



Developer's Guide

OpenAM 10

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Abstract

Guide to developing OpenAM client applications and service providers. OpenAM provides open source Authentication, Authorization, Entitlement and Federation software.



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Preface

This guide demonstrates how to handle sessions to permit single sign on and single log out in OpenAM client applications. This guide further demonstrates how to use the OpenAM APIs including both APIs for client applications, and also SPIs for authentication, policy, service management, delegation, and identity storage. Finally, this guide demonstrates how to write your own web policy agent.

1. Who Should Use this Guide

This guide is written for developers who adapt client applications to use OpenAM access management capabilities. It is also written for designers and developers extending and integrating OpenAM services for their organizations.

You do not need to be an OpenAM wizard to learn something from this guide, though a background in access management and developing web applications or developing for web and application servers can help. You can nevertheless get started with this guide, and then learn more as you go along.

2. Formatting Conventions

Most examples in the documentation are created in GNU/Linux or Mac OS X operating environments. If distinctions are necessary between operating environments, examples are labeled with the operating environment name in parentheses. To avoid repetition file system directory names are often given only in UNIX format as in `/path/to/server`, even if the text applies to `C:\path\to\server` as well.

Absolute path names usually begin with the placeholder `/path/to/`. This path might translate to `/opt/`, `C:\Program Files\`, or somewhere else on your system.

Command-line, terminal sessions are formatted as follows:

```
$ echo $JAVA_HOME
/path/to/jdk
```

Command output is sometimes formatted for narrower, more readable output even though formatting parameters are not shown in the command.

Program listings are formatted as follows:

```
class Test {  
    public static void main(String [] args) {  
        System.out.println("This is a program listing.");  
    }  
}
```

3. 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.

4. Using the ForgeRock.org Site

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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.

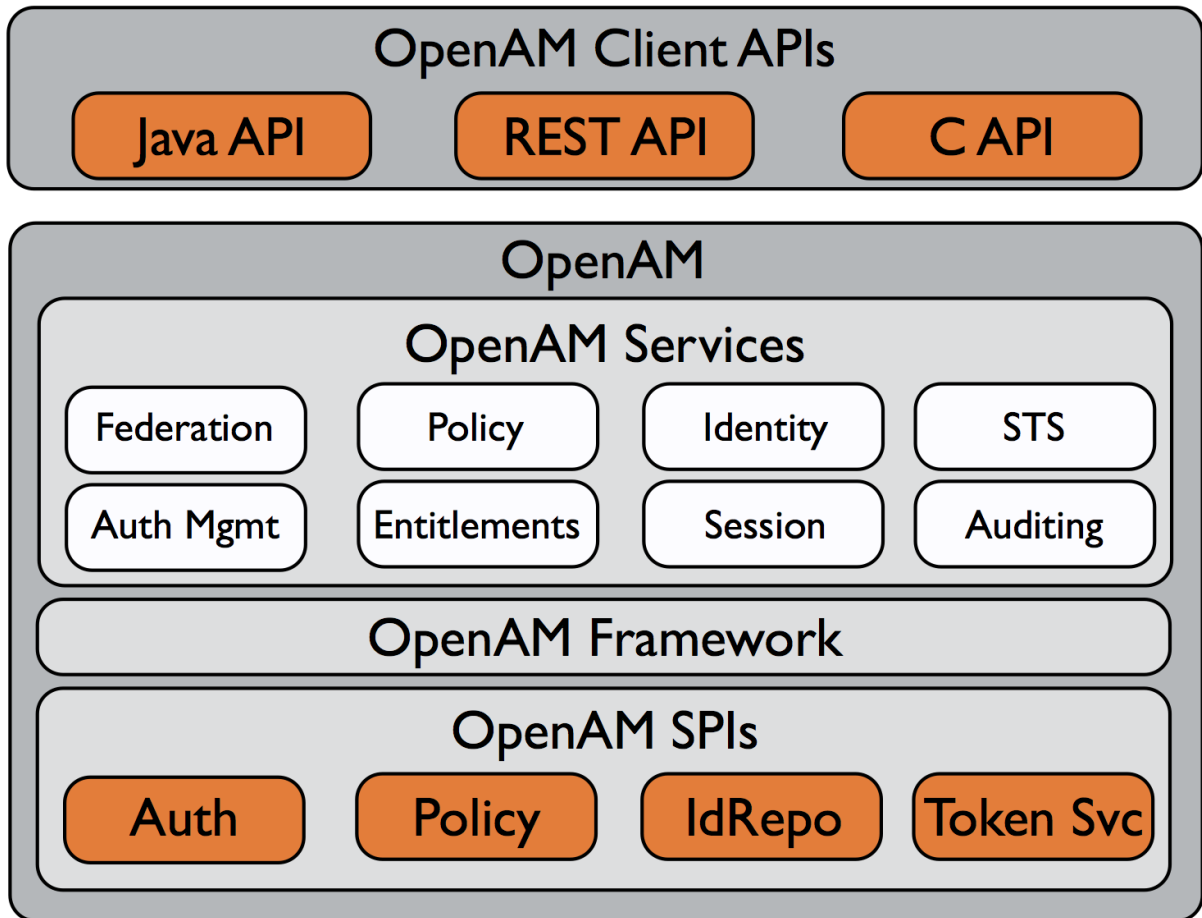
Chapter 1

OpenAM APIs and Protocols

Although policy agents and standards support make it possible for applications to use OpenAM for access management without changing your code, some deployments require tighter integration, or direct use of supported protocols and OpenAM APIs.

OpenAM supports a range of protocols and APIs that allow you not only to define specifically how access is managed in your client applications, but also to extend OpenAM capabilities to meet even those deployment requirements not yet covered in OpenAM.

This short chapter presents an overview of the APIs and protocols that OpenAM supports.



This guide primarily covers the OpenAM client APIs and SPIs, with emphasis on the Java APIs.

1.1. OpenAM APIs

OpenAM provides client application programming interfaces for a variety of needs.

- The OpenAM Java APIs provided through the OpenAM Java SDK let your Java and Java EE applications call on OpenAM for authentication, and authorization in both OpenAM and federated environments.

Detailed reference information is provided in the *OpenAM Java SDK API Specification*.

- The C SDK also provides APIs for native applications, such as new web server policy agents. The C SDK is delivered with OpenAM for Linux, Solaris, and Windows platforms.
- OpenAM exposes a RESTful API that can return JSON or XML over HTTP, allowing you to access authentication, authorization, and identity services from your web applications using REST clients in the language of your choice.

1.2. OpenAM SPIs

OpenAM provides Java based service provider interfaces to let you extend services for the requirements of your particular deployment.

Some examples of the plugins you can write follow in the list below. This guide demonstrates how to implement such plugins.

- Custom authentication plugins let OpenAM authenticate users against a new authentication service or an authentication service specific to your deployment
- Post authentication plugins perform additional processing at the end of the authentication process, but before the subject is authenticated. Post authentication plugins can for example store information about the authentication in the user's profile, or call another system for audit logging purposes.
- Policy evaluation plugins implement new policy conditions, send attributes from the user profile as part of a policy response, extend the definition of the subjects to whom the policy applies, or customize how policy management is delegated.
- Identity repository plugins let OpenAM employ a new or custom user data store, other than a directory server or JDBC-accessible database.

Chapter 2

Developing Client Applications

Client applications access OpenAM services for authentication, authorization, and single sign on/single log out through the use of sessions. Client applications can also be allowed to manage authorization policies.

Client application integration with OpenAM can be coupled loosely, as in the case of an application running in a web server with an OpenAM policy agent to handle interaction with OpenAM service, more directly, as in the case where the client interacts with OpenAM over protocol, or tightly, as in the case of an application using the OpenAM Java or C API to interact with OpenAM services.

This part of the guide covers client interaction with OpenAM over supported protocols and using OpenAM APIs.

Chapter 3

Using RESTful Web Services

This chapter shows how to use the OpenAM RESTful interfaces for direct integration between web client applications and OpenAM.

3.1. About the RESTful API

OpenAM offers a RESTful API for these access and identity management operations:

- Authentication (login)
- Logout
- Token attribute retrieval
- Token validation
- Authorization
- Logging
- Identity management (creating, reading, updating, deleting identities)

To call the API, access URLs under `identity/` where OpenAM is deployed, such as `https://openam.example.com:8080/openam/identity/`.

You can select the output format returned by specifying `json/` or `xml/` in the URL after `identity/`. For example, to return JSON, specify `https://openam.example.com:8080/openam/identity/json/`.

For the examples in this chapter, OpenAM has `c66Encode` for cookies activated. The encoding ensures that OpenAM tokens need not be percent encoded before being submitted with a request. Thus, an example token looks like this.

```
token.id=AQIC5wM2LY4SfczntBbXvEA0uECbqMY3J4NW3byH6xwgkGE.*AAJTSQACMDE.*
```

Without `c66Encode` activated, the same token might look like this.

```
token.id=AQIC5wM2LY4SfczntBbXvEA0uECbqMY3J4NW3byH6xwgkGE=@AAJTSQACMDE=#
```

In the latter example, you would have to percent encode the `=`, `@`, and `#` characters in your requests.

In this chapter, long URLs are wrapped to fit the printed page.

3.2. Authentication & Logout

Simple authentication with a user name and password returns a token.

```
$ curl "https://openam.example.com:8080/openam/identity/authenticate?
username=bjensen
&password=hifalutin"
token.id=AQIC5wM2LY4SfxcvvdvH0XjtC_eWSs2RB54tgvGK8SuYi7aQ.*AAJTSQACMDE.*
```

If you must specify parameters as when authenticating to `/UI/Login`, you provide a percent encoded string of the parameters as the value of the `uri` parameter.

```
$ curl "https://openam.example.com:8080/openam/identity/authenticate?
username=bjensen
&password=hifalutin
&uri=realm=%2F%26module=DataStore"
token.id=AQIC5wM2LY4SfxcvvdvH0XjtC_eWSs2RB54tgvGK8SuYi7aQ.*AAJTSQACMDE.*
```

You log out using the token to end the user session.

```
$ curl "https://openam.example.com:8080/openam/identity/logout?
subjectid=AQIC5wM2LY4SfxcvvdvH0XjtC_eWSs2RB54tgvGK8SuYi7aQ.*AAJTSQACMDE.*"
```

3.3. Token Validation & Attribute Retrieval

You check whether a token is valid as follows.

```
$ curl "https://openam.example.com:8080/openam/identity/isTokenValid?
tokenId=AQIC5wM2LY4SfxcuxIP0VnP2LVjs7ypEM6VDx6srk56CN1Q.*AAJTSQACMDE.*"
boolean=true
```

An invalid token returns a 401 and an error page.

```
$ curl "https://openam.example.com:8080/openam/identity/isTokenValid?
tokenId=INVALID"
<html>...HTTP Status 401...</html>
```

With a valid token, you can retrieve attributes about the subject. OpenAM returns a series of *name, value* pairs.

```
$ curl "https://openam.example.com:8080/openam/identity/attributes?
subjectid=AQIC5wM2LY4SfcxuxIP0VnP2lVjs7ypEM6VDx6srk56CN1Q.*AAJTSQACMDE.*"
userdetails.token.id=
AQIC5wM2LY4SfcxuxIP0VnP2lVjs7ypEM6VDx6srk56CN1Q.*AAJTSQACMDE.*
userdetails.attribute.name=uid
userdetails.attribute.value=bjensen
userdetails.attribute.name=mail
userdetails.attribute.value=bjensen@example.com
userdetails.attribute.name=sn
userdetails.attribute.value=Jensen
userdetails.attribute.name=userpassword
userdetails.attribute.value={SSHA}rhus0fYpkapDWEHcft2Y7y83LMuC++F4Abqvig==
userdetails.attribute.name=cn
userdetails.attribute.value=Babs Jensen
userdetails.attribute.value=Barbara Jensen
userdetails.attribute.name=givenname
userdetails.attribute.value=Barbara
userdetails.attribute.name=dn
userdetails.attribute.value=uid=bjensen,ou=people,dc=example,dc=com
userdetails.attribute.name=telephonenumber
userdetails.attribute.value=+1 408 555 1862
userdetails.attribute.name=objectclass
userdetails.attribute.value=organizationalPerson
userdetails.attribute.value=person
userdetails.attribute.value=posixAccount
userdetails.attribute.value=inetOrgPerson
userdetails.attribute.value=krbprincipalaux
userdetails.attribute.value=krbTicketPolicyAux
userdetails.attribute.value=top
```

You can specify attributes to limit what you retrieve.

```
$ curl "https://openam.example.com:8080/openam/identity/attributes?
subjectid=AQIC5wM2LY4SfcxuxIP0VnP2lVjs7ypEM6VDx6srk56CN1Q.*AAJTSQACMDE.*
&attributenames=mail
&attributenames=uid"
userdetails.token.id=
AQIC5wM2LY4SfcxuxIP0VnP2lVjs7ypEM6VDx6srk56CN1Q.*AAJTSQACMDE.*
userdetails.attribute.name=uid
userdetails.attribute.value=bjensen
userdetails.attribute.name=mail
userdetails.attribute.value=bjensen@example.com
```

When retrieving attributes, you can refresh the session thus setting the idle time to 0, by adding the boolean parameter `refresh=true` to the query string.

```
$ curl "https://openam.example.com:8080/openam/identity/attributes?
subjectid=AQIC5wM2LY4SfcxuxIP0VnP2lVjs7ypEM6VDx6srk56CN1Q.*AAJTSQACMDE.*
&attributenames=cn
&refresh=true"
userdetails.token.id=
AQIC5wM2LY4SfcxuxIP0VnP2lVjs7ypEM6VDx6srk56CN1Q.*AAJTSQACMDE.*
userdetails.attribute.name=cn
userdetails.attribute.value=Babs Jensen
userdetails.attribute.value=Barbara Jensen
```

3.4. Authorization

You can call on OpenAM to decide whether to authorize access to a protected resource based on a valid token. Of course, you must percent encode the resource URI.

```
$ curl "https://openam.example.com:8080/openam/identity/authorize?
uri=http%3A%2F%2Fwww.example.com%3A8080%2Fexamples%2Findex.html
&subjectid=AQIC5wM2LY4SfcuxIP0VnP2lVjs7ypEM6VDx6srk56CN1Q.*AAJTSQACMDE.*"
boolean=true
```

To indicate access denied, OpenAM returns `boolean=false`.

Additionally, you can access entitlements and entitlement policy decisions using the REST interface. In order to access the entitlements interface, you cannot however use the authentication token as is. Instead you must encode the token as performed in `Encoder.java`, and then URL-encode the result.

The entitlements REST interface uses the following path suffixes and query string parameters.

Path suffixes for entitlements include the following.

- `ws/1/entitlement/decision`: request a decision pertaining to a single resource
- `ws/1/entitlement/decisions`: request decisions pertaining to multiple resources
- `ws/1/entitlement/entitlement`: request decisions for a specified resource URL and all resources underneath

Query string parameters for entitlements include the following.

- `subject=encoded-token`, where the encoded token is as describe above.
- `action=get`, or `action=post`, which identifies the user agent action when requesting a decision.
- `application=iPlanetAMWebAgentService`
- `resource=resource-url`, or multiple `resources=resource-url` parameters for multiple decisions.
- `env=requestDnsName%3Dfqdn`, `env=requestIP%3Ddotted-quads`, `env=requestTime%3Dseconds-since-epoch`, and `env=requestDnsName%3Dtime-zone` where `time-zone` is from Java `TimeZone.getTimeZone().getID()`. The `env` parameters thus express conditions.

3.5. Logging

You can send OpenAM messages to log, specifying the message content and the log file in which to write your message.

```
$ curl "https://openam.example.com:8080/openam/identity/authenticate?
username=amadmin
&password=password"
token.id=AQIC5wM2LY4SfcwyCZkk-1JXzx6q1EzgagabHfBjMidb5jI.*AAJTSQACMDE.*
$ curl "https://openam.example.com:8080/openam/identity/log?
appid=AQIC5wM2LY4SfcwyCZkk-1JXzx6q1EzgagabHfBjMidb5jI.*AAJTSQACMDE.*
&subjectid=AQIC5wM2LY4SfcxuxIP0VnP2LVjs7ypEM6VDx6srk56CN1Q.*AAJTSQACMDE.*
&logname=rest.access
&message=Hello%20World"
```

Logging takes a valid `appid` token for the subject with access to log the message, and also a `subjectid` token for the user whom the message concerns. If the tokens are valid and the access rights correct, your message ends up in the log specified.

```
$ cat openam/openam/log/rest.access
#Version: 1.0
#Fields: time Data LoginID ContextID IPAddr LogLevel Domain
LoggedBy MessageID ModuleName NameID HostName
"2011-09-14 16:38:17" /home/mark/openam/openam/log/
"cn=dsameuser,ou=DSAME Users,o=openam" aa307b2dcb721d4201
"Not Available" INFO o=openam "cn=dsameuser,ou=DSAME Users,o=openam"
LOG-1 rest.access "Not Available"192.168.56.2
"2011-09-14 16:38:17" "Hello World" id=bjensen,ou=user,o=openam
8a4025a2b3af291d01 "Not Available" INFO o=openam
id=amadmin,ou=user,o=openam "Not Available" rest.access "Not Available"
192.168.56.2
```

3.6. Identity Management

This section shows how you create, read (search), update, and delete identities using the RESTful API.

3.6.1. Creating Identities

OpenAM lets you create user profiles, and also create web and J2EE policy agent profiles. When you create an entry, you must provide the following parameters.

admin

Valid token for the user with permissions to add the identity

identity_name

A unique name for the identity to create

identity_attribute_names

LDAP attribute names for attributes to create

identity_attribute_values_name

LDAP attribute values for the identity to create. For example,
`identity_attribute_names=sn&identity_attribute_values_sn=Jensen.`

identity_realm

The realm in which to create the identity

identity_type

Either `user` or `AgentOnly`

```
$ curl "https://openam.example.com:8080/openam/identity/authenticate?
username=amadmin
&password=password"
token.id=AQIC5wM2LY4SfcxSYA8eG-vrNHb_W7nG8XkfAGyRyuaebDY.*AAJTSQACMDE.*
$ curl "https://openam.example.com:8080/openam/identity/create?
admin=AQIC5wM2LY4SfcxSYA8eG-vrNHb_W7nG8XkfAGyRyuaebDY.*AAJTSQACMDE.*
&identity_name=testuser
&identity_attribute_names=cn
&identity_attribute_values_cn=Test%20User
&identity_attribute_names=sn
&identity_attribute_values_sn=User
&identity_attribute_names=userpassword
&identity_attribute_values_userpassword=secret12
&identity_realm=%2F
&identity_type=user"
```

3.6.2. Reading & Searching for Identities

Reading is similar to attribute retrieval, as described in Section 3.3, "Token Validation & Attribute Retrieval", but obtained using the token of a user with permissions to perform the search, as shown in the following example.

```
$ curl "https://openam.example.com:8080/openam/identity/read?
admin=AQIC5wM2LY4SfcxSYA8eG-vrNHb_W7nG8XkfAGyRyuaebDY.*AAJTSQACMDE.*
&name=testuser
&attributes_names_realm
&attributes_values_realm=%2F"
identitydetails.name=testuser
identitydetails.type=user
identitydetails.realm=o=openam
identitydetails.attribute=
identitydetails.attribute.name=uid
identitydetails.attribute.value=testuser
identitydetails.attribute=
identitydetails.attribute.name=sn
identitydetails.attribute.value=User
identitydetails.attribute=
identitydetails.attribute.name=userpassword
identitydetails.attribute.value={SSHA}AzpT+N1sjrQhL1wfX2ETWh/Aqbd+lH9L0lhDqg==
identitydetails.attribute=
identitydetails.attribute.name=cn
```



```
identitydetails.attribute.value=Test User
identitydetails.attribute=
identitydetails.attribute.name=inetuserstatus
identitydetails.attribute.value=Active
identitydetails.attribute=
identitydetails.attribute.name=dn
identitydetails.attribute.value=uid=testuser,ou=people,dc=example,dc=com
identitydetails.attribute=
identitydetails.attribute.name=objectclass
identitydetails.attribute.value=person
identitydetails.attribute.value=sunIdentityServerLibertyPPService
identitydetails.attribute.value=inetorgperson
identitydetails.attribute.value=sunFederationManagerDataStore
identitydetails.attribute.value=iPlanetPreferences
identitydetails.attribute.value=iplanet-am-auth-configuration-service
identitydetails.attribute.value=organizationalperson
identitydetails.attribute.value=sunFMSAML2NameIdentifier
identitydetails.attribute.value=inetuser
identitydetails.attribute.value=iplanet-am-managed-person
identitydetails.attribute.value=iplanet-am-user-service
identitydetails.attribute.value=sunAMAuthAccountLockout
identitydetails.attribute.value=top
identitydetails.attribute=
identitydetails.attribute.name=universalid
identitydetails.attribute.value=id=testuser,ou=user,o=openam
```

You can search for user IDs by providing the following parameters.

admin

Valid token for the user with access to perform the search

attributes_names

LDAP attribute names for attributes to search

attributes_values_name

LDAP attribute values for the identity to search. For example,
`attribute_names=sn&attribute_values_sn=Jensen.`

filter

Additional LDAP filter component to limit the search results returned

```
$ curl "https://openam.example.com:8080/openam/identity/search?
admin=AQIC5wM2LY4SfcxSYA8eG-vrNHb_W7nG8XkfAGyRyuabDY.*AAJTSQACMDE.*
&attributes_names=sn
&attributes_values_sn=Jensen
&attributes_names=mail
&attributes_values_mail=bjensen*
&attributes_names_realm
&attributes_values_realm=%2F"
string=bjensen
```

3.6.3. Updating Identities

You can update an identity with the same parameters used to create identities, provided the token corresponds to a user with access to update the identity.

```
$ curl "https://openam.example.com:8080/openam/identity/update?
admin=AQIC5wM2LY4SfcxSYA8eG-vrNHb_w7nG8XkfAGyRyuaebDY.*AAJTSQACMDE.*
&identity_name=testuser
&identity_attribute_names=mail
&identity_attribute_values_mail=testuser%40example.com
&identity_realm=%2F
&identity_type=user"
```

3.6.4. Deleting Identities

You can also delete an identity.

```
$ curl "https://openam.example.com:8080/openam/identity/delete?
admin=AQIC5wM2LY4SfcxSYA8eG-vrNHb_w7nG8XkfAGyRyuaebDY.*AAJTSQACMDE.*
&identity_name=testuser
&identity_realm=%2F
&identity_type=user"
```

Chapter 4

Using the OpenAM Java SDK

This chapter introduces OpenAM Java SDK. OpenAM Java SDK is delivered in the `samples/opensso-client.zip` where you unpacked the full version of OpenAM, such as `/path/to/OpenAM/samples/opensso-client.zip`. To prepare to install the OpenAM Java SDK, first unzip `opensso-client.zip`.

```
$ mkdir -p /path/to/openam-client ; cd /path/to/openam-client
$ unzip /path/to/OpenAM/samples/opensso-client.zip
```

As a result, you have two directories that include the SDK and also sample command-line and web-based client applications.

`src/`

This directory contains the SDK and client sample commands.

- `classes/`: compiled samples
- `lib/`: SDK and required libraries
- `resources/`: properties configuration for the SDK and samples
- `scripts/`: installation scripts and scripts to run the samples on UNIX, Linux, and Windows systems
- `sources/`: sample code

`war/`

This directory contains a web application archive with client samples accessible through the browser after you install the `.war` in a web application container.

Procedure 4.1. To Install OpenAM SDK Command-Line Examples

The command-line samples access OpenAM over HTTP or HTTPS.

1. Compile the samples.

```
$ cd sdk/
$ chmod +x scripts/*.sh
$ ./scripts/compile-samples.sh
```

2. Set up the samples to connect to OpenAM.

```
$ mkdir /path/to/openam-client/debug
$ ./scripts/setup.sh
Debug directory (make sure this directory exists): /path/to/openam-client/debug
Application user (e.g. URLAccessAgent) password: secret12
Protocol of the server: http
Host name of the server: openam.example.com
Port of the server: 8080
Server's deployment URI: openam
Naming URL (hit enter to accept default value,
http://openam.example.com:8080/openam/namingservice):
$
```

This sets up the configuration file for the samples, `resources/AMConfig.properties`. Read the comments in the file to see the configuration settings, many of which are similar to those used by OpenAM on the server side.

3. Check that the login sample works.

```
$ ./scripts/Login.sh
Realm (e.g. /):
Login module name (e.g. DataStore or LDAP): DataStore
Login locale (e.g. en_US or fr_FR): en_US
DataStore: Obtained login context
User Name:amadmin
Password:password
Login succeeded.
Logged Out!!
```

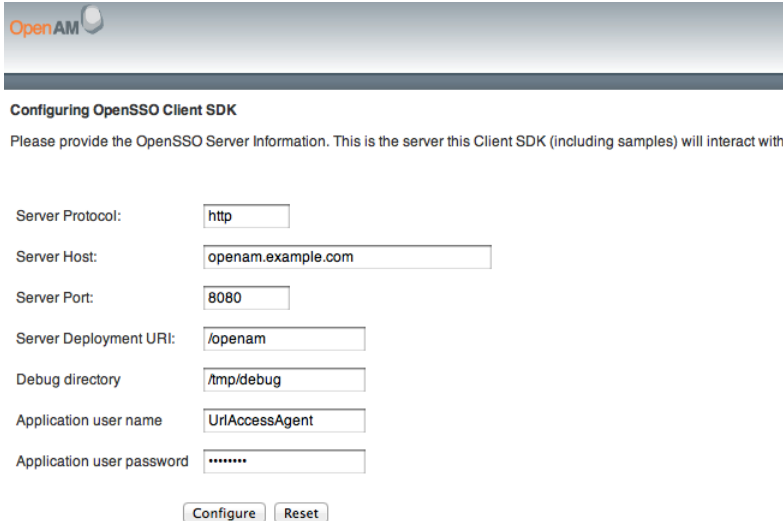
Procedure 4.2. To Install OpenAM SDK Web-Based Samples

The web-based samples also access OpenAM over HTTP or HTTPS.

1. Deploy the web application.

```
$ mv war/opensso-client-jdk15.war /path/to/tomcat/webapps/openam-client.war
```

2. Browse to the application you deployed to configure access to OpenAM.



OpenAM

Configuring OpenSSO Client SDK

Please provide the OpenSSO Server Information. This is the server this Client SDK (including samples) will interact with.

Server Protocol:

Server Host:

Server Port:

Server Deployment URI:

Debug directory:

Application user name:

Application user password:

Use the following hints to complete the configuration.

Server Protocol

Protocol to access OpenAM ([http](#) or [https](#))

Server Host

Fully qualified domain name for OpenAM, such as [openam.example.com](#)

Server Port

OpenAM port number such as 8080 or 8443

Server Deployment URI

URI entry point to OpenAM such as [/openam](#)

Debug directory

Where to write the debug messages for the client samples

Application user name

An user agent configured to access OpenAM, such as [UrlAccessAgent](#) set up when OpenAM was installed

Application user password

The user agent password

3. After successful configuration, click the link to return to the URL where you deployed the application to view the available sample clients.

Chapter 5

Authenticating Using OpenAM Java SDK

This chapter looks at authentication with the OpenAM Java SDK and at the sample client, `Login.java`, which demonstrates authenticating to OpenAM from a client application, provided a realm, user name, and password.

With OpenAM, your client application performs the following steps to handle authentication.

1. Sets up an `AuthContext`, based on the realm in which the user authenticates.
2. Starts the login process by calling the `AuthContext login()` method.
3. Handling authentication callbacks to retrieve credentials from the user who is authenticating.

Your application loops through the authentication callbacks by using the `AuthContext getRequirements()` and `hasMoreRequirements()` methods. Each time it finishes populating a callback with the credentials retrieved, your application calls `submitRequirements()` to send the credentials to OpenAM's Authentication Service.

4. After handling all authentication callbacks, your application calls the `AuthContext getStatus()` method.

On login success, OpenAM sets up an `SSOToken` that holds information about the authentication, and also about the user's environment and session.

5. When the user logs out, your application can end the session by calling the `AuthContext logout()` method.

The `AuthContext` class is provided by the `com.sun.identity.authentication` package, part of the OpenAM client API. Callback classes are provided by the `javax.security.auth.callback` package, which provides callbacks for choices, confirmations, locales, names, passwords, text input, and text output.

See the *OpenAM Java SDK API Specification* for reference.

As the sample client gets the realm (called organization in the sample), locale, and authentication module to set up the authentication context, there is not need for a language callback to get the local afterwards. The `Login.java` example does, however, show simple ways of handling callbacks for the command-line context. The implementation of the sample client follows.

```
package com.sun.identity.samples.authentication;

import java.io.BufferedReader;
import java.io.InputStreamReader;
import java.io.IOException;
import javax.security.auth.callback.Callback;
```

```

import javax.security.auth.callback.ChoiceCallback;
import javax.security.auth.callback.NameCallback;
import javax.security.auth.callback.PasswordCallback;
import javax.security.auth.callback.TextInputCallback;
import javax.security.auth.callback.TextOutputCallback;
import javax.security.auth.callback.UnsupportedCallbackException;
import com.sun.identity.authentication.AuthContext;
import com.sun.identity.authentication.spi.AuthLoginException;
import com.sun.identity.shared.debug.Debug;

public class Login {
    private String loginIndexName;
    private String orgName;
    private String locale;

    private Login(String loginIndexName, String orgName) {
        this.loginIndexName = loginIndexName;
        this.orgName = orgName;
    }

    private Login(String loginIndexName, String orgName, String locale) {
        this.loginIndexName = loginIndexName;
        this.orgName = orgName;
        this.locale = locale;
    }

    protected AuthContext getAuthContext()
        throws AuthLoginException {
        AuthContext lc = new AuthContext(orgName);
        AuthContext.IndexType indexType = AuthContext.IndexType.MODULE_INSTANCE;
        if (locale == null || locale.length() == 0) {
            lc.login(indexType, loginIndexName);
        } else {
            lc.login(indexType, loginIndexName, locale);
        }
        debugMessage(loginIndexName + " : Obtained login context");
        return lc;
    }

    private void addLoginCallbackMessage(Callback[] callbacks)
        throws UnsupportedCallbackException {
        int i = 0;
        try {
            for (i = 0; i < callbacks.length; i++) {
                if (callbacks[i] instanceof TextOutputCallback) {
                    handleTextOutputCallback((TextOutputCallback)callbacks[i]);
                } else if (callbacks[i] instanceof NameCallback) {
                    handleNameCallback((NameCallback)callbacks[i]);
                } else if (callbacks[i] instanceof PasswordCallback) {
                    handlePasswordCallback((PasswordCallback)callbacks[i]);
                } else if (callbacks[i] instanceof TextInputCallback) {
                    handleTextInputCallback((TextInputCallback)callbacks[i]);
                } else if (callbacks[i] instanceof ChoiceCallback) {
                    handleChoiceCallback((ChoiceCallback)callbacks[i]);
                }
            }
        } catch (IOException e) {
            e.printStackTrace();
            throw new UnsupportedCallbackException(callbacks[i], e.getMessage());
        }
    }
}

```



```

    }
}

private void handleTextOutputCallback(TextOutputCallback toc) {
    debugMessage("Got TextOutputCallback");
    // display the message according to the specified type

    switch (toc.getMessageType()) {
        case TextOutputCallback.INFORMATION:
            debugMessage(toc.getMessage());
            break;
        case TextOutputCallback.ERROR:
            debugMessage("ERROR: " + toc.getMessage());
            break;
        case TextOutputCallback.WARNING:
            debugMessage("WARNING: " + toc.getMessage());
            break;
        default:
            debugMessage("Unsupported message type: " +
                toc.getMessageType());
    }
}

private void handleNameCallback(NameCallback nc)
    throws IOException {
    // prompt the user for a username
    System.out.print(nc.getPrompt());
    System.out.flush();
    nc.setName((new BufferedReader
        (new InputStreamReader(System.in))).readLine());
}

private void handleTextInputCallback(TextInputCallback tic)
    throws IOException {
    // prompt for text input
    System.out.print(tic.getPrompt());
    System.out.flush();
    tic.setText((new BufferedReader
        (new InputStreamReader(System.in))).readLine());
}

private void handlePasswordCallback>PasswordCallback pc)
    throws IOException {
    // prompt the user for sensitive information
    System.out.print(pc.getPrompt());
    System.out.flush();
    String passwd = (new BufferedReader(new InputStreamReader(System.in))).
        readLine();
    pc.setPassword(passwd.toCharArray());
}

private void handleChoiceCallback(ChoiceCallback cc)
    throws IOException {
    // ignore the provided defaultValue
    System.out.print(cc.getPrompt());

    String[] strChoices = cc.getChoices();
    for (int j = 0; j < strChoices.length; j++) {
        System.out.print("choice[" + j + "] : " + strChoices[j]);
    }
}

```

```

    }
    System.out.flush();
    cc.setSelectedIndex(Integer.parseInt((new BufferedReader(
        (new InputStreamReader(System.in))).readLine())));
}

protected boolean login(AuthContext lc)
    throws UnsupportedOperationException {
    boolean succeed = false;
    Callback[] callbacks = null;

    // get information requested from module
    while (lc.hasMoreRequirements()) {
        callbacks = lc.getRequirements();
        if (callbacks != null) {
            addLoginCallbackMessage(callbacks);
            lc.submitRequirements(callbacks);
        }
    }

    if (lc.getStatus() == AuthContext.Status.SUCCESS) {
        System.out.println("Login succeeded.");
        succeed = true;
    } else if (lc.getStatus() == AuthContext.Status.FAILED) {
        System.out.println("Login failed.");
    } else {
        System.out.println("Unknown status: " + lc.getStatus());
    }

    return succeed;
}

protected void logout(AuthContext lc)
    throws AuthLoginException {
    lc.logout();
    System.out.println("Logged Out!!!");
}

static void debugMessage(String msg) {
    System.out.println(msg);
}

public static void main(String[] args) {
    try {
        System.out.print("Realm (e.g. /): ");
        String orgName = (new BufferedReader(
            new InputStreamReader(System.in))).readLine();

        System.out.print("Login module name (e.g. DataStore or LDAP): ");
        String moduleName = (new BufferedReader(
            new InputStreamReader(System.in))).readLine();

        System.out.print("Login locale (e.g. en_US or fr_FR): ");
        String locale = (new BufferedReader(
            new InputStreamReader(System.in))).readLine();

        Login login = new Login(moduleName, orgName, locale);
        AuthContext lc = login.getAuthContext();
        if (login.login(lc)) {

```

```
        login.logout(lc);
    }
} catch (IOException e) {
    e.printStackTrace();
} catch (AuthLoginException e) {
    e.printStackTrace();
} catch (UnsupportedCallbackException e) {
    e.printStackTrace();
}
}
System.exit(0);
}
```

For instructions on building the sample clients, see the chapter *Using the OpenAM Java SDK*.

Chapter 6

Handling Single Sign On Using OpenAM Java SDK

This chapter looks at handling session tokens with the OpenAM Java SDK using the sample client `SS0TokenSample.java`.

When a user authenticates successfully, OpenAM sets up a single sign on session for the user. The session is associated with an SSO token that holds information about the authentication, and also about the user's environment and session. OpenAM disposes of the session when the authentication context `logout()` method is called, or when a session timeout is reached. At that point the SSO token is no longer valid.

When your application has an `AuthContext` after successful authentication, you can retrieve the SSO token from the context. You also can get the token as shown in the sample client by passing an SSO token ID from OpenAM to an `SS0TokenManager`.

If your application needs to be notified of changes, you can register an `SS0TokenListener` on the token by using the token's `addSS0TokenListener()` method. OpenAM then calls your `SS0TokenListener.ssoTokenChanged()` method when the session times out, is disposed of, or has a property that changes.

The sample client takes an SSO token ID to get the token from OpenAM, and then displays some information from the SSO token. The implementation of the sample client follows.

```
package com.sun.identity.samples.sso;

import java.io.BufferedReader;
import java.io.InputStreamReader;
import java.io.IOException;
import java.net.InetAddress;
import com.ipplanet.sso.SS0Exception;
import com.ipplanet.sso.SS0Token;
import com.ipplanet.sso.SS0TokenID;
import com.ipplanet.sso.SS0TokenManager;

public class SS0TokenSample {
    private SS0TokenManager manager;
    private SS0Token token;

    private SS0TokenSample(String tokenID)
        throws SS0Exception
    {
        if (validateToken(tokenID)) {
            setGetProperties(token);
        }
    }
}
```

```

private boolean validateToken(String tokenID)
    throws SS0Exception
{
    boolean validated = false;
    manager = SS0TokenManager.getInstance();
    token = manager.createSS0Token(tokenID);

    // isValid method returns true for valid token.
    if (manager.isValidToken(token)) {
        // let us get all the values from the token
        String host = token.getHostName();
        java.security.Principal principal = token.getPrincipal();
        String authType = token.getAuthType();
        int level = token.getAuthLevel();
        InetAddress ipAddress = token.getIPAddress();
        long maxTime = token.getMaxSessionTime();
        long idleTime = token.getIdleTime();
        long maxIdleTime = token.getMaxIdleTime();

        System.out.println("SS0Token host name: " + host);
        System.out.println("SS0Token Principal name: " +
            principal.getName());
        System.out.println("Authentication type used: " + authType);
        System.out.println("IPAddress of the host: " +
            ipAddress.getHostAddress());
        validated = true;
    }

    return validated;
}

private void setGetProperties(SS0Token token)
    throws SS0Exception
{
    /*
     * Validate the token again, with another method
     * if token is invalid, this method throws an exception
     */
    manager.validateToken(token);
    System.out.println("SS0 Token validation test Succeeded.");

    // Get the SS0TokenID associated with the token and print it.
    SS0TokenID id = token.getTokenID();
    String tokenId = id.toString();
    System.out.println("Token ID: " + tokenId);

    // Set and get properties in the token.
    token.setProperty("TimeZone", "PST");
    token.setProperty("County", "SantaClara");
    String tZone = token.getProperty("TimeZone");
    String county = token.getProperty("County");

    System.out.println("Property: TimeZone: " + tZone);
    System.out.println("Property: County: " + county);
}

public static void main(String[] args) {
    try {

```

```
        System.out.print("Enter SSOToken ID: ");
        String ssoTokenID = (new BufferedReader(
            new InputStreamReader(System.in))).readLine();
        new SSOTokenSample(ssoTokenID.trim());
    } catch (SSOException e) {
        e.printStackTrace();
    } catch (IOException e) {
        e.printStackTrace();
    }
    System.exit(0);
}
}
```

Before you run the script that calls the sample, authenticate to OpenAM in order to have OpenAM generate the SSO token ID. To see the SSO token ID, you can either authenticate on the command line using the RESTful `authenticate` command, or alternatively run the `SSOTokenSampleServlet` web-based sample.

```
$ scripts/SSOTokenSample.sh
Enter SSOToken ID:
AQIC5wM2LY4Sfxcsdru55RwePLUIbY8xTjeHf3Xnw6hph0E.*AAJTSQACMDE.*
SSOToken host name: 192.168.56.1
SSOToken Principal name:
 id=bjensen,ou=user,o=realm,ou=services,dc=opensso,dc=java,dc=net
Authentication type used: DataStore
IPAddress of the host: 192.168.56.1
SSO Token validation test Succeeded.
Token ID: AQIC5wM2LY4Sfxcsdru55RwePLUIbY8xTjeHf3Xnw6hph0E.*AAJTSQACMDE.*
Property: TimeZone: PST
Property: County: SantaClara
```

Notice both the properties populated by OpenAM, and also the two properties, `TimeZone` and `County`, that are set by the sample client.

6.1. Receiving Notifications

If your application implements a listener for change notification, such as a `SessionListener` to handle notification when a session is invalidated, then you must configure the following settings in the `AMConfig.properties` configuration file for your application.

com.iplanet.am.notification.url

Set this parameter to `http://host:port/context/notificationsservice`.

com.iplanet.am.sdk.caching.enabled

Set this parameter to `true`.

com.iplanet.am.serverMode

Set this parameter to `false`.

com.sun.identity.client.notification.url

Set this parameter to `http://host:port/context/notificationsevice`.

com.sun.identity.idm.cache.enabled

Set this parameter to `true`.

com.sun.identity.idm.remote.notification.enabled

Set this parameter to `true`.

com.sun.identity.sm.cache.enabled

Set this parameter to `true`.

com.sun.identity.sm.enableDataStoreNotification

Set this parameter to `true`.

The above configuration to access the notification service also applies for other types of listeners, such as `ServiceListener`, and `IdEventListener` implementations. See the *OpenAM Java SDK API Specification* for details on the available listener interfaces.

Chapter 7

Requesting Policy Decisions Using OpenAM Java SDK

This chapter shows how to request policy decision by using OpenAM Java SDK. The chapter focuses on the sample client, `PolicyEvaluationSample.java`, which demonstrates making a request to OpenAM for a policy decision about access to a web resource.

OpenAM centralizes policy administration, policy evaluation, and policy decision making so that your applications do not have to do so. In many deployments, OpenAM policy agents and the Open Identity gateway can handle policy enforcement independently from your application code.

If your application does need to request a policy decision from OpenAM, then your application can retrieve a `PolicyEvaluator` from a client-side `PolicyEvaluatorFactory`, and then call the `PolicyEvaluator.getPolicyDecision()` method. For boolean decisions such as allow or deny, your application can also call the `isAllowed()` method.

To make a policy decision, OpenAM needs an `SSOToken`, the resource to access, the action the user wants to perform on the resource such as HTTP `GET` or `POST`, and a `Map` of environment settings you can use to specify conditions and attributes in the session or can pass back as an empty `Map` if your policy does not include conditions and response attributes.

The `PolicyEvaluationSample` class takes as its configuration the user credentials, service name, resource, and action that you provide in a Java properties file. It then authenticates the user to get an `SSOToken` using the `TokenUtils.java` helper methods. At that point it has sufficient information to request a policy decision.

The implementation of the sample client follows.

```
package samples.policy;

import com.iplanet.sso.SSOToken;
import com.iplanet.sso.SSOTokenManager;

import com.sun.identity.policy.PolicyDecision;
import com.sun.identity.policy.client.PolicyEvaluator;
import com.sun.identity.policy.client.PolicyEvaluatorFactory;

import samples.policy.TokenUtils;

import java.util.Enumeration;
import java.util.HashMap;
import java.util.Map;
import java.util.HashSet;
import java.util.Properties;
```



```

import java.util.MissingResourceException;
import java.util.ResourceBundle;
import java.util.Set;

public class PolicyEvaluationSample {

    public PolicyEvaluationSample() {
    }

    public static void main(String[] args) throws Exception {
        PolicyEvaluationSample clientSample = new PolicyEvaluationSample();
        clientSample.runSample(args);
        System.exit(0);
    }

    public void runSample(String[] args) throws Exception {
        if (args.length == 0 || args.length > 1) {
            System.out.println("Missing argument:"
                + "properties file name not specified");
        } else {
            System.out.println("Using properties file:" + args[0]);
            Properties sampleProperties = getProperties(args[0]);
            SSOToken ssoToken = getSSOToken(
                (String)sampleProperties.get("user.name"),
                (String)sampleProperties.get("user.password")
            );
            getPolicyDecision(
                ssoToken,
                (String)sampleProperties.get("service.name"),
                (String)sampleProperties.get("resource.name"),
                (String)sampleProperties.get("action.name")
            );
        }
    }

    private SSOToken getSSOToken(
        String userName, String password) throws Exception {
        System.out.println("Entering getSSOToken():"
            + "userName=" + userName + ","
            + "password=" + password);
        SSOToken ssoToken = TokenUtils.getSessionToken("/",
            userName, password);
        System.out.println("TokenID:" + ssoToken.getTokenID().toString());
        System.out.println("returning from getSSOToken()");
        return ssoToken;
    }

    private void getPolicyDecision(
        SSOToken ssoToken,
        String serviceName,
        String resourceName,
        String actionName)
        throws Exception {

        System.out.println("Entering getPolicyDecision():"
            + "resourceName=" + resourceName + ","
            + "serviceName=" + serviceName + ","
            + "actionName=" + actionName);
    }
}

```

```
PolicyEvaluator pe = PolicyEvaluatorFactory.getInstance().
    getPolicyEvaluator(serviceName);

Map env = new HashMap();
Set attrSet = new HashSet();
Set actions = new HashSet();
actions.add(actionName);
PolicyDecision pd = pe.getPolicyDecision(ssoToken, resourceName,
    actions, env);
System.out.println("policyDecision:" + pd.toXML());

System.out.println("returning from getPolicyDecision()");
}

private Properties getProperties(String file)
throws MissingResourceException {
    Properties properties = new Properties();
    ResourceBundle bundle = ResourceBundle.getBundle(file);
    Enumeration e = bundle.getKeys();
    System.out.println("sample properties:");
    while (e.hasMoreElements()) {
        String key = (String) e.nextElement();
        String value = bundle.getString(key);
        properties.put(key, value);
        System.out.println(key + ":" + value);
    }
    return properties;
}
}
```

Before you run the script that calls the sample, edit the properties file, [resources/policyEvaluationSample.properties](#), to indicate the user credentials, resource to access, and HTTP method to use. You can use a resource that might not exist for the purposes of this example.

```
user.name=demo
user.password=changeit
service.name=iPlanetAMWebAgentService
resource.name=http://www.example.com:80/banner.html
action.name=GET
```

Also, set up a policy in OpenAM that corresponds to the resource in question. You can set up the policy in OpenAM console under Access Control > *Realm Name* > Policies. Concerning the *Realm Name*, notice that unless you change the code, the sample uses the top-level realm, / to authenticate the user.

With the properties configured and policy in place, get the decision from OpenAM using the script, [scripts/run-policy-evaluation-sample.sh](#).

```
$ scripts/run-policy-evaluation-sample.sh
Using properties file:policyEvaluationSample
sample properties:
user.password:changeit
service.name:iPlanetAMWebAgentService
user.name:demo
resource.name:http://www.example.com:80/banner.html
action.name:GET
-----:
Entering getSSOToken():userName=demo,password=changeit
TokenID:AQIC5wM2LY4Sfcwu-JzDtYKcaxP-DxR0XYd73zLlDt3fCh4.*AAJTSQACMDE.*
returning from getSSOToken()
Entering getPolicyDecision():
  resourceName=http://www.example.com:80/banner.html,
  serviceName=iPlanetAMWebAgentService,
  actionName=GET
policyDecision:<PolicyDecision>
<ResponseAttributes>
</ResponseAttributes>
<ActionDecision timeToLive="9223372036854775807">
<AttributeValuePair>
<Attribute name="GET"/>
<Value>allow</Value>
</AttributeValuePair>
<Advices>
</Advices>
</ActionDecision>
</PolicyDecision>

returning from getPolicyDecision()
```

As you see, the policy decision response is formatted here as an XML document.¹ Notice here the line showing that OpenAM has allowed access to the resource.

```
<Value>allow</Value>
```

¹The `PolicyDecision` element is defined in `openam/WEB-INF/remoteInterface.dtd` where `openam` is the location where the OpenAM web application is deployed.

Chapter 8

Using Fedlets in Java Web Applications

This chapter introduces OpenAM Fedlets, and shows how to use the Fedlet as part of your Java web application.

An OpenAM *Fedlet* is a small web application that can do federation in your service provider application with OpenAM acting as the identity provider. The Fedlet does not require an entire OpenAM installation alongside your application, but instead can redirect to OpenAM for single sign on, and to retrieve SAML assertions.

Procedure 8.1. To Create a Fedlet

The OpenAM administrator running the identity provider server creates a `Fedlet.zip` file for your service provider application, and then sends you the `.zip`.

1. (Optional) Before creating the Fedlet, create a Hosted Identity Provider if you have not already done so.
2. On the Common Tasks page of the OpenAM console, click Create Fedlet.
3. Note that the Circle of Trust includes your hosted identity provider, and that Identity Provider is set to your to hosted identity provider.
4. Name the Fedlet, and also set the Destination URL.

You can use the deployment URL, such as `http://www.example.com:8080/fedlet` as both the name and the destination URL.

5. If you must map attributes to match profiles on the service provider, set up the attribute mapping.

To prepare to perform the Fedlet Attribute Query example, set `CommonName=cn`, `GivenName=sn`, and `UserStatus=inetUserStatus`.

6. Click create to generate the Fedlet.zip file, such as `$HOME/openam/myfedlets/httpwwwexamplecom8080fedlet/Fedlet.zip`.
7. Provide the Fedlet to the service provider.

Procedure 8.2. To Install the Fedlet as a Demo Application

`Fedlet.zip` includes the `fedlet.war` archive corresponding to the identity provider, and a `README` file.

- The `fedlet.war` archive contains both the Fedlet as a demo web application, and also the files you use to include the Fedlet in your service provider application.
- The README file describes how to use the Fedlet.

1. Deploy the Fedlet in your web container.

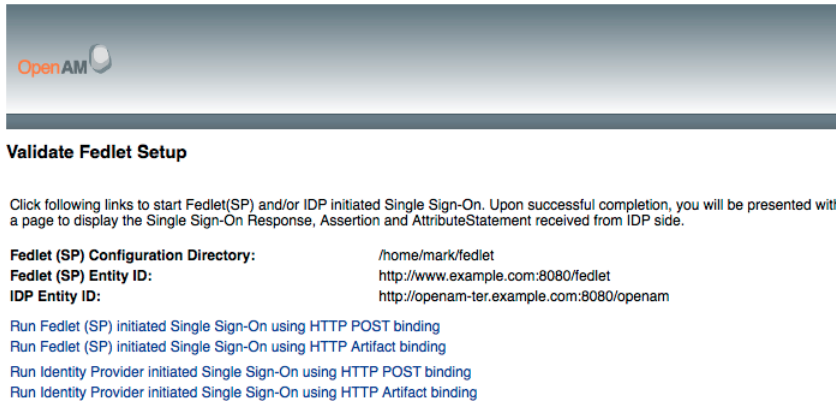
```
$ unzip Fedlet.zip
$ mv fedlet.war /path/to/tomcat/webapps
```

2. Browse to the Fedlet URL, and then click the links to set up the configuration directory in `$HOME/fedlet`, where `$HOME` corresponds to the user running the web application container.
3. In the Fedlet configuration directory, set up a JKS keystore file, keystore password file, and key password file.

For demo purposes, you can copy the test `keystore.jks`, `.keypass`, and `.storepass` from the OpenAM identity provider.

```
$ cd /home/user/openam/openam
$ scp keystore.jks .keypass .storepass www.example.com:/home/user/fedlet/
user@www.example.com's password:
keystore.jks          100% 1348    1.3KB/s   00:00
.keypass              100%  36     0.0KB/s   00:00
.storepass            100%  36     0.0KB/s   00:00
```

4. Try one or more examples from the Fedlet home page to validate Fedlet setup.



OpenAM

Validate Fedlet Setup

Click following links to start Fedlet(SP) and/or IDP initiated Single Sign-On. Upon successful completion, you will be presented with a page to display the Single Sign-On Response, Assertion and AttributeStatement received from IDP side.

Fedlet (SP) Configuration Directory: `/home/mark/fedlet`
Fedlet (SP) Entity ID: `http://www.example.com:8080/fedlet`
IDP Entity ID: `http://openam-ter.example.com:8080/openam`

[Run Fedlet \(SP\) initiated Single Sign-On using HTTP POST binding](#)
[Run Fedlet \(SP\) initiated Single Sign-On using HTTP Artifact binding](#)
[Run Identity Provider initiated Single Sign-On using HTTP POST binding](#)
[Run Identity Provider initiated Single Sign-On using HTTP Artifact binding](#)

After setting up OpenAM with the default subjects, you can login on the identity provider with user name `demo` and password `changeit`.

Procedure 8.3. To Add Your Application

The Fedlet includes the following files that you use when building your own service provider application based on the demo web application, including a set of JavaServer Pages (JSP) examples.

conf/

Configuration files copied to `$HOME/fedlet` when you first deploy and configure the Fedlet. When deploying your application, you can move these to an alternate location passed to the Java virtual machine for the web application container at startup. For example, if you store the configuration under `/export/fedlet/`, then you could pass the following property to the JVM.

```
-Dcom.sun.identity.fedlet.home=/export/fedlet/conf
```

You do not need to include these files in your application.

fedletAttrQuery.jsp**fedletAttrResp.jsp**

Sample SAML attribute query and response handlers. See the Fedlet README file for more information.

fedletEncode.jsp

Utility JSP to encode a password, such as the password used to protect a Java keystore

fedletSampleApp.jsp**index.jsp**

Demo application. You can remove these before deployment to replace them with your application.

fedletXACMLQuery.jsp**fedletXACMLResp.jsp**

Sample SAML XACML query and response handlers. See the Fedlet README file for more information.

logout.jsp

Utility page to perform single log out

saml2/jsp/

JSPs to initiate single sign on and single logout, and to handle error, and also a JSP for obtaining Fedlet metadata, `saml2/jsp/exportmetadata.jsp`

WEB-INF/classes/

Localized Java properties files for strings used in the Fedlet user interface

WEB-INF/lib/

Fedlet libraries required by your application

WEB-INF/web.xml

Fedlet web application configuration, showing how JSPs map to URLs used in the Fedlet. Add mappings for your application before deployment.

In the `web.xml` mappings, your application must be mapped to `/fedletapplication`, as this is the assertion consumer URL set in the Fedlet metadata.

```
<servlet>
  <servlet-name>yourApp</servlet-name>
  <jsp-file>/fedletSampleApp.jsp</jsp-file>
</servlet>
<servlet-mapping>
  <servlet-name>yourApp</servlet-name>
  <url-pattern>/fedletapplication</url-pattern>
</servlet-mapping>
```

Follow these steps for a very simple demonstration of how to customize the Fedlet.

1. Backup `fedletSampleApp.jsp`.

```
$ cd /path/to/tomcat/webapps/fedlet/
$ cp fedletSampleApp.jsp fedletSampleApp.jsp.orig
```

2. Edit `fedletSampleApp.jsp` to reduce it to a single redirection to `myapp.jsp`. An implementation of the `<html>` element of the file follows below.

```
<html>
<head>
  <title>Fedlet Sample Application</title>
  <meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
</head>

<body>
<%
  // BEGIN : following code is a must for Fedlet (SP) side application
  Map map;
  try {
    // invoke the Fedlet processing logic. this will do all the
    // necessary processing conforming to SAMLv2 specifications,
    // such as XML signature validation, Audience and Recipient
    // validation etc.
    map = SPACSUtills.processResponseForFedlet(request, response);
    response.sendRedirect("myapp.jsp");
  } catch (SAML2Exception sme) {
    SAMLUtils.sendError(request, response,
      response.SC_INTERNAL_SERVER_ERROR, "failedToProcessSSOResponse",
      sme.getMessage());
    return;
  } catch (IOException ioe) {
    SAMLUtils.sendError(request, response,
      response.SC_INTERNAL_SERVER_ERROR, "failedToProcessSSOResponse",
      ioe.getMessage());
    return;
  } catch (SessionException se) {
    SAMLUtils.sendError(request, response,
      response.SC_INTERNAL_SERVER_ERROR, "failedToProcessSSOResponse",
      se.getMessage());
```

```
        return;  
    } catch (ServletException se) {  
        SAMLUtils.sendError(request, response,  
            response.SC_BAD_REQUEST, "failedToProcessSSOResponse",  
            se.getMessage());  
        return;  
    }  
    // END : code is a must for Fedlet (SP) side application  
</body>  
</html>
```

3. Add a `myapp.jsp` page to the Fedlet, such as the following.

```
<html>  
<head>  
<title>My Application</title>  
<meta http-equiv="Content-Type" content="text/html" />  
</head>  
  
<body>  
<h1>My Application</h1>  
<p>After you change the fedletSampleApp.jsp,  
    all it does is redirect to this home page after  
    successful login.</p>  
<p>See the fedlet README file and example JSPs for hints  
    on how to retrieve attributes from OpenAM, or to send  
    XACML queries for policy decisions.</p>  
</body>  
</html>
```

4. Browse to the Fedlet URL, such as <http://www.example.com:8080/fedlet/>, and try one of the login methods.

After login you are redirected to `myapp.jsp`.

8.1. Signing & Encryption

By default when you create the Java Fedlet, signing and encryption are not configured. You can however set up OpenAM and the fedlet to sign and to verify XML signatures and to encrypt and to decrypt data such as SAML assertions.

Enable signing and encryption for the Java Fedlet involves the following high level stages.

- Before you create the Fedlet, configure the IDP to sign and encrypt data. See Federation > Entity Providers > *IDP Name* > Signing and Encryption in the OpenAM console.

For evaluation, you can use the `test` certificate delivered with OpenAM.

- Initially deploy and configure the Fedlet, but do not use the Fedlet until you finish.
- On the Fedlet side set up a JKS keystore used for signing and encryption. For evaluation, you can use copy the `keystore.jks` file delivered with OpenAM. You can find the file under the configuration

directory for OpenAM, such as `$HOME/openam/openam/` for a server instance with base URI `openam`. The built-in keystore includes the `test` certificate.

You must also set up `.storepass` and `.keypass` files using the `fedletEncode.jsp` page, such as `http://www.example.com:8080/fedlet/fedletEncode.jsp`, to encode passwords on the Fedlet side. The passwords for the test key store and private key are both `changeit`.

- Configure the Fedlet to perform signing and encryption by ensuring the Fedlet has access to the key store, and by updating the SP metadata for the Fedlet.
- Import the updated SP metadata into the IDP to replace the default Fedlet configuration.
- Restart the Fedlet or container in which the Fedlet runs for the changes you made on the Fedlet side to take effect.

Procedure 8.4. To Configure the Fedlet For Signing & Encryption

The `FederationConfig.properties` file specifies the paths to the JKS keystore holding the signing or encryption keys for the Fedlet, the keystore password file, and the private key password file.

1. After setting up your keystore and password files as described above, edit the properties file in the configuration directory, such as `$HOME/fedlet/FederationConfig.properties`, to point to the keystore and password files.
2. Export the certificate to use for signing and encryption purposes.

```
$ keytool -export -rfc -keystore keystore.jks -alias test
Enter keystore password:
-----BEGIN CERTIFICATE-----
MIICQDCCAakCBEeNB0swDQYJKoZIhvcNAQEEBQAwwZELMAKGA1UEBhMCVVMxEzARBgNVBAgTCkNh
bGlb3JuaWExFDASBgNVBAcTC1NhbRhIENsYXJhMQwwCgYDVQQKEwNtdW4xEDA0BgNVBAsTB09w
ZW5TU08xDAlBgNVBAMTBHRlc3QwHhcNMDE1MTkxOTM5WWhcNMTgWMTkxOTM5WjBnMQsw
CQYDVQQGEwJVUzETMBEGA1UECBMQ2FsaWZvcm5pYTEUMBIGA1UEBxMLU2FudGEGQ2xhcmExDDAK
BgNVBAoTA1N1bjEQMA4GA1UECzMHT3BlbnNTtZENMA5GA1UEAxMEdGVzdDcBnzANBgkqhkiG9w0B
AQEFAA0BjQAwwYkCgYEArsQc/U75GB2AtKhbGS5piiLkmJzqEsp64rDxbMJ+xDrYe0EN/q1U50f+
RkDsaN/igkAvVlcuXegTL6RlafFPcUX7QxDhZBhsYF9pbwtMzi4A4su9hnXIhURebGEmxKW9qJNY
Js0Vo5+IgjxuEwnjnnVgHTs1+mq5QYTA7E6ZyL8CAwEAATANBgkqhkiG9w0BAQQFAA0BgQB3Pw/U
QzPKTPTYi9upbFXlrAKMwtFf20W4yvGWvLcwcNSZJmTJ8ARvVYOMEVNsT40FcFu2/PeYoAdiDA
cGy/F2Zuj8XJJpuQRSE6PtQqBuDEHj jmOQJ0rV/r8m01ZcTHRhpZ5YRjhRC9eCbjx9VrFax0JDC
/FfwWigmrW0Y0Q==
```

3. Edit the standard metadata file for the Fedlet, such as `$HOME/fedlet/sp.xml`, to include the certificate in KeyDescriptor elements, that are children of the SPSSODescriptor element.

```
<EntityDescriptor
  xmlns="urn:oasis:names:tc:SAML:2.0:metadata"
  entityID="http://www.example.com:8080/fedlet">
  <SPSSODescriptor
    AuthnRequestsSigned="true"
    WantAssertionsSigned="true"
    protocolSupportEnumeration="urn:oasis:names:tc:SAML:2.0:protocol">
    <KeyDescriptor use="signing">
      <ds:KeyInfo xmlns:ds="http://www.w3.org/2000/09/xmldsig#">
        <ds:X509Data>
          <ds:X509Certificate>
```

```

MIICQDCCAakCBEeNB0swDQYJKoZIhvcNAQEEBQAwZzELMAkGA1UEBhMCVVMxEzARBgNVBAgTCKNh
bGLmb3JuaWExFDASBgNVBAcTC1NhbnRhIENsYXJhMQwwCgYDVQQKEwNtdW4xEDA0BgNVBA5TB09w
ZW5TU08xDALBgNVBAMTBHRlc3QwHhcNMDgwMTE1MTkxOTM5WhcNMTgwMTEyMTkxOTM5WjBnMQsw
CQYDVQQGEwJVUzETMBEGA1UECBMzQ2FsaWZvcml5TEUMBIGA1UEBxMLU2FudGEGQ2xhcmExDDAK
BgNVBAoTA1N1bjEQMA4GA1UECXMHT3B1b1NTTzENMAsGA1UEAxMEDGVzdDcBnzANBGlkG9w0B
AQEFAA0BjQAwYkCgYEArsQc/U75GB2AtKhbGS5piiLkmJzqEsp64rDxbMJ+xDrye0EN/q1U50f+
RkDsaN/igkAvV1cuXegTL6RLafFPcUX7QxDhZBhsYF9pbwtMzi4A4su9hnxIhURbGEmxKW9qJNY
Js0Vo5+IgjxuEwnjnnVgHTs1+mq5QYTA7E6ZyL8CAwEAATANBgkqhkiG9w0BAQQFAA0BgQB3Pw/U
QzPKTPTYi9upbFXlRAKmwTfF20W4yvGwVlCwcNSZJmTJ8ARvVYOMEVnbsT40Fcfu2/PeYoAdiDA
cGy/F2Zuj8XJJpuQRSE6PtQqBuDEHjJm0QJ0rV/r8m01ZcTHRhpZ5YRjhRC9eCbjx9VrFax0JDC
/FfwWigmrW0Y0Q==
    </ds:X509Certificate>
    </ds:X509Data>
    </ds:KeyInfo>
    </KeyDescriptor>
    <KeyDescriptor use="encryption">
    <ds:KeyInfo xmlns:ds="http://www.w3.org/2000/09/xmldsig#">
    <ds:X509Data>
    <ds:X509Certificate>
MIICQDCCAakCBEeNB0swDQYJKoZIhvcNAQEEBQAwZzELMAkGA1UEBhMCVVMxEzARBgNVBAgTCKNh
bGLmb3JuaWExFDASBgNVBAcTC1NhbnRhIENsYXJhMQwwCgYDVQQKEwNtdW4xEDA0BgNVBA5TB09w
ZW5TU08xDALBgNVBAMTBHRlc3QwHhcNMDgwMTE1MTkxOTM5WhcNMTgwMTEyMTkxOTM5WjBnMQsw
CQYDVQQGEwJVUzETMBEGA1UECBMzQ2FsaWZvcml5TEUMBIGA1UEBxMLU2FudGEGQ2xhcmExDDAK
BgNVBAoTA1N1bjEQMA4GA1UECXMHT3B1b1NTTzENMAsGA1UEAxMEDGVzdDcBnzANBGlkG9w0B
AQEFAA0BjQAwYkCgYEArsQc/U75GB2AtKhbGS5piiLkmJzqEsp64rDxbMJ+xDrye0EN/q1U50f+
RkDsaN/igkAvV1cuXegTL6RLafFPcUX7QxDhZBhsYF9pbwtMzi4A4su9hnxIhURbGEmxKW9qJNY
Js0Vo5+IgjxuEwnjnnVgHTs1+mq5QYTA7E6ZyL8CAwEAATANBgkqhkiG9w0BAQQFAA0BgQB3Pw/U
QzPKTPTYi9upbFXlRAKmwTfF20W4yvGwVlCwcNSZJmTJ8ARvVYOMEVnbsT40Fcfu2/PeYoAdiDA
cGy/F2Zuj8XJJpuQRSE6PtQqBuDEHjJm0QJ0rV/r8m01ZcTHRhpZ5YRjhRC9eCbjx9VrFax0JDC
/FfwWigmrW0Y0Q==
    </ds:X509Certificate>
    </ds:X509Data>
    </ds:KeyInfo>
    <EncryptionMethod Algorithm="http://www.w3.org/2001/04/xmenc#aes128-cbc">
    <xenc:KeySize xmlns:xenc="http://www.w3.org/2001/04/xmenc#">
    128
    </xenc:KeySize>
    </EncryptionMethod>
    </KeyDescriptor>
    <SingleLogoutService
    Binding="urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Redirect"
    Location="http://www.example.com:8080/fedlet/fedletSloRedirect"
    ResponseLocation="http://www.example.com:8080/fedlet/fedletSloRedirect" />
    <SingleLogoutService
    Binding="urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST"
    Location="http://www.example.com:8080/fedlet/fedletSloPOST"
    ResponseLocation="http://www.example.com:8080/fedlet/fedletSloPOST" />
    <SingleLogoutService
    Binding="urn:oasis:names:tc:SAML:2.0:bindings:SOAP"
    Location="http://www.example.com:8080/fedlet/fedletSloSoap" />
    <NameIDFormat>
    urn:oasis:names:tc:SAML:2.0:nameid-format:transient
    </NameIDFormat>
    <AssertionConsumerService
    index="0"
    isDefault="true"
    Binding="urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST"
    Location="http://www.example.com:8080/fedlet/fedletapplication" />
    <AssertionConsumerService
    
```

```

    index="1"
    Binding="urn:oasis:names:tc:SAML:2.0:bindings:HTTP-Artifact"
    Location="http://www.example.com:8080/fedlet/fedletapplication" />
  </SPSSODescriptor>
  <RoleDescriptor
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:query="urn:oasis:names:tc:SAML:metadata:ext:query"
    xsi:type="query:AttributeQueryDescriptorType"
    protocolSupportEnumeration="urn:oasis:names:tc:SAML:2.0:protocol">
  </RoleDescriptor>
  <XACMLAuthzDecisionQueryDescriptor
    WantAssertionsSigned="false"
    protocolSupportEnumeration="urn:oasis:names:tc:SAML:2.0:protocol" />
</EntityDescriptor>

```

4. Edit the extended metadata file for the Fedlet, such as `$HOME/fedlet/sp-extended.xml`, to set the certificate alias names to the alias for the Fedlet certificate, and the `want*Signed` and `want*Encrypted` values to `true`.

If you reformat the file, take care not to add white space around string values in elements.

```

<EntityConfig xmlns="urn:sun:fm:SAML:2.0:entityconfig"
  xmlns:fm="urn:sun:fm:SAML:2.0:entityconfig" hosted="1"
  entityID="http://www.example.com:8080/fedlet">
  <SPSSOConfig metaAlias="/sp">
    <Attribute name="description">
      <Value></Value>
    </Attribute>
    <Attribute name="signingCertAlias">
      <Value>test</Value>
    </Attribute>
    <Attribute name="encryptionCertAlias">
      <Value>test</Value>
    </Attribute>
    <Attribute name="basicAuthOn">
      <Value>>false</Value>
    </Attribute>
    <Attribute name="basicAuthUser">
      <Value></Value>
    </Attribute>
    <Attribute name="basicAuthPassword">
      <Value></Value>
    </Attribute>
    <Attribute name="autofedEnabled">
      <Value>>false</Value>
    </Attribute>
    <Attribute name="autofedAttribute">
      <Value></Value>
    </Attribute>
    <Attribute name="transientUser">
      <Value>anonymous</Value>
    </Attribute>
    <Attribute name="spAdapter">
      <Value></Value>
    </Attribute>
    <Attribute name="spAdapterEnv">
      <Value></Value>
    </Attribute>
  </SPSSOConfig>
</EntityConfig>

```

```
</Attribute>
<Attribute name="fedletAdapter">
  <Value>com.sun.identity.saml2.plugins.DefaultFedletAdapter</Value>
</Attribute>
<Attribute name="fedletAdapterEnv">
  <Value></Value>
</Attribute>
<Attribute name="spAccountMapper">
  <Value>com.sun.identity.saml2.plugins.DefaultLibrarySPAccountMapper</Value>
</Attribute>
<Attribute name="useNameIDAsSPUserID">
  <Value>>false</Value>
</Attribute>
<Attribute name="spAttributeMapper">
  <Value>com.sun.identity.saml2.plugins.DefaultSPAttributeMapper</Value>
</Attribute>
<Attribute name="spAuthncontextMapper">
  <Value>com.sun.identity.saml2.plugins.DefaultSPAuthnContextMapper</Value>
</Attribute>
<Attribute name="spAuthncontextClassrefMapping">
  <Value>urn:oasis:names:tc:SAML:2.0:ac:classes:PasswordProtectedTransport|0|default</Value>
</Attribute>
<Attribute name="spAuthncontextComparisonType">
  <Value>exact</Value>
</Attribute>
<Attribute name="attributeMap">
  <Value>*</Value>
</Attribute>
<Attribute name="saml2AuthModuleName">
  <Value></Value>
</Attribute>
<Attribute name="localAuthURL">
  <Value></Value>
</Attribute>
<Attribute name="intermediateUrl">
  <Value></Value>
</Attribute>
<Attribute name="defaultRelayState">
  <Value></Value>
</Attribute>
<Attribute name="appLogoutUrl">
  <Value>http://www.example.com:8080/fedlet/logout</Value>
</Attribute>
<Attribute name="assertionTimeSkew">
  <Value>300</Value>
</Attribute>
<Attribute name="wantAttributeEncrypted">
  <Value>>true</Value>
</Attribute>
<Attribute name="wantAssertionEncrypted">
  <Value>>true</Value>
</Attribute>
<Attribute name="wantNameIDEncrypted">
  <Value>>true</Value>
</Attribute>
<Attribute name="wantPOSTResponseSigned">
  <Value></Value>
</Attribute>
```

```

<Attribute name="wantArtifactResponseSigned">
  <Value></Value>
</Attribute>
<Attribute name="wantLogoutRequestSigned">
  <Value></Value>
</Attribute>
<Attribute name="wantLogoutResponseSigned">
  <Value></Value>
</Attribute>
<Attribute name="wantMNIRequestSigned">
  <Value></Value>
</Attribute>
<Attribute name="wantMNIResponseSigned">
  <Value></Value>
</Attribute>
<Attribute name="responseArtifactMessageEncoding">
  <Value>URI</Value>
</Attribute>
<Attribute name="cotlist">
  <Value>fedlet-cot</Value>
</Attribute>
<Attribute name="saeAppSecretList">
</Attribute>
<Attribute name="saeSPUrl">
  <Value></Value>
</Attribute>
<Attribute name="saeSPLogoutUrl">
</Attribute>
<Attribute name="ECPRequestIDPListFinderImpl">
  <Value>com.sun.identity.saml2.plugins.ECPIIDPFinder</Value>
</Attribute>
<Attribute name="ECPRequestIDPList">
  <Value></Value>
</Attribute>
<Attribute name="ECPRequestIDPListGetComplete">
  <Value></Value>
</Attribute>
<Attribute name="enableIDPProxy">
  <Value>>false</Value>
</Attribute>
<Attribute name="idpProxyList">
  <Value></Value>
</Attribute>
<Attribute name="idpProxyCount">
  <Value>0</Value>
</Attribute>
<Attribute name="useIntroductionForIDPProxy">
  <Value>>false</Value>
</Attribute>
<Attribute name="spSessionSyncEnabled">
  <Value>>false</Value>
</Attribute>
<Attribute name="relayStateUrllist">
</Attribute>
</SPSSOConfig>
<AttributeQueryConfig metaAlias="/attrQuery">
  <Attribute name="signingCertAlias">
    <Value>test</Value>
  </Attribute>

```

```
<Attribute name="encryptionCertAlias">
  <Value>test</Value>
</Attribute>
<Attribute name="wantNameIDEncrypted">
  <Value>true</Value>
</Attribute>
<Attribute name="cotlist">
  <Value>fedlet-cot</Value>
</Attribute>
</AttributeQueryConfig>
<XACMLAuthzDecisionQueryConfig metaAlias="/pep">
  <Attribute name="signingCertAlias">
    <Value>test</Value>
  </Attribute>
  <Attribute name="encryptionCertAlias">
    <Value>test</Value>
  </Attribute>
  <Attribute name="basicAuthOn">
    <Value>false</Value>
  </Attribute>
  <Attribute name="basicAuthUser">
    <Value></Value>
  </Attribute>
  <Attribute name="basicAuthPassword">
    <Value></Value>
  </Attribute>
  <Attribute name="wantXACMLAuthzDecisionResponseSigned">
    <Value>false</Value>
  </Attribute>
  <Attribute name="wantAssertionEncrypted">
    <Value>true</Value>
  </Attribute>
  <Attribute name="cotlist">
    <Value>fedlet-cot</Value>
  </Attribute>
</XACMLAuthzDecisionQueryConfig>
</EntityConfig>
```

5. In OpenAM console delete the original SP entity configuration for the Fedlet, and then import the updated metadata for the new configuration into OpenAM on the IDP side.
6. Restart the Fedlet or the container in which it runs in order for the Fedlet to pick up the changes to the configuration properties and the metadata.

Chapter 9

Using Fedlets in .NET Applications

This chapter explains how to use the Fedlet in your .NET application. You must configure the OpenAM .NET Fedlet to work with the identity provider. Before creating the Fedlet, therefore, set up a Hosted Identity Provider in OpenAM.

Procedure 9.1. To Install the .NET Fedlet as a Demo Application

Before you start, create the hosted identity provider, and the Circle of Trust to which you plan to add the Fedlet. You can perform these steps using the Create Hosted Identity Provider wizard on the Common Tasks page of the OpenAM console. The .NET Fedlet demo requires a signing key for the Identity Provider. For evaluation, use the `test` certificate installed with OpenAM.

Follow these steps to configure and install the .NET Fedlet demo application.

1. Unzip the `Fedlet-unconfigured.zip` file, and copy the contents of the `Fedlet-unconfigured\asp.net\` folder to a working directory.

`bin\`

This folder contains the `Fedlet.dll` library, that you copy to your application's `bin\` folder.

`conf\`

This folder contains the templates you edit to prepare your Fedlet configuration, including the identity provider and Fedlet (SP) metadata for federation. The completed configuration files belong in your application's `App_Data\` folder.

`readme.txt`

This file describes how to set up and configure .NET Fedlets.

`SampleApp\`

This folder contains the demo application.

2. Edit the template files in the `SampleApp\App_Data\` folder based on where you deploy the Fedlet demo application, and on how your identity provider is configured.
 - Edit `fedlet.cot` to set `cot-name` to the name of the Circle of Trust, and to set `sun-fm-trusted-providers` to include the entity ID of the identity provider, and the entity ID of the Fedlet service provider.

- Edit `sp.xml` and `sp-extended.xml` to configure the entity IDs, URLs, and Circle of Trust names to correspond to your sample application.
3. Export the identity provider metadata from OpenAM, and copy the resulting `idp.xml` and `idp-extended.xml` metadata to the Fedlet `SampleApp\App_Data\` folder.

```
$ ssoadm
create-metadata-templ
--entityid "http://idp.example.com:8080/openam"
--adminid amadmin
--password-file /tmp/pwd.txt
--identityprovider /idp
--meta-data-file idp.xml
--extended-data-file idp-extended.xml
--idpscertainalias test

Hosted entity configuration was written to idp-extended.xml.
Hosted entity descriptor was written to idp.xml.
```

4. Register the Fedlet with OpenAM as a remote service provider using the `sp.xml` and `sp-extended.xml` metadata.

```
$ ssoadm
import-entity
--adminid amadmin
--password-file /tmp/pwd.txt
--cot fedlet-cot
--meta-data-file sp.xml
--extended-data-file sp-extended.xml

Import file, sp.xml.
Import file, sp-extended.xml.
```

5. Deploy the demo application in Internet Information Server.

Note

IIS must be installed with ASP.NET and additional application support necessary for web applications beyond static web sites. The additional support is not necessarily installed by default when you activate IIS as a Windows feature.

6. Try the demo application links to run Fedlet initiated single sign on using HTTP POST binding and HTTP Artifact binding.

If you are using the embedded directory as a user store, you can authenticate to OpenAM using the `demo` user whose password is `changeit`.

Chapter 10

Using the OpenAM C API

This chapter introduces OpenAM C SDK. OpenAM C SDK is delivered for selected platforms in `libraries/native/agent-csdk/agent-csdk.zip` where you unpacked the full version of OpenAM. To prepare to install OpenAM C SDK, first unzip `agent-csdk.zip`.

```
$ unzip /path/to/OpenAM/libraries/native/agent-csdk/agent-csdk.zip
Archive:  /path/to/OpenAM/libraries/native/agent-csdk/agent-csdk.zip
  inflating: README
  inflating: agent-csdk-linux-32.tar.gz
  inflating: agent-csdk-linux-64.tar.gz
  inflating: agent-csdk-solaris-sparc-32.tar.gz
  inflating: agent-csdk-solaris-sparc-64.tar.gz
  inflating: agent-csdk-solaris-x86-32.tar.gz
  inflating: agent-csdk-solaris-x86-64.tar.gz
  extracting: agent-csdk-windows-32.zip
  extracting: agent-csdk-windows-64.zip
```

Unpack the archive for your platform.

```
$ mkdir -p /path/to/openam-client ; cd /path/to/openam-client
$ tar xzvf /path/to/agent-csdk-linux-32.tar.gz
```

As a result, you have several directories that include the SDK and also sample client applications.

`bin/`

The `crypt_util` or `cryptit.exe` command for encrypting passwords

`config/`

Configuration data for the SDK

`include/`

Header files for the SDK

`lib/`

SDK and other required libraries

`samples/`

Sample code

Procedure 10.1. To Build OpenAM C SDK Samples

1. Review the `samples/README.TXT` file to complete any specific instructions required for your platform.

```
$ uname -s
Linux
$ cd ../lib
$ ln -s libamsdk.so.3 libamsdk.so
$ ln -s libxml2.so.2 libxml2.so
$ cd ../samples
```

2. Build the samples in the appropriate way for your platform.

```
$ LD_LIBRARY_PATH=../lib gmake
```

On recent systems, you might need to install compatibility libraries for the build to complete successfully. You might make the following change on Linux, for example.

```
$ diff Makefile Makefile.orig
115c115
< LDFLAGS = -L$(AM_LIB_DIR) $(LIBS) /usr/lib/libstdc++.so.5
---
> LDFLAGS = -L$(AM_LIB_DIR) $(LIBS)
```

3. Set up `OpenSSOAgentBootstrap.properties` and `OpenSSOAgentConfiguration.properties` as appropriate for your environment.

Base your work on the template files in the `config/` directory. You can find the Password Encryption Key in the OpenAM console under Configuration > Servers and Sites > *Server Name* > Security.

4. Try one of the samples you built to test your build.

```
$ LD_LIBRARY_PATH=../lib
./am_auth_test
-f ../config/OpenSSOAgentBootstrap.properties
-u demo
-p changeit
-o /
Login 1 Succeeded!
SSOToken = AQIC5wM2LY4SfcxZfk4EzC9Y46P9cXG9ogwf2ixnY0eZ0K0.*AAJTSQACMDE.*
Organization = /
Module Instance Name [0] = SAE
Module Instance Name [1] = LDAP
Module Instance Name [2] = WSSAuthModule
Module Instance Name [3] = Federation
Module Instance Name [4] = HOTP
Module Instance Name [5] = DataStore
Logout 1 Succeeded!
```

Chapter 11

Extending OpenAM

OpenAM services solve a wide range of access and federation management problems out of the box. Yet, OpenAM also exposes APIs and SPIs that enable you extend OpenAM services when built-in functionality does not fit your deployment.

This part of the guide covers OpenAM mechanisms for plugging in additional functionality not available out of the box.

Chapter 12

Customizing Profile Attributes

You can extend user profiles by adding custom attributes. This chapter demonstrates how to add a custom attribute to a user profile when storing user profiles in the embedded LDAP directory.

Adding a custom attribute involves both updating the `iPlanetAMUserService`, and also updating the identity repository schema to hold the new attribute. Furthermore, to allow users to update the attribute in their own profiles, you must also update the OpenAM policy configuration stored in the configuration directory.

Procedure 12.1. To Update the AMUser Service For the New Attribute

Follow the steps below to create a custom attribute in OpenAM.

1. Create a backup copy of the configuration file for the `iPlanetAmUserService`.

```
$ cd $HOME
$ cp openam/config/xml/amUser.xml openam/config/xml/amUser.xml.orig
```

2. Edit the file to add your attribute as one of the list of `<User>` attributes.

```
<AttributeSchema name="customAttribute"
  type="single"
  syntax="string"
  any="display"
  i18nKey="Custom Attribute">
</AttributeSchema>
```

Here, the name refers to the attribute type name used in LDAP. The `i18nKey` holds either the reference, or in this case the content, of the text that appears in the user interface.

3. Delete `iPlanetAMUserService`, and then create it from your updated configuration file.

```

$ cd /path/to/tools/openam/bin/
$ ssoadm
delete-svc
--adminid amadmin
--password-file /tmp/pwd.txt
--servicename iPlanetAMUserService

Service was deleted.
$ ssoadm
create-svc
--adminid amadmin
--password-file /tmp/pwd.txt
--xmlfile $HOME/openam/config/xml/amUser.xml

Service was added.

```

Procedure 12.2. To Update the Identity Repository For the New Attribute

Follow the steps below to update the identity repository LDAP schema for the custom attribute, and then update OpenAM to use the custom attribute and object class.

Tip

If you are using OpenDJ as the identity repository, you can update the schema through OpenDJ Control Panel > Schema > Manage Schema, as described in the OpenDJ documentation.

1. Prepare the attribute type object class definitions in LDIF format.

```

$ cat custom-attr.ldif
dn: cn=schema
changetype: modify
add: attributeTypes
attributeTypes: ( temp-custom-attr-oid NAME 'customAttribute' EQUALITY case
IgnoreMatch ORDERING caseIgnoreOrderingMatch SUBSTR caseIgnoreSubstrings
Match SYNTAX 1.3.6.1.4.1.1466.115.121.1.15 USAGE userApplications )
-
add: objectClasses
objectClasses: ( temp-custom-oc-oid NAME 'customObjectclass' SUP top AUX
ILIARY MAY customAttribute )

```

2. Add the schema definitions to the directory.

```

$ /path/to/OpenDJ/bin/ldapmodify
--port 1389
--hostname openam.example.com
--bindDN "cn=Directory Manager"
--bindPassword password
--filename custom-attr.ldif
Processing MODIFY request for cn=schema
MODIFY operation successful for DN cn=schema

```

3. In OpenAM console, browse to Access Control > *Realm Name* > Data Stores > *Data Store Name*.
4. Add the object class, here `customObjectclass`, to the LDAP User Object Class list.

5. Add the attribute type, here `customAttribute`, to the LDAP User Attributes list.
6. Save your work.

Procedure 12.3. To Allow Users To Update the New Attribute

Follow these steps to make the new attribute editable by users. The steps imply use of the embedded configuration directory. If you use a different directory server to store the configuration, then adapt them for your tools.

1. Login to the control panel for the embedded configuration directory.

```
$ ./openam/opens/bin/control-panel &
```

Connect using bind DN `cn=Directory Manager` and the the password for `amadmin`.

2. Select Manage Entries to open the LDAP browser.
3. Search with `LDAP Filter`: set to `ou=SelfWriteAttributes`, and then expand the tree views to see the two entries found.
4. In the entry under `iPlanetAMPolicyService`, edit the `sunKeyValue` attribute to add your custom attribute to the list of self-writable attributes, as in `<Value>customAttribute</Value>`.
5. In the entry under `sunEntitlementIndexes`, edit the `sunKeyValue` attribute to add your custom attribute to the list of self-writable attributes, as in replacing the last `\n` in the list with `,\n \"customAttribute \\\"\\n`.
6. Restart OpenAM or the web container where it runs.

```
$ /etc/init.d/tomcat stop
$ /etc/init.d/tomcat start
```

7. Login to OpenAM console as a user to check that a user can save a value for your new, custom attribute.

OpenAM

Information
Profile was updated.

Babs Jensen

Custom Attribute:

First Name:

* Last Name:

* Full Name:

Chapter 13

Customizing Authentication Modules

This chapter shows how to customize authentication with a sample custom authentication module. For deployments with particular requirements not met by existing OpenAM authentication modules, determine whether you can adapt one of the built-in or extension modules for your needs. If not, build the functionality into a custom authentication module.

13.1. About the Sample Authentication Module

The sample authentication module prompts for a user name and password to authenticate the user, and handles error conditions. The sample shows how you integrate an authentication module into OpenAM such that you can configure the module through OpenAM console, and also localize the user interface.

The name for the sample authentication module is `SampleAuth`. Notice how this name is used to form module component names according to OpenAM conventions.

An OpenAM authentication module is comprised of five components.

- The authentication logic, which is a class that extends the `com.sun.identity.authentication.spi.AMLoginModule` class. In this case, `SampleAuth.java`.
- The principal, which is a class that implements the `java.security.Principal` interface. In this case, `SampleAuthPrincipal.java`.
- The callbacks XML file, which describes the states of authentication logic and the user input needed for each state. In this case there is one file, `SampleAuth.xml`.
- The service configuration XML file, which defines how the authentication module is configured in OpenAM. In this case, `amAuthSampleAuth.xml`.
- The properties files for the module, which map localized strings to identifiers used elsewhere in the module. In this case, `amAuthSampleAuth.properties`.

13.2. The Sample Auth Callbacks

OpenAM callbacks XML files prompt the user for identity information needed to process the authentication. The document type for a callback XML file is described in `war-file-name/WEB-INF/Auth_Module_Properties.dtd`.

Tip

Callback files for built-in modules are under `war-file-name/config/auth/default/`; extension modules are stored in the OpenAM source tree.

Example 13.1. Simplified Callbacks File

This example shows a simplified sample auth callbacks XML file that does no error handling. The file specifies only one state (`order="1"`), and prompts the user for two pieces of information: user name and password. All strings for the user interface are hard coded into the file.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE ModuleProperties PUBLIC
  "-//iPlanet//Authentication Module Properties XML Interface 1.0 DTD//EN"
  "jar://com/sun/identity/authentication/Auth_Module_Properties.dtd">

<ModuleProperties moduleName="SampleAuth" version="1.0" >
  <Callbacks length="2" order="1" timeout="600" header="Please Login" >
    <NameCallback isRequired="true">
      <Prompt> User Name: </Prompt>
    </NameCallback>
    <PasswordCallback echoPassword="false" >
      <Prompt> Password: </Prompt>
    </PasswordCallback>
  </Callbacks>
</ModuleProperties>
```

Example 13.2. Full Callbacks File

This example shows a full callbacks file with dynamic text and error handling. Use this as your `SimpleAuth.xml` file.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE ModuleProperties PUBLIC
  "-//iPlanet//Authentication Module Properties XML Interface 1.0 DTD//EN"
  "jar://com/sun/identity/authentication/Auth_Module_Properties.dtd">

<ModuleProperties moduleName="SampleAuth" version="1.0" >
  <Callbacks length="0" order="1" timeout="600" header="#NOT SHOWN#" />
  <Callbacks length="2" order="2" timeout="600" header="#TO BE SUBSTITUTED#">
    <NameCallback isRequired="true">
      <Prompt>#USERNAME#</Prompt>
    </NameCallback>
    <PasswordCallback echoPassword="false" >
      <Prompt>#PASSWORD#</Prompt>
    </PasswordCallback>
  </Callbacks>
  <Callbacks length="1" order="3" timeout="600" header="#TO BE SUBSTITUTED#"
    error="true" >
    <NameCallback>
      <Prompt>#THE DUMMY WILL NEVER BE SHOWN#</Prompt>
    </NameCallback>
  </Callbacks>
</ModuleProperties>
```


This file specifies three states.

1. The initial state (order="1") is used dynamically to replace the dummy strings shown between hashes (for example, #USERNAME#) by the `substituteUIStrings()` method in `SampleAuth.java`.
2. The next state (order="2") handles prompting the user for authentication information.
3. The last state (order="3") has the attribute `error="true"`. If the authentication module state machine reaches this order then the authentication has failed. The `NameCallback` is not used and not displayed to user. OpenAM requires that the callbacks array have at least one element. Otherwise OpenAM does not permit header substitution.

13.3. The Sample Authentication Logic

An OpenAM authentication module must extend the `com.sun.identity.authentication.spi.AMLoginModule` abstract class, and must implement the methods shown below.

See the *OpenAM Java SDK API Specification* for reference.

```
// OpenAM calls the init() method once when the module is created.
public void init(Subject subject, Map sharedState, Map options)

// OpenAM calls the process() method when the user submits authentication
// information. The process() method determines what happens next:
// success, failure, or the next state specified by the order
// attribute in the callbacks XML file.
public int process(Callback[] callbacks, int state) throws LoginException

// OpenAM expects the getPrincipal() method to return an implementation of
// the java.security.Principal interface.
public Principal getPrincipal()
```

OpenAM does not reuse authentication module instances. This means that you can store information specific to the authentication process in the instance.

The implementation, `SimpleAuth.java`, is shown below.

```
/**
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 * of the Common Development and Distribution License
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```

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* with the fields enclosed by brackets [] replaced by
* your own identifying information:
* "Portions Copyrighted [year] [name of copyright owner]"
*/

package com.forgerock.openam.examples;

import java.security.Principal;
import java.util.Map;
import java.util.ResourceBundle;

import javax.security.auth.Subject;
import javax.security.auth.callback.Callback;
import javax.security.auth.callback.NameCallback;
import javax.security.auth.callback.PasswordCallback;
import javax.security.auth.login.LoginException;

import com.sun.identity.authentication.spi.AMLoginModule;
import com.sun.identity.authentication.spi.AuthLoginException;
import com.sun.identity.authentication.spi.InvalidPasswordException;
import com.sun.identity.authentication.util.ISAuthConstants;
import com.sun.identity.shared.datastruct.CollectionHelper;
import com.sun.identity.shared.debug.Debug;

public class SampleAuth extends AMLoginModule
{
    // Name for the debug-log
    private final static String DEBUG_NAME = "SampleAuth";

    // Name of the resource bundle
    private final static String amAuthSampleAuth = "amAuthSampleAuth";

    // User names for authentication logic
    private final static String USERNAME = "test";
    private final static String ERROR_1_NAME = "test1";
    private final static String ERROR_2_NAME = "test2";

    // Orders defined in the callbacks file
    private final static int STATE_BEGIN = 1;
    private final static int STATE_AUTH = 2;
    private final static int STATE_ERROR = 3;

    private final static Debug debug = Debug.getInstance(DEBUG_NAME);

    private Map options;
    private ResourceBundle bundle;

    public SampleAuth()
    {
        super();
    }
}
```

```
}

@Override
// This method stores service attributes and localized properties
// for later use.
public void init(Subject subject, Map sharedState, Map options)
{
    if (debug.messageEnabled())
    {
        debug.message("SampleAuth::init");
    }
    this.options = options;
    bundle = amCache.getResBundle(amAuthSampleAuth, getLoginLocale());
}

@Override
public int process(Callback[] callbacks, int state) throws LoginException
{
    if (debug.messageEnabled())
    {
        debug.message("SampleAuth::process state: " + state);
    }

    switch (state)
    {
        case STATE_BEGIN:
            // No time wasted here - simply modify the UI and
            // proceed to next state
            substituteUIStrings();
            return STATE_AUTH;

        case STATE_AUTH:
            // Get data from callbacks. Refer to callbacks XML file.
            NameCallback nc = (NameCallback) callbacks[0];
            PasswordCallback pc = (PasswordCallback) callbacks[1];
            String username = nc.getName();
            String password = new String(pc.getPassword());

            // First errorstring is stored in "sampleauth-error-1" property.
            if (username.equals(ERROR_1_NAME))
            {
                setErrorText("sampleauth-error-1");
                return STATE_ERROR;
            }

            // Second errorstring is stored in "sampleauth-error-2" property.
            if (username.equals(ERROR_2_NAME))
            {
                setErrorText("sampleauth-error-2");
                return STATE_ERROR;
            }

            if (username.equals(USERNAME) && password.equals("password"))
```

```
{
    return ISAuthConstants.LOGIN_SUCCEEDED;
}

throw new InvalidPasswordException("password is wrong", USERNAME);

case STATE_ERROR:
    return STATE_ERROR;
default:
    throw new AuthLoginException("invalid state");
}
}

@Override
public Principal getPrincipal()
{
    return new SampleAuthPrincipal(USERNAME);
}

private void setErrorText(String err) throws AuthLoginException
{
    // Receive correct string from properties and substitute the
    // header in callbacks order 3.
    substituteHeader(STATE_ERROR, bundle.getString(err));
}

private void substituteUIStrings() throws AuthLoginException
{
    // Get service specific attribute configured in OpenAM
    String ssa = CollectionHelper.getMapAttr(options,
        "sampleauth-service-specific-attribute");

    // Get property from bundle
    String new_hdr = ssa + " "
        + bundle.getString("sampleauth-ui-login-header");
    substituteHeader(STATE_AUTH, new_hdr);

    replaceCallback(STATE_AUTH, 0, new NameCallback(bundle
        .getString("sampleauth-ui-username-prompt")));

    replaceCallback(STATE_AUTH, 1, new PasswordCallback(bundle
        .getString("sampleauth-ui-password-prompt"), false));
}
}
```

13.4. The Sample Auth Principal

The implementation, `SimpleAuthPrincipal.java`, is shown below.

```
/**
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 *
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 * If applicable, add the following below the CDDL Header,
 * with the fields enclosed by brackets [] replaced by
 * your own identifying information:
 * "Portions Copyrighted [year] [name of copyright owner]"
 */

package com.forgerock.openam.examples;

import java.io.Serializable;
import java.security.Principal;

public class SampleAuthPrincipal implements Principal, Serializable
{
    private final String name;
    private final static String CLASSNAME = "SampleAuthPrincipal";
    private final static String COLON = " : ";

    public SampleAuthPrincipal(String name)
    {
        if (name == null)
        {
            throw new NullPointerException("illegal null input");
        }

        this.name = name;
    }

    /**
     * Return the LDAP username for this SampleAuthPrincipal.
     *
     * @return the LDAP username for this SampleAuthPrincipal
     */
}
```

```
*/
@Override
public String getName()
{
    return name;
}

/**
 * Return a string representation of this <code> SampleAuthPrincipal </code>.
 *
 * @return a string representation of this
 *         <code>TestAuthModulePrincipal</code>.
 */
@Override
public String toString()
{
    return new StringBuilder().append(CLASSNAME).append(COLON)
        .append(name).toString();
}

/**
 * Compares the specified Object with this <code> SampleAuthPrincipal </code>
 * for equality. Returns true if the given object is also a
 * <code> SampleAuthPrincipal </code> and the two SampleAuthPrincipal have
 * the same username.
 *
 * @param o Object to be compared for equality with this
 *         <code> SampleAuthPrincipal </code>.
 * @return true if the specified Object is equal equal to this
 *         <code> SampleAuthPrincipal </code>.
 */
@Override
public boolean equals(Object o)
{
    if (o == null)
    {
        return false;
    }

    if (this == o)
    {
        return true;
    }

    if (!(o instanceof SampleAuthPrincipal))
    {
        return false;
    }
    SampleAuthPrincipal that = (SampleAuthPrincipal) o;

    if (this.getName().equals(that.getName()))
    {
        return true;
    }
    return false;
}
```

```
}

/**
 * Return a hash code for this  SampleAuthPrincipal .
 *
 * @return a hash code for this  SampleAuthPrincipal .
 */
@Override
public int hashCode()
{
    return name.hashCode();
}
}
```

13.5. The Sample Auth Service Configuration

OpenAM requires that all authentication modules be configured by means of an OpenAM service. At minimum, the service must include an authentication level attribute. Your module can access these configuration attributes in the `options` parameter passed to the `init()` method.

Some observations about the service configuration file follow in the list below.

- The document type for a service configuration file is described in `war-file-name/WEB-INF/sms.dtd`.
- The service name is taken from the module name: `iPlanetAMAuthmodule-nameService`. In this case, the service name is `iPlanetAMAuthSampleAuthService`.
- The service must have a localized description, retrieved from a properties file.
- The `i18nFileName` attribute in the service configuration holds the default (non-localized) base name of the Java properties file. The `i18nKey` attributes indicate properties keys to string values in the Java properties file.
- The authentication level attribute name is taken from the module name: `iplanet-am-auth-module-name-auth-level`, where the `module-name` is all lower case. Here, the authentication level attribute is named `iplanet-am-auth-sampleauth-auth-level`.
- The Sample Auth service configuration includes an example `sampleauth-service-specific-attribute`, which can be configured through OpenAM console.

The service configuration file, `amAuthSampleAuth.xml`, is shown below.

```
<?xml version="1.0" encoding="UTF-8"?>
<!--
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 If applicable, add the following below the CDDL Header,
 with the fields enclosed by brackets [] replaced by
 your own identifying information:

```
"Portions Copyrighted [year] [name of copyright owner]"
```

```
-->
```

```
<!DOCTYPE ServicesConfiguration
  PUBLIC "-//iPlanet//Service Management Services (SMS) 1.0 DTD//EN"
  "jar://com/sun/identity/sm/sms.dtd">

<ServicesConfiguration>
  <Service name="iPlanetAMAuthSampleAuthService" version="1.0">
    <Schema
      serviceHierarchy="/DSAMEConfig/authentication/iPlanetAMAuthSampleAuthService"
      i18nFileName="amAuthSampleAuth" revisionNumber="10"
      i18nKey="sampleauth-service-description">
      <Organization>
        <AttributeSchema name="iplanet-am-auth-sampleauth-auth-level"
          type="single" syntax="number_range" rangeStart="0" rangeEnd="2147483647"
          i18nKey="a500">
          <DefaultValues>
            <Value>1</Value>
          </DefaultValues>
        </AttributeSchema>

        <AttributeSchema name="sampleauth-service-specific-attribute"
          type="single" syntax="string" validator="no" i18nKey="a501">
          <DefaultValues>
            <Value></Value>
          </DefaultValues>
        </AttributeSchema>

        <SubSchema name="serverconfig" inheritance="multiple">
          <AttributeSchema name="iplanet-am-auth-sampleauth-auth-level"
            type="single" syntax="number_range" rangeStart="0" rangeEnd="2147483647"
            i18nKey="a500">
            <DefaultValues>
              <Value>1</Value>
            </DefaultValues>
          </AttributeSchema>

          <AttributeSchema name="sampleauth-service-specific-attribute"
            type="single" syntax="string" validator="no" i18nKey="a501">
            <DefaultValues>
              <Value></Value>
            </DefaultValues>
          </AttributeSchema>

        </SubSchema>
      </Organization>
```



```
</Schema>
</Service>
</ServicesConfiguration>
```

13.6. The Sample Auth Properties

OpenAM uses a Java properties file per locale to retrieve the appropriate, localized strings for the authentication module. The default properties file, `amAuthSampleAuth.properties`, is shown below.

```
sampleauth-service-description=Sample Authentication Module
a500=Authentication Level
a501=Service Specific Attribute

sampleauth-ui-login-header=Login
sampleauth-ui-username-prompt=User Name:
sampleauth-ui-password-prompt=Password:

sampleauth-error-1=Error 1 ocured during the authentication
sampleauth-error-2=Error 2 ocured during the authentication
```

13.7. Building & Installing the Sample Auth Module

Once you have the files for the sample authentication module, build the module, and then install the module into OpenAM.

13.7.1. Building the Module

The sample authentication module code relies on three `.jar` files, two of which are deployed with OpenAM, and the third which is provided by your web application container.

`amserver.jar`

When you deploy OpenAM, the file is `war-file-name/WEB-INF/lib/amserver.jar`.

`opensso-sharedlib.jar`

When you deploy OpenAM, the file is `war-file-name/WEB-INF/lib/opensso-sharedlib.jar`.

`servlet-api.jar`

This `.jar` provides the Java EE Servlet API.

If you use Apache Tomcat as your web application container, the file is `/path/to/tomcat/lib/servlet-api.jar`.

Put these libraries for example in a `lib/` directory, and then put them on your CLASSPATH to compile the custom authentication authentication module classes.

```
$ mkdir classes
$ javac -d classes -cp lib/servlet-api.jar:lib/amserver.jar:
  lib/opensso-sharedlib.jar src/com/forgerock/openam/examples/SampleAuth*.java
```

Add the resulting classes to a new `sampleauth.jar` file.

```
$ cd classes/
$ jar cf ../sampleauth.jar .
```

13.7.2. Installing the Module

Installing the sample authentication module consists of putting the `.jar` and other files in the right places, registering the module with OpenAM, and then restarting the web application or the web application container.

Copy the `sampleauth.jar` file to `war-file-name/WEB-INF/lib/` where OpenAM is deployed.

```
$ cp sampleauth.jar /path/to/tomcat/webapps/openam/WEB-INF/lib/
```

Copy the `amAuthSampleAuth.properties` file to `war-file-name/WEB-INF/classes/` where OpenAM is deployed.

```
$ cp amAuthSampleAuth.properties /path/to/tomcat/webapps/openam/WEB-INF/classes/
```

Copy the `amAuthSampleAuth.xml` service definition file to `war-file-name/WEB-INF/classes/` where OpenAM is deployed.

```
$ cp amAuthSampleAuth.xml /path/to/tomcat/webapps/openam/WEB-INF/classes/
```

Copy the `SimpleAuth.xml` callbacks file to `war-file-name/config/auth/default/` where OpenAM is deployed.

```
$ cp SampleAuth.xml /path/to/tomcat/webapps/openam/config/auth/default/
```

Register the module with OpenAM using the `ssoadm` command.

```
$ ssoadm
  create-svc
    --adminid amadmin
    --password-file /tmp/pwd.txt
    --xmlfile amAuthSampleAuth.xml

Service was added.
$ ssoadm
  register-auth-module
    --adminid amadmin
    --password-file /tmp/pwd.txt
    --authmodule com.forgerock.openam.examples.SampleAuth

Authentication module was registered.
```

See the `ssoadm` reference in the *Reference* a full list of Authentication Service Management subcommands.

Restart OpenAM, or the web applications container where it runs.

```
$ /path/to/tomcat/bin/shutdown.sh
$ /path/to/tomcat/bin/startup.sh
$ tail -1 /path/to/tomcat/logs/catalina.out
INFO: Server startup in 32746 ms
```

13.8. Configuring & Testing the Sample Auth Module

Login to the console as OpenAM administrator, `amadmin`, and browse to Access Control > *Realm Name* > Authentication > Module Instances. Click New, and then create an instance of your Sample Authentication Module.

After creating the module, click the name in the Module Instances list, and configure as appropriate.

Sample Authentication Module

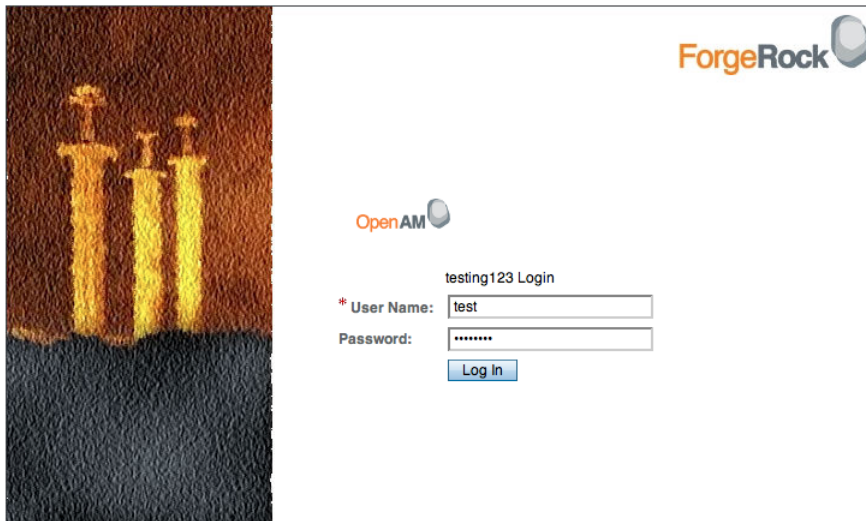
Realm Attributes

Authentication Level:

Service Specific Attribute:

Add your module to the top of the default authentication chain so that OpenAM considers the module sufficient to login. Also, under All Core Settings... for the realm, set User Profile creation to Dynamic so that successful login results

Now that your module is configured, logout of OpenAM console, to return to the login page.



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You can try different combinations as seen in `SimpleAuth.java`. Unless you create a `test` subject with a user profile in OpenAM or set User Profile creation to Dynamic for the login realm, successful login results in an "User has no profile in this organization" error. This is because OpenAM attempts to redirect the authenticated test user to a profile page that does not exist.

Chapter 14

Creating a Post Authentication Plugin

Post authentication plugins (PAP) let you include custom processing at the end of the authentication process, immediately before the subject is authenticated. Common uses of post authentication plugins include setting cookies and session variables. Post authentication plugins are often used in conjunction with policy agents. The post authentication plugin sets custom session properties, and then the policy agent injects the custom properties into the request header to the protected application.

This chapter explains how to create a post authentication plugin.

14.1. Designing Your Post Authentication Plugin

Your post authentication plugin class implements the `AMPostAuthProcessInterface` interface, and in particular the following three methods.

```
public void onLoginSuccess(
    Map requestParamsMap,
    HttpServletRequest request,
    HttpServletResponse response,
    SSOToken token
) throws AuthenticationException

public void onLoginFailure(
    Map requestParamsMap,
    HttpServletRequest request,
    HttpServletResponse response
) throws AuthenticationException

public void onLogout(
    HttpServletRequest request,
    HttpServletResponse response,
    SSOToken token
) throws AuthenticationException
```

OpenAM calls the `onLoginSuccess()` and `onLoginFailure()` methods immediately before informing the user of login success or failure, respectively. OpenAM calls the `onLogout()` method only when the user actively logs out, not when a user's session times out.

See the *OpenAM Java SDK API Specification* for reference.

These methods can perform whatever processing you require. Yet, know that OpenAM calls your methods synchronously as part of the authentication process. Therefore, if your methods take a

long time to complete, you will keep users waiting. Minimize the processing done in your post authentication methods.

14.2. Building Your Sample Post Authentication Plugin

The following example post authentication plugin sets a session property during successful login, writing to its debug log if the operation fails.

```
package com.forgerock.openam.examples;

import java.util.Map;

import com.iplanet.sso.SSOException;
import com.iplanet.sso.SSOToken;

import com.sun.identity.authentication.spi.AMPostAuthProcessInterface;
import com.sun.identity.authentication.spi.AuthenticationException;
import com.sun.identity.shared.debug.Debug;

import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

public class SamplePAP implements AMPostAuthProcessInterface
{
    private final static String PROP_NAME = "MyProperty";
    private final static String PROP_VALUE = "MyValue";
    private final static String DEBUG_FILE = "SamplePAP";

    protected Debug debug = Debug.getInstance(DEBUG_FILE);

    public void onLoginSuccess(
        Map requestParamsMap,
        HttpServletRequest request,
        HttpServletResponse response,
        SSOToken token
    ) throws AuthenticationException
    {
        try {
            token.setProperty(PROP_NAME, PROP_VALUE);
        } catch (SSOException ssoe) {
            debug.error("Unable to set property");
        }
    }

    public void onLoginFailure(
        Map requestParamsMap,
        HttpServletRequest request,
        HttpServletResponse response
    ) throws AuthenticationException
    {
        ; // Not used
    }

    public void onLogout(
        HttpServletRequest request,
        HttpServletResponse response,
```

```
SSOToken token
) throws AuthenticationException
{
    ; // Not used
}
}
```

A post authentication plugin code relies on three .jar files, two of which are deployed with OpenAM, and the third which is provided by your web application container.

amserver.jar

When you deploy OpenAM, the file is `war-file-name/WEB-INF/lib/amserver.jar`.

opensso-sharedlib.jar

When you deploy OpenAM, the file is `war-file-name/WEB-INF/lib/opensso-sharedlib.jar`.

servlet-api.jar

This .jar provides the Java EE Servlet API.

If you use Apache Tomcat as your web application container, the file is `/path/to/tomcat/lib/servlet-api.jar`.

Put the sample plugin in `src/com/forgerock/openam/examples/SamplePAP.java`, and compile the class.

```
$ cd src
$ mkdir ../classes
$ javac
-d ../classes
-classpath /path/to/tomcat/webapps/openam/WEB-INF/lib/amserver.jar:
/path/to/tomcat/webapps/openam/WEB-INF/lib/opensso-sharedlib.jar:
/path/to/tomcat/lib/servlet-api.jar
com/forgerock/openam/examples/SamplePAP.java
```

Copy the classes to the `WEB-INF/classes` directory where you deployed OpenAM.

```
$ cp -r ../classes/* /path/to/tomcat/webapps/openam/WEB-INF/classes/
```

Restart OpenAM or your web container to ensure the post authentication plugin class is loaded.

```
$ /etc/init.d/tomcat stop
$ /etc/init.d/tomcat start
$ tail -1 /path/to/tomcat/logs/catalina.out
INFO: Server startup in 32070 ms
```

14.3. Configuring Your Post Authentication Plugin

You can configure the post authentication plugin for a realm, for a service (authentication chain), or for a role. Where you configure the plugin depends on the scope to which the plugin should apply.

Configuring the plugin at the realm level as shown here, for example, ensures that OpenAM calls your plugin for all authentications to the realm.

In the OpenAM console, browse to Access Control > *Realm Name* > Authentication > All Core Settings... In the Authentication Post Processing Classes list, add the sample plugin class, `com.forgerock.openam.examples.SamplePAP`, and then click Save.

Alternatively, you can configure sample plugin for the realm by using the **ssoadm** command.

```
$ ssoadm
set-svc-attrs
--adminid amadmin
--password-file /tmp/pwd.txt
--servicename iPlanetAMAuthService
--realm /realm
--attributevalues iplanet-am-auth-post-login-process-class=
com.forgerock.openam.examples.SamplePAP

iPlanetAMAuthService under /realm was modified.
```

14.4. Testing Your Post Authentication Plugin

To test the sample post authentication plugin, login successfully to OpenAM in the scope where the plugin is configured. For example, if you configured your plugin for the realm, `/realm`, specify the realm in the login URL.

```
http://openam.example.com:8080/openam/UI/Login?realm=realm
```

Although as a user you do not notice anywhere in the user interface that OpenAM calls your plugin, a policy agent or custom client code could retrieve the session property your plugin added to the user session.

Chapter 15

Customizing Policy Evaluation

OpenAM policies let you restrict access to resources based both on identity and group membership, and also on a range of conditions including session age, authentication chain or module used, authentication level, realm, session properties, IP address and DNS name, user profile content, resource environment, date, day, time of day, and time zone. Yet, some deployments require further distinctions for policy evaluation. This chapter explains how to customize policy evaluation for deployments with particular requirements not met by built-in OpenAM functionality.

OpenAM comes with sample plugins that demonstrate how to customize policy evaluation. This chapter shows how to compile the samples, and how to configure OpenAM to use one of the plugins.

15.1. About the Sample Plugins

The OpenAM policy framework lets you build plugins to extend subjects, conditions, and response providers for policies, and also extend referrals for policy delegation. When you deploy OpenAM, you find Java code for sample policy evaluation plugins under `war-file-name/source/com/sun/identity/samples/policy`.

`SampleCondition.java`

Extends the `Condition` interface. Shows an implementation of a condition to base the policy decision on the length of the user name.

`SampleReferral.java`

Extends the `Referral` interface. Shows an implementation of a policy referral for delegation.

`SampleResponseProvider.java`

Extends the `ResponseProvider` interface. Shows an implementation of a response provider to send an attribute from the user profile with the response.

`SampleSubject.java`

Extends the `Subject` interface. Shows an implementation that defines the users to whom the policy applies, in this case all authenticated users.

Before including the plugins in OpenAM, you compile the four files, and package the classes into a `.jar` for deployment.

The sample policy evaluation code relies on two `.jar` files deployed with OpenAM.

amserver.jar

When you deploy OpenAM, the file is `war-file-name/WEB-INF/lib/amserver.jar`.

opensso-sharedlib.jar

When you deploy OpenAM, the file is `war-file-name/WEB-INF/lib/opensso-sharedlib.jar`.

```
$ cd /path/to/tomcat/webapps/openam/
$ mkdir classes
$ javac -d classes
  -classpath /path/to/tomcat/webapps/openam/WEB-INF/lib/amserver.jar:
  /path/to/tomcat/webapps/openam/WEB-INF/lib/opensso-sharedlib.jar
  source/com/sun/identity/samples/policy/Sample*.java
$ cd classes/
$ jar cf ../policy-plugins.jar .
```

The `jar` belongs under `war-file-name/WEB-INF/lib/`.

```
$ cp ../policy-plugins.jar /path/to/tomcat/webapps/openam/WEB-INF/lib
```

Alternatively, you can add individual classes under `war-file-name/WEB-INF/classes/`.

15.2. Configuring A Sample Policy Plugin

This section shows how to configure the sample custom policy condition that you built. Configuration involves defining the strings that describe the policy condition, and plugging the policy condition into the `iPlanetAMPolicyService`, and then restarting OpenAM in order to be able to add the condition to your policies.

The strings describing your plugin belong as properties values in two files, `war-file-name/WEB-INF/classes/amPolicy.properties` and `war-file-name/WEB-INF/classes/amPolicyConfig.properties`. To the former, add this property:

```
samplecondition-policy-name=Sample Condition
```

To the later, add this property:

```
x100=Sample Condition
```

Add the schema that describes your plugin to OpenAM.

```
$ ssoadm
  add-plugin-schema
  --adminid amadmin
  --password-file /tmp/pwd.txt
  --servicename iPlanetAMPolicyService
  --interfacename Condition
  --pluginname SampleCondition
  --i18nname amPolicy
  --i18nkey samplecondition-policy-name
  --classname com.sun.identity.samples.policy.SampleCondition
```

```
Plug-in schema, Condition was added to service, iPlanetAMPolicyService.
```

Set the choice values of the schema to include your plugin with other policy conditions in the policy service.

```
$ ssoadm
set-attr-choicevals
--adminid amadmin
--password-file /tmp/pwd.txt
--servicename iPlanetAMPolicyConfigService
--schematype Organization
--attributename iplanet-am-policy-selected-conditions
--add
--choicevalues "x100=Sample Condition"
```

Choice Values were set.

Set the plugin policy condition as one of the default attributes of the policy service.

```
$ ssoadm
add-attr-defs
--adminid amadmin
--password-file /tmp/pwd.txt
--servicename iPlanetAMPolicyConfigService
--schematype Organization
--attributevalues "iplanet-am-policy-selected-conditions=Sample Condition"
```

Schema attribute defaults were added.

After completing configuration, restart OpenAM or the web application container.

```
$ /etc/init.d/tomcat stop
Password:
Using CATALINA_BASE:   /path/to/tomcat
Using CATALINA_HOME:   /path/to/tomcat
Using CATALINA_TMPDIR: /path/to/tomcat/temp
Using JRE_HOME:        /path/to/jdk1.6/jre
Using CLASSPATH:       /path/to/tomcat/bin/bootstrap.jar:
/path/to/tomcat/bin/tomcat-juli.jar
[mark@openam-ter bin]$ /etc/init.d/tomcat start
Password:
Using CATALINA_BASE:   /path/to/tomcat
Using CATALINA_HOME:   /path/to/tomcat
Using CATALINA_TMPDIR: /path/to/tomcat/temp
Using JRE_HOME:        /path/to/jdk1.6/jre
Using CLASSPATH:       /path/to/tomcat/bin/bootstrap.jar:
/path/to/tomcat/bin/tomcat-juli.jar
```

In OpenAM console, browse to Access Control > *Realm Name* > Policies > *Policy Name* > Conditions > New... Notice in the list of conditions that you can now apply your Sample Condition.



Step 1 of 2: Select Condition Type

- * Type:
- Active Session Time
 - Authentication by Module Chain
 - Authentication by Module Instance
 - Authentication Level (greater than or equal to)
 - Authentication Level (less than or equal to)
 - Authentication to a Realm
 - Current Session Properties
 - Identity Membership
 - IP Address/DNS Name
 - LDAP Filter Condition
 - Resource/Environment/IP Address
 - Sample Condition
 - Time (day, date, time, and timezone)

Chapter 16

Customizing Identity Data Storage

OpenAM maps user and group identities into a realm using data stores. An OpenAM data store relies on a Java identity repository (IdRepo) plugin to implement interaction with the identity repository where the users and groups are stored.

16.1. About the Identity Repository Plugin

This chapter describes how to create a custom identity repository plugin. OpenAM includes built-in support for LDAP and JDBC identity repositories. For most deployments, you therefore do not need to create your own custom identity repository plugin. Only create custom identity repository plugins for deployments with particular requirements not met by built-in OpenAM functionality.

Tip

Before creating your own identity repository plugin, start by reading the OpenAM source code for the `FilesRepo` or `DatabaseRepo` plugins under `com.sun.identity.idm.plugins`.

16.1.1. IdRepo Inheritance

Your identity repository plugin class must extend the `com.sun.identity.idm.IdRepo` abstract class, and must include a constructor method that takes no arguments.

16.1.2. IdRepo Lifecycle

When OpenAM instantiates your IdRepo plugin, it calls the `initialize()` method.

```
public void initialize(Map configParams)
```

The `configParams` are service configuration parameters for the realm where the IdRepo plugin is configured. The `configParams` normally serve to set up communication with the underlying identity data store. OpenAM calls the `initialize()` method once, and considers the identity repository ready for use.

If you encounter errors or exceptions during initialization, catch and store them in your plugin for use later when OpenAM calls other plugin methods.

After initialization, OpenAM calls the `addListener()` and `removeListener()` methods to register listeners that inform OpenAM client code of changes to identities managed by your IdRepo.

```
public int addListener(SSOToken token, IdRepoListener listener)
public void removeListener()
```

You must handle listener registration in your IdRepo plugin, and also return events to OpenAM through the `IdRepoListener`.

When stopping, OpenAM calls your IdRepo plugin `shutdown()` method.

```
public void shutdown()
```

You are not required to implement `shutdown()` unless your IdRepo plugin has shut down work of its own to do, such as close connections to the underlying identity data store.

16.1.3. IdRepo Plugin Capabilities

Your IdRepo plugin provides OpenAM with a generic means to manage subjects—including users and groups but also special types such as roles, realms, and agents— and to create, read, update, delete, and search subjects. In order for OpenAM to determine your plugin's capabilities, it calls the methods described in this section.

```
public Set getSupportedTypes()
```

The `getSupportedTypes()` method returns a set of `IdType` objects, such as `IdType.USER` and `IdType.GROUP`. You can either hard-code the supported types into your plugin, or make them configurable through the IdRepo service.

```
public Set getSupportedOperations(IdType type)
```

The `getSupportedOperations()` method returns a set of `IdOperation` objects, such as `IdOperation.CREATE` and `IdOperation.EDIT`. You can also either hard-code these, or make them configurable.

```
public boolean supportsAuthentication()
```

The `supportsAuthentication()` method returns true if your plugin supports the `authenticate()` method.

16.2. Identity Repository Plugin Implementation

Your IdRepo plugin implements operational methods depending on what you support. These methods perform the operations in your data store.

Create

OpenAM calls `create()` to provision a new identity in the repository, where `name` is the new identity's name, and `attrMap` holds the attributes names and values.

```
public String create(SSOToken token, IdType type, String name, Map attrMap)
    throws IdRepoException, SSOException
```

Read

OpenAM calls the following methods to retrieve subjects in the identity repository, and to check account activity. If your data store does not support binary attributes, return an empty `Map` for `getBinaryAttributes()`.

```
public boolean isExists(
    SSOToken token,
    IdType type,
    String name
) throws IdRepoException, SSOException

public boolean isActive(
    SSOToken token,
    IdType type,
    String name
) throws IdRepoException, SSOException

public Map getAttributes(
    SSOToken token,
    IdType type,
    String name
) throws IdRepoException, SSOException

public Map getAttributes(
    SSOToken token,
    IdType type,
    String name,
    Set attrNames
) throws IdRepoException, SSOException

public Map getBinaryAttributes(
    SSOToken token,
    IdType type,
    String name,
    Set attrNames
) throws IdRepoException, SSOException

public RepoSearchResults search(
    SSOToken token,
    IdType type,
    String pattern,
    Map avPairs,
    boolean recursive,
    int maxResults,
    int maxTime,
    Set returnAttrs
) throws IdRepoException, SSOException

public RepoSearchResults search(
    SSOToken token,
    IdType type,
    String pattern,
    int maxTime,
    int maxResults,
    Set returnAttrs,
    boolean returnAllAttrs,
    int filterOp,
```

```
Map avPairs,  
boolean recursive  
) throws IdRepoException, SS0Exception
```

Edit

OpenAM calls the following methods to update a subject in the identity repository.

```
public void setAttributes(  
    SS0Token token,  
    IdType type,  
    String name,  
    Map attributes,  
    boolean isAdd  
) throws IdRepoException, SS0Exception  
  
public void setBinaryAttributes(  
    SS0Token token,  
    IdType type,  
    String name,  
    Map attributes,  
    boolean isAdd  
) throws IdRepoException, SS0Exception  
  
public void removeAttributes(  
    SS0Token token,  
    IdType type,  
    String name,  
    Set attrNames  
) throws IdRepoException, SS0Exception  
  
public void modifyMemberShip(  
    SS0Token token,  
    IdType type,  
    String name,  
    Set members,  
    IdType membersType,  
    int operation  
) throws IdRepoException, SS0Exception  
  
public void setActiveStatus(  
    SS0Token token,  
    IdType type,  
    String name,  
    boolean active  
)
```

Authenticate

OpenAM calls `authenticate()` with the credentials from the `DataStore` authentication module.

```
public boolean authenticate(Callback[] credentials)  
    throws IdRepoException, AuthLoginException
```

Delete

The `delete()` method removes the subject from the identity repository. The `name` specifies the subject.


```
public void delete(SSOToken token, IdType type, String name)
    throws IdRepoException, SSOException
```

Service

The `IdOperation.SERVICE` operation is rarely used in recent OpenAM deployments.

16.3. Identity Repository Plugin Deployment

Your IdRepo plugin must link to `amserver.jar`, which when you deploy OpenAM is `war-file-name/WEB-INF/lib/amserver.jar`.

You can either package your plugin as a `jar`, and then add it to `war-file-name/WEB-INF/lib/`, or add the classes under `war-file-name/WEB-INF/classes/`.

To register your plugin with OpenAM, you add a `SubSchema` to the `sunIdentityRepositoryService` using the `ssoadm` command. First, you create the `SubSchema` document having the following structure.

```
<SubSchema i18nKey="x4000" inheritance="multiple" maintainPriority="no"
    name="CustomRepo" supportsApplicableOrganization="no" validate="yes">
  <AttributeSchema cosQualifier="default" isSearchable="no"
    name="RequiredValueValidator" syntax="string"
    type="validator" >
    <DefaultValues>
      <Value>com.sun.identity.sm.RequiredValueValidator</Value>
    </DefaultValues>
  </AttributeSchema>
  <AttributeSchema any="required" cosQualifier="default"
    i18nKey="x4001" isSearchable="no"
    name="sunIdRepoClass" syntax="string"
    type="single" validator="RequiredValueValidator" >
    <DefaultValues>
      <Value>org.test.CustomRepo</Value>
    </DefaultValues>
  </AttributeSchema>
  <AttributeSchema cosQualifier="default" i18nKey="x4002" isSearchable="no"
    name="sunIdRepoAttributeMapping" syntax="string" type="list">
    <DefaultValues>
      <Value></Value>
    </DefaultValues>
  </AttributeSchema>
</SubSchema>
```

Also include the `AttributeSchema` required to configure your IdRepo plugin.

Notice the `i18nKey` attributes on `SubSchema` elements. The `i18nKey` attribute values correspond to properties in the `amIdRepoService.properties` file, stored under `war-file-name/WEB-INF/classes/`. OpenAM console displays the label for the configuration user interface that it retrieves from the value of the `i18nKey` property in the `amIdRepoService.properties` file.

Register your plugin using the `ssoadm` command after copy the files into place.

```
$ ssoadm
add-sub-schema
--adminid amadmin
--password-file /tmp/pwd.txt
--servicename sunIdentityRepositoryService
--schematype Organization
--filename customIdRepo.xml
--subschemaname CustomRepo
```

Login to OpenAM console as administrator, then then Browse to Access Control > *Realm Name* > Data Stores. In the Data Stores table, click New... to create a Data Store corresponding to your custom IdRepo plugin. In the first screen of the wizard, name the Data Store and select the type corresponding to your plugin. In the second screen of the wizard, add the configuration for your plugin.

After creating the Data Store, create a new subject in the realm to check that your plugin works as expected. You can do this under Access Control > *Realm Name* > Subjects.

If your plugin supports authentication, then users should now be able to authenticate using the **DataStore** module for the realm.

```
http://openam.example.com:8080/openam/UI/Login?realm=test&module=DataStore
```

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