster attribute:** `defaultACR`

### OpenID Connect id_token amr Values to Auth Module Mappings

Specify amr values to be returned in the OpenID Connect id_token. Once authentication has completed, the authentication modules that were used from the authentication service will be mapped to the amr values. If you do not require amr values, or are not providing OpenID Connect tokens, leave this field blank.

**amster attribute:** `amrMappings`

### Always Return Claims in ID Tokens

If enabled, include scope-derived claims in the id_token, even if an access token is also returned that could provide access to get the claims from the userinfo endpoint.

If not enabled, if an access token is requested the client must use it to access the userinfo endpoint for scope-derived claims, as they will not be included in the ID token.

Default value: `false`

**amster attribute:** `alwaysAddClaimsToToken`

### Store Ops Tokens

Whether OpenAM will store the ops tokens corresponding to OpenID Connect sessions in the CTS store. Note that session management related endpoints will not work when this setting is disabled.

Default value: `true`

**amster attribute:** `storeOpsTokens`

### Request Parameter Signing Algorithms Supported

Algorithms supported to verify signature of Request parameter. OpenAM supports signing algorithms listed in JSON Web Algorithms (JWA): "alg" (Algorithm) Header Parameter Values for JWS:

- **HS256** - HMAC with SHA-256.
- **HS384** - HMAC with SHA-384.
• **HS512** - HMAC with SHA-512.

• **ES256** - ECDSA with SHA-256 and NIST standard P-256 elliptic curve.

• **ES384** - ECDSA with SHA-384 and NIST standard P-384 elliptic curve.

• **ES512** - ECDSA with SHA-512 and NIST standard P-521 elliptic curve.

• **RS256** - RSASSA-PKCS-v1_5 using SHA-256.

Default value:

<table>
<thead>
<tr>
<th>PS384</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS384</td>
</tr>
<tr>
<td>ES384</td>
</tr>
<tr>
<td>HS256</td>
</tr>
<tr>
<td>HS512</td>
</tr>
<tr>
<td>ES256</td>
</tr>
<tr>
<td>RS256</td>
</tr>
<tr>
<td>HS384</td>
</tr>
<tr>
<td>ES512</td>
</tr>
<tr>
<td>PS256</td>
</tr>
<tr>
<td>PS512</td>
</tr>
<tr>
<td>RS512</td>
</tr>
</tbody>
</table>

**amster** attribute: supportedRequestParameterSigningAlgorithms

**Request Parameter Encryption Algorithms Supported**

Encryption algorithms supported to decrypt Request parameter.

OpenAM supports the following ID token encryption algorithms:

• **RSA-OAEP** - RSA with Optimal Asymmetric Encryption Padding (OAEP) with SHA-1 and MGF-1.

• **RSA-OAEP-256** - RSA with OAEP with SHA-256 and MGF-1.

• **A128KW** - AES Key Wrapping with 128-bit key derived from the client secret.

• **RSA1_5** - RSA with PKCS#1 v1.5 padding.

• **A256KW** - AES Key Wrapping with 256-bit key derived from the client secret.

• **dir** - Direct encryption with AES using the hashed client secret.

• **A192KW** - AES Key Wrapping with 192-bit key derived from the client secret.

Default value:

<table>
<thead>
<tr>
<th>RSA-OAEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA-OAEP-256</td>
</tr>
<tr>
<td>A128KW</td>
</tr>
<tr>
<td>RSA1_5</td>
</tr>
</tbody>
</table>
A256KW
    dir
A192KW

**amster attribute**: supportedRequestParameterEncryptionAlgorithms

### Request Parameter Encryption Methods Supported

Encryption methods supported to decrypt Request parameter.

OpenAM supports the following Request parameter encryption algorithms:

- **A128GCM**, **A192GCM**, and **A256GCM** - AES in Galois Counter Mode (GCM) authenticated encryption mode.

- **A128CBC-HS256**, **A192CBC-HS384**, and **A256CBC-HS512** - AES encryption in CBC mode, with HMAC-SHA-256 for integrity.

Default value:

<table>
<thead>
<tr>
<th>A256GCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>A192GCM</td>
</tr>
<tr>
<td>A128GCM</td>
</tr>
<tr>
<td>A128CBC-HS256</td>
</tr>
<tr>
<td>A192CBC-HS384</td>
</tr>
<tr>
<td>A256CBC-HS512</td>
</tr>
</tbody>
</table>

**amster attribute**: supportedRequestParameterEncryptionEnc

### Require Pre-registered request_uri Values

When enabled, any `request_uri` values used must be pre-registered using the `request_uris` registration parameter.

Default value: **false**

**amster attribute**: requireRequestUriRegistration

### Authorized OIDC SSO Clients

Clients authorized to use OpenID Connect ID tokens as SSO Tokens.

Allows clients to act with the full authority of the user. Grant this permission only to trusted clients.

**amster attribute**: authorisedOpenIdConnectSSOClients

### 5.3.7. Device Flow

The following settings appear on the **Device Flow** tab:
Verification URL

The URL that the user will be instructed to visit to complete their OAuth 2.0 login and consent when using the device code flow.

\texttt{amster} attribute: \texttt{verificationUrl}

Device Completion URL

The URL that the user will be sent to on completion of their OAuth 2.0 login and consent when using the device code flow.

\texttt{amster} attribute: \texttt{completionUrl}

Device Code Lifetime (seconds)

The lifetime of the device code, in seconds.

Default value: 300

\texttt{amster} attribute: \texttt{deviceCodeLifetime}

Device Polling Interval

The polling frequency for devices waiting for tokens when using the device code flow.

Default value: 5

\texttt{amster} attribute: \texttt{devicePollInterval}

5.3.8. Consent

The following settings appear on the \textbf{Consent} tab:

Saved Consent Attribute Name

Name of a multi-valued attribute on resource owner profiles where OpenAM can save authorization consent decisions.

When the resource owner chooses to save the decision to authorize access for a client application, then OpenAM updates the resource owner's profile to avoid having to prompt the resource owner to grant authorization when the client issues subsequent authorization requests.

\texttt{amster} attribute: \texttt{savedConsentAttribute}

Allow Clients to Skip Consent

If enabled, clients may be configured so that the resource owner will not be asked for consent during authorization flows.

Default value: \texttt{false}
amster attribute: clientsCanSkipConsent

Enable Remote Consent

Default value: false

amster attribute: enableRemoteConsent

Remote Consent Service ID

The ID of an existing remote consent service agent.

The possible values for this property are:

- [Empty]

amster attribute: remoteConsentServiceId

Remote Consent Service Request Signing Algorithms Supported

Algorithms supported to sign consent_request JWTs for Remote Consent Services.

OpenAM supports signing algorithms listed in JSON Web Algorithms (JWA): "alg" (Algorithm) Header Parameter Values for JWS:

- **HS256** - HMAC with SHA-256.
- **HS384** - HMAC with SHA-384.
- **HS512** - HMAC with SHA-512.
- **ES256** - ECDSA with SHA-256 and NIST standard P-256 elliptic curve.
- **ES384** - ECDSA with SHA-384 and NIST standard P-384 elliptic curve.
- **ES512** - ECDSA with SHA-512 and NIST standard P-521 elliptic curve.
- **RS256** - RSASSA-PKCS-v1_5 using SHA-256.

Default value:

```
PS384
RS384
ES384
HS256
HS512
ES256
RS256
HS384
ES512
PS256
PS512
RS256
```
**amster** attribute: `supportedRcsRequestSigningAlgorithms`

### Remote Consent Service Request Encryption Algorithms Supported

Encryption algorithms supported to encrypt Remote Consent Service requests.

OpenAM supports the following encryption algorithms:

- **RSA1_5** - RSA with PKCS#1 v1.5 padding.
- **RSA-OAEP** - RSA with Optimal Asymmetric Encryption Padding (OAEP) with SHA-1 and MGF-1.
- **RSA-OAEP-256** - RSA with OAEP with SHA-256 and MGF-1.
- **A128KW** - AES Key Wrapping with 128-bit key derived from the client secret.
- **A192KW** - AES Key Wrapping with 192-bit key derived from the client secret.
- **A256KW** - AES Key Wrapping with 256-bit key derived from the client secret.
- **dir** - Direct encryption with AES using the hashed client secret.

Default value:

```markdown
RSA-OAEP
RSA-OAEP-256
A128KW
RSA1_5
A256KW
dir
A192KW
```

**amster** attribute: `supportedRcsRequestEncryptionAlgorithms`

### Remote Consent Service Request Encryption Methods Supported

Encryption methods supported to encrypt Remote Consent Service requests.

OpenAM supports the following encryption methods:

- **A128GCM, A192GCM, and A256GCM** - AES in Galois Counter Mode (GCM) authenticated encryption mode.
- **A128CBC-HS256, A192CBC-HS384, and A256CBC-HS512** - AES encryption in CBC mode, with HMAC-SHA-2 for integrity.

Default value:

```markdown
A256GCM
A192GCM
A128GCM
A128CBC-HS256
A192CBC-HS384
```
Remote Consent Service Response Signing Algorithms Supported

Algorithms supported to verify signed consent_response JWT from Remote Consent Services.

OpenAM supports signing algorithms listed in JSON Web Algorithms (JWA): "alg" (Algorithm)
Header Parameter Values for JWS:

- **HS256** - HMAC with SHA-256.
- **HS384** - HMAC with SHA-384.
- **HS512** - HMAC with SHA-512.
- **ES256** - ECDSA with SHA-256 and NIST standard P-256 elliptic curve.
- **ES384** - ECDSA with SHA-384 and NIST standard P-384 elliptic curve.
- **ES512** - ECDSA with SHA-512 and NIST standard P-521 elliptic curve.
- **RS256** - RSASSA-PKCS-v1_5 using SHA-256.

Default value:

- PS384
- RS384
- ES384
- HS256
- HS512
- ES256
- RS256
- HS384
- ES512
- PS256
- PS512
- RS512

Remote Consent Service Response Encryption Algorithms Supported

Encryption algorithms supported to decrypt Remote Consent Service responses.

OpenAM supports the following encryption algorithms:

- **RSA1_5** - RSA with PKCS#1 v1.5 padding.
- **RSA-OAEP** - RSA with Optimal Asymmetric Encryption Padding (OAEP) with SHA-1 and MGF-1.
- **RSA-OAEP-256** - RSA with OAEP with SHA-256 and MGF-1.
- **A128KW** - AES Key Wrapping with 128-bit key derived from the client secret.
- **A192KW** - AES Key Wrapping with 192-bit key derived from the client secret.
- **A256KW** - AES Key Wrapping with 256-bit key derived from the client secret.
- **dir** - Direct encryption with AES using the hashed client secret.

Default value:

<table>
<thead>
<tr>
<th>Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA-OAEP</td>
</tr>
<tr>
<td>RSA-OAEP-256</td>
</tr>
<tr>
<td>A128KW</td>
</tr>
<tr>
<td>RSA1_5</td>
</tr>
<tr>
<td>A256KW</td>
</tr>
<tr>
<td>dir</td>
</tr>
<tr>
<td>A192KW</td>
</tr>
</tbody>
</table>

**amster attribute:** `supportedRcsResponseEncryptionAlgorithms`

### Remote Consent Service Response Encryption Methods Supported

Encryption methods supported to decrypt Remote Consent Service responses.

OpenAM supports the following encryption methods:

- **A128GCM**, **A192GCM**, and **A256GCM** - AES in Galois Counter Mode (GCM) authenticated encryption mode.
- **A128CBC-HS256**, **A192CBC-HS384**, and **A256CBC-HS512** - AES encryption in CBC mode, with HMAC-SHA-2 for integrity.

Default value:

<table>
<thead>
<tr>
<th>Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A256GCM</td>
</tr>
<tr>
<td>A192GCM</td>
</tr>
<tr>
<td>A128GCM</td>
</tr>
<tr>
<td>A128CBC-HS256</td>
</tr>
<tr>
<td>A192CBC-HS384</td>
</tr>
<tr>
<td>A256CBC-HS512</td>
</tr>
</tbody>
</table>

**amster attribute:** `supportedRcsResponseEncryptionMethods`

### 5.4. OAuth 2.0 and OpenID Connect 1.0 Client Settings

To register an OAuth 2.0 client with AM as the OAuth 2.0 authorization server, or register an OpenID Connect 1.0 client through the AM console, then create an OAuth 2.0 client profile. After creating the client profile, you can further configure the properties in the AM console by navigating to Realms > **Realm Name** > Applications > OAuth 2.0 > **Client Name**.
5.4.1. Core

The following properties appear on the Core tab:

**Group**

Set this field if you have configured an OAuth 2.0 client group.

**Status**

Specify whether the client profile is active for use or inactive.

**Client secret**

Specify the client secret as described by RFC 6749 in the section, Client Password.

For OAuth 2.0/OpenID Connect 1.0 clients, AM uses the client password as the client shared secret key when signing the contents of the request parameter with HMAC-based algorithms, such as HS256.

**Client type**

Specify the client type.

Confidential clients can maintain the confidentiality of their credentials, such as a web application running on a server where its credentials are protected. Public clients run the risk of exposing their passwords to a host or user agent, such as a JavaScript client running in a browser.

**Redirection URIs**

Specify client redirection endpoint URIs as described by RFC 6749 in the section, Redirection Endpoint. AM's OAuth 2.0 authorization service redirects the resource owner's user-agent back to this endpoint during the authorization code grant process. If your client has more than one redirection URI, then it must specify the redirection URI to use in the authorization request. The redirection URI must NOT contain a fragment (#).

Redirection URIs are required for OpenID Connect 1.0 clients.

**Scope(s)**

Specify scopes that are to be presented to the resource owner when the resource owner is asked to authorize client access to protected resources.

The openid scope is required. It indicates that the client is making an OpenID Connect request to the authorization server.

Scopes can be entered as simple strings, such as openid, read, email, profile, or as a pipe-separated string in the format: scope|locale|localized description. For example, read|en|Permission to view email messages.
Locale strings have the format: language_country_variant. For example, en, en_GB, or en_US_WIN. If the locale and pipe is omitted, the localized description is displayed to all users having undefined locales. If the localized description is omitted, nothing is displayed to all users. For example, a scope of read| would allow the client to use the read scope but would not display it to the user when requested.

AM reserves a special scope, am-introspect-all-tokens. As administrator, add this scope to the OAuth 2.0 client profile to allow the client to introspect access tokens issued to other clients in the same realm. This scope cannot be added during dynamic client registration.

**Default Scope(s)**

Specify scopes in scope or scope|locale|localized description format. These scopes are set automatically when tokens are issued.

The openid scope is required. It indicates that the client is making an OpenID Connect request to the authorization server.

Scopes can be entered as simple strings, such as openid, read, email, profile, or as a pipe-separated string in the format: scope|locale|localized description. For example, read|en|Permission to view email messages.

Locale strings have the format: language_country_variant. For example, en, en_GB, or en_US_WIN. If the locale and pipe is omitted, the localized description is displayed to all users having undefined locales. If the localized description is omitted, nothing is displayed to all users. For example, a scope of read| would allow the client to use the read scope but would not display it to the user when requested.

**Client Name**

Specify a human-readable name for the client.

**Authorization Code Lifetime (seconds)**

Specify the time in seconds for an authorization code to be valid. If this field is set to zero, the authorization code lifetime of the OAuth2 provider is used.

Default: 0

**Refresh Token Lifetime (seconds)**

Specify the time in seconds for a refresh token to be valid. If this field is set to zero, the refresh token lifetime of the OAuth2 provider is used. If the field is set to -1, the token will never expire.

Default: 0

**Access Token Lifetime (seconds)**

Specify the time in seconds for an access token to be valid. If this field is set to zero, the access token lifetime of the OAuth2 provider is used.
5.4.2. Advanced

The following properties appear on the Advanced tab:

**Display name**

Specify a client name to display to the resource owner when the resource owner is asked to authorize client access to protected resources. Valid formats include `name` or `locale|localized_name`.

The Display name can be entered as a single string or as a pipe-separated string for locale and localized name, for example, `en|My Example Company`.

*Locale* strings have the format:`language_country_variant`. For example, `en`, `en_GB`, or `en_US_WIN`. If the `locale` is omitted, the name is displayed to all users having undefined locales.

**Display description**

Specify a client description to display to the resource owner when the resource owner is asked to authorize client access to protected resources. Valid formats include `description` or `locale|localized_description`.

The Display description can be entered as a single string or as a pipe-separated string for locale and localized name, for example, `en|The company intranet is requesting the following access permission`.

*Locale* strings have the format:`language_country_variant`. For example, `en`, `en_GB`, or `en_US_WIN`. If the `locale` is omitted, the name is displayed to all users having undefined locales.

**Request uris**

Specify `request_uri` values that a dynamic client would pre-register.

Only required if the *Require request URI supported* property is enabled in the OAuth2 Provider service. See "Advanced OpenID Connect"

**Response Types**

Specify the response types that the client uses. The response type value specifies the flow that determine how the ID token and access token are returned to the client. For more information, see OAuth 2.0 Multiple Response Type Encoding Practices.

By default, the following response types are available:

- `code`. Specifies that the client application requests an authorization code grant.
- `token`. Specifies that the client application requests an implicit grant type and requests a token from the API.
- `id_token`. Specifies that the client application requests an ID token.
• **code token.** Specifies that the client application requests an access token, access token type, and an authorization code.

• **token id_token.** Specifies that the client application requests an access token, access token type, and an ID token.

• **code id_token.** Specifies that the client application requests an authorization code and an ID token.

• **code token id_token.** Specifies that the client application requests an authorization code, access token, access token type, and an ID token.

**Contacts**

Specify the email addresses of users who administer the client.

**Token Endpoint Authentication Method**

Specify the authentication method with which a client authenticates to AM (as an authorization server) at the token endpoint. The authentication method applies to OIDC requests with scope openid.

• **client_secret_basic.** Clients authenticate with AM (as an authorization server) using the HTTP Basic authentication scheme after receiving a client_secret value.

• **client_secret_post.** Clients authenticate with AM (as an authorization server) by including the client credentials in the request body after receiving a client_secret value.

• **private_key_jwt.** Clients sign a JSON web token (JWT) with a registered public key.

For more information, see Client Authentication in the [OpenID Connect Core 1.0 incorporating errata set 1](#) specification.

**Sector Identifier URI**

Specify the host component of this URI, which is used in the computation of pairwise subject identifiers.

**Subject Type**

Specify the subject identifier type, which is a locally unique identifier that will be consumed by the client. Select one of two options:

• **public.** Provides the same sub (subject) value to all clients.

• **pairwise.** Provides a different sub (subject) value to each client.

**Access Token**

Specify the registration_access_token value that you provide when registering the client, and then subsequently when reading or updating the client profile.
Implied Consent

Enable the implied consent feature. When enabled, the resource owner will not be asked for consent during authorization flows. The OAuth2 Provider must also be configured to allow clients to skip consent.

OAuth 2.0 Mix-Up Mitigation enabled

Enable OAuth 2.0 mix-up mitigation on the authorization server side.

Enable this setting only if this OAuth 2.0 client supports the OAuth 2.0 Mix-Up Mitigation draft, otherwise AM will fail to validate access token requests received from this client.

5.4.3. OpenID Connect

The following properties appear on the OpenID Connect tab:

Claim(s)

Specify one or more claim name translations that will override those specified for the authentication session. Claims are values that are presented to the user to inform them what data is being made available to the client.

Claims can be entered as simple strings, such as name, email, profile, or sub, or as a pipe-separated string in the format: scope|locale|localized description. For example, name|en|Full name of user.

Locale strings have the format: language_country_variant. For example, en, en_GB, or en_US_WIN. If the locale and pipe is omitted, the localized description is displayed to all users having undefined locales. If the localized description is omitted, nothing is displayed to all users. For example, a claim of name| would allow the client to use the name claim but would not display it to the user when requested.

If a value is not given, the value is computed from the OAuth2 provider.

Post Logout Redirect URIs

Specify one or more allowable URIs to which the user-agent can be redirected to after the client logout process.

Client Session URI

Specify the relying party (client) URI to which the OpenID Connect Provider sends session changed notification messages using the HTML 5 postMessage API.

Default Max Age

Specify the maximum time in seconds that a user can be authenticated. If the user last authenticated earlier than this value, then the user must be authenticated again. If specified, the request parameter max_age overrides this setting.
Minimum value: 1.
Default: 600

Default Max Age Enabled

Enable the default max age feature.

OpenID Connect JWT Token Lifetime (seconds)

Specify the time in seconds for a JWT to be valid. If this field is set to zero, the JWT token lifetime of the OAuth2 provider is used.

Default: 0

5.4.4. Signing and Encryption

The following properties appear on the Signing and Encryption tab:

Json Web Key URI

Specify the URI that contains the client's public keys in JSON web key format.

JWKs URI content cache timeout in ms

Specify the maximum amount of time, in milliseconds, that the content of the JWKS URI can be cached before being refreshed. This avoids fetching the JWKS URI content for every token encryption.

Default: 3600000

JWKs URI content cache miss cache time

Specify the minimum amount of time, in milliseconds, that the content of the JWKS URI is cached. This avoids fetching the JWKS URI content for every token signature verification, for example if the key ID \( \text{kid} \) is not in the JWKS content already cached.

Default: 60000

Token Endpoint Authentication Signing Algorithm

Specify the JWS algorithm that must be used for signing JWTs used to authenticate the client at the Token Endpoint.

JWTs that are not signed with the selected algorithm in token requests from the client using the \texttt{private_key_jwt} or \texttt{client_secret_jwt} authentication methods will be rejected.

Default: RS256
Json Web Key

Raw JSON web key value containing the client's public keys.

ID Token Signing Algorithm

Specify the signing algorithm that the ID token must be signed with.

Enable ID Token Encryption

Enable ID token encryption using the specified ID token encryption algorithm.

ID Token Encryption Algorithm

Specify the algorithm that the ID token must be encrypted with.

Default value: RSA1_5 (RSAES-PKCS1-V1_5).

ID Token Encryption Method

Specify the method that the ID token must be encrypted with.

Default value: A128CBC-HS256.

Client ID Token Public Encryption Key

Specify the Base64-encoded public key for encrypting ID tokens.

Client JWT Bearer Public Key Certificate

Specify the base64-encoded X509 certificate in PEM format. The certificate is never used during the signing process, but is used to obtain the client's JWT bearer public key. The client uses the private key to sign client authentication and access token request JWTs, while AM uses the public key for verification.

The following is an example of the certificate:

```
-----BEGIN CERTIFICATE-----
MIIDETCfmgAwIBAgIUE08XLjANBgkqhkiG9w0BAQsFADA5MRswGQYDVQQKEJvCVuYW0uZXhhbXBsb290IjAACPgIwAaMBQX0B
MAwGA1UdDgQWBBSI/xq2dXzFNC815eipuVy5hQXMMAgEGC3dfsYIDYQAgMBAIGAwRzAlBgkqhkiG9w0BAQjCggEDDwB
------END CERTIFICATE-----
```
You can generate a new key pair alias by using the Java `keytool` command. Follow the steps in “To Create Key Aliases In an Existing Keystore” in the Setup and Maintenance Guide.

To export the certificate from the new key pair in PEM format, run a command similar to the following:

```bash
$ keytool \
  -list \
  -alias myAlias \
  -rfc \
  -storetype JCEKS \
  -keystore myKeystore.jceks \
  -keypass myKeypass \
  -storepass myStorepass
```

```
Alias name: myAlias
Creation date: Oct 27, 2014
Entry type: PrivateKeyEntry
Certificate chain length: 1
Certificate[1]:
---BEGIN CERTIFICATE----
MIIDETCAfmgAwIBAgIGkVg0BAQsFADA5MRswGQYDVQQKEcJvcGVuYW0uZXhhbXBsZS5idXNpbmcuY2EiIjAgIBAgI)
```

Public key selector

Select the public key for this client, which comes from either the JWKs_URI, manual JWKs, or X.509 field.

User info response format.

Specify the output formats from the UserInfo endpoint.

The supported output formats are as follows:

- User info JSON response format.
- User info encrypted JWT response format.
- User info signed JWT response format.
- User info signed then encrypted response format.
For more information on the output format of the UserInfo Response, see Successful UserInfo Response in the OpenID Connect Core 1.0 incorporating errata set 1 specification.

Default: User info JSON response format.

**User info signed response algorithm**

Specify the JSON Web Signature (JWS) algorithm for signing UserInfo Responses. If specified, the response will be JSON Web Token (JWT) serialized, and signed using JWS.

The default, if omitted, is for the UserInfo Response to return the claims as a UTF-8-encoded JSON object using the application/json content type.

**User info encrypted response algorithm**

Specify the JSON Web Encryption (JWE) algorithm for encrypting UserInfo Responses.

If both signing and encryption are requested, the response will be signed then encrypted, with the result being a nested JWT.

The default, if omitted, is that no encryption is performed.

**User info encrypted response encryption algorithm**

Specify the JWE encryption method for encrypting UserInfo Responses. If specified, you must also specify an encryption algorithm in the User info encrypted response algorithm property.

AM supports the following encryption methods:

- **A128GCM**, **A192GCM**, and **A256GCM** - AES in Galois Counter Mode (GCM) authenticated encryption mode.

- **A128CBC-HS256**, **A192CBC-HS384**, and **A256CBC-HS512** - AES encryption in CBC mode, with HMAC-SHA-2 for integrity.

Default: **A128CBC-HS256**

**Request parameter signing algorithm**

Specify the JWS algorithm for signing the request parameter.

Must match one of the values configured in the Request parameter Signing Algorithms supported property of the OAuth2 Provider service. See "Advanced OpenID Connect".

**Request parameter encryption algorithm**

Specify the JWE algorithm for encrypting the request parameter.

Must match one of the values configured in the Request parameter Encryption Algorithms supported property of the OAuth2 Provider service. See "Advanced OpenID Connect".
**Request parameter encryption method**

Specify the JWE method for encrypting the request parameter.

Must match one of the values configured in the *Request parameter Encryption Methods supported* property of the OAuth2 Provider service. See "Advanced OpenID Connect".

Default: **A128CBC+HS256**

### 5.4.5. UMA

The following properties appear on the UMA tab:

**Client Redirection URIs**

**Note**

This property is for future use, and not currently active.

Specify one or more allowable URIs to which the client can be redirected after the UMA claims collection process. The URIs must not contain a fragment (#).

If multiple URIs are registered, the client MUST specify the redirection URI to be redirected to following approval.
Appendix A. About Scripting

You can use scripts for client-side and server-side authentication, policy conditions, and handling OpenID Connect claims.

A.1. The Scripting Environment

This section introduces how AM executes scripts, and covers thread pools and security configuration.

You can use scripts to modify default AM behavior in the following situations, also known as contexts:

Client-side Authentication

Scripts that are executed on the client during authentication. Client-side scripts must be in JavaScript.

Server-side Authentication

Scripts are included in an authentication module and are executed on the server during authentication.

Policy Condition

Scripts used as conditions within policies.

OIDC Claims

Scripts that gather and populate the claims in a request when issuing an ID token or making a request to the userinfo endpoint.
AM implements a configurable scripting engine for each of the context types that are executed on the server.

The scripting engines in AM have two main components: security settings, and the thread pool.

A.1.1. Security

AM scripting engines provide security features for ensuring that malicious Java classes are not directly called. The engines validate scripts by checking all directly-called Java classes against a configurable blacklist and whitelist, and, optionally, against the JVM SecurityManager, if it is configured.

Whitelists and blacklists contain class names that are allowed or denied execution respectively. Specify classes in whitelists and blacklists by name or by using regular expressions.

Classes called by the script are checked against the whitelist first, and must match at least one pattern in the list. The blacklist is applied after the whitelist, and classes matching any pattern are disallowed.
You can also configure the scripting engine to make an additional call to the JVM security manager for each class that is accessed. The security manager throws an exception if a class being called is not allowed to execute.

For more information on configuring script engine security, see "Scripting".

**Important Points About Script Engine Security**

The following points should be considered when configuring the security settings within each script engine:

**The scripting engine only validates directly accessible classes.**

The security settings only apply to classes that the script *directly* accesses. If the script calls `Foo.a()` and then that method calls `Bar.b()`, the scripting engine will be unable to prevent it. You must consider the whole chain of accessible classes.

**Note**

*Access includes actions such as:*

- Importing or loading a class.
- Accessing any instance of that class. For example, passed as a parameter to the script.
- Calling a static method on that class.
- Calling a method on an instance of that class.
- Accessing a method or field that returns an instance of that class.

**Potentially dangerous Java classes are blacklisted by default.**

All Java reflection classes (`java.lang.Class, java.lang.reflect.*) are blacklisted by default to avoid bypassing the security settings.

The `java.security.AccessController` class is also blacklisted by default to prevent access to the `doPrivileged()` methods.

**Caution**

You should not remove potentially dangerous Java classes from the blacklist.

**The whitelists and blacklists match class or package names only.**

The whitelist and blacklist patterns apply only to the exact class or package names involved. The script engine does not know anything about inheritance, so it is best to whitelist known, specific classes.
A.1.2. Thread Pools

Each script is executed in an individual thread. Each scripting engine starts with an initial number of threads available for executing scripts. If no threads are available for execution, AM creates a new thread to execute the script, until the configured maximum number of threads is reached.

If the maximum number of threads is reached, pending script executions are queued in a number of buffer threads, until a thread becomes available for execution. If a created thread has completed script execution and has remained idle for a configured amount of time, AM terminates the thread, shrinking the pool.

For more information on configuring script engine thread pools, see "Scripting".

A.2. Global Scripting API Functionality

This section covers functionality available to each of the server-side script types.

Global API functionality includes:

• Accessing HTTP Services

• Debug Logging

A.2.1. Accessing HTTP Services

AM passes an HTTP client object, `httpClient`, to server-side scripts. Server-side scripts can call HTTP services with the `httpClient.send` method. The method returns an `HttpClientResponse` object.

Configure the parameters for the HTTP client object by using the `org.forgerock.http.protocol` package. This package contains the `Request` class, which has methods for setting the URI and type of request.

The following example, taken from the default server-side Scripted authentication module script, uses these methods to call an online API to determine the longitude and latitude of a user based on their postal address:
function getLongitudeLatitudeFromUserPostalAddress() {
    var request = new org.forgerock.http.protocol.Request();

    request.setUri("http://maps.googleapis.com/maps/api/geocode/json?address=" +
    encodeURIComponent(userPostalAddress));
    request.setMethod("GET");

    var response = httpClient.send(request).get();
    logResponse(response);

    var geocode = JSON.parse(response.getEntity());
    var i;

    for (i = 0; i < geocode.results.length; i++) {
        var result = geocode.results[i];
        latitude = result.geometry.location.lat;
        longitude = result.geometry.location.lng;

        logger.message("latitude:" + latitude + " longitude:" + longitude);
    }
}

HTTP client requests are synchronous and blocking until they return. You can, however, set a global timeout for server-side scripts. For details, see "Scripted Authentication Module Properties" in the Authentication and Single Sign-On Guide.

Server-side scripts can access response data by using the methods listed in the table below.

**HTTP Client Response Methods**

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameters</th>
<th>Return Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HttpClientResponse.getCookies</td>
<td>Void</td>
<td>Map&lt;String, String&gt;</td>
<td>Get the cookies for the returned response, if any exist.</td>
</tr>
<tr>
<td>HttpClientResponse.getEntity</td>
<td>Void</td>
<td>String</td>
<td>Get the entity of the returned response.</td>
</tr>
<tr>
<td>HttpClientResponse.getHeaders</td>
<td>Void</td>
<td>Map&lt;String, String&gt;</td>
<td>Get the headers for the returned response, if any exist.</td>
</tr>
<tr>
<td>HttpClientResponse.getReasonPhrase</td>
<td>Void</td>
<td>String</td>
<td>Get the reason phrase of the returned response.</td>
</tr>
<tr>
<td>HttpClientResponse.getStatusCode</td>
<td>Void</td>
<td>Integer</td>
<td>Get the status code of the returned response.</td>
</tr>
<tr>
<td>HttpClientResponse.hasCookies</td>
<td>Void</td>
<td>Boolean</td>
<td>Indicate whether the returned response had any cookies.</td>
</tr>
</tbody>
</table>
A.2.2. Debug Logging

Server-side scripts can write messages to AM debug logs by using the `logger` object.

AM does not log debug messages from scripts by default. You can configure AM to log such messages by setting the debug log level for the `amScript` service. For details, see "Debug Logging By Service" in the Setup and Maintenance Guide.

The following table lists the `logger` methods.

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameters</th>
<th>Return Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>logger.error</code></td>
<td><code>Error Message</code> (type: String)</td>
<td>Void</td>
<td>Write <code>Error Message</code> to AM debug logs if ERROR level logging is enabled.</td>
</tr>
<tr>
<td><code>logger.errorEnabled</code></td>
<td>Void</td>
<td>Boolean</td>
<td>Return true when ERROR level debug messages are enabled.</td>
</tr>
<tr>
<td><code>logger.message</code></td>
<td><code>Message</code> (type: String)</td>
<td>Void</td>
<td>Write <code>Message</code> to AM debug logs if MESSAGE level logging is enabled.</td>
</tr>
<tr>
<td><code>logger.messageEnabled</code></td>
<td>Void</td>
<td>Boolean</td>
<td>Return true when MESSAGE level debug messages are enabled.</td>
</tr>
<tr>
<td><code>logger.warning</code></td>
<td><code>Warning Message</code> (type: String)</td>
<td>Void</td>
<td>Write <code>Warning Message</code> to AM debug logs if WARNING level logging is enabled.</td>
</tr>
<tr>
<td><code>logger.warningEnabled</code></td>
<td>Void</td>
<td>Boolean</td>
<td>Return true when WARNING level debug messages are enabled.</td>
</tr>
</tbody>
</table>

A.3. Managing Scripts

This section shows you how to manage scripts used for client-side and server-side scripted authentication, custom policy conditions, and handling OpenID Connect claims using the AM console, the `ssoadm` command, and the REST API.

A.3.1. Managing Scripts With the AM Console

The following procedures describe how to create, modify, and delete scripts using the AM console:
• "To Create Scripts by Using the AM Console"
• "To Modify Scripts by Using the AM Console"
• "To Delete Scripts by Using the AM Console"

**To Create Scripts by Using the AM Console**

1. Log in to the AM console as an AM administrator, for example, amadmin.
2. Navigate to Realms > *Realm Name* > Scripts.
3. Click New Script.
   
   The New Script page appears:

4. Specify a name for the script.
5. Select the type of script from the Script Type drop-down list.
6. Click Create.
   
   The *Script Name* page appears:
7. Enter values on the *Script Name* page as follows:

   a. Enter a description of the script.

   b. Choose the script language, either JavaScript or Groovy. Note that not every script type supports both languages.

   c. Enter the source code in the Script field.

      On supported browsers, you can click Upload, navigate to the script file, and then click Open to upload the contents to the Script field.

   d. Click Validate to check for compilation errors in the script.
Correct any compilation errors, and revalidate the script until all errors have been fixed.

e. Save your changes.

To Modify Scripts by Using the AM Console

1. Log in to the AM console as an AM administrator, for example, amadmin.

2. Navigate to Realms > Realm Name > Scripts.

3. Select the script you want to modify from the list of scripts.

   The Script Name page appears.

4. Modify values on the Script Name page as needed. Note that if you change the Script Type, existing code in the script is replaced.

5. If you modified the code in the script, click Validate to check for compilation errors.

   Correct any compilation errors, and revalidate the script until all errors have been fixed.

6. Save your changes.

To Delete Scripts by Using the AM Console

1. Log in to the AM console as an AM administrator, for example, amadmin.

2. Navigate to Realms > Realm Name > Scripts.

3. Choose one or more scripts to delete by activating the checkboxes in the relevant rows. Note that you can only delete user-created scripts—you cannot delete the global sample scripts provided with AM.

4. Click Delete.

A.3.2. Managing Scripts With the REST API

This section shows you how to manage scripts used for client-side and server-side scripted authentication, custom policy conditions, and handling OpenID Connect claims by using the REST API.

AM provides the scripts REST endpoint for the following:

- "Querying Scripts"
- "Reading a Script"
- "Validating a Script"
- "Creating a Script"
- "Updating a Script"
- "Deleting a Script"

User-created scripts are realm-specific, hence the URI for the scripts' API can contain a realm component, such as `/json/{realm}/scripts`. If the realm is not specified in the URI, the top level realm is used.

**Tip**

AM includes some global example scripts that can be used in any realm.

Scripts are represented in JSON and take the following form. Scripts are built from standard JSON objects and values (strings, numbers, objects, sets, arrays, `true`, `false`, and `null`). Each script has a system-generated **universally unique identifier** (UUID), which must be used when modifying existing scripts. Renaming a script will not affect the UUID:

```json
{
    "_id": "7e3d7067-d50f-4674-8c76-a3e13a810c33",
    "name": "Scripted Module - Server Side",
    "description": "Default global script for server side Scripted Authentication Module",
    "script": "dmFyIFNUQVJUX1RJ...",
    "language": "JAVASCRIPT",
    "context": "AUTHENTICATION_SERVER_SIDE",
    "createdBy": "id=dsameuser,ou=user,dc=openam,dc=forgerock,dc=org",
    "creationDate": 1433147666269,
    "lastModifiedBy": "id=dsameuser,ou=user,dc=openam,dc=forgerock,dc=org",
    "lastModifiedDate": 1433147666269
}
```

The values for the fields shown in the example above are explained below:

- **_id**

  The UUID that AM generates for the script.

- **name**

  The name provided for the script.

- **description**

  An optional text string to help identify the script.

- **script**

  The source code of the script. The source code is in UTF-8 format and encoded into Base64.
For example, a script such as the following:

```
var a = 123;
var b = 456;
```

When encoded into Base64 becomes:

```
dmFyIGEgPSAxMjM7IA0KdmFyIGIgPSA0NTY7
```

**language**

The language the script is written in - **JAVASCRIPT** or **GROOVY**.

### Language Support per Context

<table>
<thead>
<tr>
<th>Script Context</th>
<th>Supported Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLICY_CONDITION</td>
<td>JAVASCRIPT, GROOVY</td>
</tr>
<tr>
<td>AUTHENTICATION_SERVER_SIDE</td>
<td>JAVASCRIPT, GROOVY</td>
</tr>
<tr>
<td>AUTHENTICATION_CLIENT_SIDE</td>
<td>JAVASCRIPT</td>
</tr>
<tr>
<td>OIDC_CLAIMS</td>
<td>JAVASCRIPT, GROOVY</td>
</tr>
<tr>
<td>AUTHENTICATION_TREE_DECISION_NODE</td>
<td>JAVASCRIPT, GROOVY</td>
</tr>
</tbody>
</table>

**context**

The context type of the script.

Supported values are:

**POLICY_CONDITION**

Policy Condition

**AUTHENTICATION_SERVER_SIDE**

Server-side Authentication

**AUTHENTICATION_CLIENT_SIDE**

Client-side Authentication

**Note**

Client-side scripts must be written in JavaScript.

**OIDC_CLAIMS**

OIDC Claims
AUTHENTICATION_TREE_DECISION_NODE

Authentication scripts used by Scripted Tree Decision authentication nodes.

createdBy

A string containing the universal identifier DN of the subject that created the script.

creationDate

An integer containing the creation date and time, in ISO 8601 format.

lastModifiedBy

A string containing the universal identifier DN of the subject that most recently updated the resource type.

If the script has not been modified since it was created, this property will have the same value as createdBy.

lastModifiedDate

A string containing the last modified date and time, in ISO 8601 format.

If the script has not been modified since it was created, this property will have the same value as creationDate.

A.3.2.1. Querying Scripts

To list all the scripts in a realm, as well as any global scripts, perform an HTTP GET to the /json{/realm}/scripts endpoint with a _queryFilter parameter set to true.

Note

If the realm is not specified in the URL, AM returns scripts in the top level realm, as well as any global scripts.

The iPlanetDirectoryPro header is required and should contain the SSO token of an administrative user, such as amAdmin, who has access to perform the operation.

```bash
$ curl
   --header "iPlanetDirectoryPro: AQIC5..."
   --header "Accept-API-Version: resource=1.1"
   https://openam.example.com:8443/openam/json/realms/root/realms/myrealm/scripts?_queryFilter=true

{
   "result": [
      {
         "_id": "9de3eb62-f131-4fac-a294-7bd170fd4acb",
         "name": "Scripted Policy Condition",
```
Supported _queryFilter Fields and Operators

<table>
<thead>
<tr>
<th>Field</th>
<th>Supported Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>_id</td>
<td>Equals (eq), Contains (co), Starts with (sw)</td>
</tr>
<tr>
<td>name</td>
<td>Equals (eq), Contains (co), Starts with (sw)</td>
</tr>
<tr>
<td>description</td>
<td>Equals (eq), Contains (co), Starts with (sw)</td>
</tr>
<tr>
<td>script</td>
<td>Equals (eq), Contains (co), Starts with (sw)</td>
</tr>
<tr>
<td>language</td>
<td>Equals (eq), Contains (co), Starts with (sw)</td>
</tr>
<tr>
<td>context</td>
<td>Equals (eq), Contains (co), Starts with (sw)</td>
</tr>
</tbody>
</table>

A.3.2.2. Reading a Script

To read an individual script in a realm, perform an HTTP GET using the `/json/{realm}/scripts` endpoint, specifying the UUID in the URL.

**Tip**

To read a script in the top-level realm, or to read a built-in global script, do not specify a realm in the URL.

The `iPlanetDirectoryPro` header is required and should contain the SSO token of an administrative user, such as `amAdmin`, who has access to perform the operation.
### A.3.2.3. Validating a Script

To validate a script, perform an HTTP POST using the `/json{realm}/scripts` endpoint, with an `_action` parameter set to `validate`. Include a JSON representation of the script and the script language, **JAVASCRIPT** or **GROOVY**, in the POST data.

The value for `script` must be in UTF-8 format and then encoded into Base64.

The `iPlanetDirectoryPro` header is required and should contain the SSO token of an administrative user, such as `amAdmin`, who has access to perform the operation.

```
$curl \
--request POST \
--header "Content-Type: application/json" \
--header "iPlanetDirectoryPro: AQIC5..." \
--header "Accept-API-Version: resource=1.1" \
https://openam.example.com:8443/openam/json/realms/root/realms/myrealm/scripts/?_action=validate \
'{
   "script": "dmFyIGEgPSAxMjM7dmFyIGIgPSA0NTY7Cg==",
   "language": "JAVASCRIPT"
}' \
https://openam.example.com:8443/openam/json/realms/root/realms/myrealm/scripts/?_action=validate \
{   "success": true
}
```

If the script is valid the JSON response contains a `success` key with a value of `true`.

If the script is invalid the JSON response contains a `success` key with a value of `false`, and an indication of the problem and where it occurs, as shown below:
$ curl \
--request POST \
--header "Content-Type: application/json" \
--header "iPlanetDirectoryPro: AQIC5..." \
--header "Accept-API-Version: resource=1.1" \
--data '{
    "script": "dmFyIGEgPSAxMjM7dmFyIGIgPSA0NTY7ID1WQUxJREFUSU90IFNIT1VMRCBQGQ0==",
    "language": "JAVASCRIPT"
}' \
https://openam.example.com:8443/openam/json/realms/root/realms/myrealm/scripts/?_action=validate 
{
    "success": false,
    "errors": [
        {
            "line": 1,
            "column": 27,
            "message": "syntax error"
        }
    ]
}

A.3.2.4. Creating a Script

To create a script in a realm, perform an HTTP POST using the /json{/realm}/scripts endpoint, with an _action parameter set to create. Include a JSON representation of the script in the POST data.

The value for **script** must be in UTF-8 format and then encoded into Base64.

**Note**

If the realm is not specified in the URL, AM creates the script in the top level realm.

The **iPlanetDirectoryPro** header is required and should contain the SSO token of an administrative user, such as **amAdmin**, who has access to perform the operation.
$ curl \
   --request POST \
   \  
   --header "Content-Type: application/json" \
   --header "iPlanetDirectoryPro: AQIC5..." \
   --header "Accept-API-Version: resource=1.1" \
   --data '{
       "name": "MyJavaScript",
       "script": "dmFyIGEgPSAxMjM7CnZhciBiID0gNDU2Ow==",
       "language": "JAVASCRIPT",
       "context": "POLICY_CONDITION",
       "description": "An example script"
   }' \
   https://openam.example.com:8443/openam/json/realms/root/realms/myrealm/scripts/?_action=create \
{
   "_id": "0168d494-015a-420f-ae5a-6a2a5c1126af",
   "name": "MyJavaScript",
   "script": "dmFyIGEgPSAxMjM7CnZhciBiID0gNDU2Ow==",
   "language": "JAVASCRIPT",
   "context": "POLICY_CONDITION",
   "createdBy": "id=amadmin,ou=user,dc=openam,dc=forgerock,dc=org",
   "creationDate": 1436807766258,
   "lastModifiedBy": "id=amadmin,ou=user,dc=openam,dc=forgerock,dc=org",
   "lastModifiedDate": 1436807766258
}

A.3.2.5. Updating a Script

To update an individual script in a realm, perform an HTTP PUT using the /json{/realm}/scripts endpoint, specifying the UUID in both the URL and the PUT body. Include a JSON representation of the updated script in the PUT data, alongside the UUID.

Note

If the realm is not specified in the URL, AM uses the top level realm.

The iPlanetDirectoryPro header is required and should contain the SSO token of an administrative user, such as amAdmin, who has access to perform the operation.
A.3.2.6. Deleting a Script

To delete an individual script in a realm, perform an HTTP DELETE using the /json{/realm}/scripts endpoint, specifying the UUID in the URL.

```
$ curl \
--request DELETE \
--header "iPlanetDirectoryPro: AQIC5..." \
--header "Accept-API-Version: resource=1.1" \
https://openam.example.com:8443/openam/json/realms/root/realms/myrealm/scripts/0168d494-015a-420f-ae5a-6a2a5c1126af
{}
```

**Note**

If the realm is not specified in the URL, AM uses the top level realm.

The `iPlanetDirectoryPro` header is required and should contain the SSO token of an administrative user, such as `amAdmin`, who has access to perform the operation.

```
$ curl \
--request DELETE \
--header "iPlanetDirectoryPro: AQIC5..." \
--header "Accept-API-Version: resource=1.1" \
https://openam.example.com:8443/openam/json/realms/root/realms/myrealm/scripts/0168d494-015a-420f-ae5a-6a2a5c1126af
{}
```
A.3.3. Managing Scripts With the ssoadm Command

Use the **ssoadm** command's **create-sub-cfg**, **get-sub-cfg**, and **delete-sub-cfg** subcommands to manage AM scripts.

Create an AM script as follows:

1. Create a script configuration file, for example `/path/to/myScriptConfigurationFile.txt`, containing the following:

   ```
   script-file=/path/to/myScriptFile.js
   language=JAVASCRIPT
   name=My New Script
   context=AUTHENTICATION_SERVER_SIDE
   ```

   ① Possible values for the **language** property are:
   
   - JAVASCRIPT
   
   ② Possible values for the **context** property are:
   
   - POLICY_CONDITION
   - AUTHENTICATION_SERVER_SIDE
   - AUTHENTICATION_CLIENT_SIDE
   - OIDC_CLAIMS
   - AUTHENTICATION_TREE_DECISION_NODE

2. Run the **ssoadm create-sub-cfg** command. The **--datafile** argument references the script configuration file you created in the previous step:

   ```
   $ ssoadm \
       create-sub-cfg \
       --realm /myRealm \
       --adminid amadmin \
       --password-file /tmp/pwd.txt \
       --servicename ScriptingService \
       --subconfigname scriptConfigurations/scriptConfiguration \
       --subconfigid myScriptID \
       --datafile /path/to/myScriptConfigurationFile.txt
   Sub Configuration scriptConfigurations/scriptConfiguration was added to realm /myRealm
   ```

To list the properties of a script, run the **ssoadm get-sub-cfg** command:
$ ssoadm \
  get-sub-cfg \
   --realm /myRealm \
   --adminid amadmin \
   --password-file /tmp/pwd.txt \
   --servicename ScriptingService \
   --subconfigname scriptConfigurations/myScriptID
createdBy=
lastModifiedDate=
lastModifiedBy=
name=My New Script
context=AUTHENTICATION_SERVER_SIDE
description=
language=JAVASCRIPT
creationDate=
script=...Script output follows...

To delete a script, run the **ssoadm delete-sub-cfg** command:

$ ssoadm \
  delete-sub-cfg \
   --realm /myRealm \
   --adminid amadmin \
   --password-file /tmp/pwd.txt \
   --servicename ScriptingService \
   --subconfigname scriptConfigurations/myScriptID
Sub Configuration scriptConfigurations/myScriptID was deleted from realm /myRealm

A.4. Scripting

**amster** service name: **scripting**

A.4.1. Configuration

The following settings appear on the **Configuration** tab:

**Default Script Type**

The default script context type when creating a new script.

The possible values for this property are:

- **POLICY_CONDITION**, Policy Condition
- **AUTHENTICATION_SERVER_SIDE**, Server-side Authentication
- **AUTHENTICATION_CLIENT_SIDE**, Client-side Authentication
- **OIDC_CLAIMS**, OIDC Claims
- **AUTHENTICATION_TREE_DECISION_NODE**, Decision node script for authentication trees
Default value: `POLICY_CONDITION`

**amster attribute**: defaultContext

A.4.2. Secondary Configurations

This service has the following Secondary Configurations.

A.4.2.1. Engine Configuration

The following properties are available for Scripting Service secondary configuration instances:

**Engine Configuration**

Configure script engine parameters for running a particular script type in OpenAM.

**ssoadm attribute**: `engineConfiguration`

To access a secondary configuration instance using the `ssoadm` command, use: `-subconfigname [primary configuration]/[secondary configuration]` For example:

```bash
$ ssoadm set-sub-cfg \
  --adminid amAdmin \ 
  --password-file admin_pwd_file \ 
  --servicename ScriptingService \ 
  --subconfigname OIDCCLAIMS/engineConfiguration \ 
  --operation set \ 
  --attributevalues maxThreads=300 queueSize=-1
```

**Note**

Supports server-side scripts only. OpenAM cannot configure engine settings for client-side scripts.

The configurable engine settings are as follows:

**Server-side Script Timeout**

The maximum execution time any individual script should take on the server (in seconds). OpenAM terminates scripts which take longer to run than this value.

**ssoadm attribute**: `serverTimeout`

**Core thread pool size**

The initial number of threads in the thread pool from which scripts operate. OpenAM will ensure the pool contains at least this many threads.

**ssoadm attribute**: `coreThreads`
**Maximum thread pool size**

The maximum number of threads in the thread pool from which scripts operate. If no free thread is available in the pool, OpenAM creates new threads in the pool for script execution up to the configured maximum.

**ssoadm** attribute: `maxThreads`

**Thread pool queue size**

The number of threads to use for buffering script execution requests when the maximum thread pool size is reached.

**ssoadm** attribute: `queueSize`

**Thread idle timeout (seconds)**

Length of time (in seconds) for a thread to be idle before OpenAM terminates created threads. If the current pool size contains the number of threads set in `core thread pool size` idle threads will not be terminated, to maintain the initial pool size.

**ssoadm** attribute: `idleTimeout`

**Java class whitelist**

Specifies the list of class-name patterns allowed to be invoked by the script. Every class accessed by the script must match at least one of these patterns.

You can specify the class name as-is or use a regular expression.

**ssoadm** attribute: `whitelist`

**Java class blacklist**

Specifies the list of class-name patterns that are NOT allowed to be invoked by the script. The blacklist is applied AFTER the whitelist to exclude those classes - access to a class specified in both the whitelist and the blacklist will be denied.

You can specify the class name to exclude as-is or use a regular expression.

**ssoadm** attribute: `blacklist`

**Use system SecurityManager**

If enabled, OpenAM will make a call to `System.getSecurityManager().checkPackageAccess(...)` for each class that is accessed. The method throws `SecurityException` if the calling thread is not allowed to access the package.

---

**Note**

This feature only takes effect if the security manager is enabled for the JVM.

**ssoadm** attribute: `useSecurityManager`
Scripting languages

Select the languages available for scripts on the chosen type. Either GROOVY or JAVASCRIPT.

**ssoadm** attribute: languages

Default Script

The source code that is presented as the default when creating a new script of this type.

**ssoadm** attribute: defaultScript
Appendix B. Getting Support

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

B.1. Accessing Documentation Online

ForgeRock publishes comprehensive documentation online:

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

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

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

B.2. Using the ForgeRock.org Site

The ForgeRock.org site has links to source code for ForgeRock open source software, as well as links to the ForgeRock forums and technical blogs.

If you are a ForgeRock customer, raise a support ticket instead of using the forums. ForgeRock support professionals will get in touch to help you.
B.3. Getting Support and Contacting ForgeRock

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

ForgeRock has staff members around the globe who support our international customers and partners. For details, visit https://www.forgerock.com, or send an email to ForgeRock at info@forgerock.com.
# Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access control</td>
<td>Control to grant or to deny access to a resource.</td>
</tr>
<tr>
<td>Account lockout</td>
<td>The act of making an account temporarily or permanently inactive after successive authentication failures.</td>
</tr>
<tr>
<td>Actions</td>
<td>Defined as part of policies, these verbs indicate what authorized identities can do to resources.</td>
</tr>
<tr>
<td>Advice</td>
<td>In the context of a policy decision denying access, a hint to the policy enforcement point about remedial action to take that could result in a decision allowing access.</td>
</tr>
<tr>
<td>Agent administrator</td>
<td>User having privileges only to read and write agent profile configuration information, typically created to delegate agent profile creation to the user installing a web or Java agent.</td>
</tr>
<tr>
<td>Agent authenticator</td>
<td>Entity with read-only access to multiple agent profiles defined in the same realm; allows an agent to read web service profiles.</td>
</tr>
<tr>
<td>Application</td>
<td>In general terms, a service exposing protected resources.</td>
</tr>
<tr>
<td>Application type</td>
<td>Application types act as templates for creating policy applications.</td>
</tr>
<tr>
<td></td>
<td>Application types define a preset list of actions and functional logic, such as policy lookup and resource comparator logic.</td>
</tr>
</tbody>
</table>
Application types also define the internal normalization, indexing logic, and comparator logic for applications.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attribute-based access control (ABAC)</td>
<td>Access control that is based on attributes of a user, such as how old a user is or whether the user is a paying customer.</td>
</tr>
<tr>
<td>Authentication</td>
<td>The act of confirming the identity of a principal.</td>
</tr>
<tr>
<td>Authentication chaining</td>
<td>A series of authentication modules configured together which a principal must negotiate as configured in order to authenticate successfully.</td>
</tr>
<tr>
<td>Authentication level</td>
<td>Positive integer associated with an authentication module, usually used to require success with more stringent authentication measures when requesting resources requiring special protection.</td>
</tr>
<tr>
<td>Authentication module</td>
<td>AM authentication unit that handles one way of obtaining and verifying credentials.</td>
</tr>
<tr>
<td>Authorization</td>
<td>The act of determining whether to grant or to deny a principal access to a resource.</td>
</tr>
<tr>
<td>Authorization Server</td>
<td>In OAuth 2.0, issues access tokens to the client after authenticating a resource owner and confirming that the owner authorizes the client to access the protected resource. AM can play this role in the OAuth 2.0 authorization framework.</td>
</tr>
<tr>
<td>Auto-federation</td>
<td>Arrangement to federate a principal's identity automatically based on a common attribute value shared across the principal's profiles at different providers.</td>
</tr>
<tr>
<td>Bulk federation</td>
<td>Batch job permanently federating user profiles between a service provider and an identity provider based on a list of matched user identifiers that exist on both providers.</td>
</tr>
<tr>
<td>Circle of trust</td>
<td>Group of providers, including at least one identity provider, who have agreed to trust each other to participate in a SAML v2.0 provider federation.</td>
</tr>
<tr>
<td>Client</td>
<td>In OAuth 2.0, requests protected web resources on behalf of the resource owner given the owner's authorization. AM can play this role in the OAuth 2.0 authorization framework.</td>
</tr>
<tr>
<td>Client-based sessions</td>
<td>AM sessions for which AM returns session state to the client after each request, and require it to be passed in with the subsequent request. For browser-based clients, AM sets a cookie in the browser that contains the session information.</td>
</tr>
</tbody>
</table>
For browser-based clients, AM sets a cookie in the browser that contains the session state. When the browser transmits the cookie back to AM, AM decodes the session state from the cookie.

### Conditions

Defined as part of policies, these determine the circumstances under which a policy applies.

Environmental conditions reflect circumstances like the client IP address, time of day, how the subject authenticated, or the authentication level achieved.

Subject conditions reflect characteristics of the subject like whether the subject authenticated, the identity of the subject, or claims in the subject's JWT.

### Configuration datastore

LDAP directory service holding AM configuration data.

### Cross-domain single sign-on (CDSSO)

AM capability allowing single sign-on across different DNS domains.

### CTS-based sessions

AM sessions that reside in the Core Token Service's token store. CTS-based sessions might also be cached in memory on one or more AM servers. AM tracks these sessions in order to handle events like logout and timeout, to permit session constraints, and to notify applications involved in SSO when a session ends.

### Delegation

Granting users administrative privileges with AM.

### Entitlement

Decision that defines which resource names can and cannot be accessed for a given identity in the context of a particular application, which actions are allowed and which are denied, and any related advice and attributes.

### Extended metadata

Federation configuration information specific to AM.

### Extensible Access Control Markup Language (XACML)

Standard, XML-based access control policy language, including a processing model for making authorization decisions based on policies.

### Federation

Standardized means for aggregating identities, sharing authentication and authorization data information between trusted providers, and allowing principals to access services across different providers without authenticating repeatedly.

### Fedlet

Service provider application capable of participating in a circle of trust and allowing federation without installing all of AM on the service provider side; AM lets you create Java Fedlets.

### Hot swappable

Refers to configuration properties for which changes can take effect without restarting the container where AM runs.
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity</td>
<td>Set of data that uniquely describes a person or a thing such as a device or an application.</td>
</tr>
<tr>
<td>Identity federation</td>
<td>Linking of a principal’s identity across multiple providers.</td>
</tr>
<tr>
<td>Identity provider (IdP)</td>
<td>Entity that produces assertions about a principal (such as how and when a principal authenticated, or that the principal’s profile has a specified attribute value).</td>
</tr>
<tr>
<td>Identity repository</td>
<td>Data store holding user profiles and group information; different identity repositories can be defined for different realms.</td>
</tr>
<tr>
<td>Java agent</td>
<td>Java web application installed in a web container that acts as a policy enforcement point, filtering requests to other applications in the container with policies based on application resource URLs.</td>
</tr>
<tr>
<td>Metadata</td>
<td>Federation configuration information for a provider.</td>
</tr>
<tr>
<td>Policy</td>
<td>Set of rules that define who is granted access to a protected resource when, how, and under what conditions.</td>
</tr>
<tr>
<td>Policy agent</td>
<td>Java, web, or custom agent that intercepts requests for resources, directs principals to AM for authentication, and enforces policy decisions from AM.</td>
</tr>
<tr>
<td>Policy Administration Point (PAP)</td>
<td>Entity that manages and stores policy definitions.</td>
</tr>
<tr>
<td>Policy Decision Point (PDP)</td>
<td>Entity that evaluates access rights and then issues authorization decisions.</td>
</tr>
<tr>
<td>Policy Enforcement Point (PEP)</td>
<td>Entity that intercepts a request for a resource and then enforces policy decisions from a PDP.</td>
</tr>
<tr>
<td>Policy Information Point (PIP)</td>
<td>Entity that provides extra information, such as user profile attributes that a PDP needs in order to make a decision.</td>
</tr>
<tr>
<td>Principal</td>
<td>Represents an entity that has been authenticated (such as a user, a device, or an application), and thus is distinguished from other entities.</td>
</tr>
<tr>
<td>Privilege</td>
<td>In the context of delegated administration, a set of administrative tasks that can be performed by specified identities in a given realm.</td>
</tr>
<tr>
<td>Provider federation</td>
<td>Agreement among providers to participate in a circle of trust.</td>
</tr>
<tr>
<td>Realm</td>
<td>AM unit for organizing configuration and identity information.</td>
</tr>
</tbody>
</table>
Realms can be used for example when different parts of an organization have different applications and user data stores, and when different organizations use the same AM deployment.

Administrators can delegate realm administration. The administrator assigns administrative privileges to users, allowing them to perform administrative tasks within the realm.

**Resource**

Something a user can access over the network such as a web page.

Defined as part of policies, these can include wildcards in order to match multiple actual resources.

**Resource owner**

In OAuth 2.0, entity who can authorize access to protected web resources, such as an end user.

**Resource server**

In OAuth 2.0, server hosting protected web resources, capable of handling access tokens to respond to requests for such resources.

**Response attributes**

Defined as part of policies, these allow AM to return additional information in the form of "attributes" with the response to a policy decision.

**Role based access control (RBAC)**

Access control that is based on whether a user has been granted a set of permissions (a role).

**Security Assertion Markup Language (SAML)**

Standard, XML-based language for exchanging authentication and authorization data between identity providers and service providers.

**Service provider (SP)**

Entity that consumes assertions about a principal (and provides a service that the principal is trying to access).

**Authentication Session**

The interval while the user or entity is authenticating to AM.

**Session**

The interval that starts after the user has authenticated and ends when the user logs out, or when their session is terminated. For browser-based clients, AM manages user sessions across one or more applications by setting a session cookie. See also CTS-based sessions and Client-based sessions.

**Session high availability**

Capability that lets any AM server in a clustered deployment access shared, persistent information about users' sessions from the CTS token store. The user does not need to log in again unless the entire deployment goes down.

**Session token**

Unique identifier issued by AM after successful authentication. For a CTS-based sessions, the session token is used to track a principal's session.
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single log out (SLO)</td>
<td>Capability allowing a principal to end a session once, thereby ending her session across multiple applications.</td>
</tr>
<tr>
<td>Single sign-on (SSO)</td>
<td>Capability allowing a principal to authenticate once and gain access to multiple applications without authenticating again.</td>
</tr>
<tr>
<td>Site</td>
<td>Group of AM servers configured the same way, accessed through a load balancer layer. The load balancer handles failover to provide service-level availability. The load balancer can also be used to protect AM services.</td>
</tr>
<tr>
<td>Standard metadata</td>
<td>Standard federation configuration information that you can share with other access management software.</td>
</tr>
<tr>
<td>Stateless Service</td>
<td>Stateless services do not store any data locally to the service. When the service requires data to perform any action, it requests it from a data store. For example, a stateless authentication service stores session state for logged-in users in a database. This way, any server in the deployment can recover the session from the database and service requests for any user. All AM services are stateless unless otherwise specified. See also Client-based sessions and CTS-based sessions.</td>
</tr>
<tr>
<td>Subject</td>
<td>Entity that requests access to a resource</td>
</tr>
<tr>
<td>User data store</td>
<td>Data storage service holding principals' profiles; underlying storage can be an LDAP directory service or a custom IdRepo implementation.</td>
</tr>
<tr>
<td>Web Agent</td>
<td>Native library installed in a web server that acts as a policy enforcement point with policies based on web page URLs.</td>
</tr>
</tbody>
</table>