IBM Security Verify Access
Version 10.0.7
December 2023

Advanced Access Control Configuration topics

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Chapter 1. Upgrading configuration

After you install the upgrade software on a Security Verify Access appliance, you must complete several configuration tasks.

Review the following tasks, and perform the ones that are appropriate for your installation.

Table 1. Advanced Access Control configuration upgrade tasks

Upgrade task	**See**
Run the **isamcfg** tool to obtain the correct configuration settings for WebSEAL and Security Verify Access.	“Using the isamcfg tool” on page 87
If you use DB2® as an external runtime database, upgrade DB2.	“Upgrading a DB2 external runtime database (for appliance versions earlier than 9.0.0.0)” on page 3 or “Upgrading external databases with the dbupdate tool (for appliance at version 9.0.0.0 and later)” on page 2
If you use Oracle as an external runtime database, upgrade Oracle.	“Upgrading an Oracle external runtime database (for appliance versions earlier than 9.0.0.0)” on page 4 or “Upgrading external databases with the dbupdate tool (for appliance at version 9.0.0.0 and later)” on page 2
After an upgrade, the setting for one-time password authentication is set to run in backward compatibility mode. Disable this mode.	“Setting backward compatibility mode for one-time password” on page 5
If you customized any template files, upgrade them.	“Updating template files” on page 5
The new role membership features in later versions of the appliance are granted the permission of **None** by default. Configure the permissions for these new role membership features, if necessary.	Managing roles of users and groups
To limit the number of OAuth tokens per user per definition, update the mapping rule.	“Updating PreTokenGeneration to limit OAuth tokens” on page 6
Review and update some existing Web Reverse Proxy instance point of contact settings for the Advanced Access Control runtime.	“ Reviewing existing Web Reverse Proxy instance point of contact settings” on page 6

After you complete the appropriate configuration tasks, go to Chapter 2, “Getting started with Advanced Access Control,” on page 9.

Upgrading external databases with the dbupdate tool (for appliance at version 9.0.0.0 and later)

Use the **dbupdate** tool that is provided by the appliance to upgrade your external runtime databases, such as DB2, Oracle, and PostgreSQL.

About this task

Use this task if your Security Verify Access appliance version is 9.0.0.0 or later. If your appliance version is earlier than 9.0.0.0, you must first update the appliance and the external database to version 9.0.0.0 by using the following methods:

- "Upgrading a DB2 external runtime database (for appliance versions earlier than 9.0.0.0)" on page 3
- "Upgrading an Oracle external runtime database (for appliance versions earlier than 9.0.0.0)" on page 4

You must have Java version 8 or later to run the database update tool.

Procedure

1. In the local management interface, go to **System** > **Secure Settings** > **File Downloads**.
2. Expand **access_control** > **database**.
3. Select the `dbupdate9.zip` file.

   This file contains the database update tool (`dbupdate.jar`), the README file, and update files for all databases and SQL types.
4. Click **Export**.
5. Save the file.
6. Extract the `dbupdate9.zip` file and run the `dbupdate.jar` tool for your environment.
   - The usage of the tool is as follows:

```
${JAVA_HOME}/bin/java -jar dbupdate.jar [-t] [-n]
<dbType> <sqlType> <connectString> <user> [<password>]
```

   -t
   Enable debug trace output.

   -n
   Do not perform any updates, but instead output the update operations that would have been executed.

   dbType
   The database type. Valid values are `config` or `runtime`.

   sqlType
   The database server type. Valid values are db2, `oracle`, or `postgresql`.

   connectString

   The string that is used when establishing a connection to the database server.

   db2
   Typically the database name, which is used in "`db2 CONNECT TO <connectString> USER <user> USING <password>;`".

   oracle
   If the string is not empty, it corresponds to the value used for `sqlplus` "`CONNECT <user>/<password>@<connectString>;`". If the string is empty (""), the `ORACLE_SID` environment variable is used.

postgresql

The `connectString` for PostgreSQL contains the psql command line options that need to be supplied to connect to the database. This usually consists of the hostname, port and database name. For example:

```
'--host=<hostname> --port=<port> --dbname=<db name>'
```

`user`
Database user to update the database with.

`password`
Database user's password. If not provided, the value is read from console.

Note: For DB2 external databases, the **db2** command must be in the path. For Oracle external databases, the **`sqlplus`** command must be in the path. For PostgreSQL external database, the **`psql`** command must be in the path.

- Java 8 or later is required for running the tool.
- The following command shows an example of using the tool to update a DB2 database:

```
/opt/ibm/java-x86_64-80/jre/bin/java -jar dbupdate.jar runtime db2
"HVDB" db2inst1 passw0rd
```

The following command shows an example of using the tool to update an Oracle database:

```
/opt/ibm/java-x86_64-80/jre/bin/java -jar dbupdate.jar runtime oracle
"" SYSTEM passw0rd
```

- If the tool is not flexible enough for your environment, you can see which commands the tool runs without executing them and manually run those commands to suit your environment. To see which commands the update tool runs against the database, run the tool with the `-n` option. This option still must be able to read from the database to get the current update versions in order to determine which updates to apply. However, it will not execute any update operations.
- See the README file that is included in the `dbupdate9.zip` file for more details about the update tool.

Upgrading a DB2 external runtime database (for appliance versions earlier than 9.0.0.0)

If DB2 is the external runtime database, upgrade it after you install the appliance upgrade so that you are using the correct `.sql` file version.

About this task

Attention: Use this task only if you have not installed `v9000` or `v1000`.

The updates to the `.sql` file for each release are not cumulative. Therefore, depending on which version of the `isam_access_control_db2_update_v*.sql` file you installed, make the following updates:

- `v8004.sql` not installed: First upgrade to v8004, then to v8005, and finally to v9000.
- `v8004.sql` is installed: Upgrade to v8005 and then to v9000.
- `v8005.sql` is installed: Upgrade to v9000.

Use this task to install each version you require, replacing references to `isam_access_control_db2_update_v9000.sql` with the version number you are upgrading to each time, and starting with the earliest version you require.

Procedure

1. Log in to the local management interface.

2. Click **System** > **File Downloads**.
3. Expand **access_control** > **database** > **db2** > **runtime**.
4. Select `isam_access_control_db2_update_v9000.sql`
5. Click **Export**.
6. Save the file.
7. Open the `isam_access_control_db2_update_v9000.sql` file in an editor on the DB2 server.
8. Replace the following macros with the values specific to your environment:

   &DBINSTANCE
   The name of the DB2 instance.

   &DBUSER
   The name of the DB2 administrator.

   &DBPASSWORD
   The password for the DB2 administrator.
9. Save the changes.
10. Log in to the DB2 Command utility (Windows) or DB2 host (UNIX) as the DB2 administrator.
11. Run the following command:

    ```
    db2 -tsvf fully_qualified_path_to_script
    ```

    The following example shows the fully qualified path to the script:

    ```
    db2 -tsvf tmp/isam_access_control_db2_update_v9000.sql
    ```
12. Validate that the tables were successfully updated.
13. Ensure that no errors were returned during the update and log in to the database to manually check that the tables exist.

Upgrading an Oracle external runtime database (for appliance versions earlier than 9.0.0.0)

If Oracle is the external runtime database, upgrade it after you install the appliance upgrade so that you are using the correct `.sql` file version.

About this task

Attention: Use this task only if you have not installed `v9000` or `v1000`.

The updates to the `.sql` file for each release are not cumulative. Therefore, depending on which version of the `isam_access_control_oracle_update_v*.sql` file you installed, make the following updates:

- `v8011.sql` not installed: First upgrade to v8011 and then to v9000.
- `v8011.sql` is installed: Upgrade to v9000.

Use this task to install each version you require, replacing references to `isam_access_control_oracle_update_v9000.sql` with the version number you are upgrading to each time, and starting with the earliest version you require.

Procedure

1. Log in to the local management interface.
2. Click **System** > **File Downloads**.
3. Expand **access_control** > **database** > **oracle** > **runtime**.
4. Select `isam_access_control_oracle_update_v9000.sql`

5. Click **Export**.
6. Save the file.
7. Copy the downloaded `isam_access_control_oracle_update_v9000.sql` file into the Oracle home directory.
   For example: `ORACLE_HOME=/opt/oracle/app/oracle/product/11.2.0/dbhome_1`
8. Log in to SQL*Plus.
9. At the SQL prompt, run **`START isam_access_control_oracle_update_v9000.sql`**.
10. Validate that the tables were successfully updated.
11. Ensure that no errors were returned during the update and log in to the database to manually check that the tables exist.

Setting backward compatibility mode for one-time password

When you upgrade your installation, the setting for one-time password authentication is set to run in backward compatibility mode. Complete this task if you need to disable this mode.

About this task

The default value for a new installation is **`false`**. For an upgrade, the value is set to **`true`**.

Procedure

1. Select **AAC** > **Global Settings** > **Advanced Configuration**.
2. Click the edit icon for `poc.otp.backwardCompatibilityEnabled`.
3. Change the value from **`true`**, which enables backward compatibility mode, to **`false`**.
4. Click **OK**.
5. Deploy the changes when prompted.

Updating template files

If you want to update your template files to the latest version, complete this task. Otherwise, the template files from the previous version are ready for use after the upgrade.

Procedure

1. Download the new template file.
2. Log in to the local management interface.
3. Select **System** > **File Downloads**.
4. Expand **access_control** > **pages** and select `mga_template_files.zip`.
5. Click **Export**.
6. Extract the file.
7. Edit and customize the template files, as necessary.
8. Compress the template files into a `.zip` file.
9. In the local management interface, select **AAC** > **Global Settings** > **Template Files**.
10. Select **Manage** > **Import Zip**.
11. Click **Browse** and locate the `.zip` file you compressed in step “8” on page 5.
12. Click **Open**.
13. Click **Import**.
14. Deploy the changes.

Updating PreTokenGeneration to limit OAuth tokens

Update the latest version of the PreTokenGeneration mapping rule to limit the number of OAuth tokens per user per definition.

About this task

Follow this procedure so that any API protection definitions you created in a previous version can take advantage of limiting OAuth tokens. If you create new definitions, the latest PreTokenGeneration mapping rule is used.

Procedure

1. Log in to the local management interface.
2. Download the updated mapping rule:
   a) Click **System** > **File Downloads**.
   b) Expand **access_control** > **examples** > **mapping_rules**.
   c) Select `oauth_20_pre_mapping.js`.
   d) Click **Export**.
3. Optional: Edit and customize the mapping rule if you customized it in the previous version.
4. Replace the PreTokenGeneration mapping rule for the existing API protection definitions.
   a) Click **AAC** > **API Protection**.
   b) Click **Advanced**.
   c) Select the appropriate PreTokenGeneration mapping rule.
   d) Click **Replace**.
   e) Browse for the updated mapping rule and click **OK**.
5. Deploy the changes.

Reviewing existing Web Reverse Proxy instance point of contact settings

After you upgrade from appliance v8.*n.n.n* to v9.*n.n.n*, it might be necessary to review and update some existing Web Reverse Proxy instance point of contact settings for the Advanced Access Control runtime.

Reviewing ACL settings for Authentication Services REST endpoint

A new REST endpoint for the Authentication Services Framework was introduced in v9.0.0.0. The default URL for this endpoint is "`/mga/sps/apiauthsvc`". After an upgrade from a Security Verify Access appliance at v8.n.n.n, if you want to use the "`/mga/sps/apiauthsvc`" endpoint with an existing web reverse proxy, it might be necessary to create an ACL named "`isam_mobile_rest_unauth`" and attach it to the "`/mga/sps/apiauthsvc`" endpoint. You can use the following Security Verify Access policy administration commands to enable this setting.

```
acl create "isam_mobile_rest_unauth"
acl modify "isam_mobile_rest_unauth" set user "sec_master" TcmdbsvaBRrxl
acl modify "isam_mobile_rest_unauth" set group iv-admin TcmdbsvaBRrxl
acl modify "isam_mobile_rest_unauth" set group webseal-servers Tgmdbsrxl
acl modify "isam_mobile_rest_unauth" set any-other Tmdrxl
acl modify "isam_mobile_rest_unauth" set unauth Tmdrxl

acl attach "/WebSEAL/<web reverse proxy>/mga/sps/apiauthsvc" "isam_mobile_rest_unauth"
```

Reviewing EAI point of contact settings

Some of the default settings that are related to Advanced Access Control point of contact and EAI headers changed in v9.0.0.0. After an upgrade from v8.*n.n.n* where an existing Web Reverse Proxy instance has been configured with Advanced Access Control, review the following settings and correct the settings if required.

In the Web Reverse Proxy configuration file, check the **[eai]** stanza settings:

```
# EAI HEADER NAMES

# EAI PAC header names
eai-pac-header = am-eai-pac
eai-pac-svc-header = am-eai-pac-svc

# EAI USER ID header names
eai-user-id-header = am-eai-user-id
eai-auth-level-header = am-eai-auth-level
eai-xattrs-header = am-eai-xattrs

# EAI external USER ID header names
eai-ext-user-id-header = am-eai-ext-user-id
eai-ext-user-groups-header = am-eai-ext-user-groups

# EAI COMMON header names
eai-redir-url-header = am-eai-redir-url
```

The names of the headers must match the point of contact settings for the Advanced Access Control runtime. You can manage these settings with the local management interface by going to **AAC** > **Global Settings** > **Point of Contact**. Review the parameter value settings for the active point of contact profile.

AAC point of contact parameter	Reverse Proxy header name
fim.user.response.header.name	am-eai-ext-user-id
fim.target.response.header.name	am-eai-redir-url
fim.attributes.response.header.name	am-eai-xattrs
fim.groups.response.header.name	am-eai-ext
fim.user.request.header.name	iv-user
fim.cred.request.header.name	iv-creds
fim.groups.request.header.name	iv-groups
fim.cred.response.header.name	am-eai-pac

Chapter 2. Getting started with Advanced Access Control

Several configuration tasks must be completed in order to start using Advanced Access Control.

After setup of IBM Security Verify Access Appliance, complete an initial configuration of Advanced Access Control.

Note: If you have not already set up your appliance, see Getting Started.

Complete the following tasks:

1. Activate the product. You must activate both the IBM Security Verify Access Platform offering and the Advanced Access Control Module.
2. Manage application interfaces.
3. Configure the runtime environment.
4. “Managing user registries” on page 264.
5. Configure the services that you require:
   - “Reverse Proxy Configuration with Authentication Services” on page 86
   - “Reverse proxy configuration for OAuth and OIDC provider” on page 129
   - “Configuring Mobile Multi-Factor Authentication” on page 190
6. Review optional runtime security services EAS configuration tasks.

You also might need to complete the following task to enable communication between appliances. See Chapter 7, “Adding runtime listening interfaces,” on page 21.

Chapter 3. Managing application interfaces

To create or edit your management and application interfaces, see Configuring Interfaces.

Chapter 4. Managing the runtime component

To manage configuration files with the local management interface, use the Runtime Component management page.

About this task

When you first install the appliance, you must configure the runtime component. At any time after configuration, you can either edit the configuration settings, or unconfigure the runtime component.

Procedure

1. From the top menu, select **Web** > **Manage** > **Runtime Component**.
2. Select one of the following actions.

- **Configure**
  a. On the Main tab, select the **User Registry** type of LDAP.

     Note: The runtime component does not communicate with the user registry, but you must select a registry type. It does not matter what user registry your system uses. Selection of the user registry type has no effect on the runtime component. Select LDAP in order to minimize the configuration steps.

  b. On the Policy Server tab, provide settings.
     – **Host name**: The name of the host that hosts the IBM Security Verify Access policy server.
     – **Port**: The port over which communication with the IBM Security Verify Access policy server takes place.
     – **Management Domain**: The IBM Security Verify Access domain name.

  c. Provide settings on the LDAP tab. Enter a **Host name** and accept the default value for **Port**.

     Note: The host name and port values are just placeholders. The runtime component does not use the values, but the configuration wizard requires that values must be set.

  d. Click **Finish** to save the settings.
- **Unconfigure** the remote policy server
  a. Select the **Force** check box if you want the unconfigure operation to forcefully remove all of the configuration data. By default, this check box is not selected.

     Note: Select the **Force** check box only if the unconfiguration fails repeatedly. Use this option only as a last resort.

  b. Click **Submit** to confirm operation.
- **Edit**
  a. Select the runtime configuration file of interest.
  b. Edit the configuration file and then click **Save** to save the changes. If you do not want to save the changes, click **Cancel**. If you want to revert to the previous version of the configuration file, click **Revert**.

Note: For the changes to take effect, they must be deployed.

Related information

Deploy pending changes

Chapter 5. Managing user registries

The appliance runtime profile has a user registry associated. Use the User Registry management page to administer the users and group memberships. The user registry in discussion here is the one used by the runtime applications, not the one used by the management interface.

Before you begin

Note: From version 9.0.7 and above, these characters "& | \ > < ; " are not allowed for passwords in the AAC or Federation user registry.

Procedure

1. From the top menu, select the user interface panel for your licensing level.
   - **AAC** > **Manage** > **User Registry**
   - **Federation** > **Manage** > **User Registry**

   A list of all the current users in the registry is displayed. You can filter and reorder the list of users.
2. Select **Users** (current page) or **Groups** to manage users or groups, respectively.
3. To manage users, perform one or more of the following actions as needed:

   Create a user in the registry

   a. Click **New**.
   b. In the **Create User** window, enter the user name and password for the new user.
   c. Click **OK**.

   Delete a user from the registry

   a. Select the user to delete.
   b. Click **Delete**.
   c. In the **Delete User** window, click **Yes** to confirm the delete operation.

   Change the password of a user in the registry

   a. Select the user for which you want to change password.
   b. Click **Set Password**.
   c. In the **Set Password** window, enter the password in the **New Password** and **Confirm Password** fields.
   d. Click **OK**.

   Manage group memberships of a user

   a. Select the user of interest. The group memberships that are associated with this user are displayed under the **Group Membership** section.
   b. You can add the user to a group or delete the user from a group in the registry.

      Add the user to a group

      i) In the **Group Membership** section, click **Add**.
      ii) In the **Add to Group** window, select the group to add this user to.

      Note: Only a single group can be selected.

      iii) Click **OK**.

      Remove the user from a group

      i) In the **Group Membership** section, select the group to remove the user from.

ii) Click **Delete**.

iii) In the **Remove from Group** window, click **Yes** to confirm the removal.

4. To manage groups, perform one or more of the following actions as needed:

Create a new group in the registry

a. Click **New**.

b. In the **New Group** window, enter the group name for the new group.

c. Click **OK**.

Delete a group from the registry

a. Select the group to delete.

b. Click **Delete**.

c. In the **Delete Group** window, click **Yes** to confirm the delete operation.

Manage group members

a. Select the group of interest. The users that are currently members of this group are displayed under the **Group Members** section.

b. You can add a user to the group or delete a user from the group in the registry.

Add a user to the group

a. In the **Group Members** section, click **Add**.

b. In the **Add to Group** window, select the user to add to the group.

Note: Only a single user can be selected.

c. Click **OK**.

Remove a user from the group

a. In the **Group Members** section, select the user to remove from the group.

b. Click **Remove**.

c. In the **Remove from Group** window, click **Yes** to confirm the removal.

Chapter 6. Runtime security services external authorization service

The runtime security services external authorization service (EAS) provides the policy enforcement point function for context-based access.

You can configure the runtime security services EAS to include context-based access decisions as part of the standard authorization on WebSEAL requests. WebSEAL becomes the authorization enforcement point for access to resources that context-based access protects.

The runtime security services EAS constructs a request that it sends to the policy decision point (PDP). Based on the policy decision that is received from the PDP, the EAS takes one of the actions listed in the following table.

Table 2. Runtime security services EAS access decisions

Action	Description
Permit	Grants access to the protected resource.
Deny	Denies access to the protected resource.
Permit with Authentication	Grants access to the protected resource, after a specific authentication action successfully takes place.
Permit with Obligation	Grants access to the protected resource, after the user successfully authenticates with a secondary challenge.
Deny with Obligation	Denies access to the protected resource, after the user unsuccessfully responds to a secondary challenge.

The following steps set up the initial integration with Advanced Access Control:

1. Configure runtime security services for client certificate authentication.
2. Run the **isamcfg** tool to automatically update the WebSEAL configuration file and to complete other configuration setup.
3. (Optional) Update the WebSEAL configuration file to:
   - Retain the version 7.0 attribute IDs.
   - Define custom attributes for the authorization service.
   - Map an obligation to a URL.
   - Permit access decisions when runtime security services cannot be contacted.

For information about WebSEAL, see Web Reverse Proxy configuration.

Configuring runtime security services for client certificate authentication

Configure runtime security services for client certificate authentication used for authentication between WebSEAL and Advanced Access Control.

About this task

Before selecting the client certificate authentication option provided in the **isamcfg** tool, you must perform the following general steps for the client certificate:

1. Generate a certificate that represents the user who will be authenticating from WebSEAL, or the Web Reverse Proxy, to Advanced Access Control. For example, use `easuser`.

2. Import that certificate into the WebSEAL or Web Reverse Proxy key database as a personal certificate.
3. Import the signer of this certificate as a trusted certificate in the Advanced Access Control keystore.
4. Set **Accept Client Certificates** to `True` on the appliance.

Procedure

1. Create a client certificate for user **`easusercert`**.
   a. In the local management interface, go to **System** > **Secure Settings** > **SSL Certificates**.
   b. Select the **pdsrv** certificate database.
   c. Click **Manage** > **Edit SSL Certificate Database**.
   d. Click **Personal Certificates**.
   e. Click **New** to create a new personal certificate.
   f. Provide the following information:
      - Certificate Label: `easusercert`
      - Certificate Distinguished Name: `cn=easuser`
      - Key Size: `2048`
      - Expiration Time (in days): `365`
   g. Click **Save**.
2. Deploy pending changes. See Chapter 15, “Deploying pending changes,” on page 221.
3. Restart your reverse proxy instances.
4. Export the client certificate.
   a. Select the **pdsrv** certificate database.
   b. Click **Manage** > **Edit SSL Certificate Database**.
   c. Click **Personal Certificates**.
   d. Select the **easusercert** certificate you created.
   e. Click **Manage** > **Export**.
   f. Save the file.
5. Import the exported personal certificate as a signer certificate on the appliance. The signer of the client certificate needs to be trusted. The certificate is self-signed. Importing the **`easusercert`** as a signer certificate into the appliances allows that trust.
   a. Click **System** > **Secure Settings** > **SSL Certificates**.
   b. Select the **rt_profiles_keys** certificate database.
   c. Click **Manage** > **Edit SSL Certificate Database**.
   d. Click **Signer Certificates**.
   e. Click **Manage** > **Import**.
   f. Click **Browse**.
   g. Browse to the directory that contains the file to be imported and select the file. Click **Open**.
   h. Click **Import**. A message that indicates successful import is displayed.
6. Deploy pending changes. See Chapter 15, “Deploying pending changes,” on page 221.
7. Configure the appliance for client certificate authentication.
   a. In the local management interface, go to **AAC** > **Global Settings** > **Runtime Parameters**.
   b. Select **Accept Client Certificates**.
   c. Click **Edit** and set the value as `True`.
8. Restart the runtime.

What to do next

Run the **isamcfg** tool. Ensure that you respond to the following **isamcfg** prompts appropriately:

- When answering the question `Select the method for authentication between WebSEAL and the Advanced Access Control rumtime listening interface` in the **isamcfg** tool, select `Certificate Authentication`.
- When prompted to enter the `Advanced Access Control rumtime listening interface SSL keyfile label`, enter the label of the certificate that represents the user who will be authenticating from WebSEAL or Web Reverse Proxy to Advanced Access Control.

For more information, see "isamcfg Security Verify Access appliance configuration worksheet" on page 93.

Permitting access decisions when runtime security services cannot be contacted

Update the WebSEAL configuration file if you want to change the behavior when runtime security services servers cannot be contacted by the EAS.

About this task

By default, if the EAS cannot contact a runtime security services server, the EAS removes the server from the pool of servers. If all of the servers are removed from the pool, WebSEAL returns an error. To prevent the error, you can permit access decisions even if no servers can be contacted. The following instructions show you how to update the WebSEAL configuration file to make this change.

Important: When you perform this task, every single request will be permitted only when none of the runtime security services servers are available. This includes access that might not be permitted if the server was available.

Procedure

1. Open the WebSEAL configuration file.
2. Add the following entry to the `[rtss-eas]` stanza:

   ```
   permit-when-no-rtss-available = true
   ```

   The default value for this entry is `false`.
3. Save the file.
4. Restart the WebSEAL server for the change to take effect.

Results

If none of the servers are available, the user is always be permitted to access a resource. The access is granted even when the runtime security services server would normally deny access if it was available.

Retaining the version 7.0 attribute IDs in existing policies

If your existing policies contain any of the changed attribute IDs, you can update your WebSEAL configuration file to continue using risk-based access version 7.0 IDs.

Before you begin

. Determine whether it is necessary for you to continue using the risk-based access version 7.0 IDs.

About this task

Use the following procedure to continue to use the version 7.0 attribute IDs.

Procedure

1. Open the WebSEAL configuration file, and locate the `[rtss-eas]` stanza.
2. Add the `provide_700_attribute_ids` flag and set it to `true`. This flag enables your existing policies to use the version 7.0 attribute IDs. For example:

```
[rtss-eas]
provide_700_attribute_ids = true
```

3. Save the file.
4. Restart the WebSEAL server for the changes to take effect.

Chapter 7. Adding runtime listening interfaces

Add your interfaces to the list of runtime listening interfaces. This procedure enables communication between an appliance with Advanced Access Control and another Security Verify Access appliance.

Before you begin

When you run the **`isamcfg`** tool, ensure that you specify the runtime listening interface host name and port when prompted.

Define your interfaces.

About this task

If you want to configure a specific IP other than using the Local Host of the Verify Access Appliance, you must configure this as an Interface.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Global Settings**, click **Runtime Parameters**.
4. On the **Runtime Tuning Parameters** page, click **Add** to add a runtime listening interface on port 443:
   a) For **Interface**, select your interface.
   b) For **Port**, select or type 443.
   c) Ensure **SSL** is checked.
   d) Click **OK**.
5. Click **Add** to add a runtime listening interface on port 80:
   a) For **Interface**, select your interface.
   b) For **Port**, select or type 80.
   c) Clear the **SSL** checkbox.
   d) Click **OK**.
6. Deploy these changes.

Chapter 8. Support for compliance with NIST SP800-131a

Advanced Access Control supports the requirements that are defined by the National Institute of Standards and Technology (NIST) Special Publications 800-131a.

SP 800-131a strengthens security by defining stronger cryptographic keys and more robust algorithms. The standard defines a period to allow customers time to make the transition to the new requirements. The transition period closes at the end of 2013. See the NIST publication Transitions: Recommendation for Transitioning the Use of Cryptographic Algorithms and Key Lengths for the new standards that are defined by Special Publication 800-131, and details about allowed protocols, cipher suites, and key strength.

You can run the appliance that provides Advanced Access Control in either of the two modes that are supported by NIST SP800-131a:

- Transition mode
- Strict mode

When configured in transition mode, server components support the transition mode Transport Layer Security (TLS) protocols, which include TLS 1.0 and TLS 1.1. Client components, such as the HTTPS client that performs one-time password (OTP) delivery and the syslog auditing client, support TLS 1.2 only.

When configured in strict mode, both the server components and the client components of Advanced Access Control support TLS 1.2 only.

To deploy in transition mode, you need to select only the mode during initial configuration of the appliance. To run in strict mode, you must also set an extra configuration option.

If your deployment uses client certificate authentication, and you want to use strict mode, you must complete more configuration steps for the point of contact server. The point of contact server can be either IBM Security Verify Access WebSEAL or IBM Security Web Gateway appliance 7.0.

Transition mode

When you install the appliance, select the option to enable FIPS 140-2 mode. This selection turns on compliance for NIST SP800-131a.

When enabled, NIST SP800-131a compliance is run in transition mode. You do not have to complete any further configuration steps in order to run in transition mode.

Note:

- Enable FIPS 140-2 mode only if you must comply with the NIST SP800-131a requirements. There is no advantage to enabling FIPS 140-2 mode if your installation does not require this compliance.

  Important: The setting of the FIPS 140-2 Mode option is permanent and cannot be turned off after it is enabled. To disable the option, you must reinstall the appliance.
- If you enable FIPS 140-2 mode, the appliance is automatically restarted before it continues with the rest of the setup.
- FIPS Limitation: For Advanced Access Control, the FIPS 140-2 mode option in the appliance setup wizard does not turn on compliance for FIPS 140-2. It turns on compliance for NIST SP800-131a only.

Strict mode

Overview of configuration tasks:

1. Enable FIPS 140-2 mode during appliance configuration.
2. Set a tuning parameter to enable strict mode.

3. (Optional) If your deployment uses client certificate authentication, configure TLS v1.2.

Instructions:

1. Install the appliance and choose to enable FIPS 140-2 mode. This selection turns on compliance for NIST SP800-131a.
2. Use the appliance local management interface (LMI) to modify the advanced tuning parameter `nist.sp800-131a.strict`. This parameter is set by default to false. Complete the following steps:
   a. Verify that your browser supports TLS 1.2.

      CAUTION: Strict mode requires the use of TLS 1.2. Some browsers support TLS 1.2 but have the support disabled by default. If you set the value of the `nist.sp800-131a.strict` parameter to true, and your browser is not configured to support TLS 1.2, you lose access to the appliance LMI.

   b. On the LMI, select **System > System Settings > Advanced Tuning Parameters.**
   c. Select `nist.sp800-131a.strict`. Select **Edit**. Change the value to `true`.
3. Determine whether your deployment uses basic authentication or client certificate authentication, for communication between Advanced Access Control and the point of contact server.
   - If you use basic authentication, the configuration is complete.
   - If you use client certificate authentication, continue with the next section.

Client certificate configuration for strict mode

If you use client certificate authentication on the point of contact server, you must configure it to be in compliance with NIST SP800-131a strict mode.

To comply with strict mode, configure the point of contact server to use TLS v.1.2 for client certificate authentication.

You must create a self-signed certificate, and configure the point of contact server to use TLS v1.2 with the runtime security services external authorization service (EAS). Complete each of the following tasks:

1. Create a self-signed certificate.
   - Review the "Before you begin" section of “Configuring runtime security services for client certificate authentication” on page 17. Select one of the following actions, as fits your deployment:
     – If your deployment uses Web Reverse Proxy, follow the instructions in “Configuring runtime security services for client certificate authentication” on page 17. In Step 1 “Create a client certificate for user easusercert", specify:

       ```
       Signature Algorithm: SHA2withRSA
       ```

     – If your deployment uses WebSEAL:

       Manually create a self-signed certificate. To specify a NIST-compliant algorithm, use an external utility such as **`gsk7ikm`**. Open the `pd.srv` certificate database, and create a self-signed certificate with these credentials:

       ```
       Certificate Label: easusercert
       Certificate Distinguished Name: cn=easuser
       Key Size: 2048
       Expiration Time (in days): 365
       Signature Algorithm: SHA2withRSA
       ```

       Note:

       - The user cn=easuser is the built-in user, but any user with sufficient permissions (as created by the Advanced Access Control administrator) can be used instead.
       - It is not mandatory that WebSEAL has FIPS 140-2 mode configured in order to communicate with the Advanced Access Control server. However, to comply with NIST SP800-131a strict mode, client certificate authentication between WebSEAL and the server must be over TLS v1.2.

- See the WebSEAL information in the IBM Knowledge Center for complete information on configuring client certificate authentication.

2. Configure the point of contact server to use TLS v1.2 with the Runtime Security Services External Authorization Service (EAS)

   The point of contact server uses the EAS to process authorization requests. The default EAS setting for communication specifies Secure Sockets Layer (SSL) v2, which is not supported by Advanced Access Control when it operates in NIST SP800-131a strict mode. If you do not adjust the configuration setting for the EAS, the authorization request (and the regular ping call) does not succeed.

   Select the action that fits your deployment:

   - If you deploy your point of contact server on the same computer as the appliance:

     a. In the Advanced Access Control local management interface, select **Reverse Proxy Settings > *your_instance_name* > Manage > Configuration > Edit** to open the configuration file. Add the following parameter to the existing stanza:

     ```
     [rtss-cluster:cluster1]
     gsk-attr-name = enum:438:1
     ```

     b. Click **Save**. Deploy the changes. Restart the instance.

   - If you deploy your point of contact server on a different computer from the appliance:

     a. Open the WebSEAL instance configuration file for editing. For example: `/opt/pdweb/etc/webseald-appliance-default.conf`.

     b. Add the following parameter to the existing stanza:

     ```
     [rtss-cluster:cluster1]
     gsk-attr-name = enum:438:1
     ```

   .

Chapter 9. Authentication

Security Verify Access provides user authentication functions that allow for simple and complex authentication scenarios.

The users who want to access your protected resources can be challenged to provide credentials to authenticate with the various authentication technologies that are supported by Security Verify Access. The component responsible for this capability is called the Authentication Service. The Authentication Service consists of a framework you can use to enforce the execution of various supported authentication mechanisms to authenticate users.

Authentication mechanisms are modules that authenticate the user with a specific challenge or authentication technology, such as user name and password and one-time password. The order on which the authentication mechanisms are run is controlled by an authentication policy. An authentication policy is an XML document that you create with the authentication policy editor. The authentication policy dictates the order of authentication mechanisms to execute.

During an authentication event, the Authentication Service manages the execution of the authentication policy that is required for the event. Each authentication mechanism is included on the authentication policy workflow. This workflow is started by the Authentication Service authentication policy. After the user successfully authenticates to all of the authentication mechanisms that are required by the authentication policy, the Authentication Service generates a user credential. This user credential creates an authenticated session for the user at the point of contact.

The administrator can determine what information is included in the credential by configuring the authentication policy. The authentication policy editor provides a credential editor that an administrator can use to specify the attributes to be included in the resulting credential.

The generated credential contains:

- **`authenticationTypes`** and **`authenticationMechanismTypes`** attributes to indicate the authentication policies.
- Authentication mechanisms that are completed during the authenticated session.

The administrator can use **`authenticationTypes`** and **`authenticationMechanismTypes`** attributes to author an access control policy to require:

- The user to authenticate through an authentication policy or mechanism once per policy.
- The user to authenticate every time they access the protected resource.

The Authentication Service supports two flows of execution:

- Enforcement of an authentication event as a result of an access control evaluation.
- Request the user to authenticate as a result of either:
  - A point of contact access control list (ACL).
  - A protected object policy (POP) evaluation.

Authentication mechanisms

Security Verify Access provides the following authentication mechanisms:

One-time password authentication mechanisms

A one-time password is a password that is generated for an authentication event and is valid for one use. The one-time password authentication capability in Security Verify Access provides the following features:

- One-time password generation and validation with support for various implementations as provided.
- One-time password delivery with email and short message service (SMS) implementation.

- Time-based, counter-based, and RSA one-time password generation and validation that requires no delivery mechanism.

The one-time password authentication mechanisms are described in the following table.

Mechanism	Description
One-time password authentication	Users provide a one-use password that is generated for an authentication event and is typically communicated between the client and the server through a secure channel. The OTP mechanism groups all the supported one-time passwords methods in a single flow and ask the user to select which one-time password method to use to login. The user can select from the supported one-time password authentication methods: • HOTP • TOTP • RSA OTP • MAC OTP with SMS delivery • MAC OTP with email delivery
MAC One-time password authentication	Users provide a one-use password that is generated for an authentication event and is typically communicated between the client and the server through a secure channel. The MAC mechanism generates one-time passwords by randomly drawing one character at a time from the configured character set until the configured number of characters are drawn. The MAC mechanism also stores the generated one-time passwords in the configured one-time password store plug-in. Each one-time password is salted and hashed before it is stored in the configured one-time password store plug-in. The user can select from the supported MAC one-time password authentication methods: • MAC OTP with email delivery. The email delivery sends the email address of the user and the one-time password in a message, whose MIME type is text/plain, to the configured SMTP Server. The SMTP Server then sends the one-time password to the user by email. The product does not provide an SMTP Server. You must configure your own SMTP Server. • MAC OTP with SMS delivery. The SMS Delivery first sends the phone number of the user and the one-time password in an HTTP POST request, whose content type is `application/x-www-form-urlencoded`, to the configured SMS Gateway. The SMS Gateway then sends the one-time password to

Mechanism	Description
	the user through SMS. The product does not provide an SMS Gateway. You must configure your own SMS Gateway. This mechanism also supports the one-time password mapping rules.
HOTP One-time password authentication	Users provide a one-use password that is generated for an authentication event. The one-time password is generated by the HOTP method.
TOTP One-time password authentication	Users provide a one-use password that is generated for an authentication event. The TOTP mechanism generates one-time passwords by using a specified algorithm with a time-based one-time password application. Passwords are not communicated or stored, but are verified as a match between server and client as they are regenerated at regular intervals.
RSA One-time password authentication	Users provide a one-use password that is generated for an authentication event. The RSA mechanism works with an RSA SecurID Authentication Manager and passcode generator. You must own the RSA Authentication Manager product to use RSA as a mechanism. The RSA Authentication Manager and passcode generator generates a passcode every 30 - 60 seconds. The user name and passcode are supplied by the user and passed to the RSA Authentication Manager. The RSA Authentication Manager makes a decision and returns it to Security Verify Access, which relays the decision back to the user.

Username and Password mechanism
Users provide a user name and password.

HTTP Redirect mechanism
Use this mechanism to integrate a custom authentication mechanism into the workflow of an authentication policy. Users provide credentials that are required by the custom authentication mechanism.

Consent to device registration mechanism
Users provide consent to allow their device to be registered.

FIDO Universal 2nd Factor mechanism
Users authenticate through the use of registered FIDO Universal 2nd Factor tokens.

FIDO2/WebAuthn mechanism
Users authenticate through the use of registered FIDO2/WebAuthn authenticators.

FIDO2/WebAuthn registration mechanism
Users can register FIDO2/WebAuthn authenticators.

Decision JavaScript mechanism
This mechanism is used to run JavaScript rules during branching policies.

Authentication policies

By grouping the provided authentication mechanisms into the workflow of an authentication policy, you can achieve several types of authentication:

- Simple authentication

  Users provide basic identifying information such as a user name and password.

- Step-up authentication

  Users provide a specific type of credential usually to access sensitive resources. The users might be challenged to authenticate and provide an extra set of credentials to prove that they are allowed to access sensitive resources.

- Multi-factor authentication

  Users provide more than one type of credential to access a protected resource.

Each authentication policy has a unique identifier that you can use with an access policy or to start the authentication service directly without any prior access policy invocation.

Web-based authentication

For web-based authentication (using HTML template files and responses)

```
/mga/sps/authsvc?PolicyId=urn:ibm:security:authentication:asf:<Unique PolicyId>
/mga/sps/authsvc/policy/<Unique PolicyId>
```

For example, the TOTP can be started like this:

```
/mga/sps/authsvc?PolicyId=urn:ibm:security:authentication:asf:totp
/mga/sps/authsvc/policy/totp
```

When the policy runs, it cycles based on a rolling `StateId` parameter, on either the policy URL or the query string of the `authsvc` URL, depending on how it is started.

For example, `/mga/sps/authsvc/policy/totp?StateId=cf845efa-52d0-4296-a524-9028acba4108` or `/mga/sps/authsvc?StateId=cf845efa-52d0-4296-a524-9028acba4108`.

REST API-based authentication

For REST based authentication (Using JSON Template files and responses). This is suitable for use from Single Page Applications making ajax requests or other REST clients. For more information, see Authentication Service Framework for REST API clients.

```
/mga/sps/apiauthsvc?PolicyId=urn:ibm:security:authentication:asf:<Unique PolicyId>
/mga/sps/apiauthsvc/policy/<Unique PolicyId>
```

For example, the TOTP policy can be started like this:

```
/mga/sps/apiauthsvc?PolicyId=urn:ibm:security:authentication:asf:totp
/mga/sps/apiauthsvc/policy/totp
```

When the policy runs, it cycles based on a rolling `StateId` parameter, on either the policy URL or the query string of the `authsvc` URL, depending on how it is started.

For example, `/mga/sps/apiauthsvc/policy/totp?StateId=cf845efa-52d0-4296-a524-9028acba4108` or `/mga/sps/apiauthsvc?StateId=cf845efa-52d0-4296-a524-9028acba4108`.

Note: Query string invocation can be disabled through the advanced configuration parameter: `sps.authService.policyKickoffMethod`.

This allows administrators to set or use ACLs or POPs and CBA policy to prevent access to certain Authentication policies where necessary.

Authentication Service configuration overview

Most of the configuration that is associated with the authentication service and the supported authentication mechanisms is pre-configured on the appliance. In most scenarios, this configuration is adequate. However, some scenarios require customization to meet your requirements.

You can configure the following components to customize the authentication support:

- Configure the point of contact settings.
- Customize the authentication mechanism settings.
- Modify the template pages to customize how you interact with your users.

Point of contact settings

You can configure the point of contact in the **Advanced Configuration** settings of the local management interface. For more information, see the configuration settings that begin with `poc.` in Managing Advanced Configuration.

This version of the Security Verify Access simplified the configuration that is required for the authentication service. Previous versions relied on a list of preconfigured authentication callbacks to determine the authentication flow. The addition of the new authentication policy format eliminated the need to rely on the authentication level value to determine the order of execution of the authentication mechanisms. The execution of an authentication event now depends on the content of the authentication policy. You can configure the Authentication Service to allow reauthentication. If enabled, the Authentication Service runs all the authentication mechanisms included on the authentication policy regardless of a pre-existing authentication session.

Access policy scenario configuration

This scenario is almost fully configured when you complete deployment and run activation and **`isamcfg`**. To enable this scenario:

1. Create an access policy that references any of the authentication policies that are provided.
2. Attach the access policy to the resource that you want to protect.

No further configuration is needed.

Web Gateway Appliance step-up authentication scenario

This scenario requires a set of manual steps to enable it when you complete deployment and run activation and **`isamcfg`**. This scenario relies on an ACL or POP on the point of contact configuration to initiate the policy execution. The user must complete an authentication policy flow when the policy requires that the user step up to a higher authentication. This setup is specific to and dependent on the point of contact technology you are using in your environment. To configure the Web Gateway Appliance to enable this scenario, see “Configuring step-up authentication” on page 32.

Web Gateway Appliance authentication scenario

This scenario requires a set of manual steps to enable it when you complete deployment and run activation and **`isamcfg`**. This scenario relies on an ACL or POP on the point of contact configuration to initiate the policy execution. The user must complete an authentication policy flow when the policy requires that the user authenticate. This setup is specific to and dependent on the point of contact technology you are using in your environment. To configure the Web Gateway Appliance to enable this scenario, see “Configuring authentication” on page 34.

Authentication mechanism settings

You can modify authentication mechanism settings through the local management interface. See the configuring topics for the authentication mechanisms you want to use:

- “Configuring a TOTP one-time password mechanism” on page 37
- “Configuring an HOTP one-time password mechanism” on page 35
- “Configuring an RSA one-time password mechanism” on page 41
- “Configuring a MAC one-time password mechanism” on page 39
- “Configuring consent to device registration” on page 52
- “Configuring an HTTP redirect authentication mechanism” on page 50
- “Configuring username and password authentication” on page 48
- “Configuring an End-User License Agreement authentication mechanism” on page 53
- “Configuring a Knowledge Questions authentication mechanism ” on page 62

For advanced customization of the authentication service or the one-time password generation, delivery, and verification, you can customize the mapping rules. See “Managing mapping rules” on page 73.

Template configuration

Many HTML pages and XML documents are provided to interact with your users. The pages prompt users for authentication information, provide them with one-time passwords, or notify them of errors during authentication. For information about customizing the template pages, see Managing template files.

Authentication configuration scenarios

Use the configuration scenarios to create a custom configuration for your environment.

Configuring step-up authentication

The appliance reverse proxy server can be configured to use the authentication service for step-up authentication. The user is required to complete an authentication policy flow when the policy (ACL or POP) dictates that the user steps up to a higher authentication level.

About this task

This task applies to both the Web Gateway appliance and the Security Verify Access appliance.

Procedure

1. Configure the appliance with the **isamcfg** tool. See “Using the isamcfg tool” on page 87 .
2. Modify the appliance `stepuplogin.html` file so that it redirects the authentication request to the Security Verify Access Authentication Service.
   a) Locate the `stepuplogin.html` file.
      For information about working with reverse proxy pages, see HTML server response page modification.
   b) Edit the file to insert the following code in the JavaScript section of the file. Optionally, to indicate where to send the user agent after successful authentication, pass the **Target** query string parameters, which is the default.
      For example:

```
var authnlevel="%AUTHNLEVEL%";
if (authnlevel == "2"){
  window.location = "https://<HOST>:<PORT>/<JUNCTION>
     /sps/authsvc?Target=%HTTPS_BASE%%URL_ENCODED%&PolicyId=<POLICY_ID>";
}
```

Where:

HOST

The host name for the reverse proxy instance.

PORT

The port number for the reverse proxy instance.

JUNCTION

The Advanced Access Control junction name. For example: `mga`.

POLICY_ID

The authentication policy identifier to execute when the user is requested to step up.

The following example uses one-time password as the step-up mechanism:

```
var authnlevel="%AUTHNLEVEL%";
if (authnlevel == "2"){
   window.location = "https://example.com/mga/
     sps/authsvc?Target=%HTTPS_BASE%%URL_ENCODED%&PolicyId=urn:ibm:security:
     authentication:asf:otp";
}
```

3. Restart the appliance.
4. Verify the configuration:
   a) Create a test user account.
   For example:

   ```
   pdadmin> user create john cn=john, dc=iswga John Doe password
   ```

   b) Activate the account.
   For example:

   ```
   pdadmin> user modify john account-valid yes
   ```

   c) Create a test resource that is protected with level 2 authentication and place it in the document root of the appliance reverse proxy server.
   For example:

   ```
   /junction-root/test.html
   ```

   For information about working with reverse proxy pages, see HTML server response page modification

   d) Try accessing that resource through the appliance reverse proxy server.
   For example:

   ```
   https://mga.example.com/test.html
   ```

   A web form is displayed and prompts you to enter the user name and password.

   e) Enter the credential that you created in step “4.a” on page 33. The contents of the resource is displayed.

   f) Create a Protected Object Policy (POP) with a level 2 authentication.
   For example:

   ```
   pdadmin> pop create level2only
   pdadmin> pop modify level2only set ipauth anyothernw 2
   ```

   g) Attach the POP to the protected resource that you created in step “4.c” on page 33.
   For example:

   ```
   pdadmin> pop attach /WebSEAL/mga.example.com-default/
      test.html level2only
   ```

h) Open a new browser session and try accessing the test resource again. A web form is displayed and prompts you to enter the user name and password.

i) Enter the credential for the test user. You are forwarded to the extended authentication endpoint. You are now starting the authentication policy.

j) Enter the required credentials to complete the authentication policy. If you authenticate successfully, you are redirected to back to the test resource and you can access the contents of the resource.

Configuring authentication

The appliance reverse proxy server can be configured to use the authentication service for authentication. The user will be required to complete an authentication policy flow when the Security Verify Access policy (ACL or POP) dictates that the user authenticates.

Procedure

1. Configure the appliance using the **isamcfg** tool. See “Using the isamcfg tool” on page 87 .
2. Modify the appliance `login.html` so that it redirects the authentication request to the Security Verify Access Authentication Service.
   a) Locate the `login.html` file on the appliance.

      For information about working with reverse proxy pages, see HTML server response page modification.

   b) Open the file in a text editor and insert a meta-tag refresh tag to send the request to the authentication service. Optionally, to indicate where to send the user agent after successful authentication, pass the **Target** query string parameters, which is the default.
   For example:

```
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML//EN">
<HTML>
<HEAD>
<meta http-equiv="refresh" content="2;url=https://<HOST>:<PORT>/<JUNCTION>/
  sps/authsvc?Target=%HTTPS_BASE%%URL_ENCODED&PolicyId=<POLICY_ID>">
<TITLE>Access Manager for Web Login</TITLE>
</HEAD>
<BODY BGCOLOR="#FFFFFF" TEXT="#000000">
</BODY>
</HTML>
```

   Where:

   HOST

   The host name for the reverse proxy instance.

   PORT

   The port number for the reverse proxy instance.

   JUNCTION

   The Advanced Access Control junction name. For example: `mga`.

   POLICY_ID

   The authentication policy identifier to execute when the user is requested to step up.

   The following example uses user name and password as the login mechanism:

```
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML//EN">
<HTML>
<HEAD>
<meta http-equiv="refresh" content="2;url=https://example.com/mga/
  sps/authsvc?Target=%HTTPS_BASE%
%URL_ENCODED%&PolicyId=urn:ibm:security:authentication:asf:password">
<TITLE>Access Manager for Web Login</TITLE>
</HEAD>
<BODY BGCOLOR="#FFFFFF" TEXT="#000000">
```

```
</BODY>
</HTML>
```

3. Restart the appliance.
4. Verify the configuration:
   a) Create a test user account.
   For example:

   ```
   pdadmin> user create john cn=john,dc=iswga John Doe password
   ```

   b) Activate the account.
   For example:

   ```
   pdadmin> user modify john account-valid yes
   ```

   c) Create a test resource that is protected with the `isam_mobile_anyauth` ACL and place it in the document root of WebSEAL.
   For example:

   ```
   junction-root/test.html
   ```

   For information about working with reverse proxy pages, see HTML server response page modification

   d) Attach the `isam_mobile_anyauth` ACL to the protected resource.
   For example:

   ```
   pdadmin> acl attach /WebSEAL/mga.example.com-default/test.html
            isam_mobile_anyauth
   ```

   e) Open a new browser session and try accessing the test resource. You are forwarded to the authentication service endpoint. You are now starting the authentication policy.
   f) Enter the required credentials to complete the authentication policy. If you authentication successfully, you are redirected to the test resource and you can access the contents of that resource.

Configuring an HOTP one-time password mechanism

The HOTP one-password mechanism relies on a public algorithm to generate the one-time password.

About this task

The HOTP client solution and Security Verify Access use the same algorithm to generate the one-time password value. No interaction is required between the client software and the Security Verify Access solution. The algorithm uses a shared secret key and a counter to generate the one-time password value. Every time a new one-time password is generated, the counter value increments on both server and client solutions. No delivery of the one-time password is required.

This task describes the steps and properties for configuring a HOTP mechanism. For information about configuring other providers, see:

- “Configuring a MAC one-time password mechanism” on page 39
- “Configuring a TOTP one-time password mechanism” on page 37
- “Configuring an RSA one-time password mechanism” on page 41

Note: When users attempt to log in using HOTP or TOTP and submit an incorrect one-time password, they receive one strike against their account. This strike remains on their account for a configurable duration. By default, the duration is 10 minutes. After that duration, the strike is removed from their account. When users submit multiple incorrect one-time passwords, they can reach a maximum and are then prevented from making another attempt until one of their strikes expires. By default, the maximum is 5. If the users log in successfully, any strikes on their account are cleared. Strikes are shared between TOTP and

HOTP. For example, if the users made two incorrect attempts using TOTP, those strikes count against them on HOTP as well. Because user retries affect only TOTP and HOTP logins, users who exceeded password attempt using those logins can still use other OTP provider logins or basic username/password authentication. You can modify the password retry settings through the Advanced Configuration settings in the local management interface. For more information, see "Managing advanced configuration" on page 232.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **HOTP One-time Password**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

HOTP

Max Counter Lookahead
The number of times to increment the counter to see whether the one-time password is valid before stopping. Any non-negative number is valid.

The default is 25.

Password Length
The length of the generated one-time passwords, which can be 6 - 9 characters or numbers.

The default is 6.

Generation Algorithm
The algorithm that is used to generate the one-time password. Valid options include the following algorithms:

- `HmacSHA1`
- `HmacSHA256`
- `HmacSHA512`

The default is `HmacSHA1`.

Secret key URL

The URL that is used to deliver the secret key. The QR code is also generated using this URL. The URL format might include information specific to your environment, such as your company name.

The default URL is:

```
otpauth://hotp/Example:@USER_NAME@?secret=@SECRET_KEY
@&issuer=Example&counter=0
```

The URL supports the following macros and may be positioned wherever their corresponding values belong.

@SECRET_KEY@
The secret key.

@USER_NAME@
The user name of the authorized user who logs in.

@ALGORITHM@
The one-time password generation algorithm.

@DIGITS@
The one-time password length.

A secret key URL example to utilize all macros is:

```
otpauth://hotp/Example:@USER_NAME@?secret=@SECRET_KEY@&issuer=Example
&counter=0&algorithm=@ALGORITHM@&digits=@DIGITS@
```

Secret key attribute name
The attribute name that is used for storage of the HOTP secret key in the database.

Data type: String

Example: `otp.hmac.hotp.secret.key`

Secret key attribute namespace
The attribute namespace of the HOTP secret key. The namespace in combination with the attribute name constitutes the unique identifier for the attribute in the database.

Data type: String

Example: `urn:ibm:security:otp:hmac`

9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy changes when you are finished. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Configuring a TOTP one-time password mechanism

The TOTP one-password mechanism relies on a public algorithm to generate the one-time password.

About this task

The TOTP client solution and the Security Verify Access use the same algorithm to generate the one-time password value. No interaction is required between the client software and the Security Verify Access solution. The algorithm uses a shared secret key and the time to generate the one-time password value. No delivery of the one-time password is required.

This task describes the steps and properties for configuring a TOTP mechanism. For information about configuring other one-time password providers, see:

- “Configuring a MAC one-time password mechanism” on page 39
- “Configuring an HOTP one-time password mechanism” on page 35
- “Configuring an RSA one-time password mechanism” on page 41

Note: When users attempt to log in using HOTP or TOTP and submit an incorrect one-time password, they receive one strike against their account. This strike remains on their account for a configurable duration. By default, the duration is 10 minutes. After that duration, the strike is removed from their account. When users submit multiple incorrect one-time passwords, they can reach a maximum and are then prevented from making another attempt until one of their strikes expires. By default, the maximum is 5. If the users log in successfully, any strikes on their account are cleared. Strikes are shared between TOTP and HOTP. For example, if the users made two incorrect attempts using TOTP, those strikes count against them on HOTP as well. Because user retries affect only TOTP and HOTP logins, users who exceeded

password attempt using those logins can still use other OTP provider logins or basic username/password authentication. You can modify the password retry settings through the Advanced Configuration settings in the local management interface. For more information, see “Managing advanced configuration” on page 232.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **TOTP One-time Password**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

TOTP

Generation Interval (seconds)
The number of seconds an interval lasts. This number determines how long a one-time password is active before the next one-time password generates.

The default is `30`.

Password Length
The length of the generated one-time passwords, which can be 6 - 9 characters or numbers.

The default is 6.

Skew Intervals
The skew intervals of the algorithm. The skew intervals consider any possible synchronization delay between the server and the client that generates the one-time password. For example, a skew interval of 2 means a one-time password in up to two intervals in the past, or two in the future are valid. For example, if it is interval 563, and intervals are 30 seconds, then one-time passwords for intervals 561-565 are computed and checked against within a range of 2.5 minutes.

The default is 1.

One Time Use
Whether to cache one-time passwords if they are used to successfully log in. If set to `true`, then the reuse of a one-time password is prevented while it is in cache.

The default is `true`.

Generation Algorithm
The algorithm that is used to generate the one-time password. Valid options include the following algorithms:

- `HmacSHA1`
- `HmacSHA256`
- `HmacSHA512`

The default is `HmacSHA1`.

Secret key URL

The URL that is used to deliver the secret key. The QR code is also generated using this URL. The URL format might include information specific to your environment, such as your company name.

The default URL is:

```
otpauth://totp/Example:@USER_NAME@?secret=@SECRET_KEY@&issuer=Example
```

The URL supports the following macros and may be positioned wherever their corresponding values belong.

@SECRET_KEY@
The secret key.

@USER_NAME@
The user name of the authorized user who logs in.

@ALGORITHM@
The one-time password generation algorithm.

@DIGITS@
The one-time password length.

@PERIOD@
The one-time password generation interval.

A secret key URL example to utilize all macros is:

```
otpauth://totp/Example:@USER_NAME@?secret=@SECRET_KEY@&issuer=Example
&algorithm=@ALGORITHM@&digits=@DIGITS@&period=@PERIOD@
```

Secret key attribute name
The attribute name that is used for storage of the TOTP secret key in the database.

Data type: String

Example: `otp.hmac.totp.secret.key`

Secret key attribute namespace
The attribute namespace of the TOTP secret key. The namespace in combination with the attribute name constitutes the unique identifier for the attribute in the database.

Data type: String

Example: `urn:ibm:security:otp:hmac`

9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy changes when you are finished. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Configuring a MAC one-time password mechanism

A one-time password is valid for one session or login. The MAC password is generated by Security Verify Access and can be delivered to the user through Short Message Service (SMS) or e-mail.

About this task

This task describes the steps and properties for configuring a MAC mechanism. For information about configuring other providers, see:

- “Configuring an HOTP one-time password mechanism” on page 35
- “Configuring a TOTP one-time password mechanism” on page 37
- “Configuring an RSA one-time password mechanism” on page 41

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **MAC One-time Password**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

MAC

Password Character Set
The character set from which the characters in the one-time password are generated.

The default is `0123456789`.

Password Length
The length of the characters in the one-time password.

The default is `6`.

Store Entry Hash Algorithm
The hash algorithm that is used for hashing the one-time password before it is stored in the one-time password store plug-in. The supported algorithms are:

- `SHA1`
- `SHA-256`
- `SHA-512`

The default is `SHA-256`.

Store Entry Lifetime (seconds)
The length of time that the one-time password is stored. The lifetime is in seconds.

The default is `300`.

Delivery Selection Template Page
Override the path of the delivery selection template page that displays the list of methods for generating, delivering, and verifying the one-time password. Allows for the page branding or user experience to be customized.

If no path is specified, the default path `/authsvc/authenticator/macotp/delivery_selection.html` is used.

Login Template Page
Override the path of the login template page that displays the form where the user can enter the MAC one-time password. Allows for the page branding or user experience to be customized.

If no path is specified, the default path `/authsvc/authenticator/macotp/login.html` is used.

Error Template Page
Override the path of the error template page that displays errors during the MAC one-time password authentication. Allows for the page branding or user experience to be customized.

If no path is specified, the default path `/authsvc/authenticator/macotp/error.html` is used.

9. Click **Save**.

What to do next

When you configure one-time password providers, a message indicates that changes have not been deployed. If you have finished making changes, deploy them. For more information, see Chapter 15, "Deploying pending changes," on page 221.

Next, consider configuring the delivery methods for the one-time password. Both SMS and Email delivery are enabled but you will want to configure the delivery properties, such as SMTP server or connection URL, for your environment. See "Configuring one-time password delivery methods" on page 44.

Configuring an RSA one-time password mechanism

A one-time password is valid for one session or login. To use RSA as a mechanism, you must own RSA Authentication Manager. The server and the client generate the passwords with the same algorithm.

Before you begin

Complete the following steps.

1. On your RSA server, generate the following files:

   sdconf.rec
   The configuration file for connecting to the RSA Authentication server.

   sdopts.rec
   The configuration properties file that contains optional configurations for load balancing.

2. See your RSA Authentication server documentation for details on creating these files and use the following guidelines:

   - On the appliance, you must specify an Agent Network Interface. See Agent Network Interface in step "8" on page 42. If you connect the RSA server to the appliance by using an application network interface with multiple IP addresses, list all the IP addresses in the **Alternate IPs** box on the RSA server.
   - For **Agent type**, choose **Standard**.
   - **Agent Auto-Registration** must be enabled when the first RSA one-time password authentication is performed. You can disable it after the first successful authentication is completed.

   Note: The RSA one-time password mechanism does not support replication of the RSA session information through the cluster environment. The session information is local to each cluster node and the environment must be configured to enforce session affinity between the client and the cluster node.

3. Move or copy the generated files from the RSA server to the appliance.

About this task

This task describes the steps and properties for configuring an RSA mechanism. For information about configuring other providers, see:

- "Configuring an HOTP one-time password mechanism" on page 35
- "Configuring a MAC one-time password mechanism" on page 39
- "Configuring a TOTP one-time password mechanism" on page 37

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **RSA One-time Password**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

   Agent Network Interface
   The name of the network interface that the RSA Agent is using to connect to the RSA server.

   Required: Yes

   Data type: String

   Valid interface values:

   - `1.1`
   - `1.2`
   - `1.3`
   - `1.4`

   Note: If you are using the RSA mechanism in a cluster environment and use an application interface with multiple IP addresses defined for that interface, use the RSA console to add all of those IP addresses to the allowlist. See the RSA documentation for information about adding IP addresses to the allowlist.

   Example: `1.1`

   Server Exchange Initial Timeout
   The initial timeout coefficient in milliseconds used to calculate the timeout of the request.

   Required: No

   Data type: Integer

   Example: `1000`

   Server Exchange Timeout Offset
   The offset timeout coefficient in milliseconds used to calculate the timeout of the request.

   Required: No

   Data type: Integer

   Example: `200`

   Server Exchange Timeout Increment
   The increment coefficient in milliseconds used to calculate the timeout of the request.

   Required: No

   Data type: Integer

   Example: `100`

Event Log Level
The minimum event level to be logged. Events below the level that is specified in this property are not logged.

The events in order from lowest level to highest are:

a. OFF
b. DEBUG
c. INFO
d. WARN
e. ERROR
f. FATAL

Required:

Data type: String

Example: INFO. If this property is set to INFO, the DEBUG errors are not logged.

Enable Debug Tracing
The property that enables debug tracing.

Required: No

Data type: Boolean

Example: FALSE. If set to FALSE, debug tracing is not enabled.

Trace Function Entries
The property that enables tracing of function entries.

Required: No

Data type: Boolean

Example: FALSE. If set to FALSE, function entries are not traced.

Trace Function Exits
The property that enables tracing of exits.

Required: No

Data type: Boolean

Example: FALSE. If set to FALSE, exits are not traced.

Trace Flow Statements
The property that enables tracing of flow statements.

Required: No

Data type: Boolean

Example: FALSE. If set to FALSE, flow statements are not traced.

Trace Regular Statements
The property that enables tracing of regular statements.

Required: No

Data type: Boolean

Example: FALSE. If set to FALSE, regular statements are not traced.

Trace Location
The property that enables the class name and line number to be displayed in the trace.

Required: No

Data type: Boolean

Example: FALSE. If set to FALSE, class name and line number are not displayed.

Session Timeout
The length of time, in seconds, that a connection to the RSA Authentication Manager server remains open before it times out when a user attempts to authenticate.

Required: No

Data type: Integer

Example: 1800

9. Click the **Agent Files** tab.
10. Select a file in the table the corresponds to the file you generated on the RSA server.
11. Click **Upload** to upload the file or **Clear** to remove the contents of the selected file.
    The status area indicates one of three statuses:

    Not uploaded
    Upload is not completed.

    Last upload date
    Upload was completed on date indicated.

    Auto-generated
    The SecurID was automatically generated instead of uploaded.

    Repeat this step until all of your files have been uploaded to the appliance.
12. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy changes when you are finished. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Configuring one-time password delivery methods

Passwords can be delivered to the user through Short Message Service (SMS) or email.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click the delivery type.
   - **SMS One-time Password**
   - **Email One-time Password**
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the delivery method.

SMS

Basic Authentication User Name

The username that is used in HTTP Basic authentication.

SMS Delivery does not perform the HTTP basic authentication if this configuration is not specified.

Required: False

Multi-value: No

Example: `username`

Basic Authentication Password

The password that is used in HTTP basic authentication.

SMS Delivery does not perform HTTP Basic authentication if this configuration is not specified.

Required: False

Multi-value: No

Example: `password`

Connection URL

The URL of the SMS Gateway where the phone number of the user and the one-time password is sent.

Required: True

Multi-value: No

Example: `https://smsgateway.tfim.example.com/`

HTTP Request Parameters

The list of name and value pairs that is included in the body of the **HTTP POST** request to the SMS Gateway. In each pair, the name and the value must be separated by equal sign.

Two macros, **$DEST_NO$** and **MSG,** are replaced by the phone number of the user and the content of the SMS. These two macros can be used only as value in the name and value pair.

Required: True

Multi-value: Yes

Example:

- `From=+0123456789`
- To= *$DEST_NO$*
- Body= *MSG*

Success HTTP Response Body Regex Pattern

This parameter defines the Java™ regular-expression pattern that matches the HTTP response body that is returned by the SMS Gateway. When the match is successful, the SMS delivery is successful.

The default value is empty.

The default behavior is that the HTTP response body is not going to be matched against any Java regular-expression and the success or failure decision is going to be based on the `SuccessHTTP ReturnCode` value only.

Note: If the HTTP response from the SMS Gateway does not contain a body, this matching is not performed.

Required: False

Multi-value: No

Example:

- When the body of all responses by the SMS Gateway contains either `Success` or `Failure` followed by no newline character, the sample `SuccessHTTP Response BodyRegex Pattern` value is

```
Success
```

- When the body of all responses by the SMS Gateway contains the following text:

```
MGDID=TTTT
TTTTTTTTT
RESPONSE
CODE=NNN
SMS=TTTTTTT
TTTTTTTT
TTTTTTT
DATE=NNNNNNNN
```

where each line ends with the `\n` character without any preceding `\r` character, and the RESPONSECODE is defined such that a three-digit number from 0 to 199 indicates success, the sample `SuccessHTTP ResponseBody RegexPattern` value is

```
(?s).*

RESPONSE
CODE=(\d{1,2}
|[0-1]{1}
\d{2})\n.*
```

Success HTTP Return Code

The response code from the SMS Gateway that is an acknowledge
ment from the SMS Gateway that the request is successfully processed.

The default `SuccessHTTP ReturnCode`, which is 200, is used when this configuration is not specified.

Note: The `SuccessHTTP ReturnCode` match must be successful before this matching is done.

Required: False

Multi-value: No

Example: `200`

HTTPS Trust Store

The keystore that validates the SMS Gateway SSL certificate.

This configuration must be specified only when SMS Delivery communicates with the SMS Gateway by using HTTPS.

Required: False

Multi-value: No

Example: `rt_profile_keys`

Client Authentication Key

The keystore and certificate that are used as client certificate in SSL Client authentication in the format:

`keystore_alias`

Where keystore is the name of the keystore to use and alias is the label of the certificate in the keystore.

SMS Delivery does not perform SSL Client authentication if this configuration is not specified.

Required: False

Multi-value: No

Example: `rt_profile_keys_smscert`

Email

Sender Email
The email address that is used as the sender of the email that is sent to the user.

Required: True

Multi-value: No

Example: `otp_emailer@example.com`

SMTP Host Name
The host name of the SMTP Server.

Required: True

Multi-value: No

Example: `smtpserver.tfim.example.com`

SMTP User Name
The username that is used in SMTP authentication.

Required: False

Multi-value: No

Example: `username`

SMTP Password
The password that is used in SMTP authentication.

Required: False

Multi-value: No

Example: `password`

Use SSL
Use SSL for the connection to the SMTP server.

Required: True

Multi-value: No

Example: `false`

Enable STARTTLS
Defines whether STARTTLS will be used to negotiate TLS to the SMTP server.

Required: True

Default: false

Type: Boolean

TLS protocol
TLS protocol to be used when connecting to the SMTP server.

Required: True

Default: TLS

Type: String

9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy changes when you are finished. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Configuring username and password authentication

The user name and password authentication mechanism authenticates users with their user name and password credentials that are stored in the Verify Access user repository.

Before you begin

This authentication mechanism uses the user registry that is configured as part of the runtime component settings. Ensure that you configured this registry before you use the mechanism. See Chapter 4, “Managing the runtime component,” on page 13.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **Username Password**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

LDAP Bind DN

An LDAP account with sufficient rights to update the user registry entries. For example: `cn=SecurityMaster,secAuthority=Default`

One method for creating such an account is using the **pdadmin** command. For example:

```
user create no-password-policy testapi cn=testapi,secAuthority=Default
  testapi api passw0rd (SecurityGroup ivacld-servers remote-acl-users)
```

Data type: String

LDAP Bind Password

The LDAP bind password.

Data type: String

LDAP Host Name

The host name of the LDAP server.

Data type: String

LDAP Port

The port number of the LDAP server.

Data type: String

Default: 389

Management Domain

The Security Verify Access Management Domain name. This name is used to determine the location of subdomain in the registry. Subdomains are located relative to the Management Domain LDAP location.

Data type: String

Default: `Default`.

SSL Enabled
Set this option to true to enable SSL to the LDAP server.

Data type: Boolean

Default: `False`.

SSL Trust Store
The keystore that contains the trusted CA signers for the LDAP server certificate.

Specify an SSL trust store if you use one of the following LDAP registry scenarios for user name and password authentication:

- You configure one primary LDAP registry which uses SSL.
- You configure federated directories, where at least one of the directories uses SSL. In this scenario, the **Use Federated Directories Configuration** property must be set to `true`.

The trust store you specify must be configured to work with any and all of the LDAP registries that use SSL.

Data type: String

Use Federated Directories Configuration
Set this option to `true` to use the configured federated directories when authenticating a user name and password.

If you specify `true`:

- The **LDAP Host Name** and **LDAP Port** properties must define a Security Verify Access user registry. This is typically the user registry of the runtime component.
- The users in any of the additional federated directories you configure must exist in the user registry of the runtime component. Therefore, import these users, if necessary.

Data type: Boolean

Default: `false`.

User Search Filter
An LDAP search filter that selects any native user entry.

Data type: String

Default: `(|(objectclass=ePerson)(objectclass=Person))`.

Maximum Server Connections
The maximum number of connections that can exist on the LDAP server. Valid values are 2 though 4096.

Data type: Integer

Default: 16.

Login Failures Persistent
Login failures are used with the three-strikes policy. If you set this option to `false`, each process that uses this API stores the number of login failures in memory. If you use multiple appliances in a cluster, the total number of login failures to trigger a strike-out might vary.

If you set this option to `true`, the strike count is stored in LDAP and shared across all servers. An accurate count can be kept in a multiserver environment.

Data type: Boolean

Default: `False`.

Last successful login
If tthis property is enabled, upon a successful authentication using password, the last successful login attribute associated with the user is updated. By default this attribute is part of the

`secEntity` (for full ISVA users). It can be set to a custom attribute. See Authentication service properties.

Data type: Boolean

Default: `False`.

9. Click the **Attributes** tab.
10. Complete any of the following tasks.

Add an attribute. Complete the **Registry Attribute**, **Context Name**, **Context Namespace** fields for the attribute.

Modify an attribute. Modify the **Registry Attribute**, **Context Name**, **Context Namespace** fields for the attribute.

Delete an attribute. Select an attribute and click delete.

By default, this mechanism uses the following attributes. These registry attributes are retrieved from the user account in the user registry and are stored in the Session context with the context name and name space.

Registry Attribute	Context Name	Context Namespace
`mail`	`emailAddress`	`urn:ibm:security:authentication :asf:mechanism:password`
`mobile`	`mobileNumber`	`urn:ibm:security:authentication: asf:mechanism:password`

11. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy changes when you are finished. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Configuring an HTTP redirect authentication mechanism

The HTTP redirect authentication mechanism integrates an external application that you provide to use for authenticating users.

Before you begin

The external application that you plan to use must exist before you begin this task. The application must meet the following requirements:

- To indicate a successful authentication, the application must generate a credential with an attribute that matches the **Success Credential Attribute Name** and **Success Credential Attribute Value** properties.
- When the authentication is complete, the application must return control to Security Verify Access by redirecting the browser to the location provided on the `ReturnURL` query string parameter when the application was invoked.

About this task

When you are using the HTTP Redirect Authentication Mechanism the value for 'Redirect URL' redirects the end user to an application that eventually performs an EAI Authentication.

To this effect, the application should have an associated EAI Trigger URL in the Security Verify Access configuration file. See Configuration of the external authentication interface trigger URL.

The EAI Application should also return an attribute with a name that matches the HTTP Redirect Authentication Mechanism property 'Success Credential Attribute Name'. The value of that credential attribute must match the configured value in the property **Success Credential Attribute Value** to indicate that the redirected authentication mechanism is successful.

When you are redirecting to the External Application, the HTTP Redirect Authenticaton mechanism includes a Query Parameter of `ReturnURL`. This must be provided back to Verify Access as the `am-eai-redir-url` to redirect back to the authentication mechanism for validation that the credential attribute is added as expected.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **HTTP Redirect Authentication**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

   Redirect URL
   The URL to the external authentication application.

   Data type: String

   Success Credential Attribute Name
   The credential attribute name that verifies successful authentication.

   Data type: String

   Default: `httpRedirectAuthCompleted`.

   Success Credential Attribute Value
   The credential attribute value that verifies successful authentication.

   Data type: String

   Default: `true`.
9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. When you finish the changes, deploy them. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Configuring consent to device registration

Consent-based device registration is the process of registering the device fingerprint only after the user consents to the device registration.

About this task

The settings of the consent to device registration mechanism specify:

- Whether to set the authentication level of the user's credential when the consent to device registration is completed.
- The value to be used to set the authentication level. The authentication level on the credential is used to represent the strength of the authentication that is used to generate the credential.

By default, the authentication level is not set by the consent to device registration operation. Use this task to enable setting the authentication level on the user credential. When the authentication level is set, it can be evaluated as part of an access control policy or by the policy enforcement point to grant access to a resource that requires a specific authentication level .

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **Consent to device registration**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

   Set Authentication Level Credential Attribute
   Enables the consent to device registration authentication to set the authentication level on the session.

   Data type: Boolean

   Default: `False`.

   Authentication Level Credential Attribute Value
   The authentication level value to be used when the consent to device registration is configured to set the authentication level.

   Data type: Integer.

   Default: 2.
9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy changes when you are finished. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Configuring an End-User License Agreement authentication mechanism

The End-User License Agreement authentication mechanism prompts the user to accept an End-User License Agreement (EULA) during an authentication flow.

About this task

Configure the End-User License Agreement and the corresponding properties to determine when the mechanism will show the license agreement.

Note: When you accept the license, the date that you last accepted the license file is stored.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **End-User License Agreement**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

Accept If Last Accepted Date Before

If the date the user last accepted the license is before this date, the mechanism requires the user to accept the license again.

Data type: Date

There is not a default value.

Valid values: A date in the following format: `YYYY-MM-DD`

Always Show License

Set this option to `true` so that the mechanism always prompts the user to accept the license file.

Data type: Boolean

Default value: `false`

License File

Specify the path to the license template file to display for the End-User License Agreement. The path to the license file is relative to the locale in the template tree. For more information about how to update the license and add additional license files, see Template files and Template file macros

Data type: String

Default value: `/authsvc/authenticator/eula/license.txt`

License Renewal Term

Specify the number of days until the user must accept the license again. When you specify a value that is less than 1, there is not a renewal term. This property compares the date that the user last

accepted the license to the current date. The software then determines the number of days since the user last accepted the license.

Data type: String

Default value: `0`

9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy them. See Chapter 15, “Deploying pending changes,” on page 221.

Related reference

Authentication policy parameters and credentials

Configuring an Email Message mechanism

The Email Message mechanism provides arbitrary information about a user via either email, webpage, or JSON for consumption by users or applications.

Before you begin

Before using the Email Message mechanism, an SMTP server connection must first be configured. For more information about how to configure the SMTP server connection, see Managing server connections.

About this task

This mechanism can be used in conjunction with the Info Map mechanism. The Info Map mechanism populates some session info and potentially enriches the session further through user mapping. The Email Message mechanism then provides this information to the user via email.

For example, for a forgotten username:

- The user initiates the forgot username flow.
- The user is prompted to enter his or her email and date of birth.
- The user provides the details.
- The Info Map mechanism performs a lookup based on the information and enriches the session with the user name.
- The Email Message mechanism sends an email that provides the user name to the user.

If this mechanism is not used in conjunction with the Info Map mechanism, only information from the Verify Access credential will be made available.

To use values in the Verify Access credential or session information added by the Info Map mechanism, add wrapping @ signs to the attribute identifier in the same way as they are used in macros. For example, to make use of a user's credential that contains the attribute "**`firstName`**" in the template page:

```
...
This is the welcome page for @firstName@
...
```

Note: The attribute identifier is case sensitive. For example, **`@firstname@`** cannot be used to reference the attribute **`firstName`**.

You can use the Email Message mechanism to send messages in HTML format. See “HTML format for OTP email messages” on page 55.

Procedure

1. Log in to the local management interface.

2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **Email Message**.
6. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click **Modify Property**.
   c) Enter the value for that property.
   d) Click **OK**.
7. Take note of the properties for the mechanism.

   Email Attribute Identifier

   The name of the attribute that contains the email address to be used.

   If this attribute is not set, the system always displays the template HTML page to the user.

   Default value: `emailAddress`

   Email Sender Value

   The value to use in the sender field of an email.

   Email Template

   The path to the template XML file to be used when sending an email to the user.

   Default value: `/authsvc/authenticator/sessionattributeresponse/email_message.xml`

   Note: The default value omits the locale portion of the path, which you can see in the templates page view.

   Error Template

   The path to the template HTML file to be used when displaying an error message to the user.

   Default value: `/authsvc/authenticator/sessionattributeresponse/error.html`

   Server Connection
   This field defines the SMTP connection that is used to send the email. You can select the SMTP server from the drop-down list.
8. Click **Save**.

What to do next

After you have configured the mechanism, a message that indicates the changes are not deployed will be displayed. Deploy changes when you are finished. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

After deploying the changes, you can create policies that include this mechanism. For more information, see Creating an authentication policy.

HTML format for OTP email messages

The HTML format for One-Time Password (OTP) email messages includes an identifying header of the Security Verify Access host that sent the message.

The email message mechanism supports sending an HTML formatted message to the configured SMTP server. The server receives a message that contains a `Message-ID` with information that identifies the Security Verify Access LMI host that sent the message. When your deployment is a Security Verify Access cluster, this information is useful for determining which host sent the email.

For example, in the email below, the LMI host `acme.com` is included in the `Message-ID`.

```
Date: Thu, 5 Oct 2017 01:55:29 -0400 (EDT)
From: support@mycompany.com
To: testuser@example.company.com
Message-ID: <1932638797.7.1507182929009.JavaMail.www-data@acme.com>
Subject: Email Subject
MIME-Version: 1.0
Content-Type: text/plain; charset=utf-8
Content-Transfer-Encoding: 7bit
```

Configuring the reCAPTCHA Verification authentication mechanism

The reCAPTCHA Verification authentication mechanism provides anti-robot protection.

Before you begin

The appliance uses the Google reCAPTCHA service to provide such verification. For more information, see www.google.com/recaptcha.

Note: The appliance supports only Google reCAPTCHA V2.

Before configuring a reCAPTCHA Verification mechanism, you must first complete the following steps.

- Ensure that the appliance can connect to www.google.com. You can test the connection in the CLI, for example:

```
myappliance.example.ibm.com:tools>
myappliance.example.ibm.com:tools> connect www.google.com:443
Test:   www.google.com (address: 216.58.197.68) on port 443
Status: connection was successful
```

- Add the issuer of the Google CA certificate to the HTTP client default trust store, which is set by the value of the **`util.httpClient.defaultTrustStore`** advanced tuning parameter. The default value of the **`util.httpClient.defaultTrustStore`** parameter is **`rt_profile_keys`**.
  1. From the top menu, select **System** > **Secure Settings** > **SSL Certificates**.
  2. Select the **`rt_profile_keys`** key database.
  3. Select **Manage** > **Edit SSL Certificate Database**.
  4. Select the **Signer Certificates** tab.
  5. Select **Manage** > **Load**.
  6. Specify the following fields.

     ```
     Server: www.google.com
     Port:443
     Certificate Label: Google
     ```

  7. Click **Load**.

About this task

The reCAPTCHA Verification mechanism can provide protection against spam or abuse caused by robots. With this mechanism, the user is presented with a web page that contains a simple Turing test provided by the Google reCAPTCHA API. These tests can distinguish a human user from a robot. You can add this mechanism to your policy to prevent robots from accessing your applications.

The following HTML snippet shows an example of embedding the reCAPTCHA mechanism in the template page:

```
<form method="POST" action="@ACTION@">
      <input type="hidden" name="operation" value="verify"></input>
```

```
      <div class="g-recaptcha" data-sitekey="@SITE_KEY@"></div>
      <br>
      <div class="controls">
      <input class="submitButton" id="Submit" name="Submit"
      type="submit" value="Submit"></input>
      </div>
</form>
```

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **reCAPTCHA Verification**.
6. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click **Modify Property**.
   c) Enter the value for that property.
   d) Click **OK**.
7. Take note of the properties for the mechanism.

   Site Key

   This property is embedded in the HTML template and used to generate the CAPTCHA in the client browser.

   Default value: 6LeIxAcTAAAAAJcZVRqyHh71UMIEGNQ_MXjiZKhI

   Secret Key

   This property is used on the server side by the appliance to verify reCAPTCHA responses with Google.

   Default value: 6LeIxAcTAAAAAGG-vFI1TnRWxMZNFuojJ4WifJWe

   Note: The default Site Key and Secret Key values are designated Google test credentials. When these default values are used, all verification requests will pass.

   Template Page
   The path to the template HTML page to be displayed to the user.

   Default value: `/authsvc/authenticator/recaptcha/standalone.html`
8. Click **Save**.

What to do next

After you have configured the mechanism, a message that indicates the changes are not deployed will be displayed. Deploy changes when you are finished. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

After deploying the changes, you can create policies that include this mechanism. For more information, see Creating an authentication policy.

Configuring an Info Map authentication mechanism

Use this mechanism in your policy to return a template form and perform validation on the responding POST data. This mechanism is intended to work in conjunction with the Email Message mechanism.

About this task

The Info Map mechanism can be used to implement JavaScript authentication mechanisms. When this mechanism is invoked, the configured JavaScript mapping rule will be run.

- If the rule returns FALSE, then a page will be returned to the user. The JavaScript can also define which page to return or it can use a preconfigured page. The JavaScript can also populate any macros on the page and modify what is displayed to the user.
- If the rule returns TRUE, then the mechanism will return success and the policy will continue.

The following parameters are available in an Info Map mapping rule:

Context

This is an authentication service context. It is identical to what is provided in the Authentication Service Credential mapping rule. For more information about how to use the context, see the context attributes section of Authentication policy parameters and credentials.

Use the context to make changes to the credential and the values that the Email Message mechanism will display.

State

A state map that is used for the lifetime of this mechanism invocation.

Note: Each instance of this mechanism will have a new state map created per invocation of the policy. If the user invokes the policy again, the state map will be empty because the state map is discarded when the rule returns TRUE.

Page

The path to the page to be returned. By default, this parameter is set to the value that is configured in the mechanism properties. It can be modified to return a different page.

Macros

A map of macros that will be populated on the returned page.

Success

Indicates whether the rule execution was successful. This parameter is set to TRUE if the rule was successful and the policy will continue. It is set to FALSE if the rule was not successful and a page will be returned to a user.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **Info Map Authentication**.
6. In the **New Authentication Mechanism** window, set the name and identifier of the mechanism on the **General** tab. If you are modifying an existing Info Map authentication mechanism instead of creating a new instance, values on the **General** tab cannot be changed.
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click **Modify Property**.

c) Enter the value for that property.

Template Page
This property defines the HTML template page.

Mapping Rule
Select a mapping rule from the list. Only JavaScript mapping rules in the **InfoMap** category are displayed in the list for selection.

d) Click **OK**.

e) Repeat the previous steps as needed.

8. Click **Save**.

What to do next

After you have configured the mechanism, a message that indicates the changes are not deployed will be displayed. Deploy the changes when you are finished. For more information, see Chapter 15, "Deploying pending changes," on page 221.

After deploying the changes, you can create policies that include this mechanism. For more information, see Creating an authentication policy.

Embedding reCAPTCHA verification in an Info Map mechanism

You can embed reCAPTCHA verification in Info Map mechanism instances.

The Site Key and Secret Key configured in the reCAPTCHA Verification mechanism are made available to the Info Map mechanism via two default macros: @RECAPTCHASITEKEY@ and @RECAPTCHASECRETKEY@.

For more information about configuring reCAPTCHA support, see "Configuring the reCAPTCHA Verification authentication mechanism" on page 56.

In the HTML template:

- Include the reCAPTCHA JavaScript in the head of your template
- Include the reCAPTCHA element in your form

For example:

```
...
<SCRIPT SRC="https://www.google.com/recaptcha/api.js" ASYNC DEFER></SCRIPT>
...
<DIV CLASS="g-recaptcha" DATA-SITEKEY="@RECAPTCHASITEKEY@"></DIV>
...
```

In the JavaScript mapping rule:

- The reCAPTCHA response is received in a request parameter named **g-recaptcha-response**
- Verification can be performed in the JavaScript mapping rule

For example:

```
importClass(Packages.com.ibm.security.access.recaptcha.RecaptchaClient);
...
// Retrieve the reCAPTCHA response from the request.
var captchaResponse = context.get(Scope.REQUEST, "urn:ibm:security:asf:request:parameter",
"g-recaptcha-response");
// Verify captchaResponse with Google, using @RECAPTCHASECRETKEY@. The third parameter
allows you to overload Google's verify endpoint URL, passing null will use the default.
var captchaVerified = (captchaResponse != null) && RecaptchaClient.verify(captchaResponse,
macros.get("@RECAPTCHASECRETKEY@"), null);
```

Available parameters in Info Map

The following parameters are available in a mapping rule that is invoked by the Info Map authentication mechanism.

Input:

- var:context - type:Context - The same session context that is passed into the `authsvc_credential` mapping rule. For more information, see Table 2 in Authentication policy parameters and credentials.
- var:state - type:Map - Any values placed in the user's state by prior invocations of this instance of the Info Map authentication mechanism.

Output:

- var:page - type:InfoMapString - The page template to be displayed if this rule returns false. The following methods can be used to get and set the string:

  `java.lang.String getValue()` - Returns the internal String value.

  `void setValue(java.lang.String value)` - Sets the internal String value.

  For more information, see the Javadoc on the appliance.
- var:macros - type:Map<String, String> - Values to populate on the returned template page.
- var:success - type:InfoMapResult - An object that captures the status of this Info Map invocation. Set it to `true` to signal success or `false` to signal failure. The following methods are available:

  `void setValue(boolean value)`
  Used to set `success` or `failure`.

  `boolean getValue()`
  Used to fetch the currently set result value. If not set, the value defaults to `false`.

  `void endPolicyWithoutCredential()`
  Used to set whether the running policy should be ended in an error case. No credential is returned.

  `boolean isEndPolicyWithoutCredential()`
  Used to fetch the currently set `endPolicyWithoutCredential` value.

  For more information, see the Javadoc on the appliance.
- var:responseHeaders –type:Map<String, String> -HTTP headers to be added to the HTTP response returned by the authentication service. Header syntax must conform to relevant RFC specifications.

Client:

var:fido2ClientManager –type:FIDOClientManager –The client manager is used to create instances of LocalFIDOClient's which are used to request attestations and assertions from a Relying Party. See "FIDO Client Manager" on page 207.

Embedded Cloud Identity API calls in an Info Map mechanism

You can embed Cloud Identity (CI) API calls in Info Map mechanism instances with a new client, CI Client. Configure a CI Server connection to make calls with the CI Client.

The client ID and client secret that are configured in the CI Server Connection are made available to the CI Client by using the Server Connection Factory. The CI Client then automatically manages the client credentials token.

For more information about configuring the CI Server Connection, see Server connection properties.

There are two implementations of the CI Client that are available for use:

- `com.ibm.security.access.ciclient.CiClient`
- `com.ibm.security.access.ciclient.CiClientV2`

They are functionally equivalent. The difference is that the CiClientV2 internally uses the HttpClientV2 which is a newer and more performant version of the HttpClient that is used by CiClient. For details on how to configure the HttpClientV2 see Advanced configuration properties.

For example, using CiClient:

```
importPackage(Packages.com.ibm.security.access.ciclient);
importPackage(Packages.com.ibm.security.access.server_connections);
importClass(Packages.com.tivoli.am.fim.trustserver.sts.utilities.IDMappingExtUtils);

IDMappingExtUtils.traceString("entry Cloud Identity Mapping Rule");

var connection = ServerConnectionFactory.getCiConnectionByName("milano");

var id = CiClient.getUserId(connection, "testuser@ibm.com");
if (id != null) {
    IDMappingExtUtils.traceString("CI User ID: " + id);
} else {
    IDMappingExtUtils.traceString("CI User does not exist.");
}
```

For example, using CiClientV2:

```
importPackage(Packages.com.ibm.security.access.ciclient);
importPackage(Packages.com.ibm.security.access.server_connections);
importClass(Packages.com.tivoli.am.fim.trustserver.sts.utilities.IDMappingExtUtils);

IDMappingExtUtils.traceString("entry Cloud Identity Mapping Rule");

var connection = ServerConnectionFactory.getCiConnectionByName("milano");

var id = CiClientV2.getUserId(connection, "testuser@ibm.com");
if (id != null) {
    IDMappingExtUtils.traceString("CI User ID: " + id);
} else {
    IDMappingExtUtils.traceString("CI User does not exist.");
}
```

Available CI Client methods for both CiClient and CiClientV2 include:

```
getUser(CiServerConnection connection, String username)
Retrieve a user object (via SCIM) by username

getUserId(CiServerConnection connection, String username)
Retrieve the user's IUI (via SCIM) by username

registerAuthenticator(CiServerConnection connection, String json)
Initiate device registration (to be completed by the user's authenticator app)

getAuthenticators(CiServerConnection connection, String username)
Get all authenticators for the given user

getAuthenticator(CiServerConnection connection, String id)
Get a specific authenticator based on ID

updateAuthenticator(CiServerConnection connection, String id, String json)
Update a specific authenticator based on ID

deleteAuthenticator(CiServerConnection connection, String id)
Delete a specific authenticator based on ID

getAuthMethods(CiServerConnection connection, String username)
Get all auth methods for the given user

getAuthMethod(CiServerConnection connection, String id)
Get a specific auth method based on ID

updateAuthMethod(CiServerConnection connection, String id, String json)
Update a specific auth method based on ID

deleteAuthMethod(CiServerConnection connection, String id)
Delete a specific auth method based on ID

createTransaction(CiServerConnection connection, String authenticatorId, String json)
Create a new transaction for the given authenticator ID
```

```
getTransactions(CiServerConnection connection, String authenticatorId)
Get all transactions for the given authenticator ID

getTransaction(CiServerConnection connection, String authenticatorId, String id)
Get a specific transaction for the given authenticator ID

getRequest(CiServerConnection connection, String url)
Generic GET request on the given URL

postRequest(CiServerConnection connection, String url, String json)
Generic POST request on the given URL

putRequest(CiServerConnection connection, String url, String json)
Generic PUT request on the given URL

deleteRequest(CiServerConnection connection, String url)
Generic DELETE request on the given URL

enrollFactor(CiServerConnectionconnection, String type, String json, boolean respAsJson, String
locale)
Enroll an authentication factor based on the given type and JSON.

getFactor(CiServerConnection connection, String type, String id, String locale)
Retrieve a specific authentication factor based on ID.

getFactors(CiServerConnection connection, String search, String locale)
Retrieve all authentication factors, with an optional search string.

createFactorVerification(CiServerConnectionconnection, String type, String id, String json,
String locale)
Create a verification for the given factor based on type and enrollment ID.

getFactorVerification(CiServerConnection connection, String type, String id, String
verificationId, String locale)
Retrieve a specific factor verification based on type, enrollment ID, and verification ID.

getFactorVerifications(CiServerConnection connection, String type, String id, String locale)
Retrieve all factor verifications based on type and enrolment ID.

updateFactor(CiServerConnection connection, String type, String id, String json, String locale)
Update a specific authentication factor based on type and ID.

deleteFactor(CiServerConnection connection, String type, String id, String locale)
Delete a specific authentication factor based on type and ID.

verifyFactor(CiServerConnection connection, String type, String id, String verificationId,
String json, String locale)
Verify a specific authentication factor based on type and ID.

verifyTOTPFactor(CiServerConnection connection, String id, String json, String locale)
Verify a TOTP based on ID.
```

Configuring a Knowledge Questions authentication mechanism

The Knowledge Questions authentication mechanism is an extra step-up authentication measure that uses knowledge questions and answers to authenticate the user.

Before you begin

The user must register answers to the knowledge questions that the mechanism uses during authentication.

About this task

The mechanism requires users to provide personal information to successfully authenticate. You can use the Knowledge Questions authentication mechanism:

- With user ID and password authentication to provide two-factor authentication.
- As a step-up authentication method when the user accesses a high-value resource or performs a high-value transaction.

The administrator can configure the mechanism to provide a predetermined list of knowledge questions, or the user can specify and register their own knowledge questions. Typical knowledge questions about the user might include:

- Mother's maiden name.
- Name of first grade teacher.
- Name of favorite pet.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **Knowledge Questions**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

   Allow User Provided Questions
   Specify `true` to specify custom questions as opposed to pre-configured questions.

   Default value: `true`

   Valid values: Boolean

   Answer Hashing Algorithm
   Specify this property to indicate the hashing algorithm that the appliance uses to store the knowledge questions for each user.

   Default value: `SHA-256`

   Valid values include the following string values:

   - `SHA-1`
   - `SHA-256`
   - `SHA-512`

   Answer Hashing Enabled
   The mechanism uses a hashing algorithm to store hash values of the answers to the knowledge questions provided by the user instead of storing the actual answers to the knowledge questions. This prevents the administrator from reading the knowledge question answers for the user. Specify `False` so that the mechanism does not hash the question answer before it stores it.

   Default value: `true`

   Valid values: Boolean

   Correct Answers Required
   Specify the number of correct answers that is required for the authentication to be successful.

   Default value: `1`

   Valid values: Any positive integer that does not exceed the number of questions that are stored per user.

Retry Count Attribute Name
Specify the number of times that a user can submit invalid answers to the knowledge questions. When the user reaches this number, they are unable to authenticate.

Default value: `user:knowledge:questions:retry:count`

Valid values: String

Grace Period Authentication Count Attribute Name
Specify the name of the attribute that is used to record the number of times the user has authenticated during the grace period. The number of times that the user has authenticated during the grace period is stored in the user information database. The mechanism does not require the user to authenticate during the grace period.

Default value: `user:knowledge:questions:grace:period:count`

Valid values: String

Maximum Amount of Answers Stored
Specify the maximum number of question and answer combinations that the mechanism can store for each user.

Default value: 3

Valid values: Any positive integer.

Maximum Amount of Grace Period Authentications
Specify the maximum number of user authentications that the mechanism permits during the grace period. The mechanism does not require the user to configure knowledge questions during the grace period.

Default value: `0`

Valid values: Any positive integer.

Presentation Mode
Specify `Individual` so that the mechanism presents one knowledge question at a time. When you specify `Group`, the mechanism presents all of the knowledge questions in one form.

Default value: Group

Presentation Order
Specify `Sequential` so that the mechanism presents the questions in the order that they are stored. When you specify `Random`, the mechanism presents the questions in random order.

Default value: Random

Questions Attribute Name
Specify the name of the attribute that is used to store the user knowledge questions in the user information database.

Default value: `user:knowledge:questions`

Valid values: String

Retry Protection Enabled
Specify `false` to disable retry protection.

Default value: `true`

Valid values: Boolean

Retry Protection Max Number Of Attempts
Specify the maximum number of times that a user can supply incorrect answers before the mechanism prohibits the user from logging in.

Default value: 5

Valid values: Integer

Retry Timeout
Specify the number of seconds that a user must wait before trying to log in again after the user reaches the maximum number of login attempts.

Note: If a value of -1 is entered the user is locked out indefinitely until an administrator explicitly unlocks the user with the SCIM API.

Default value: `600`

Valid values: Integer

Use Exact Answer Matching
Specify `true` so that the mechanism performs an exact match when it validates the submitted answer.

Default value: `false`

Valid values: Boolean

User Attributes Namespace
Specify the namespace to be used to store all of the user attributes that are related to the Knowledge Questions authentication mechanism that are stored in the user information database.

Default value:
`urn:ibm:security:authentication:asf:mechanism:knowledge_questions`

Valid values: String

9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy them. See Chapter 15, “Deploying pending changes,” on page 221.

Related reference

Authentication policy parameters and credentials

Configuring a FIDO Universal 2nd Factor authentication mechanism

The FIDO Universal 2nd Factor authentication mechanism prompts the user to sign a random challenge string with a FIDO Universal 2nd Factor token provided during the authentication flow.

Before you begin

The user must register a compatible FIDO Universal 2nd Factor token.

Note: Support for the FIDO U2F Specification was deprecated in favor of the new FIDO2/WebAuthn specification, which includes support for U2F devices. As a result, the ability to register new devices or authenticate by using the FIDO Universal 2nd Factor mechanism was removed.

About this task

Configure the FIDO Universal 2nd Factor and the corresponding properties to determine the operation of the mechanism.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **[Obsolete] FIDO Universal 2nd Factor**.

6. Click **Modify**.
7. Click the **Properties** tab.
   a. Select a property that you want to configure.
   b. Click **Modify**.
   c. Enter the value for that property.
   d. Click **OK**.
8. Take note of the properties for the mechanism.

   Application ID

   The protocol, hostname, and port that the user will use to attempt authentication.

   Default value: `https://webseal.com`

   Valid values: String, valid URL

   Attestation Type

   The type of certificate attestation validation to perform. Specify `None` to not perform certificate attestation validation. Specify `Keystore` to perform certificate attestation validation using the keystore configured in **attestationSource**. Specify `JWKS` to perform certificate attestation validation using the JSON Web Key Set configured in **attestationSource**.

   Default value: `None`

   Valid values: `None`, `Keystore`, `JWKS`

   Attestation Source

   The keystore or key set to use for certificate attestation validation. Either the name of the keystore on the appliance, or the URL for a JSON Web Key Set.

   Default value: No default value

   Valid values: String

   Attestation Enforcement

   The level of enforcement of certificate attestation validation. When you specify `Required`, certificate attestation validation is required, and requests that fail validation will return a validation error. When you specify `Optional`, certificate attestation validation is performed, but requests that fail validation will not return an error.

   Default value: `Required`

   Valid values: `Required`, `Optional`
9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy them. See Chapter 15, “Deploying pending changes,” on page 221.

Related information

Authentication policy parameters and credentials

Configuring a FIDO2/WebAuthn authentication mechanism

The FIDO2/WebAuthn authentication mechanism prompts the user to sign a random challenge string with a FIDO2/WebAuthn authenticator provided during the authentication flow.

Before you begin

The user must register a compatible FIDO2/WebAuthn authenticator.

About this task

Configure the FIDO2/WebAuthn mechanism and the corresponding properties to determine the operation of the mechanism.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **FIDO2 WebAuthn Authenticator**.
6. Click **Modify**.
7. Click the **Properties** tab.
   a. Select a property that you want to configure.
   b. Click **Modify**.
   c. Enter the value for that property.
   d. Click **OK**.
8. Take note of the properties for the mechanism.

   Relying Party Config ID

   The relying party configuration ID to use with this mechanism, which identifies the Relying Party and the relying party specific configuration to use. See “FIDO2 Configuration” on page 202.

   Default value: Empty string

   Example: `4df78eac-c3a5-4fbb-8e23-22abad2f3b6a`

   Valid values: String

   Abort Policy on Error

   Whether the policy should abort completely in an error case, or return a state ID such that a user can re-attempt authentication.

   Default value: false

   Example: false

   Valid values: boolean
9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy them. See Chapter 15, “Deploying pending changes,” on page 221.

More advanced configuration can be configured for each Relying Party ID. See “FIDO2 Configuration” on page 202.

Configuring a QR Code authentication mechanism

The QR Code authentication mechanism is an authentication capability that permits a registered device to scan a QR Code to authenticate the user. It provides a completely alternative-to-password method of authenticating a user.

About this task

The mechanism requires users to scan a generated QR code to successfully authenticate using a previous registered application such as IBM Verify or an equivalent built on the IBM Verify SDK. The QR Code authentication mechanism operates in one of the following modes:

Initiate

In this mode the mechanism generates a QR code and displays it to the user. It then waits for the code to be scanned or a timeout period to be reached. The waiting process consists of polling the authentication policy using a `device_session_index` until it is associated with an authenticated user. Scanning the code results in the IBM Verify mobile application contacting a companion authentication policy. This policy uses the same mechanism in **Response** mode. After successful login with the QR Code scan, there are three attributes that are made available in the session context for downstream policies:

- **`urn:ibm:security:asf:qrcode.prompt`**- This is a confirmation message that might be used by other mechanisms to ensure that the QR code login operation is what the user intended.
- **`urn:ibm:security:asf:qrcode.qr_login_session_index`**- This is analogous to the `user_code` from the OAuth device flow.
- **`urn:ibm:security:asf:qrcode.qr_device_session_index`**- This is analogous to the `device_code` from the OAuth device flow.

Response

In this mode the mechanism associates the `login_session_index` with the authenticated username from the request. Any associated policy using the QR code mechanism in **Initiate** mode that is polling on the `device_session_index` is unblocked and completed.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **QR Code**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the properties for the mechanism.

   Timeout

   This is the period in seconds that the QR code remains valid.

   Enable Browser Testing

   This is a flag that can be set such that if a registered device is not available to scan the QR Code, the user can simulate the back channel flow with another (authenticated) browser. This is only

relevant when the mechanism is configured in **Response** mode and should only be used for testing the mechanism.

a. Login to IBM Security Verify Access by using a protected page. For example, <https://<reverseproxy>>.

b. Navigate to the "backchannel" URL with a browser, where you are able to enter the login session index (LSI) to authenticate. The LSI is shown on the QR code login page in clear text for this reason: <https://<reverseproxy>/mga/sps/authsvc?PolicyId=urn:ibm:security:authentication:asf:qrcode_response>

9. Click **Save**.

Configuring an RSA SecurID one-time password mechanism

The RSA SecurID mechanism provides support for a one-time password using an RSA SecurID token and RSA Authentication Manager.

Before you begin

Complete the following steps on your RSA Authentication Manager server:

1. Ensure that the RSA SecurID Authentication API is enabled. Take note of the Access ID and Access Key.
2. Ensure that an Authentication Agent has been created which can be used by the authentication mechanism. Take note of the identity of the authentication agent.
3. Obtain the root signing certificate of the server certificate which is used by the RSA Authentication Manager server and add this to the runtime profile trust store using the Verify Access LMI. This step is required so that the runtime profile can 'trust' the RSA Authentication Manager server. The default trust store for the LMI runtime profile is named: ''rt_profile_keys".

For detailed instructions on how to complete these steps, refer to the documentation provided with your RSA Authentication Manager.

About this task

This task describes the steps and properties for configuring an RSA SecurID authentication mechanism. For information about configuring other providers, see the following topics:

- Configuring an HOTP one-time password mechanism
- Configuring a MAC one-time password mechanism
- Configuring a TOTP one-time password mechanism

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **RSA SecurID**.
6. Click .
7. Click the **Properties** tab.
   a) Select a property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.

Access Identifier

Description:	The Access Identifier for the RSA Authentication API – as obtained from the RSA Authentication Manager.
Required:	Required if HMAC Security is enabled, otherwise not required.
Data Type:	String
Default:	-
Example:	`6mxv61ac0811200387sj0emkyh0d 2v3zrlu9ktgvro32y7o3lgtaqs7ac96p75dg`

Access Key

Description:	The Access Key for the RSA Authentication API – as obtained from the RSA Authentication Manager.
Required:	Yes
Data Type:	String
Default:	-
Example:	`6mxv61ac0811200387sj0emkyh0d2 v3zrlu9ktgvro32y7o3lgtaqs7ac96p75dh`

Authentication Attempt Timeout

Description:	A number, in seconds, representing how long the server will keep the authentication attempt ID available after each call. Defaults to a server-defined session lifetime. For further details refer to the RSA SecurID Authentication API Developer's Guide.
Required:	No
Data Type:	Integer
Default:	180
Example:	180

Authentication Manager Base URL

Description:	The base URL to be used when accessing the authentication API. This URL should include everything up to, but not including, the '/mfa/v1_1/authn' part of the RSA SecurID Authentication API URL.
Required:	Yes
Data Type:	String
Default:	-
Example:	https://rsaauthmgr.ibm.com:5555

Client Identifier

Description:	The client identifier to be used by this authentication mechanism. The identifier should match an authentication agent which has been registered with the RSA Authentication Manager.
Required:	Yes
Data Type:	String
Default:	-

Enable HMAC Security

Description:	Should a Hash-based Message Authentication Code (HMAC) be used to authenticate to the RSA Authentication Manager? This property should only be enabled if the RSA Authentication Manager has been configured to require HMAC for authentication.
Required:	No
Data Type:	Boolean
Default:	false
Example:	true

Network Timeout

Description:	The length of time, in seconds, to wait for a response from the RSA Authentication Manager.
Required:	No
Data Type:	Integer
Default:	30
Example:	30

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy changes when you are finished. For more information, see Deploy pending changes.

Configuring a FIDO2/WebAuthn registration mechanism

The FIDO2/WebAuthn registration mechanism prompts the user to enroll a new FIDO2/WebAuthn authenticator.

Before you begin

The user must own a compatible FIDO2/WebAuthn authenticator.

About this task

Configure the FIDO2/WebAuthn registration mechanism and the corresponding properties to determine the operation of the mechanism.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **FIDO2 WebAuthn Registration**.
6. Click **Modify**.
7. Click the **Properties** tab.
   a. Select a property that you want to configure.
   b. Click **Modify**.
   c. Enter the value for that property.
   d. Click **OK**.
8. Take note of the properties for the mechanism.

   Relying Party Config ID

   The relying party configuration ID to use with this mechanism, which identifies the Relying Party and the relying party specific configuration to use. See "FIDO2 Configuration" on page 202.

   Default value: Empty string

   Example: `4df78eac-c3a5-4fbb-8e23-22abad2f3b6a`

   Valid values: String

   Template Page

   The template page to be displayed to the end user as part of this mechanism. Allows for the page branding or user experience to be customized depending on the policy.

   Default value: `/authsvc/authenticator/fido/attestation.html`

   Example: `/authsvc/authenticator/howtofido/howtofido_reg_mechanism.html`

   Valid values: String, valid template file

   Options JSON Template

   In the attestation flow an options request is usually sent from the browser to the server, and the response is passed into the `navigator.credentials.create` call. This registration mechanism will populate the options request from the Options JSON template file, instead of a request payload. Allows for the user experience to be customized depending on the policy.

   Default value: `/authsvc/authenticator/fido/default_attestation_options.json`

   Example: `/authsvc/authenticator/howtofido/howtofido_attestation_options.json`

   Valid values: String, valid template file

   Abort Policy on Error

   Whether the policy should abort completely in an error case, or return a state ID such that a user can re-attempt registration.

   Default value: false

   Example: false

   Valid values: boolean
9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that changes are not deployed. Deploy them. See Chapter 15, “Deploying pending changes,” on page 221.

More advanced configuration can be configured for each Relying Party ID. See “FIDO2 Configuration” on page 202.

Enabling or disabling authentication policies

You can selectively enable or disable authentication policies to control exactly which authentication policies are enabled in your environment.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Policies**.
   - To enable or disable a specific authentication policy, select the authentication policy and then click **Enable** or **Disable**. Follow the prompts.
   - To enable or disable all authentication policies, click **Enable all** or **Disable all**. Follow the prompts.

Managing mapping rules

The mapping rules are JavaScript code that run during the authentication flow. Use the rules to customize the authentication service and the one-time password generation, delivery, and verification.

Before you begin

Attention: Use extreme care when you replace mapping rules. Any change that you make to a mapping rule can affect the entire runtime environment. Always export a copy of the original rule you plan to replace so that you have a backup copy.

About this task

You can customize several components through JavaScript code. For example, you can customize the Authentication Service to modify the content of user credential by modifying the AuthSvcCredential mapping rule.

The JavaScript code is run by the Rhino JavaScript engine. Your JavaScript code must conform to JavaScript 1.7. Your JavaScript code is not run under a browser environment. Therefore, you cannot use objects and functions that are available only in a browser environment. You can, however, use standard JavaScript objects (such as `Math`) and functions (such as `parseInt`). In addition, your JavaScript code can use allowed Java classes, which you might need so that you can use operations that are not supported by standard JavaScript functions. You can find the list of these Java classes at “JavaScript Allowlist” on page 339. To find out more about using Java classes in JavaScript, see the Rhino documentation https://developer.mozilla.org/en/docs/Rhino.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Advanced**.
5. Take one of the following actions:

View a mapping rule:

a. Select a mapping rule.

b. Click . The **View Mapping Rule** panel opens. The content of the mapping rule is displayed.

c. Click **OK** to close the panel.

Export a mapping rule:

a. Select a mapping rule.

b. Click .

c. Choose a location and save the file.

Replace a mapping rule:

Use an existing mapping rule as the basis for the updated mapping rule.

Attention: When you replace this file, an error in the JavaScript source might be found immediately after it is replaced or it might not be found until the file is run.

a. Select a mapping rule that you want to replace.

b. Click . The **Replace Mapping Rule** panel opens.

c. Click the field or the **Browse** button and select a file.

Attention: The name of the mapping rule cannot be replaced. The name of the uploaded file is ignored.

d. Click **OK** to upload the mapping rule.

What to do next

When you replace a mapping rule, the appliance displays a message that there are undeployed changes. Deploy the changes when you are done. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Authentication Service Credential mapping rule

The Authentication Service Credential mapping rule is JavaScript code that you can use to customize the information that is contained in the user credential.

During authentication, the Authentication Service gathers information about the authenticated user, including attributes associated with the user ID. After successful authentication, the Authentication Service provides this information to the Authentication Service Credential mapping rule. The main task of the mapping rule is to modify or add attributes to the user information before it is used to generate a credential.

Customizing the mapping rule is an advanced way to customize the credential. To specify basic credential attributes, use an authentication policy and the **Credentials** panel in the local management interface instead of creating a custom mapping rule. See Creating an authentication policy.

If you write your own mapping rule and use it to replace the existing rule, be aware of the following considerations:

- Credential attributes are string values. For example, user names and lists of groups are string arrays.
- Do not use spaces, commas, or colons in credential attribute names. Use alphanumeric characters.

The sample mapping rule provides more descriptions about considerations for writing your own mapping rule.

A default `AuthSvcCredential` mapping rule is provided. To review the rule:

1. Log in to the local management interface.
2. Click **AAC**

3. Under **Policy**, click **Authentication**.
4. Click **Advanced**.
5. Select `AuthSvcCredential`.
6. Click .
7. Choose a location and save the file.

To review an example of a customized credential mapping rule:

1. Log in to the local management interface.
2. Click **System**.
3. Click **File Downloads**.
4. Click **access_control** > **examples** > **mapping_rules**.
5. Select `authsvc_credential.js`.
6. Click **Export** to download the file.

If you create your own rule, use it to replace the existing rule. See the replacement instructions in "Managing mapping rules" on page 73.

OTPGetMethods mapping rule

`OTPGetMethods` specifies the methods for delivering the one-time password to the user.

This sample mapping rule sets password delivery conditions for the following delivery methods:

- By email
- By SMS
- No delivery

Each delivery method includes the following attributes and their corresponding value:

`id`
Specifies a unique delivery method ID. This value replaces the `@OTP_METHOD_ID@` macro in the **OTP Method Selection** page. Use a unique value across different methods. For example, `sms`.

`deliveryType`
Specifies the delivery plug-in that delivers the one-time password. The value must match one of the types in the `DeliveryTypesToOTPDeliveryModuleIds` parameter of the OTP response file. For example, `sms_delivery`.

`deliveryAttribute`
Specifies an attribute that is associated with the delivery type. The value depends on the one-time password provider plug-in for the delivery type. For example:

- For SMS delivery, the value is the mobile number of the user. For example, `mobileNumber`.
- For email delivery, the value is the email address of the user. For example, `emailAddress`.
- For no delivery, the value is an empty string.

`label`
Specifies the unique delivery method to the user. For time-based and counter-based one-time password, use this attribute to specify the secret key of the user. If `label` is not specified, the time-based and counter-based one-time password code retrieves the key by invoking the user information provider plug-in. This parameter replaces the `@OTP_METHOD_LABEL@` macro in the **OTP Method Selection** page.

`otpType`
Specifies the one-time password provider plug-in that generates and verifies the password. The value must match one of the types in the `OTPTypesToOTPProviderModuleIds` parameter of the OTP response file. For example, `mac_otp`.

userInfoType
Specifies which user information provider plug-in to use to retrieve user information that is required to calculate the one-time password. This parameter is only required if user information is used for calculation of the one-time password.

To customize one-time password delivery, you can do one of the following actions:

- Create your own mapping rules that are based on the sample `OTPGetMethods` mapping rule.
- Modify the sample `OTPGetMethods` mapping rule.

You can also customize the mapping rule to use access control context data. For details see, "Customizing one-time password mapping rules to use access control context data" on page 78.

OTPGenerate mapping rule

`OTPGenerate` mapping rule specifies the generation of the one-time password for the user.

You can use the `OTPGenerate` mapping rule in the following configuration:

Modify the one-time password type of the selected method to generate the one-time password
Indicates the one-time password type to determine the one-time password Provider plug-in that generates the one-time password for the user.

Note: See the comments in the mapping rule for more details.

You can also customize the mapping rule to use access control context data. For details see, "Customizing one-time password mapping rules to use access control context data" on page 78.

OTPDeliver mapping rule

The `OTPDeliver` mapping rule specifies the delivery method of the one-time password to the user.

Use the following `OTPDeliver` mapping rules:

Generate the one-time password hint
The one-time password hint is a sequence of characters that is associated with the one-time password. The one-time password hint is displayed in the **One-Time Password Login** page. It is also sent to the user together with the one-time password.

You can customize the way the one-time password hint is generated by modifying the following section in the default `OTPDeliver` mapping rule:

```
var otpHint = Math.floor(1000 + (Math.random() * 9000));
```

Note: See the comments in the mapping rule for more details.

Generate the formatted one-time password
The formatted one-time password is the formatted version of the one-time password. The formatted one-time password, instead of the actual one-time password, is sent to the user. For example, for one-time password hint `abcd`, and one-time password `12345678`, you can set the formatted one-time password as `abcd-12345678`. For one-time password hint `efgh`, and one-time password`87654321`, you can set the one-time password as `efgh#8765#4321`.

You can customize the way that the one-time password is generated by modifying the following section in the sample OTPDeliver mapping rule:

```
var otpFormatted = otpHint + "-" + otp;
```

Note: See the comments in the mapping rule for more details.

Modify the delivery type of the selected method for delivering the one-time password
The delivery type specifies the one-time password Delivery plug-in that delivers the one-time password to the user.

Modify the delivery attribute of the selected method to deliver

The delivery attribute is an attribute that is associated with delivery type. The meaning of the delivery attribute depends on the one-time password provider plug-in for the delivery type. For example, for SMS delivery type, the delivery attribute is the mobile number of the user. For email delivery type, the delivery attribute is the email address of the user.

Note: See the comments in the mapping rule for more details.

You can also customize the mapping rule to use access control context data. For details see, "Customizing one-time password mapping rules to use access control context data" on page 78.

OTPVerify mapping rule

OTPVerify specifies the verification of the one-time password that is submitted by the user.

You can customize the sample OTPVerify mapping rule to modify the following verification rules:

Modify the one-time password type of the user

Indicates the one-time password type to determine the one-time Provider plug-in that verifies the one-time password submitted by the user.

Set the authentication level of the user

After one-time password authentication completes, a credential is issued that contains the authentication level of the user. You can customize the authentication level by modifying the following section in the mapping rule:

```
var authenticationLevel = contextAttributesAttributeContainer.getAttributeValueByNameAndType
       ("otp.otp-callback.authentication-level", "otp.otp-callback.type");
var attributeAuthenticationLevel = new Attribute("AUTHENTICATION_LEVEL",
       "urn:ibm:names:ITFIM:5.1:accessmanager", authenticationLevel);
attributeContainer.setAttribute(attributeAuthenticationLevel);
```

Enforce the number of times the user can submit the one-time password in the one-time password login page

If a user exceeds the permitted number of times to submit a one-time password, an error message displays. You can customize the number of times that the user can submit the one-time password in the one-time password login page by modifying the following section in the mapping rule:

```
var retryLimit = 5;
```

By default, this option is set to `false`.

Note: This setting applies only to MAC OTP.

Identify the secret key of a user

When a user registers with a time-based one-time password application, they are assigned a secret key. Store the secret key in this mapping rule for verification of the user by modifying the following code:

```
var secretStr = new java.lang.String(SECRET_KEY_GOES_HERE);
```

By default, this option is set to `false`.

Override the one-time password target URL

By default, a user is redirected to a target URL upon completion of an one-time password flow. That target URL was either the initial cached request at the WebSEAL or reverse proxy instance or was specified as part of the one-time password invocation using the **Target** query string parameter.

You can use the OTPVerify mapping rule to override this target URL by adding an attribute called **itfim_override_targeturl_attr**. This attribute ensures that at the completion of a successful one-time password flow, the user is redirected to the override target instead of the initial target. Example code:

```
var targetUrl = new java.lang.String("http://www.example.com/url");
var targetUrlAttr = new Attribute("itfim_override_targeturl_attr",
```

```
"urn:ibm:names:ITFIM:5.1:accessmanager", targetUrl);
attributeContainer.setAttribute(targetUrlAttr);
```

To customize one-time password verification, you can do one of the following actions:

- Create your own verification rules that are based on the sample OTPVerify mapping rule.
- Modify the sample OTPVerify mapping rule.

You can also customize the mapping rule to use access control context data. For details see, "Customizing one-time password mapping rules to use access control context data" on page 78.

Customizing one-time password mapping rules to use access control context data

Some authentication scenarios require that context data used in making an access control decision be available during authentication. You can configure Security Verify Access to capture the content data and make it available to the one-time password mapping rules.

About this task

You can configure Security Verify Access to perform access control policy evaluation when a resource is accessed. The access control policy evaluation can result on a permit with authentication. The required authentication is determined by the access control policy. Some scenarios require that the context data used to perform the access control decision be available during the authentication. In order to provide access to the access control context data, you can persist the context information for the predefined authentication obligations that perform one-time password authentication.

Note: The context data available is limited to the attributes referenced by the access control policy and the request attributes provided by the policy enforcement point. If the policy relies on the risk score to perform access control, the context data available also includes the risk-profile attributes.

Procedure

1. Log in to the local management interface.
2. Click **AAC** > **Global Settings** > **Advanced Configuration**.
3. Select **attributeCollection.authenticationContextAttributes**.
4. Click for the property.
5. In the text field, enter a list of comma separated attribute names to be collected during the authorization policy evaluation.
   For example, if your scenario requires the authentication level and host of the request the configuration property, enter `authenticationLevel, http:host`.

   The access control context data is provided to the one-time password mapping rules as context attributes values. The following format is used:

   ```
   <stsuuser:Attribute name="AttributeName-AttributeURI"
     type=""authn.service.context.attribute.type.AttributeDatatype">
   <stsuuser:Value>AttributeValue</stsuuser:Value>
   </stsuuser:Attribute>
   ```

   Where:

   - `name` is the attribute name and attribute identifier separated by a dash (-).
   - `type` is the attribute data type prefixed by `authn.service.context.attribute.type`.

   For example the `authenticationLevel` attribute value is added as:

   ```
   <stsuuser:Attribute name="authenticationlevel-urn-ibm:
      security:subject:authenticationlevel"
      type="authn.service.context.attribute.type.Integer">
   <stsuuser:Value>1</stsuuser:Value>
   </stsuuser:Attribute>
   ```

6. Click **OK**.
7. When you edit a property, a message indicates that there are undeployed changes. If you have finished making changes, deploy them.

   For more information, see Chapter 15, “Deploying pending changes,” on page 221.
8. Configure the mapping rule to use the information collected by this property as the context attribute.
   a) Click **AAC**.
   b) Under **Policy**, click **Authentication**.
   c) Click **Advanced**.
   d) Select and export the mapping rule.
   e) Use a text editor and modify the rule to access the attributes collected during the access control policy evaluation in the following format:

   ```
   var accessControlAttribute =
   contextAttributesAttributeContainer.getAttributeValueByNameAndType
   ("AttributeName-AttributeURI",
   "authn.service.context.attribute.type.AttributeDatatype");
   ```

   Where:

   - `name` is the attribute name and attribute identifier separated by a dash (-).
   - `type` is the attribute data type prefixed by `authn.service.context.attribute.type`.

   For example, the `authenticationLevel` attribute can be obtained using the following information:

   ```
   var accessControlAuthenticationLevel =
   contextAttributesAttributeContainer.getAttributeValueByNameAndType
   ("authenticationlevel-urn-ibm:security:subject:authenticationlevel",
   "authn.service.context.attribute.type.Integer");
   ```

   f) Save the mapping rule and take note of its location.
   g) In the local management interface, click **AAC**.
   h) Under **Policy**, click **Authentication**.
   i) Click **Advanced**.
   j) Select the mapping rule you want to replace.
   k) Click **Replace**. The Replace Mapping Rule panel opens.
   l) Click the field or the **Browse** button and select the file for your saved mapping rule.

   Attention: The name of the mapping rule cannot be replaced. The name of the uploaded file is ignored.

   m) Click **OK** to upload the mapping rule.

One-time password and authentication template files

The one-time password and authentication methods rely on HTML pages to interact with users, such as displaying errors or prompting users to provide a password or pin or to indicate the method by which they want to receive the password. You can customize these pages using the one-time password and authentication template files.

For information about one-time password and authentication template files, see Template files.

Push notification registration

Security Verify Access supports push notifications on both iOS and Android platforms. It can also be configured to send push notifications to the IBM Security Verify application.

About this task

To issue a notification to a client device, a specific payload must be generated and sent to the push notification service of the device's platform (Apple Push Notification Service, Firebase Cloud Messaging, or Push for IBM Verify). This notification request requires a form of authentication and authorization. To establish a trusted connection, Apple Push Notification Service requires a provider certificate, Firebase Cloud Messaging requires a server (API) key, and Push for IBM Verify requires configuration of authentication credentials.

As an administrator, you must register such forms of authentication for your authenticator applications to successfully deliver push notifications to clients on demand. Such registration can be done through either the local management interface or the RESTful API. For details about how to register push notification endpoints through the RESTful API, see the RESTful API documentation.

Note: For certificate-based push notification registration, use a specific SSL certificate database for this purpose and import all required certificates to the SSL certificate database before registration.

The Apple Push Notification Provider implementation was previously based on the Binary Provider API prior to 10.0.2.0. When upgrading to 10.0.2.0, existing provider configurations will be updated to match the expected settings for the new implementation, based on the Apple Push Notification service (APNs).

The only changes performed will be to change the Push Provider Host (`provider_address`) when the values in the following table match.

Old Push Provider Hosts	Migrated to new Push Provider Host
`gateway.push.apple.com` `feedback.push.apple.com`	`api.push.apple.com:443`
`gateway.sandbox.push.apple.com` `feedback.sandbox.push.apple.com`	`api.development.push.apple.com:443`

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Manage**, click **Push Notification Providers**.

   Adding a push notification provider

   a. Click **Add**.

   b. Provide values for the displayed fields.

   Mobile Platform
   Specifies whether the push notification is for iOS or Android platform.

   Application ID
   Identifier of the application.

   Push Provider Host
   Host name to be used to connect to the push service provider. The value can include port number, for example, `fcm.googleapis.com:443`.

   Push Provider
   Select the provider for your push notifications. The available options are **Firebase** (Google's push notification provider), **Apple** (Apple's push notification service), or **Push for IBM Verify**.

Server Key
If **Android Application** is selected in the **Mobile Platform** field or **Firebase** is selected as the **Push Provider** when **iOS Application** is selected in the **Mobile Platform** field, then this text field becomes available to enter the Server API Key to be used for authentication.

Certificate Store
If **iOS Application** is selected in the **Mobile Platform** field and **Apple** is selected as the **Push Provider**, then this field becomes available to select the certificate store on the appliance that contains the certificate to be used to authenticate to the Apple push notification service.

Certificate Label
If **iOS Application** is selected in the **Mobile Platform** field and **Apple** is selected as the **Push Provider**, then this field becomes available to select the certificate to be used to authenticate to the Apple push notification service.

c. Click **Save**.

d. Deploy the changes.

Modifying a push notification provider

a. Select the push notification provider to be modified.

b. Click **Edit**.

c. Change the settings as needed.

d. Click **Save**.

e. Deploy the changes.

IBM Verify has the ability to send push notifications to a mobile device where the device owner after unlocking the device can process an action of the push notification without launching IBM Verify mobile app. This is functionality supported with a silent push payload. Security Verify Access will send a silent push payload when the MMFA response authentication policy has a user presence mechanism as the first step in the workflow. No other configurations will result in a silent push payload.

The silent push payload functionality is enabled by default but can be disabled by using the advanced configuration parameter mmfa.silentpush.enabled.

Obtaining the required authentication credentials to configure push notification for IBM Security Verify

IBM Security Verify mobile application (referred to as IBM Verify hereafter) can receive push notifications from Security Verify Access to alert users about pending transactions. But first Security Verify Access must be configured to have the required IBM Verify authentication credentials before it can send push notifications to IBM Verify.

To configure your Security Verify Access appliance to send push notifications to IBM Verify, you must create a push notification application in Security Verify Access. This process requires you to have a push notification account including a unique client ID and client secret for push notification.

1. Send an email to the IBM Verify Administrator, `verify@au1.ibm.com`, with the subject line "**IBM Verify Push Notification Registration**".

   In the email contents, include your Name, IBM ID, company name, customer number, and site number (as provided in your Passport Advantage account).

   For example:

```
Name: Joe Smith
IBM ID: jblack@thecompany.com
Company Name: The Company Pty Ltd
Customer Number: 7654321
Site Number: 1768
```

Privacy information:
By registering an IBM push notification account you are agreeing to provide your personal details for registration purposes and to be kept informed via email regarding the Mobile Push service. This data will not be shared or distributed.

View IBM Privacy Statement.

In the case that you require a copy of the data collected, you can email the IBM Verify Administrator.

Similarly, if you would like to delete your push notification account, please send an email to the IBM Verify administrator, `verify@au1.ibm.com`, with a request to delete your account. You will then receive email confirmation when your account and associated personal details have been deleted.

2. You will receive an email reply within two business days with the required configuration details including your unique `Client Id` and `Client Secret`.

```
Mobile platform: iOS Application
Application ID: com.ibm.security.verifyapp
Push Provider Host: push.verify.ibm.com/v1.0/push
Push Provider: Push for IBM Verify
Client ID: xxx
Client Secret: xxx

Mobile platform: Android Application
Application ID: com.ibm.security.verifyapp
Push Provider Host: push.verify.ibm.com/v1.0/push
Push Provider: Push for IBM Verify
Client ID: xxx
Client Secret: xxx
```

3. Configure a new push notification application on your appliance with the configuration details provided in the email. Select **Push for IBM Verify** as the **Push Provider** during the configuration. For more information, see "Push notification registration" on page 80.

Cloud Identity API Integration

Cloud Identity supports several multi-factor authentication types including IBM Verify. One advantage of leveraging authentication methods from the cloud is that the methods can be updated with newer technology more rapidly, and new methods can be adopted without the need for a Security Verify Access update.

A second advantage is that Cloud Identity supplies both an email gateway and an SMS gateway, for SMS and Email OTP methods.

Instead of redirecting users to Cloud Identity to perform authentication the Cloud Identity API integration within Verify Access can be used. This allows for complete control over the look and feel of the authentication experience.

The API Integration is achieved through a series of Info Map rules as well as a new Authentication Mechanism type - Cloud Identity JavaScript. The new mechanism type is very similar to an Info Map mechanism, with a few extra properties.

Cloud Identity JavaScript

The Cloud Identity JavaScript mechanism can be used to implement authentication and user self care flows between Security Verify Access, Cloud Identity, and the end user.

This mechanism has several properties:

Mapping Rule
The configured Info Map mapping rule to be run

Server Connection
The Cloud Identity server connection to use to perform all operations

Verify Client ID
The client ID configured for IBM Verify in Cloud Identity

Bypass if not enrolled
A boolean indicating whether to return success without attempting authentication if no multi-factor authentication methods are enrolled.

Similar to Info Map mechanisms, if the configured mapping rule returns FALSE, then a page will be returned to the user. The JavaScript must define which page to return. The JavaScript can also populate any macros on the page and modify what is displayed to the user. If the rule returns TRUE, then the mechanism will return success and the policy will continue.

The following parameters are available in the mapping rule: “Available parameters in Info Map” on page 60

After you have configured the mechanism, you can create policies that include this mechanism. For more information, see Creating an authentication policy

Authentication flow

One of the Cloud Identity JavaScript mapping rules provided out of the box is the Authentication rule, which operates at a high level as follows.

Action	Result
Empty or "initiate"	Produce a landing page with all authentication methods listed such that the user can choose which method they would like to perform authentication with.
"chooseMethod"	Create a transaction (if required) and return a page relevant to the chosen method. Waiting page for IBM Verify, OTP input page for SMS/Email/Time-Based OTP, and OTP delivery detail input page for Transient Email/SMS.
"submitTransient"	Create a transient transaction with the given OTP delivery detail. Returns a OTP input page.
"verifyOTP"	Send the OTP to Cloud Identity for verification. If the verification succeeds, progress to the next step in the policy. If verification fails, display an error to the user.
"poll"	Check the status of the IBM Verify transaction. If the transaction was successful progress to the next step in the policy, otherwise display an error to the user.
"register"	When jitEnrollment is enabled, users may just-in-time enroll if they have no enrollments when prompted for authentication. This action is then used to perform that enrollment.
"pollEnrollment"	Used to poll an in-progress authenticator enrollment to check if it is completed successfully yet.
"validateOTP"	In some cases, new enrollments must be validated before they can be used at runtime for authentication/verification. This action validates the given OTP.

Several parameters can be modified at the beginning of the mapping rule to control different behavior:

Variable	Affect	Default
otpCorrelation	The correlation to use in SMS and Email OTP transactions.	"Verify Access verification"
enabledMethods	The type of methods to display to a user, if enrolled.	["Verify", "SMSOTP" "EmailOTP", "TOTP", "TransientEmail", "TransientSMS"]
verifyTransactionMessage	The transaction message to send when creating Verify transactions.	"You have a pending authentication challenge."
expandVerifyMethods	A boolean indicating whether all available Verify methods should be displayed to the user, or only one (which is the highest priority in verifyMethodPriority).	false
verifyMethodPriority	The priority of Verify methods to display if expandVerifyMethods is false.	["face", "iris", "retina", "eye", "fingerprint", "userpresence"]
jitEnrollment	A boolean indicating whether to redirect to the USC flow if no enrollments are found.	false
hideTransientIfEnrolled	A boolean indicating if transient factors should be hidden if the corresponding factor is fully enrolled. For example, hide transient email if there is a validated email OTP enrollment that can be used for verification.	true

User Self Care flow

One of the Cloud Identity Javascript mapping rules provided out of the box is the User Self Care rule, which operates at a high level as follows:

Action	Result
Empty or "initiate"	Produce a landing page with all authentication methods listed and an **Add new** button.
"register"	Either register a new authenticator, or enroll a new method type.
"validateOTP"	In some cases, new enrollments must be validated before they can be used at runtime for authentication/verification. This action validates the given OTP.
"pollEnrollment"	Used to poll an in-progress authenticator enrollment to check if it is completed successfully yet.
"remove"	Remove the enrollment with the given ID.
"update"	Update the enrollment with a given ID. This is mainly used to enable or disable an enrollment.

Several parameters can be modified at the beginning of the mapping rule to control different behavior:

Variable	Affect	Default
`enabledMethods`	The type of methods to display to a user, and to allow to be enrolled.	`["Verify", "SMSOTP" "EmailOTP", "TOTP"]`

Configuring the authentication and access module for cookieless operation

To allow the Authentication and access module to function in like an API, use of a client side cookie can be avoided with an advanced configuration option.

Before you begin

Configure the appliance to use Authentication-based and Content-based access with one of the following methods:

- Set up the Distributed Map (DMap)
- Set up a Distributed Session Cache (DSC)

About this task

When the cookieless operation is enabled, several configuration options are available to suit a range of deployment configurations and use cases.

In a high availability or clustered environments it is recommended that session affinity is enforced for a sufficient period of time to allow session replication between nodes. The length of time that sticky session is enforced depends on the deployment.

During normal operation a **`jsession`** cookie is still returned. However if this sessions cookie is returned in subsequent requests, it is ignored by the authentication service.

Note: This configuration option only removes the reliance on session cookies for the authentication service (**`/sps/authsvc`** and **`/sps/apiauthsvc`**) endpoints. Users still require a WebSEAL session cookie to maintain state.

Configure the Authentication-based and Content-based access module to not rely on client side cookies to store authentication information.

Administrators can choose to store this information in either the DSC, Memory, or the DMap, depending on deployment requirements.

Procedure

1. In the local management interface, click **AAC** > **Advanced Configuration**.
2. To enable cookies operation, toggle the **`authsvc.stateMgmt.cookieless`** key to **Enabled**.
3. Select session store by using the **`authsvc.stateMgmt.store`** key (either DSC for the Distributed Session Cache, DMap for the Distributed Map, or Memory for JVM memory caching):
   - Distributed Session Cache (DSC)
     a. Enable the **`distributedSessionCache.enabled`** key.
     b. Set DSC parameters:
        – **`distributedSessionCache.localCacheEnabled`**
        – **`distributedSessionCache.localCacheSize`**
        – **`distributedSessionCache.externalServers`**
   - Distributed Map (DMap) or Memory

a. Set **authsvc.stateMgmt.lifetime** for the maximum lifetime of a session in the DMap or in Memory.

- Memory only

a. Set **authsvc.stateMgmt.memory.cleanupThread.batchSize** if a maximum cleanup batch size is required

Note: Setting this parameter as 0 disables this option.

b. Set **authsvc.stateMgmt.memory.cleanupWait** to control the cleanup thread run frequency.

Note: Setting this parameter to -1 disables the cleanup thread.

c. Set **authsvc.stateMgmt.memory.maxSessions** to control the maximum number of sessions to cache. When this value is exceeded, IBM Security Verify Access removes the oldest sessions in the case.

Reverse Proxy Configuration with Authentication Services

In order to use the authentication service and advanced access control features, the reverse proxy protecting resources must be configured first.

Configuring advanced access control authentication on a reverse proxy

Configure the reverse proxy protecting resources to use the authentication service and access control features.

About this task

There is a tool in the Local Management Interface that configures a reverse proxy to work with these services. This tool can be invoked by the User Interface or with REST APIs.

When you invoke the REST API to configure the reverse proxy from the Local Management Interface, the following changes are made:

- The reverse proxy configuration is updated.
- Access control lists (ACLs) are created and attached.
- The rba-pop is created.
- The Runtime Server certificate is loaded into the WebSEAL Truststore.

All the changes that this API performs are documented in the REST API documentation, under *Authentication and Context based access configuration for a reverse proxy*.

This API does not perform any configuration which cannot be performed with public interfaces.

After this API is invoked, the `autocfg_authsvc.log` file in the reverse proxy logs is available to view the configuration that is performed.

Note: This topic only covers Authentication and Context based access. For OAuth, MMFA, or Federation, see one of the following topics:

- "Reverse proxy configuration for OAuth and OIDC provider" on page 129
- Configuring Mobile Multi-Factor Authentication
- Configuring a reverse proxy point of contact server

To configure a reverse proxy for use with Advanced Access Control, follow the procedure below:

Procedure

1. From the local management interface, select **Web** > **Manage** > **Reverse Proxy**.
   A list of reverse proxy instances displays.

2. Select the reverse proxy instance name from the list.
3. Select **Manage** > **AAC and Federation Configuration** > **Authentication and Context Based Access Configuration**.

   A window opens where you can add the configuration information. Populate or port the host as appropriate.

   The username and password which are required are that of the RTSS and STS service user. It is, by default `easuser`.

   For more information on managing these users, see “Managing user registries” on page 264.

Using the isamcfg tool

The `isamcfg` tool is deprecated. The configuration API invoked on a reverse proxy is used instead.

Various features of Advanced Access Control can be configured with the **`isamcfg`** tool. The **`isamcfg`** tool helps automate configuration of the following software and appliances:

- WebSEAL
- Security Verify Access appliance
- Security Verify Access for Web appliance
- Security Verify Access for Web software version
- Security Web Gateway appliance

The tools helps with:

- Creating a junction that points to the Advanced Access Control runtime endpoint.
- Creating a Security Verify Access POP used by Advanced Access Control to attach a policy.
- Configuring the instance of the appliance that supplies the web function, such as WebSEAL, with the instance of the appliance that provides the authorization server for Advanced Access Control.
- Configuring SSL, sets up key stores, trust stores, and authentication configuration between Advanced Access Control and the web function.
- Configuring a set of default obligation-to-URL mappings for the authentication service.
- Modifying the Security Verify Access appliance authentication configuration to support the authentication service.

Note: If you are upgrading, see the installation and configuration instructions in the IBM Knowledge Center.

If you are upgrading from a previous version of the product, run the **`isamcfg`** tool to unconfigure the current version. Then, run the **`isamcfg`** tool to configure the new version.

Configuring an appliance reverse proxy instance from the appliance

Use the **`isamcfg`** tool to configure an appliance reverse proxy instance from a local or remote appliance.

About this task

Run the command from the appliance command-line interface.

You must use this method to configure a reverse proxy instance on an appliance that is a restricted node in a cluster.

Note: Your appliance can be one of the following product versions:

- Security Verify Access 9.*
- Security Verify Access for Web 8.*
- Security Web Gateway 7.*

Procedure

1. Connect to the appliance with SSH.
2. Enter the administrator user ID and password.
3. Navigate to **isva** > **aac** > **config**. The **isamcfg** tool starts.
4. Use **isamcfg** to complete the configuration. For configuration details, see "isamcfg Security Verify Access appliance configuration worksheet" on page 93.

Results

When you complete the configuration, a summary screen displays indicating that the configuration is complete.

Configuring an appliance reverse proxy instance from an external machine

Use the **isamcfg** tool to configure an appliance reverse proxy instance from a remote machine.

Before you begin

Your appliance server and Advanced Access Control servers must be listening for connections on the appropriate management IP addresses and port numbers.

To use the **isamcfg** tool, you must meet the following conditions:

- Obtain an IBM® JRE v6.0 Update 10 or later.
- At least one reverse proxy instance exists on the appliance.
- Configure the *com.ibm.security.cmskeystore.CMSProvider* in the `java.security` file, which is in `$JAVA_HOME/lib/security`, of the IBM® JRE. The **isamcfg** tool uses the **ikeycmd** command to manipulate key database files. This requires the JRE to have the CMS provider that is configured in the `java.security` file.
- Ensure that the **ikeycmd** tool in the `$JAVA_HOME/bin` is on the system path.
- The reverse proxy instance that you are configuring cannot be on an appliance that is a restricted node in a cluster. See "Configuring an appliance reverse proxy instance from the appliance" on page 87.

About this task

Use this procedure if you want to configure an appliance that is on a machine that is separate from the Advanced Access Control appliance. Once you download the tool from the Advanced Access Control appliance, you can then use the command shell to configure an existing remote appliance.

The appliance you configure can be one of the following product versions:

- Security Verify Access 9.*
- Security Verify Access for Web 8.*
- Security Web Gateway 7.*

Procedure

1. Download the **isamcfg.jar** from the IBM Security Verify Access appliance with Advanced Access Control activated.
2. From the command line, type:

   ```
   java -jar isamcfg -action config -cfgurl http://isam-appliance-host-url/
   ```

   The *isam-appliance-host-url/* refers to the URL of the activated Security Verify Access appliance base.
3. Use the **isamcfg** tool to complete the configuration. For configuration details, see "isamcfg Security Verify Access appliance configuration worksheet" on page 93.

Results

When you complete the configuration, a summary screen displays indicating that the configuration is complete.

Configuring a WebSEAL instance

Use the **isamcfg** tool to configure WebSEAL as a point of contact and policy enforcement point for an appliance that has Advanced Access Control activated.

Before you begin

Make sure that your WebSEAL server is listening for connections on the appropriate IP addresses and port numbers. You can control the IP address and port number by using the WebSEAL configuration file. The IP address is controlled by the [server] network-interface configuration option, and the port numbers are controlled by the [server] `https-port` and [server] `http-port` options.

To use the **isamcfg** tool, you must:

- Obtain an IBM JRE, version 8.0 or later that is supported by the version of PDJrte installed.
- Ensure that the Java Runtime used to start the **isamcfg** tool is configured into the Security Verify Access domain in full mode that uses the PDJRTE. An error is displayed if this condition is not met. For more information about using the PDJRTE, see http://download.boulder.ibm.com/ibmdl/pub/software/dw/jdk/security/60/iKeyman.8.User.Guide.pdf.
- Ensure that the **isamcfg** tool is able to access the application interface for Advanced Access Control.
- Run the command from the appliance that hosts the reverse proxy instance, if the instance is a restricted node in a cluster. Also, you must use the command-line interface to run the command.

For IBM Security Verify Access WebSEAL, version 7.0 or later, you must also meet the following conditions:

- Configure the *com.ibm.security.cmskeystore.CMSProvider* in the `java.security` file, which is in `$JAVA_HOME/lib/security`, of the IBM JRE. The **isamcfg** tool uses the **ikeycmd** command to manipulate key database files. This requires the JRE to have the CMS provider that is configured in the `java.security` file.
- Ensure that the **ikeycmd** tool in the `$JAVA_HOME/bin` is on the system path.

For Tivoli Access Manager for e-business WebSEAL versions 6.1.1 or prior, ensure that **gsk7ikm** tool is on the system path.

Run the tool on the same system where WebSEAL is located.

About this task

This procedure connects the WebSEAL software version 7.* to Security Verify Access.

Note: This procedure is not intended for deployments that have a Security Verify Access appliance with the WebSEAL function.

Procedure

1. Download the **isamcfg.jar** from the Security Verify Access appliance with Advanced Access Control.
2. On the WebSEAL machine, set up a `JAVA_HOME` environment variable for the JRE:
   For example:

   `export JAVA_HOME=/opt/ibm/java-x86_64-60/jre`, or

   `export JAVA_HOME=/opt/IBM/WebSphere/AppServer/java/jre`
3. Add `$JAVA_HOME/bin` to the path export `PATH=$JAVA_HOME/bin:$PATH`.
4. From the command line, type:

```
java -jar isamcfg.jar -action config -cfgfile /path/to/webseald.conf
```

5. Use the `isamcfg` tool to complete the configuration. For configuration details, see "isamcfg WebSEAL configuration worksheet" on page 95.

Results

When you complete the configuration, a summary screen displays indicating that the configuration is complete.

Configuring WebSEAL in a highly available environment

When you are working in an environment with multiple Security Verify Access with Advanced Access Control servers, you can configure WebSEAL for failover and high availability.

About this task

You can configure the WebSEAL junction and Runtime Security Services External Authorization Service (RTSS EAS) to take advantage of high availability.

Figure 1 on page 90 depicts an environment where WebSEAL is configured to use two Security Verify Access servers, AAC_1 and AAC_2. AAC_1 and AAC_2 are appliances with Advanced Access Control activated. For high availability, you can configure a stateful junction to each available appliance. You can also include each server in the RTSS EAS configuration.

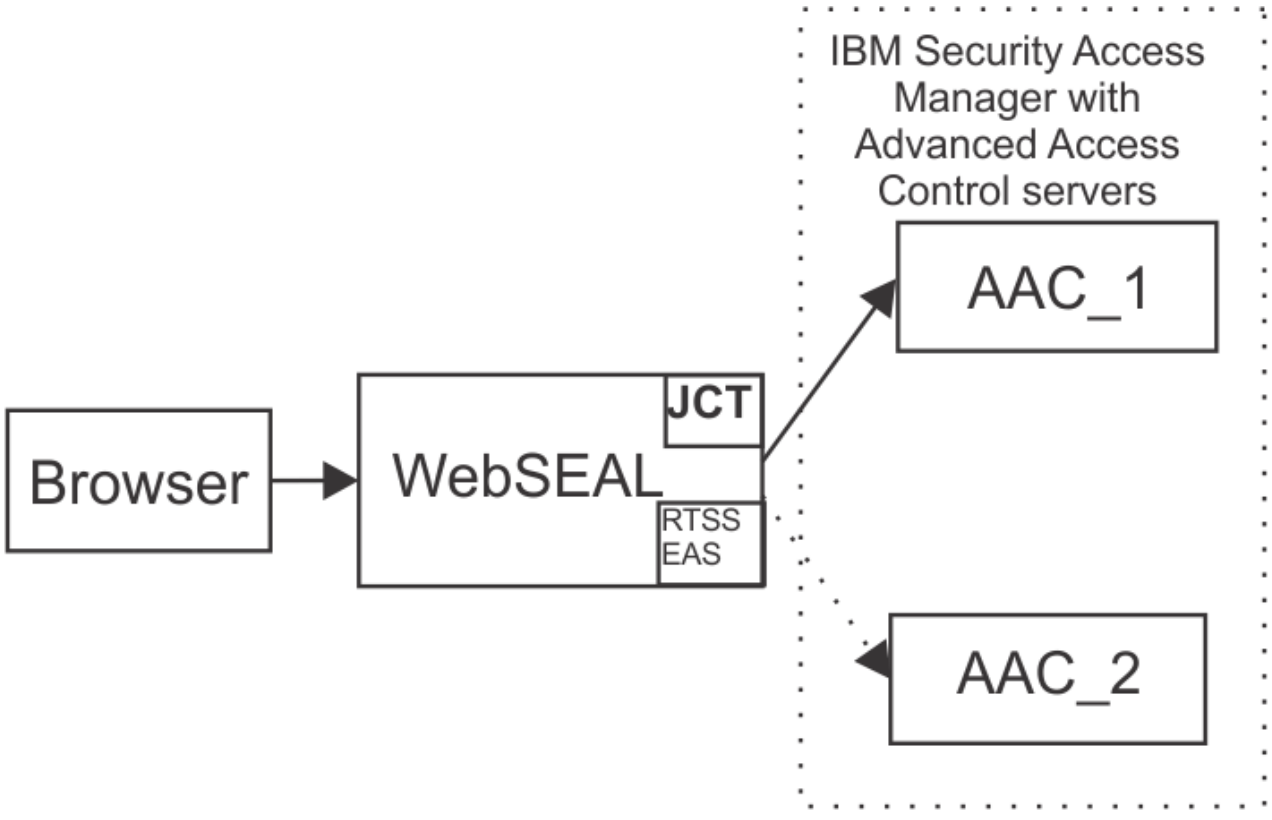


Figure 1. WebSEAL client in an environment with multiple IBM Security Verify Access servers

Advanced Access Control provides the **`isamcfg`** tool which configures each WebSEAL instance. This tool sets up a single junction server and configures the RTSS EAS to point to a single appliance.

If you have more than one appliance with Advanced Access Control activated, you need to manually configure the additional servers.

Procedure

1. For each Advanced Access Control appliance, include a server entry in the **[rtss-cluster:<*cluster*>]** stanza in the WebSEAL configuration file (for example, `webseald-default.conf`).

   ```
   [rtss-cluster:cluster1]
   server = 9,https://192.0.2.0:443/rtss/authz/services/AuthzService
   server = 9,https://192.0.2.5:443/rtss/authz/services/AuthzService
   ```

   Note:

   - The first parameter in each entry is the priority of the server in the cluster. Set the priority of your servers as appropriate to your environment. Using a priority of 9 for all servers evenly distributes the load and switches between the available appliances.
   - The second parameter is a well-formed Uniform Resource Locator (URL) for the runtime security services on the appliance. Use the IP address of the application interface on the Advanced Access Control-activated appliance.

2. Use the **pdadmin** utility to add extra servers to the junction.

   ```
   pdadmin sec_master> server task default-webseald-test.example.com add -h
    192.0.2.0 -p 443 /mga
   pdadmin sec_master> server task default-webseald-test.example.com add -h
    192.0.2.5 -p 443 /mga
   ```

   Note:

   - You must replace all example values in these commands with values that are appropriate to your environment.
   - The first parameter in this server task command is the fully qualified name of the WebSEAL server. For example, `default-webseald-test.example.com`.
   - The `-h` option specifies the appliance that you want to add to the junction. Use the IP address of the application interface on the target appliance.
   - The **isamcfg** tool creates an SSL junction by default. Therefore, when you are adding servers to this junction, use the SSL port number 443.
   - By default, the **isamcfg** tool creates a junction that is called `/mga`. This default value is used in the example commands.

3. For secure communication between WebSEAL and the appliance, use trusted certificates. WebSEAL must trust the certificates that are presented by the appliance. To establish this trust, you can use a common certificate authority (CA) that is trusted in your environment or you can configure WebSEAL to trust each individual certificate.

   Similarly, for client certificate authentication, the Advanced Access Control appliance must trust the certificates that are presented by WebSEAL.

4. To configure failover between junctioned servers, set the **use-new-stateful-on-error** stanza entry to `yes` for the stateful junction to the appliance. That is, update the **use-new-stateful-on-error** entry in the **[junction:/mga]** stanza in the WebSEAL configuration file. Where `/mga` is the name of the junction. The **isamcfg** tool creates a junction that is called `/mga` by default, but this name is configurable.

   If a stateful junction becomes unavailable when this value is set to `yes`, WebSEAL fails over to a different server. For example, if the stateful junction to `AAC_1` in Figure 1 on page 90 becomes unavailable, WebSEAL fails over to `AAC_2`.

isamcfg reference

Use the **isamcfg** tool to configure WebSEAL and Security Verify Access appliance servers. You configure a point of contact and policy enforcement point.

The appliance you configure can be one of the following product versions:

- Security Verify Access 9.*
- Security Verify Access for Web 8.*
- Security Web Gateway 7.*

isamcfg command line reference

Use the command line options described in this section to configure and unconfigure WebSEAL and Security Verify Access appliance servers.

Syntax

```
java -jar isamcfg.jar -action mode options
```

Description

The configuration tool has two modes of operation:

- **config**
- **unconfig**

Each mode uses different command line options.

Options

-action config *options*

This command configures a WebSEAL or Secure Verify Access appliance server. This mode uses different command line options:

-cfgfile *file*

Specifies which WebSEAL configuration file to use. This option is required when configuring a WebSEAL server.

-cfgurl *URL*

Specifies the appliance configuration URL to use. This option is required if configuring a Security Verify Access appliance.

-rspfile *file*

Specifies the response file for a configuration that is not interactive.

Default value: Interactive configuration.

-record

Generates a response file and make some necessary changes to WebSEAL configuration file but does not modify any other Security Verify Access appliance configuration.

-sslfactory

Specifies the secure socket connection factory to use.

When the Security Verify Access environment is enabled for NIST SP800-131a Strict mode, the only supported factory type is TLSv1.2.

If the parameter is not specified, the factory default is TLS.

-action unconfig *options*

This command unconfigures a WebSEAL or Security Verify Access appliance server. This mode uses different command line options:

-cfgfile *file*

Specifies which WebSEAL configuration file to use. This option is required when unconfiguring a WebSEAL server.

-cfgurl *URL*

Specifies the Security Verify Access appliance configuration URL to use. This option is required when unconfiguring a Security Verify Access appliance.

-rspfile *file*
Specifies the response file for a configuration that is not interactive.

Default value: Interactive configuration.

-record
Generates a response file and make some necessary changes to WebSEAL configuration file but does not modify any other Security Verify Access appliance configuration.

-sslfactory
Specifies the secure socket connection factory to use.

When the IBM Security Verify Access environment is enabled for NIST SP800-131a Strict mode, the only supported factory type is TLSv1.2.

If the parameter is not specified, the factory default is TLS.

Example

```
java -jar isamcfg.jar -action -config -cfgfile webseald.conf
```

The log files for the **isamcfg** tool are written to the system temporary directory. The system temporary file directory is specified by the system property **java.io.tmpdir**.

isamcfg Security Verify Access appliance configuration worksheet

Use the worksheet for the isamcfg command-line tool to collect the information you need about the configuration properties before you run the tool.

Description of properties

Note: If you are upgrading the Advanced Access Control module, see the installation and configuration instructions.

Select/deselect the capabilities you would like to configure by typing its number.

By default, the tool selects context-based authorization, authentication service, and API protection. You can configure all of them at the same time. If you do not want to configure them all, clear the capability that you do not want to configure by selecting its corresponding number.

Context-based Authorization

Configure this capability if your environment requires the use of behavioral and contextual data analytics to calculate the risk of a transaction.

Authentication service

Configure this capability if your environment requires the use of a step-up authentication type of authentication.

API Protection

Configure this capability if your environment requires the use of an OAuth authentication type to protect your Application Programming Interface (API).

Advanced Access Control Local Management Interface hostname
Enter the Local Management Interface hostname or IP address.

Advanced Access Control Local Management Interface port

Specify the port number of the Local Management Interface. The tool displays a port number.

Example value: 443

Press Enter to use the displayed port or enter your preferred port.

Advanced Access Control administrator user ID

Press Enter to use the displayed user ID or enter your preferred user ID.

Advanced Access Control administrator password

Enter the corresponding administrator password.

SSL certificate data valid (y/n)

Press **y** to validate that the displayed SSL certificate values are valid otherwise, press **n**.

Security Verify Access Appliance Local Management Interface hostname

Enter the Security Verify Access Appliance Local Management Interface hostname or IP address. The tool might display a value. Press Enter to use the displayed value or enter your preferred hostname or IP address.

Security Verify Access Appliance Local Management Interface port

Specify the port number of the Local Management Interface port. The tool displays a port number.

Example value: 443

Press Enter to use the port or enter your preferred port.

Security Verify Access Appliance administrator user ID
Press Enter to use the user ID or enter your preferred user ID.

Security Verify Access Appliance administrator password
Enter the corresponding administrator password.

SSL certificate data valid (y/n)

Press **y** to validated that the displayed SSL certificate values are valid otherwise, press **n**.

Instance to configure
The tool displays the available instances that you can configure in a list. Select the instance that you would like to configure.

Security Verify Access administrator user ID

Press Enter to use the displayed user ID or enter your preferred user ID.

Security Verify Access administrator password

Enter the corresponding administrator password.

Security Verify Access domain name [Default]:
Enter the corresponding domain name.

Advanced Access Control runtime listening interface hostname

Enter the hostname or IP address of the runtime listening interface for the appliance that has Advanced Access Control activated.

Example value: 172.16.229.10

Advanced Access Control runtime listening interface port

Specify the port number of the runtime listening interface for the appliance that has Advanced Access Control activated.

Example value: 443

Select the method for authentication between WebSEAL and the Advanced Access Control runtime listening interface

Certificate authentication
Use a certificate to authenticate between WebSEAL and the Advanced Access Control runtime listening interface.

User ID and password authentication
Use credentials to authenticate between WebSEAL and the Advanced Access Control runtime listening interface.

The default username is `easuser` and the default password is `passw0rd`.

Advanced Access Control runtime listening interface user ID:

Press Enter to use the displayed user ID or enter your preferred user ID.

Advanced Access Control runtime listening interface password:

Enter the corresponding Advanced Access Control runtime listening interface password.

SSL certificate data valid (y/n):

Press **y** to validated that the displayed SSL certificate values are valid otherwise, press **n**.

Automatically add CA certificate to the key database (y/n)

Press **y** if you want to automatically add the CA certificate to the key database, otherwise press **n**.

Note: Web Reverse Proxy instance restarts if **y** is selected.

The CA certificate already exists in the key database. Replace the CA certificate? (y/n)

Press **y** if you want to automatically replace the CA certificate to the key database, otherwise press **n**.

The following files are available on the Security Verify Access Appliance.

Choose one file for the following pages:

- The **400 Bad Request** response page. The default page is `oauth_template_rsp_400_bad_request.html`.
- The **401 Unauthorized** response page. The default page is `oauth_template_rsp_401_unauthorized.html`.
- The **502 Bad Gateway** response page. The default page is `oauth_template_rsp_502_bad_gateway.html`.

If you are not running the`isamcfg` tool on the appliance, you can choose **Cancel** to upload a local file.

If you are running the`isamcfg` tool on the appliance, you must upload your custom response file. Upload the file to the Security Verify Access appliance first before you run the `isamcfg` tool so that the file is displayed as an option. See “Uploading OAuth response files” on page 146.

The junction mga contains endpoints that require Authorization HTTP header to be forwarded to the backend server. Do you want to enable this feature? [y|n]?

Press y to allow endpoints that require Authorization HTTP header to be forwarded to the backend server. Otherwise, press n.

isamcfg WebSEAL configuration worksheet

Use the worksheet for the isamcfg command-line tool to collect the information you need about the configuration properties before you run the tool.

Description of properties

Note: If you are upgrading the Advanced Access Control module, see the installation and configuration instructions.

Select/deselect the capabilities you would like to configure by typing its number.

By default, the tool selects context-based authorization, authentication service, and API protection. You can configure all of them at the same time. If you do not want to configure them all, clear the capability that you do not want to configure by selecting its corresponding number.

Context-based Authorization

Configure this capability if your environment requires the use of behavioral and contextual data analytics to calculate the risk of a transaction.

Authentication service

Configure this capability if your environment requires the use of a step-up authentication type of authentication.

API Protection

Configure this capability if your environment requires the use of an OAuth authentication type to protect your Application Programming Interface (API).

Advanced Access Control Local Management Interface hostname
Enter the Local Management Interface hostname or IP address.

Advanced Access Control Local Management Interface port

Specify the port number of the Local Management Interface. The tool displays a port number.

Example value: 443

Press Enter to use the displayed port or enter your preferred port.

Advanced Access Control Appliance administrator user ID

Press Enter to use the displayed user ID or enter your preferred user ID.

Advanced Access Control Appliance administrator password

Enter the corresponding administrator password.

Domain name
Enter the Security Verify Access domain name. Press Enter to use the default domain name or enter your preferred domain name.

Security Verify Access administrator user ID

Enter a valid Security Verify Access administrator user ID. Press Enter to use the user ID or enter your preferred user ID.

Security Verify Access administrator password
Enter the corresponding Security Verify Access administrator password.

Advanced Access Control runtime listening interface hostname

Enter the hostname or IP address of the runtime listening interface for the appliance that has Advanced Access Control activated.

Example value: 172.16.229.10

Advanced Access Control runtime listening interface port

Specify the port number of the runtime listening interface for the appliance that has Advanced Access Control activated.

Example value: 443

Advanced Access Control runtime listening interface SSL key file

Specify the path to the keystore that contains the SSL keys that are required to connect to the Advanced Access Control runtime listening interface. Press Enter to use the default key file.

Advanced Access Control runtime listening interface SSL stash file

Specify the path to the stash file that contains the password to the Advanced Access Control runtime listening interface SSL keyfile. Press Enter to use the default stash file.

Select the method for authentication between WebSEAL and the Advanced Access Control runtime listening interface

Certificate authentication

Use a certificate to authenticate between WebSEAL and the Advanced Access Control runtime listening interface.

Note: On Windows operating systems, you must use certificate authentication for WebSEAL from IBM Security Verify Access for Web 7.0.0.2.

User ID and password authentication
Use credentials to authenticate between WebSEAL and the Advanced Access Control runtime listening interface.

The default username is `easuser` and the default password is `passw0rd`.

Advanced Access Control runtime listening interface SSL key file label

Specify the key label of the certificate to present to Advanced Access Control at run time.

SSL certificate data valid (y/n)

Press **y** to validated that the displayed SSL certificate values are valid otherwise, press **n**.

Automatically add CA certificate to the key database (y/n)
Press **y** if you want to automatically add the CA certificate to the key database, otherwise press **n**.

Note: Web Reverse Proxy instance restarts if **y** is selected.

The CA certificate already exists in the key database. Replace the CA certificate? (y/n)
Press **y** if you want to automatically replace the CA certificate to the key database, otherwise press **n**.

Runtime security service external authorization service library
By default, the tool displays the available library. Press Enter to use the available library or enter your preferred library.

The 400 Bad Request response page:
Choose one for the **400 Bad Request** response page. The default page is `oauth_template_rsp_400_bad_request.html`.

The following files are available on the Secure Verify Access Appliance.
Choose one file for the following pages:

- The **400 Bad Request** response page. The default page is `oauth_template_rsp_400_bad_request.html`.
- The **401 Unauthorized** response page. The default page is `oauth_template_rsp_401_unauthorized.html`.
- The **502 Bad Gateway** response page. The default page is `oauth_template_rsp_502_bad_gateway.html`.

Using a response file

Create and use a response file with the **isamcfg** tool to configure WebSEAL and IBM Security Verify Access for Web 7.0.

A response file records the actions to be taken by the **isamcfg** tool.

Use the **-record** command to create a response file without changing the configuration. For example:

```
/usr/lib/jvm/jre-1.7.0-ibm.x86_64/bin/java -jar
/opt/IBM/FIM/tools/isamcfg/isamcfg.jar -action config
-cfgurl https://1.1.1.1/ -record
```

You can then use the response file to run the **isamcfg** tool non-interactively. Use the **-rspfile** command to run the **isamcfg** tool with a response file. For example:

```
/usr/lib/jvm/jre-1.7.0-ibm.x86_64/bin/java -jar
/opt/IBM/FIM/tools/isamcfg/isamcfg.jar -action config
-cfgurl https://1.1.1.1/ -rspfile /tmp/isamcfg-access-control.properties
```

The contents of a response varies depending on your configuration, for example:

```
#Fri Sep 06 12:45:28 EST 2013
webseal.addcacert=y
tam.admin=sec_master
wga.pass=
pop.replace=pop.reuse
mga.admin.ssl.sha1fingerprint=CD\:1C\:F0\:D9\:A6\:3A\:7A\:11\
```

```
:16\:CC\:18\:CB\:56\:02\:08\:E2\:53\:99\:83\:3B
mga.runtime.auth.mode=mga.runtime.auth.ba
mga.runtime.ssl.md5fingerprint=E4\:65\:16\:A9\:D8\:B2\:97\
:3C\:F6\:13\:19\:77\:25\:8B\:B0\:0A
mga.admin.ssl.subjectdn=CN\=amapp800
wga.ssl.md5fingerprint=B2\:9F\:87\:8A\:D1\:49\:D9\:A1\:BA\
:03\:4B\:41\:E9\:DF\:44\:C7
rtss.password=
wga.ssl.sha1fingerprint=CD\:1C\:F0\:D9\:A6\:3A\:7A\:11\:16\
:CC\:18\:CB\:56\:02\:08\:E2\:53\:99\:83\:3B
wga.instance=mobile
mga.admin.user=admin
wga.port=443
isam.mode=context_based_authorization,
authentication_service,
mga.runtime.port=443
mga.admin.pass=
jct.replace=reuse
wga.host=1.1.1.1
mga.runtime.host=1.1.1.1
mga.admin.ssl.md5fingerprint=B2\:9F\:87\:8A\:D1\:49\:D9\
:A1\:BA\:03\:4B\:41\:E9\:DF\:44\:C7
wga.ssl.subjectdn=CN\=amapp800
mga.runtime.ssl.subjectdn=CN\=isva, O\=ibm, C\=us
mga.admin.ssl.issuerdn=CN\=amapp800
rtss.user=admin
mga.runtime.ssl.sha1fingerprint=F9\:38\:5A\:53\:0A\:DA\:1A\
:FF\:67\:46\:C9\:58\:3F\:F1\:2B\:00\:B0\:6C\:83\:32
mga.admin.port=443
tam.password=
wga.ssl.issuerdn=CN\=amapp800
mga.runtime.ssl.issuerdn=CN\=isva, O\=ibm, C\=us
wga.user=admin
mga.admin.host=1.1.1.1
```

Branching Authentication Policy

Default-Mapping Rules

You can use several mapping rules that are immediately available as examples of typical branching policy flows.

Generic Rule and Template

The Generic rule extracts only the branch names from the policy and provides those names to the template page to display to the user. The user then picks a branch that is based only on the name.

For example, a policy with two branches called “Forgotten Username” and “Forgotten Password”. A template page with those two names as individual options is displayed to the user.

Second Factor Rule and Template

The Second Factor rule fetches a user’s enrollment status and displays the three most used second factor options to the user. The template displays relevant information for each second factor mechanism. For example, device name for MMFA Authenticator. The user must be authenticated to use this mapping rule and template.

MMFA and TOTP Fallback

The MMFA with TOTP Fallback defaults are a subset of the Second Factor rule and template page. The rule is simpler but also demonstrates the server automatically choosing an option for the user, but allows them to return and choose a fallback method.

Username-less Login

The Username-less Login rule does not require a user to be logged in, and automatically displays the QR Code for login. It also offers the user the choice to do a FIDO2 username-less login instead.

FIDO2 Platform Authenticator Inline Registration (PAIR)

The following mapping rules are used in the FIDO2 PAIR flow:

Authentication decision mapping rule
Determines whether the user is already authenticated, or whether to prompt for FIDO2 or username and password authentication.

Registration decision mapping rule
Used to enroll or skip registration.

Info Map mapping rule
Required to switch between API and browser requests, and is included in the FIDO2 authentication and registration branches.

Identifier First Authenticatio (IFA)

The IFA scenario utilizes multiple mapping rules in both decisions and InfoMap mechanisms.

Branching_IdentiferFirstAuth
The first decision in the policy fetches the username and returns a choice of authentication methods to the user based on the scenario wizard configuration and the methods that the user has enrolled.

IFA_Credential_Complete
After successful authentication, the details of the MMFA or FIDO2/WebAuthn registration used to perform authentication are added to the user's credential.

IFA_Prep_FIDO2_PAIR
Determines if the user should be prompted to complete the registration step of the FIDO2 PAIR.

FIDO2PAIR_Reg_Decision
Used to enroll or skip registration.

FIDO2PAIR_Completed_InfoMap
Required to switch between API and browser requests.

Execute authentication service policies in an Info Map

The `AuthSvcClient` class can be used to make internal calls to authentication service policies. This allows for extra customization of authentication flows without needing to contact the authentication service through HTTP requests within an Info Map.

There are three pairs of functions that can be called. This is dependent on the calling location. If a context variable is provided, the policy state and context will be stored in that context variable (`InfoMap`, `Access Policy`). Otherwise, use the non-context functions which will store the policy state and context in the DMAP.

When you are calling from an `InfoMap` policy, the following functions should be used with the InfoMap context variable:

```
executeInInfoMap(Context, String)
executeInInfoMap(Context, String, STSUniversalUser)
```

When you are calling from an Access Policy, the following functions should be used with the Access Policy context variable:

```
executeInAccessPolicy(Context, String)
executeInAccessPolicy(Context, String, STSUniversalUser)
```

When you are calling from other contexts, or for state-less invocation in the outer calling layer, the following functions will store state and context in the DMAP:

```
execute(String)
execute(String, STSUniversalUser)
```

See distributedMap to customize the DMAP store and other parameters.

To pass user credential information to the policy, use the functions that take a `STSUniversalUser` object. This will be required in most cases, for example when performing second factor authentication. Helpers have been provided to build the `STSUniversalUser` object, see getRequestTokenAttrAsStsuu (Context) and getSimpleSTSUU (String).

executeInInfoMap

```
public static String executeInInfoMap(
    Context context,
    String payload
)
```

Execute an authentication policy from within a running InfoMap. The policy request, response, session, and context objects are completely recreated from the given arguments, and stored separately from the objects of the already running policy (for example, the objects of the outer layer of policy execution, which contains the `InfoMap`).This method will store the policy context within the outer `InfoMap` context. No user credential information or request tokens are passed to the policy. See `executeInInfoMap`(Context, String, STSUniversalUser) to include user information.

This method executes the policy specified in the given payload. Use the following parameters:

context
The context variable provided to the Info Map. Required to save the inner policy execution context, and fetch locale for translated messages.

payload
The policy payload as stringified JSON. Must include either the policy ID (`PolicyId`), or a state ID (`StateId`), and other request parameters dependent on the policy being run. For example, the '`operation`' parameter is required to complete most policies.

Returns:
A stringfied JSON payload that contains 3 parameters, status, page, and response. The status value will be set to one of three values, indicating the status of the policy: "*pause*", "*abort*", or "*success*". The response value will be set to the JSON payload returned from the policy.

executeInInfoMap

```
public static String execute(
    Context context,
    String payload,
    STSUniversalUser stsuu
)
```

Execute an authentication policy from within a running `InfoMap`, with the user identity specified by the input STSUniversalUser. The policy request, response, session, and context objects are completely recreated from the given arguments, and stored separately from the objects of the already running policy (for example, the objects of the outer layer of policy execution, which contains the `InfoMap`).

This method will store the policy context within the outer `InfoMap` context. Use the following parameters:

context
The context variable provided to the `InfoMap`. Required to save the inner policy execution context, and fetch locale for translated messages.

payload
The policy payload as stringified JSON. Must include either the policy ID (`PolicyId`), or a state ID (`StateId`), and other request parameters dependent on the policy being run. For example, the '`operation`' parameter is required to complete most policies.

stsuu
The user identity to complete the policy with. Can be constructed as per usual for mapping rules, or by using one of the `AuthSvcClient` helper functions.

Returns:
A stringfied JSON payload that contains 3 parameters, **`status`**, **`page`**, and **`response`**. The status value will be set to one of three values, indicating the status of the policy: "*pause*", "*abort*", or "*success*". The response value will be set to the JSON payload returned from the policy.

executeInAccessPolicy

```
public static String executeInAccessPolicy(
    Context accessPolicyContext,
    String payload
)
```

Execute an authentication policy from within a running Access Policy. The policy request, response, session, and context objects are completely recreated from the given arguments, and stored separately from the objects of the already running context (for example, the new request object will not impact the Access Policy request object).

This method will store the policy context within the session from the Access Policy context.

No user credential information or request tokens are passed to the policy. See **`executeInAccessPolicy`**(Context, String, STSUniversalUser) to include user information.

Use the following parameters:

accessPolicyContext
The context variable provided to the Access Policy. Required to save the inner policy execution context, and fetch locale for translated messages.

payload
The policy payload as stringified JSON. Must include either policy ID (`PolicyId`), or a state ID (`StateId`), and other request parameters dependent on the policy being run. For example, the “operation” parameter is required to complete most policies.

Returns:
A stringfied JSON payload that contains 3 parameters, **`status`**, **`page`**, and **`response`**. The status value will be set to one of three values, indicating the status of the policy: "*pause*", "*abort*", or "*success*". The response value will be set to the JSON payload returned from the policy.

executeInAccessPolicy

```
public static String executeInAccessPolicy(
    Context accessPolicyContext,
    String payload,
    STSUniversalUser stsuu
)
```

Execute an authentication policy from within a running Access Policy. The policy request, response, session, and context objects are completely recreated from the given arguments, and stored separately from the objects of the already running context (for example, the new request object will not impact the Access Policy request object).

This method will store the policy context within the session from the Access Policy context.

Use the following parameters:

accessPolicyContext
The context variable provided to the Access Policy. Required to save the inner policy execution context, and fetch locale for translated messages.

payload
The policy payload as stringified JSON. Must include either policy ID (`PolicyId`), or a state ID (`StateId`), and other request parameters dependent on the policy being run. For example, the “operation” parameter is required to complete most policies.

Returns:

A stringfied JSON payload that contains 3 parameters, **status**, **page**, and **response**. The status value will be set to one of three values, indicating the status of the policy: "*pause*", "*abort*", or "*success*". The response value will be set to the JSON payload returned from the policy.

execute

```
public static String execute(
    String payload
)
```

Execute an authentication policy from within a mapping rule. The policy request, response, session, and context objects are completely recreated from the given arguments, and stored separately from the objects of the already running context.

This method will store the policy context within the DMAP, which can be configured to use multiple different stores (for example, HVDB, Redis). No user credential information or request tokens are passed to the policy. See **execute**(String, STSUniversalUser) to include user information.

Use the following parameters:

payload

The policy payload as stringified JSON. Must include either the policy ID (`PolicyId`), or a state ID (`StateId`), and other request parameters dependent on the policy being run. For example, the '`operation`' parameter is required to complete most policies.

Returns:

A stringfied JSON payload that contains 3 parameters, **status**, **page**, and **response**. The status value will be set to one of three values, indicating the status of the policy: "*pause*", "*abort*", or "*success*". The response value will be set to the JSON payload returned from the policy.

execute

```
public static String execute(
    String payload,
    STSUniversalUser stsuu
)
```

Execute an authentication policy from within a mapping rule. The policy request, response, session, and context objects are completely recreated from the given arguments, and stored separately from the objects of the already running context.

This method will store the policy context within the DMAP, which can be configured to use multiple different stores (for example, HVDB, Redis).

Use the following parameters:

payload

The policy payload as stringified JSON. Must include either the policy ID (`PolicyId`), or a state ID (`StateId`), and other request parameters dependent on the policy being run. For example, the '`operation`' parameter is required to complete most policies.

stsuu

The user identity to complete the policy with. Can be constructed as per usual for mapping rules, or by using one of the `AuthSvcClient` helper functions.

Returns:

A stringfied JSON payload that contains 3 parameters, status, page, and response. The status value will be set to one of three values, indicating the status of the policy: "pause", "abort", or "success". The response value will be set to the JSON payload returned from the policy.

getRequestTokenAttrAsStsuu

```
public static STSUniversalUser getRequestTokenAttrAsStsuu(
    Context context
)
```

This method creates a new STSUniversalUser object with the attributes in any identity tokens available in the given InfoMap context.

Use the following parameters:

context
The context variable provided to the Info Map which contains identity attributes.

Returns:
The STSUniversalUser populated with identity attributes.

getSimpleSTSUU

```
public static STSUniversalUser getSimpleSTSUU(
    String username
)
```

This method creates a new STSUniversalUser object with the principal name set to the given username. Use the following parameters:

username
The username to set as the principal name of the new STSUniversalUser object.

Returns:
The STSUniversalUser populated with the principal name.

TOTP Example

For example, to perform TOTP authentication within the context of an Info Map, the following mapping rule can be used.

```
importClass(Packages.com.tivoli.am.fim.trustserver.sts.utilities.IDMappingExtUtils);
importClass(Packages.com.tivoli.am.fim.authsvc.local.client.AuthSvcClient);

var result = false;

var otp = context.get(Scope.REQUEST, "urn:ibm:security:asf:request:parameter", "otp");
IDMappingExtUtils.traceString("TOTP to verify: "+otp);

if(otp != null) {

    var jsonRequest = {
        "PolicyId": "urn:ibm:security:authentication:asf:totp",
        "otp":""+otp,
        "operation":"verify"
    };
    IDMappingExtUtils.traceString("AuthSvcClient JSON request: " + JSON.stringify(jsonRequest));
    var response = AuthSvcClient.executeInInfoMap(context, JSON.stringify(jsonRequest),
AuthSvcClient.getSimpleSTSUU("testuser"));
    IDMappingExtUtils.traceString("AuthSvcClient JSON response: " + response);

    var jsonResponse = JSON.parse(response);
    if(jsonResponse.status == "success") {
        // Policy completed successfully, return true.
        result = true;
        context.set(Scope.SESSION, "urn:ibm:security:asf:response:token:attributes",
"username", "testuser");
    } else {
        // Policy failed, prompt for TOTP again.
        macros.put("@ERROR_MESSAGE@", jsonResponse.response.message);
        page.setValue("/authsvc/authenticator/totp/login.html");
    }
} else {
    // Return a page to gather the TOTP
    page.setValue("/authsvc/authenticator/totp/login.html");
}

// Set result. Either true for stop running this rule, or false for run the rule again.
success.setValue(result);
IDMappingExtUtils.traceString("Result of mapping rule: "+result);
```

Chapter 10. OAuth 2.0 and OIDC support

Security Verify Access supports the OAuth 2.0 protocol, including OpenID Connect.

The support is provided at both the Advanced Access Control and the Federation licensing levels.

- OAuth is an HTTP-based authorization protocol. It gives third-party applications scoped access to a protected resource on behalf of the resource owner. It gives scoped access by creating an approval interaction between the resource owner, client, and the resource server. It gives users the ability to share their private resources between sites without providing usernames and passwords. Private resources can be anything, but common examples include photos, videos, and contact lists.

  The implementation of OAuth 2.0 in Advanced Access Control strictly follows the OAuth 2.0 standards. For a complete description of the OAuth 2.0 specifications, see the OAuth website http://www.oauth.net.

  The OAuth 2.0 implementation of Advanced Access Control also integrates with WebSphere DataPower. For more information, see DataPower Integration.
- OpenID Connect is an extension of the OAuth protocol to better support identity and authentication. For a complete description of the OpenID Connect specifications, see the OpenID website: http://openid.net/specs/

OAuth and OpenID Connect concepts

You can use the following topics to review the main concepts for the OAuth 2.0 protocol and for the OpenID Connect extensions to the protocol.

OAuth 2.0 concepts

This topic introduces the main concepts of OAuth 2.0.

The following concepts are generally used in OAuth 2.0.

Resource owner
An entity capable of authorizing access to a protected resource. When the resource owner is a person, it is called an *user*.

OAuth client
A third-party application that wants access to the private resources of the resource owner. The OAuth client can make protected resource requests on behalf of the resource owner after the resource owner grants it authorization. OAuth 2.0 introduces two types of clients: confidential and public. Confidential clients are registered with a client secret, while public clients are not.

OAuth server
Known as the **Authorization server** in OAuth 2.0. The server that gives OAuth clients scoped access to a protected resource on behalf of the resource owner. The server issues an access token to the OAuth client after it successfully does the following actions:

- Authenticates the resource owner.
- Validates a request or an authorization grant.
- Obtains resource owner authorization.

An authorization server can also be the resource server.

Scope
A property requested by the OAuth client, to specify the scope of the access request. The scope is used by the caller to tag the intended use of the token. The authorization server can use the scope response parameter to tell the client the scope of the access token that was issued. Scopes are usually shown on the consent page, so that a user can understand the client's intended use of the token. Common scopes include `profile` and `email`.

Access token
A string that represents authorization granted to the OAuth client by the resource owner. This string represents specific scopes and durations of access. It is granted by the resource owner and enforced by the OAuth server.

Bearer token
Token issued from the token endpoint. This includes an access token and potentially a refresh token. See http://tools.ietf.org/html/rfc6750 for more information on bearer tokens.

Protected resource
A restricted resource that can be accessed from the OAuth server using authenticated requests.

Resource server
The server that hosts the protected resources. It can use access tokens to accept and respond to protected resource requests. The resource server might be the same server as the authorization server.

Authorization grant
A grant that represents the resource owner authorization to access its protected resources. OAuth clients use an authorization grant to obtain an access token. There are four authorization grant types: authorization code, implicit, resource owner password credentials, and client credentials.

Authorization code
A code that the Authorization server generates when the resource owner authorizes a request.

Refresh token
A string that is used to obtain a new access token.

A refresh token is optionally issued by the authorization server to the OAuth client together with an access token. The OAuth client can use the refresh token to request another access token that is based on the same authorization, without involving the resource owner again.

OpenID Connect concepts

OpenID Connect extends OAuth 2.0 function. The OpenID Connect concepts include the OAuth 2.0 concepts.

OpenID Connect Provider (OP)
OAuth 2.0 Authorization Server that can authenticate the user and providing claims to a Relying Party about the authentication event and the user.

Relying Party (RP)
OAuth 2.0 Client application that requires user authentication and claims from an OpenID Connect Provider.

Claim

Piece of information asserted about an entity that is included in the ID token. An OpenID Connect Provider must document which claims it includes in its ID tokens.

The following claims are required claims about the authentication event:

- `aud` (Audience): Must contain the client identifier of the RP registered at the issuer.
- `iss`(Issuer): The issuer identifier of the OP.
- `exp` (Expiration time): The RP must validate the ID token before this time.
- `iat` (Issued at): The time at which the ID token was issued.

The following claims are required claims about the user:

- `sub` (Subject): A locally unique and permanent (never reassigned) identifier of the user at the issuer.

Optional claims about the user can include `first_name`, `last_name`, `picture`, `gender`, etc.

Scope
A property that is requested by the Relying Party, which can be consented to by the user, that requests certain claims be included in the ID token. In addition to the definition of scope in OAuth, OpenID

Connect adds some well-defined scopes. It requires the `openid` scope to identify a request to an OpenID Connect flow. It also includes the common scopes `profile` and `email`, which pertain to a specific set of claims.

Bearer token
In addition to the types of tokens that are listed in the description of Bearer token for OAuth 2.0 support, for OpenID Connect the token can be an ID token.

ID token

JSON Web Token (JWT) that contains claims about the authentication event and the user.

JWTs are Base64 encoded JSON objects with three sections: Header, Claims Set, and JSON Web Signature (JWS). The sections are separated in the JWT by a period ('.'). The Header must at least contain the algorithm that is used to sign the JWT (the `alg` claim).

The Claims Set includes claims about the authentication event and the user.

The JSON Web Signature (JWS) is used to verify the signing of the JWT. For more information, see RFC7515.

For more information about JWTs, see RFC7519.

Issuer
Entity that issues a set of claims.

Issuer identifier
Verifiable identifier for an issuer. An issuer identifier is a case-sensitive URL that uses the HTTPS scheme that contains scheme, host, and optionally, port number and path components and no query or fragment components.

Hybrid flow

The OpenID Connect hybrid flow is a request to `/authorize`, where both an authorization code and either an access token or id_token, or both, are returned. The value of `response_type` for a hybrid flow is any of the following values.

- `code id_token`
- `code id_token token`
- `code token`

Some tokens are returned by the authorization endpoint, and others are returned by the token endpoint.

Note: Hybrid flow is supported in OpenID Connect but not in OAuth. See http://openid.net/specs/openid-connect-core-1_0.html#HybridFlowAuth.

Metadata
Metadata is the discovery information that the OpenID Provider (OP) exposes. If metadata is configured, the Relying Party (RP) uses it as the source of the `/authorize`, `/token`, `/jwks`, and `/userinfo` URLs for the RP. See http://openid.net/specs/openid-connect-discovery-1_0.html#ProviderMetadata.

Userinfo
The Userinfo endpoint is an OAuth 2.0 protected resource that returns claims about the authenticated user. These claims are normally represented by a JSON object that contains a collection of name and value pairs for each claim. For more information, see http://openid.net/specs/openid-connect-core-1_0.html#UserInfo.

IBM Security Verify Access OIDC Provider

IBM Security Verify Access OIDC Provider is a containerized lightweight OIDC provider that is ready for immediate use. It supports OIDC and OAuth standards and can be deployed and scaled by using any modern orchestration stack, including Kubernetes.

The IBM Security Verify Access OIDC Provider has the following advantages.

- It supports the current OAuth and OIDC standards for immediate use, such as pushed authorization request and client-initiated back-channel authentication.
- It is cloud native and lightweight. It can be deployed and scaled with any modern orchestration stack, including Kubernetes.
- It is declarative configuration that uses YAML and does not require a configured database.
- Similar customization options are supported by using JavaScript mapping rules and access policies.
- It provides continuous delivery.

For more information that includes setup and configuration, see https://docs.verify.ibm.com/ibm-security-verify-access.

OAuth 2.0 endpoints

Endpoints provide OAuth clients the ability to communicate with the OAuth server or authorization server within a definition.

All endpoints can be accessed through URLs. The syntax of the URLs is specific to the purpose of the access.

If you are responsible for installing and configuring the appliance, you might find it helpful to be familiar with these endpoints and URLs.

API protection definitions

The API protection definitions naming follows the standard Advanced Access Control naming convention. The syntax is:

```
https://<hostname:port>/<junction>/sps/oauth/oauth20
```

For example:

```
https://server.oauth.com/mga/sps/oauth/oauth20
```

The following table describes the endpoints that are used in an API protection definition.

Notes:

- There is only a single set of endpoints.
- Not all authorization grant types use all three endpoints in a single OAuth 2.0 flow.

Table 3. OAuth 2.0 endpoint definitions and URLs

Endpoint name	Description	Example
Authorization endpoint	An authorization URL where the resource owner grants authorization to the OAuth client to access the protected resource.	`https://server.oauth.com/mga/sps/oauth/oauth20/authorize`
Token endpoint	A token request URL where the OAuth client exchanges an authorization grant for an access token and an optional refresh token.	`https://server.oauth.com/mga/sps/oauth/oauth20/token`

Table 3. OAuth 2.0 endpoint definitions and URLs (continued)

Endpoint name	Description	Example
Clients manager endpoint	A URL for resource owners to manage their trusted clients. The resource owner can use the clients manager endpoint to access and modify the list of clients that are authorized to access the protected resource. The trusted clients manager shows the client name and permitted scope of an authorized client. **Note:** The list does not show clients that are disabled or deleted from the definition. The resource owner can optionally remove trusted client information from the list. In doing so, the resource owner is prompted for consent to authorize the next time the OAuth client attempts to access the protected resource.	`https://server.oauth.com/mga/sps/oauth/oauth20/clients`
Session endpoint	A URL where an `access_token` can be exchanged for a web session. The client uses the endpoint to obtain an authenticated web session for the resource owner that is typically used in hybrid mobile application scenarios. **Note:** The session endpoint is disabled by default and can be enabled by using advanced configuration. The client must send a POST request with the `access_token` in the body. `POST /mga/sps/oauth/oauth20/session HTTP/1.1Host: server.oauth.com Content-Type: application /x-www-form-urlencoded access_token=abc123...`	`https://server.oauth.com/mga/sps/oauth/oauth20/session`
Authorization grant management endpoint	A URL where you can view your authorization grants and the tokens and attributes of each authorization grant.	`http://server.oauth.com/mga/sps/mga/user/mgmt/html/device/device_selection.html`
Logout endpoint	A URL where you can end a session by revoking an `access_token`. The token must be provided in the Authorization header or a session cookie must be used.	`http://server.oauth.com/mga/sps/oauth/oauth20/logout`

Table 3. OAuth 2.0 endpoint definitions and URLs (continued)

Endpoint name	Description	Example
Introspect endpoint	A URL where an `access_token` can be inspected by an `oauth_client`. For more details, see "OAuth introspection" on page 146. **Note:** The introspect endpoint is enabled by default and can be disabled by using the advanced configuration.	`https://server.oauth.com/mga/sps/oauth/oauth20/introspect`
Revocation endpoint	A URL where you can revoke OAuth tokens issued to a client. For more details, see "OAuth revocation endpoint" on page 148.	`https://server.oauth.com/mga/sps/oauth/oauth20/revoke`

Metadata endpoint	Final portion of URL is a path parameter that is the name of your API Protection definition. Template file available:
	`<locale>/oauth20/metadata.json`
	If a custom template is needed per definition use:
	`<Locale>/oauth20/<Your_API_Definition_Name>/metadata.json`
	Example:
	`{"issuer":"https://mywebseal.com", "authorization_endpoint":"https://mywebseal.com/sps/oauth/oauth20/authorize", "token_endpoint":"https://mywebseal.com/sps/oauth/oauth20/token", "userinfo_endpoint":"https://mywebseal.com/sps/oauth/oauth20/userinfo", "jwks_uri":"http://mywebseal.com/sps/oauth/oauth20/jwks/testDef", "response_types_supported": ["token","id_token","token id_token","code"], "response_modes_supported": ["fragment","form_post"], "grant_types_supported":"implicit","password","authorization_code"], "id_token_signing_alg_values_supported: ["RS256"], "introspect_endpoint":"https://mywebseal.com/sps/oauth/oauth20/introspect", "revocation_endpoint":"https://mywebseal.com/sps/oauth/oauth20/revoke"}`
		`https://server.oauth.com/mga/sps/oauth/oauth20/metadata/<Definition_Name>`

Userinfo Endpoint	The Userinfo endpoint is an OAuth 2.0 protected resource that returns claims about the authenticated end-user. These claims are normally represented by a JSON object that contains a collection of name and value pairs for each claim. For more info, see http://openid.net/specs/openid-connect-core-1_0.html#UserInfo	`https://server.oauth.com/mga/sps/oauth/oauth20/userinfo`

Table 3. OAuth 2.0 endpoint definitions and URLs (continued)		
Endpoint name	**Description**	**Example**
JWKS Uri	The URL of the JSON Web Key (JWK) Set document for the OpenID Provider. This data contains the signing key (or keys) that the Relying Party uses to validate signatures from the OpenID Provider. Optionally, the JWK Set can contain the Server's encryption key (or keys), which Relying Parties use to encrypt requests to the Server.	`https://server.oauth.com/mga/sps/oauth/oauth20/jwks/<Definition_Name>`
Client Registration Endpoint	The Client Registration Endpoint where an application can request a clientId in order to make OAuth/OIDC requests. This is also the endpoint to retrieve a registered client's definition, or delete it.	`https://server.oauth.com/mga/sps/oauth/oauth20/register/<Definition_Name>`
Device Authorize Endpoint	Endpoint initially visited by the device client to obtain a device code and user code.	`https://server.oauth.com/mga/sps/oauth/oauth20/device_authorize`
User Authorize Endpoint	Endpoint visited by a user to verify a user_code so a device client may obtain an authorization grant for the user.	`https://server.oauth.com/mga/sps/oauth/oauth20/user_authorize`
Authorization grants management API endpoint	An API to list all of a user's grants.	`https://server.oauth.com/mga/sps/mga/user/mgmt/grant`
Authorization grant management API endpoint	An API to retrieve a specific grant based on a grant ID. This API can also be used to delete a grant.	`https://server.oauth.com/mga/sps/mga/user/mgmt/grant/{grantId}`

OAuth 2.0 and OIDC workflows

The OAuth 2.0 support in IBM Security Verify Access provides four different ways for an OAuth client to obtain access the protected resource.

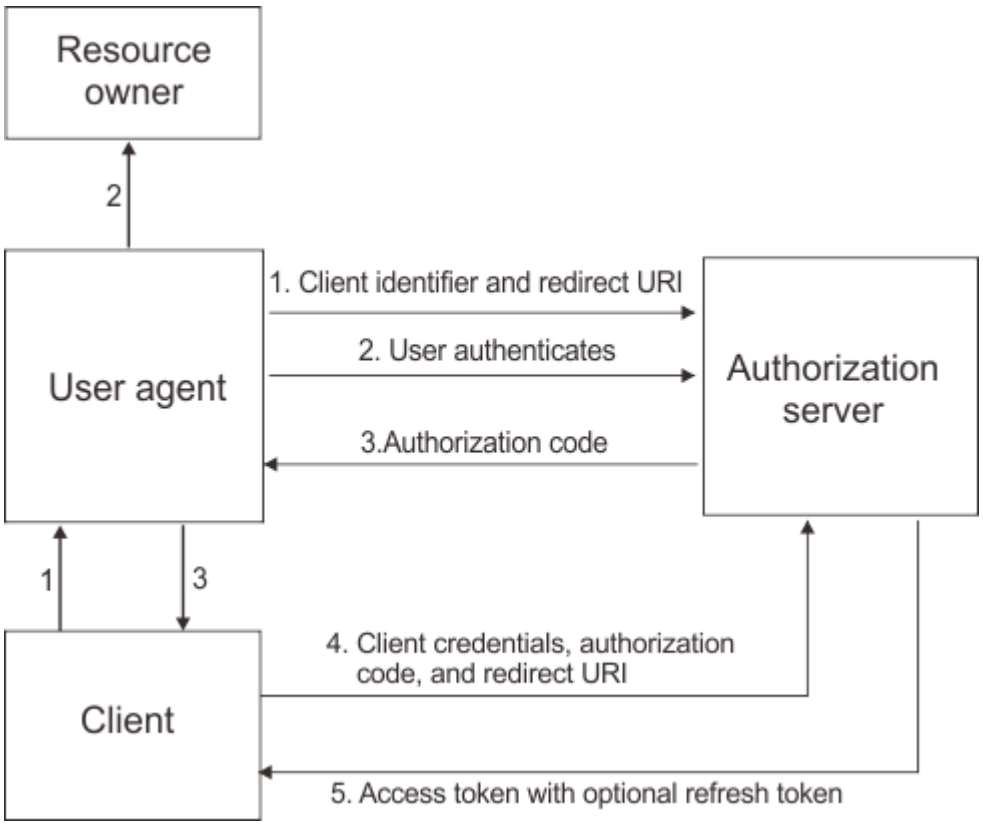
OAuth 2.0 workflow

Advanced Access Control supports the following OAuth 2.0 workflows.

Authorization code flow

The authorization code grant type is suitable for OAuth clients that can keep their client credentials confidential when authenticating with the authorization server. For example, a client implemented on a secure server. As a redirection-based flow, the OAuth client must be able to interact with the user agent of the resource owner. It also must be able to receive incoming requests through redirection from the authorization server.

Note: For OIDC, a Relying Party is an OAuth Client, and an OIDC Provider is an OAuth Authorization server. For OIDC, the authorization code flow returns an authorization code to the Relying Party, which can then directly exchange it for an ID token and access token. This mechanism provides the benefit of not exposing any tokens to the browser or end-user. The OpenID Connect Provider also authenticates the Relying Party before exchanging the authorization code for an access token. The authorization code flow is suitable for Relying Parties that can securely maintain a client secret between themselves and the OpenID Connect Provider.



1. The OAuth client initiates the flow when it directs the user agent of the resource owner to the authorization endpoint. The OAuth client includes its client identifier, requested scope, local state, and a redirection URI. The authorization server sends the user agent back to the redirection URI after access is granted or denied.

   For OIDC, the scope must include `openid`. The `state` parameter must also be included.
2. The authorization server authenticates the resource owner through the user agent and establishes whether the resource owner grants or denies the access request.
3. If the resource owner grants access, the OAuth client uses the redirection URI provided earlier to redirect the user agent back to the OAuth client. The redirection URI includes an authorization code and any local state previously provided by the OAuth client.

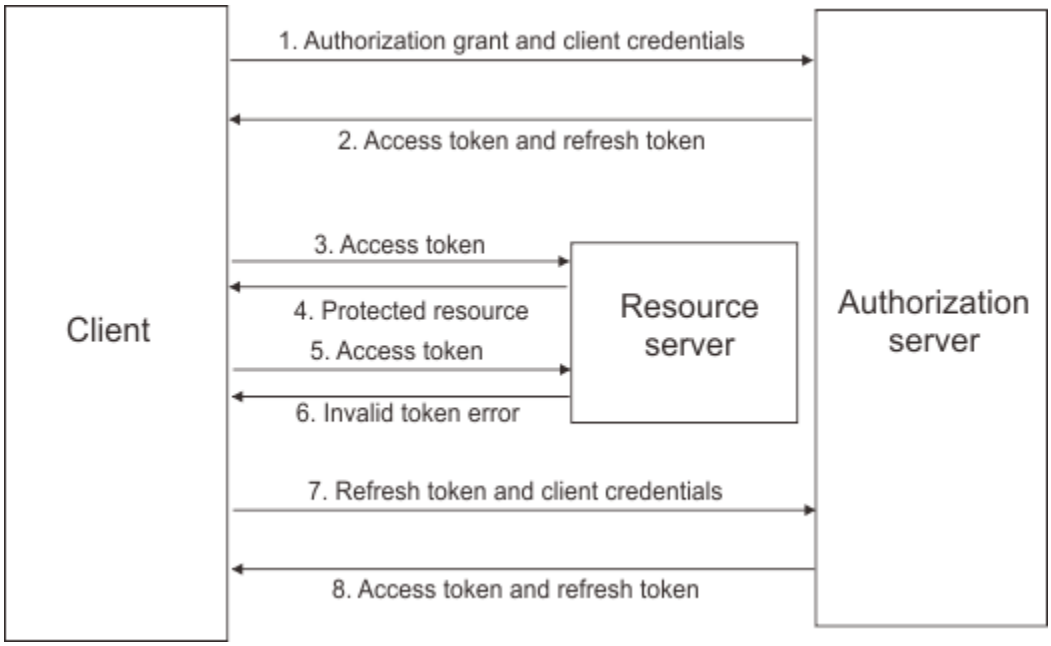
   If this is an OpenID Connect request, then the redirection URI must be present. For Oauth, by contrast, it can be sourced from the client configuration. This requirement exists because OpenID Connect is stricter on request validation.
4. The OAuth client requests an access token from the authorization server through the token endpoint. The OAuth client authenticates with its client credentials and includes the authorization code received in the previous step. The OAuth client also includes the redirection URI used to obtain the authorization code for verification.

   For OIDC, the Relying Party requests an access token and, in addition, an ID token from the OpenID Connect Provider through the token endpoint.
5. The authorization server validates the client credentials and the authorization code. The server also ensures that the redirection URI received matches the URI used to redirect the client in Step 3. If valid, the authorization server responds back with an access token. If OIDC is configured, an id token is returned.

   For OIDC, if the redirection URI is valid, the OpenID Connect Provider responds back with an access token and an ID token.

The authorization server can be the same server as the resource server or a separate entity. A single authorization server can issue access tokens accepted by multiple resource servers.

Authorization code flow with refresh token



The authorization code workflow with refresh token diagram involves the following steps:

1. The OAuth client requests an access token by authenticating with the authorization server with its client credentials, and presenting an authorization grant.
2. The authorization server validates the client credentials and the authorization grant. If valid, the authorization server issues an access token and a refresh token.
3. The OAuth client makes a protected resource request to the resource server by presenting the access token.de
4. The resource server validates the access token. If the access token is valid, the resource owner serves the request.
5. Repeat steps 3 and 4 until the access token expires. If the OAuth client knows that the access token has expired, skip to Step 7. Otherwise, the OAuth client makes another protected resource request.
6. If access token is not valid, the resource server returns an error.
7. The OAuth client requests a new access token by authenticating with the authorization server with its client credentials, and presenting the refresh token.
8. The authorization server validates the client credentials and the refresh token, and if valid, issues a new access token and a new refresh token. For OpenID Connect, an ID token is returned in addition to the new access token and refresh token.

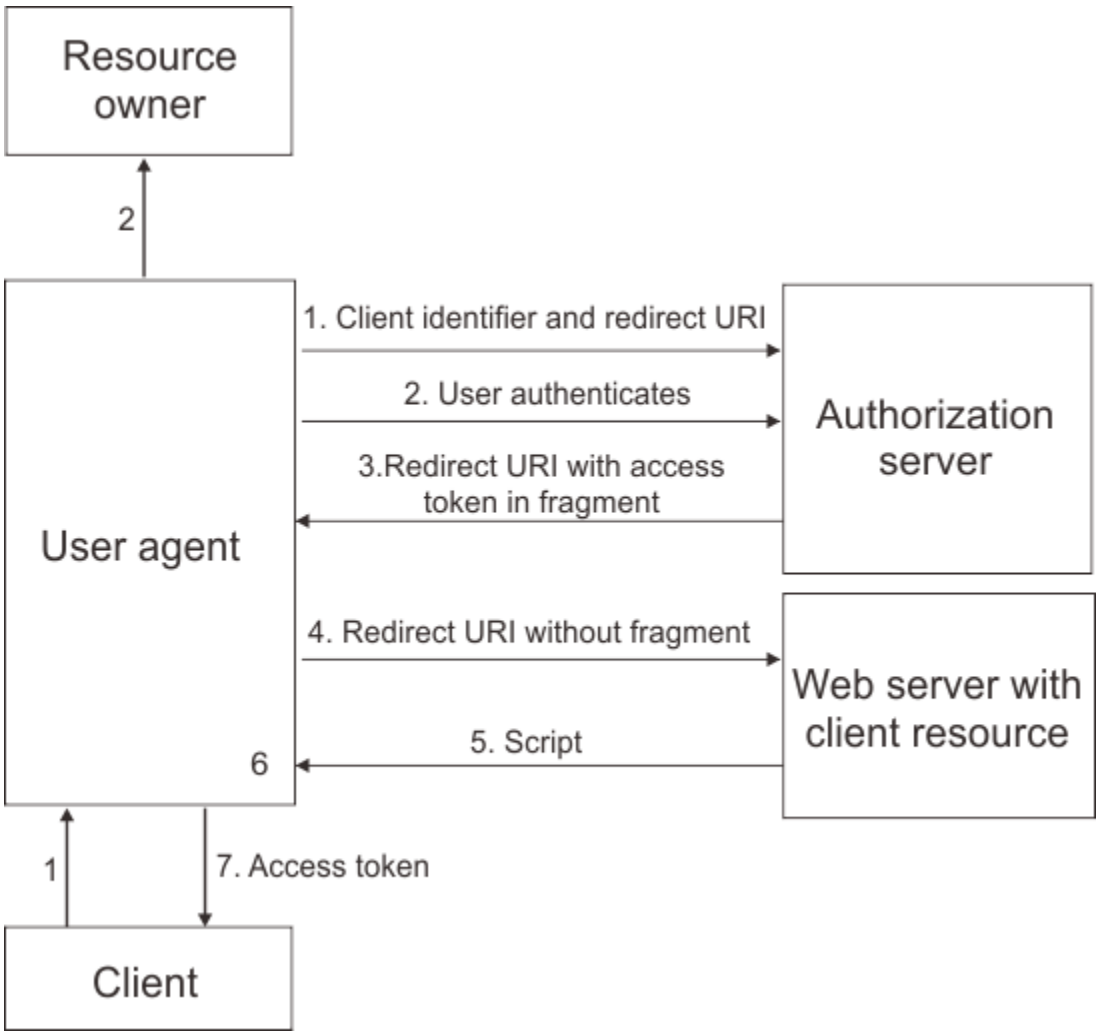
Implicit grant flow

The implicit grant type is suitable for clients that are not capable of maintaining their client credentials confidential for authenticating with the authorization server. An example can be in the form of client applications that are in a user agent, typically implemented in a browser using a scripting language such as JavaScript.

As a redirection-based flow, the OAuth client must be able to interact with the user agent of the resource owner, typically a web browser. The OAuth client must also be able to receive incoming requests through redirection from the authorization server.

Note: For OIDC, a Relying Party is an OAuth Client, and an OIDC Provider is an OAuth Authorization server. For OIDC, the implicit flow can be used by Relying Parties with an in-browser scripting language component. The access token and ID token are returned directly to the Relying Party, which may expose them to the end-user and applications that have access to the end-user's browser. The token endpoint is not used and the OpenID Connect Provider does not perform authentication on the Relying Party in this

flow. The Relying Party does not have to directly communicate with the OpenID Connect Provider as all interactions can be performed through the browser.



The implicit grant workflow diagram involves the following steps:

1. The OAuth client initiates the flow by directing the user agent of the resource owner to the authorization endpoint. The OAuth client includes its client identifier, requested scope, local state, and a redirection URI. The authorization server sends the user agent back to the redirection URI after access is granted or denied.

   For OIDC, the requested scope must include `openid`, and the parameters `nonce` and `state` must also be included.
2. The authorization server authenticates the resource owner through the user agent and establishes whether the resource owner grants or denies the access request.
3. If the resource owner grants access, the authorization server redirects the user agent back to the client using the redirection URI provided earlier. The redirection URI includes the access token in the URI fragment.

   For OIDC, the redirection URI includes both the access token and the ID token in the URI fragment.
4. The user agent follows the redirection instructions by making a request to the web server without the fragment. The user agent retains the fragment information locally.
5. The web server returns a web page, which is typically an HTML document with an embedded script. The web page accesses the full redirection URI including the fragment retained by the user agent. It can also extract the access token and other parameters contained in the fragment.

6. For OAuth 2.0, the user agent runs the script provided by the web server locally, which extracts the access token and passes it to the client.

   For OIDC, the script extracts both the access token and the ID token. If `response_mode=form_post` is specified, the OpenID Provider returns a self-posting form.

   Note: When the response type includes token or ID token, the parameter `response_mode=form_post` is set by default. You can use advanced mapping to change or remove this parameter if necessary. However, by default most authorization servers ignore this parameter if they do not support it.

Hybrid flow

OpenID Connect supports a hybrid flow. In the OAuth 2.0 hybrid flow, an authorization code (response_type = code) or an access token (response_type = token) is returned by the authorization endpoint. Some tokens are returned by the authorization endpoint, and others are returned by the token endpoint.

The hybrid flow is similar to authorization code flow in allowing clients to be authenticated, and in supporting refresh tokens. The hybrid flow is similar to implicit grant flow in allowing tokens to be revealed to the user agent.

The hybrid flow supports multiple response_type values.

Table 4. Response type values for each flow

response_type value	**Flow**
`code`	Authorization Code Flow
`id_token`	Implicit Flow
`id_token token`	Implicit Flow
`code id_token`	Hybrid Flow
`code token`	Hybrid Flow
`code id_token token`	Hybrid Flow

The hybrid flow uses the steps shown in the diagram for authorization code.

1. The OAuth client initiates the flow when it directs the user agent of the resource owner to the authorization endpoint. The OAuth client includes its client identifier, requested scope, local state, and a redirection URI. The authorization server sends the user agent back to the redirection URI after access is granted or denied.

   For OIDC, the scope must include `openid`. The `state` parameter must also be included.

   For hybrid flow, the response type is more than just code. For example, `response_type = code + id_token` will result in the return of both an id_token and code in step 3.
2. The authorization server authenticates the resource owner through the user agent and establishes whether the resource owner grants or denies the access request.
3. If the resource owner grants access, the OAuth client uses the redirection URI provided earlier to redirect the user agent back to the OAuth client. The redirection URI includes an authorization code and any local state previously provided by the OAuth client.

   If this is an OpenID Connect request, then the redirection URI must be present. For OAuth, by contrast, it can be sourced from the client configuration. This requirement exists because OpenID Connect is stricter on request validation.

   For hybrid flow, when the authorization code is returned, an id_token and (or) an access token may also be returned.
4. The OAuth client requests an access token from the authorization server through the token endpoint. The OAuth client authenticates with its client credentials and includes the authorization code

received in the previous step. The OAuth client also includes the redirection URI used to obtain the authorization code for verification.

For OIDC, the Relying Party requests an access token and, in addition, an ID token from the OpenID Connect Provider through the token endpoint.

5. The authorization server validates the client credentials and the authorization code. The server also ensures that the redirection URI received matches the URI used to redirect the client in Step 3. If valid, the authorization server responds back with an access token. If OIDC is configured, an id token is returned.

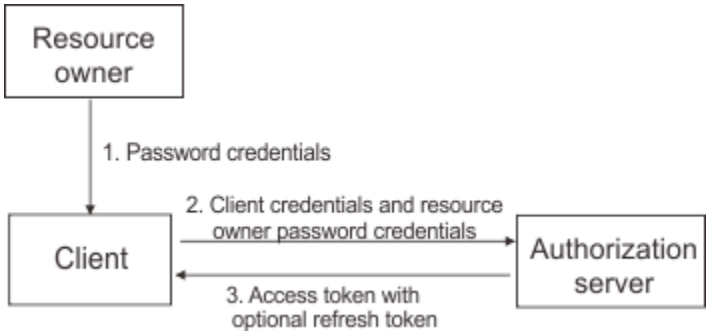
   For OIDC, if the redirection URI is valid, the OpenID Connect Provider responds back with an access token and an ID token.

For more information on the hybrid flow, see http://openid.net/specs/openid-connect-core-1_0.html#HybridFlowSteps.

Resource owner password credentials flow

The resource owner password credentials grant type is suitable in cases where the resource owner has a trust relationship with the client. For example, the resource owner can be a computer operating system of the OAuth client or a highly privileged application.

You can only use this grant type when the OAuth client has obtained the credentials of the resource owner. It is also used to migrate existing clients using direct authentication schemes by converting the stored credentials to an access token.



The resource owner password credentials workflow diagram involves the following steps:

1. The resource owner provides the client with its user name and password.
2. The OAuth client requests an access token from the authorization server through the token endpoint. The OAuth client authenticates with its client credentials and includes the credentials received from the resource owner.
3. After the authorization server validates the resource owner credentials and the client credentials, it issues an access token and optionally a refresh token.

   OIDC requests can return, from a request to /authorize, any combination of the following:

   - An access token
   - An id_token
   - A code

   If a code is returned, then the following can be returned to /token:

   - An access token
   - An ID token
   - A refresh token, if enabled

   If a refresh token is presented to /token, then following are returned:

   - An access token
   - An ID token

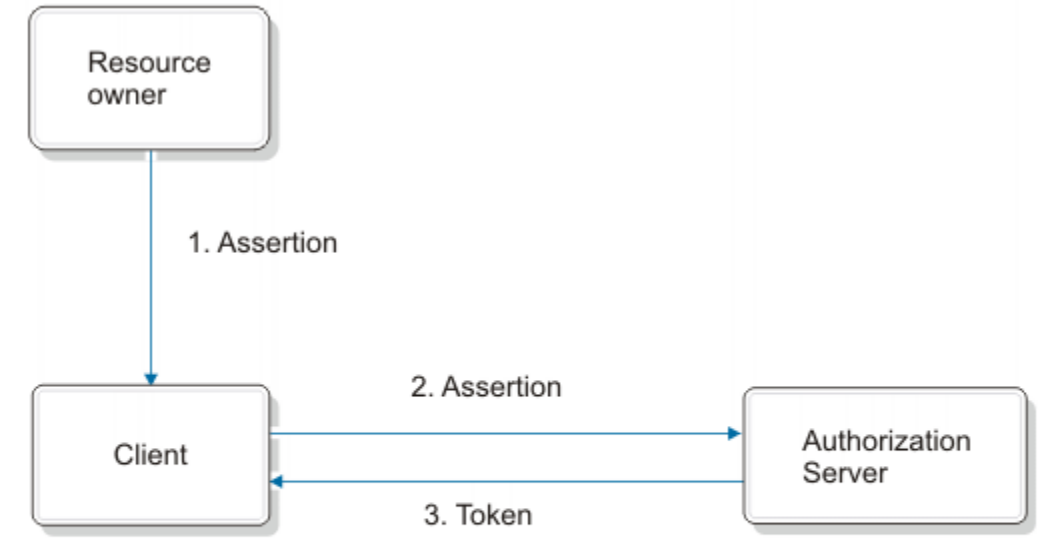
- A refresh token

JWT and SAML bearer grant type flows

The assertion bearer grant types are an extension to the OAuth 2.0 framework. In such flows, a client presents a JWT or SAML assertion to the token endpoint in exchange for tokens. The assertion that is presented must represent the resource owner for whom tokens will be issued to. See RFC 7522 and RFC 7523 for further details.

The assertions must be validated in the pre-token mapping rule. A callout to the STS is one way to validate a presented assertion.

The following diagram describes the steps in the assertion bearer grant type flows:

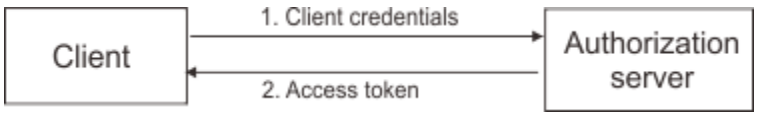


1. The client obtains a JWT or SAML assertion from the resource owner.
2. The client presents the assertion to the authorization server.
3. The authorization server validates the presented assertion through signature validation, decryption, or both. The issuer and subject are extracted and validated. If the issuer is trusted, tokens are issued to the subject that is captured in the assertion.

Client credentials flow

The client credentials flow is used when the OAuth client requests an access token using only its client credentials. This flow is applicable in one of the following situations:

- The OAuth client is requesting access to the protected resources under its control.
- The OAuth client is requesting access to a different protected resource, where authorization has been previously arranged with the authorization server.



The client credentials workflow diagram involves the following steps:

1. The OAuth client requests an access token from the token endpoint by authenticating with its client credentials.
2. After the authorization server validates the client credentials, it issues an access token.

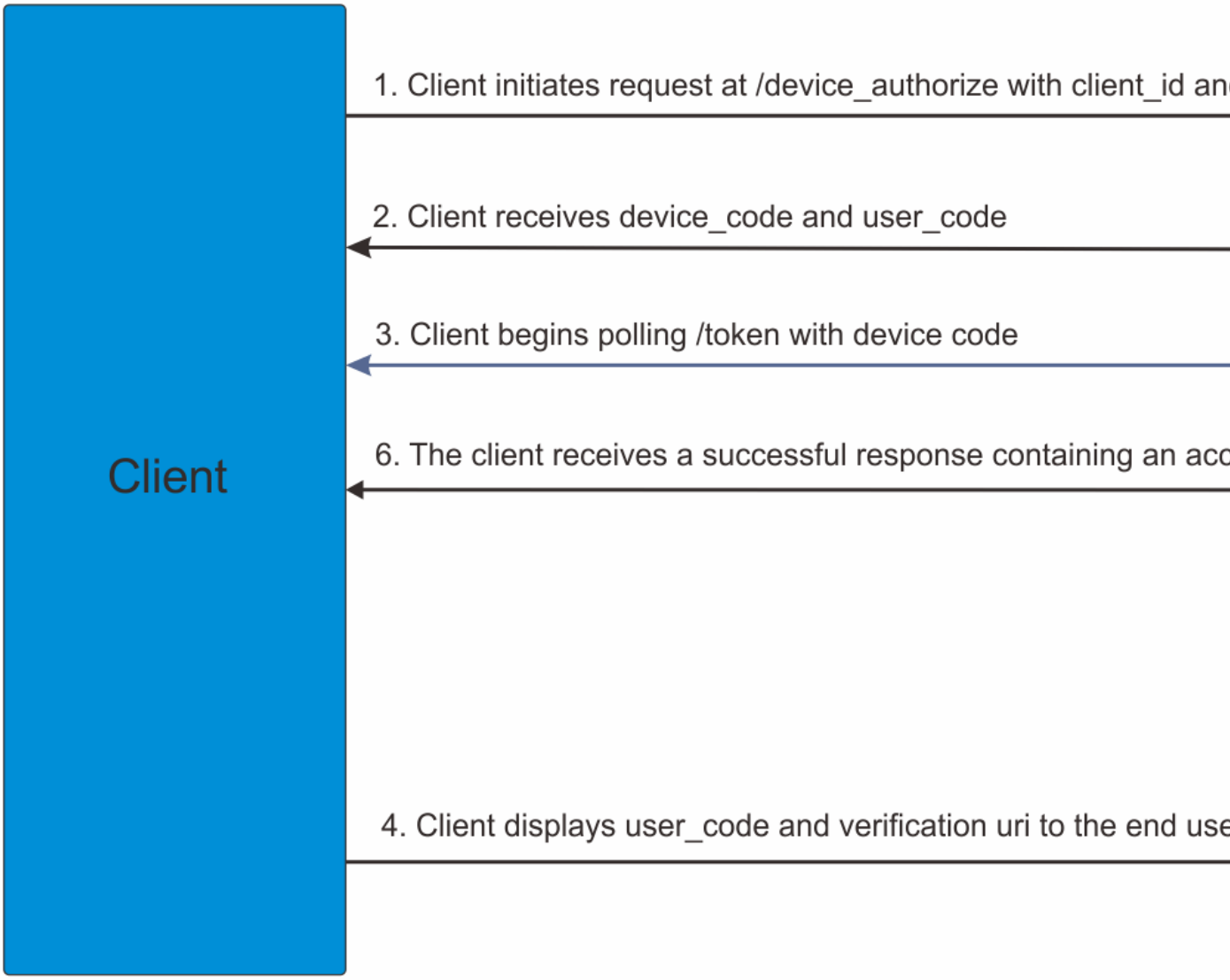
Device flow

The OAuth device flow is a draft RFC (Currently version 9, see: https://tools.ietf.org/html/draft-ietf-oauth-device-flow-09). The OAuth device flow is intended for use where the OAuth client is unable to provide any input mechanism to the user, and is only able to broadcast information. Such applications would be smart devices which can display (for example, a smart device plugged into a TV) content, but not provide a user-agent. This means the flow of information is one way from the client to the resource owner. There are three endpoints used in this flow, the device_authorize endpoint, a JSON endpoint used by the client to get the initial device and user codes. The user authorize endpoint, where the user visits to authenticate and authorize the client, and the token endpoint, where the client will poll with the device code.

The steps of a device flow are:

1. The client makes a request to device authorize and receives a device_code, a user_code and a verification_uri.
2. The client shows the user_code on the screen, along with the verification uri. The client may also choose to show an alternative method of consuming this user_code and verification code, such as a QR code to be scanned by a resource owner with a mobile device.
3. The client begins polling the token endpoint with the device_code, it will receive errors of 'authorization_pending' or 'slow_down' while it waits for a user to verify the user code.
4. The user visits the verification uri presenting the user_code. The user will then be prompted to authenticate and consent. After the user has authenticated and consented, asuccess page is shown.
5. The client, which has been continuing to poll will now receive a bearer token rather than an 'authorization_pending' error.

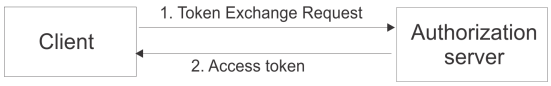
The following diagram describes the steps in the device flows:



Token Exchange Flow

The Token Exchange grant type is a draft protocol that allows one user to act on behalf of another. One common use case for a Security Token Service (STS) is to allow a resource server A to make calls to a backend service C on behalf of the requesting user B.

Note: An STS is a service capable of validating security tokens provided to it and issuing new security tokens in response, which enables clients to obtain appropriate access credentials for resources in heterogeneous environments or across security domains.



In the request, the "subject_token" represents the identity of the party on behalf of whom the token is being requested while the "actor_token" represents the identity of the party to whom the access rights of the issued token are being delegated.

Impersonation

When principal A impersonates principal B, A is given all the rights that B has within some defined rights context and is indistinguishable from B in that context. In Impersonation request, only "subject_token" is required.

Delegation
With delegation semantics, principal A still has its own identity separate from B, and it is explicitly understood that while B may have delegated some of its rights to A. In a sense, A is an agent for B. In Delegation request, "subject_token" and "actor_token" are both required.

For more information, see https://tools.ietf.org/html/rfc8693.

Client authentication considerations at the OAuth 2.0 token endpoint

The OAuth 2.0 token endpoint is used for direct communications between an OAuth client and the authorization server. The token endpoint is used to obtain an OAuth token.

The client type, whether public or confidential, determines the authentication requirements of the OAuth 2.0 token endpoint. The Advanced Access Control runtime is responsible for authenticating the client by using the `client_id` and `client_secret` in sending the request.

OAuth 2.0 workflows for confidential clients that require client authentication at the token endpoint, can be configured in one of the following ways:

1. The Advanced Access Control point of contact requires authentication at the token endpoint:
   - The point of contact is responsible for authenticating the client.
   - The **Confidential** check box from the client instance panel is not relevant. A `client_secret` parameter must *not* be sent in the token endpoint request.
   - If a `client_id` parameter is sent in the request, it must match the identity of the client that is authenticated by the point of contact.
2. The Advanced Access Control point of contact permits unauthenticated access to the token endpoint:
   - The `client_id` parameter in the token endpoint request is used to identify the client.
   - The **Confidential** check box from the client instance panel determines whether a `client_secret` parameter is required in the token endpoint request. A client secret is required for confidential clients only.
3. Basic Authentication can be performed by the runtime instead of by the point of contact server.

Note: When enforcing client authentication at the token endpoint, the point of contact must contain the client ID and client secret within its user registry. The point of contact must be able to map the authenticated user credential to the `client_id` parameter sent in the OAuth 2.0 token endpoint request.

Based on this information, the following configurations are supported:

Table 5. Configurations supported

Client types	Configurations	WebSEAL point of contact token endpoint URI considerations	Check box setting for the Confidential parameter
Confidential clients	The point of contact performs client authentication.	• Authenticated ACL on token endpoint is required. • Token endpoint port must match WebSEAL port.	N/A
Confidential clients	Basic Authentication is performed by the runtime.	The point of contact configuration does not need to make any change to the Authorization header.	N/A
Confidential clients	The **client_id** and **client_secret** parameters in the token endpoint request are used to perform client authentication.	• Unauthenticated ACL on token endpoint is required. • Token endpoint port must match WebSEAL port.	Must be cleared.

Table 5. Configurations supported (continued)			
Client types	**Configurations**	**WebSEAL point of contact token endpoint URI considerations**	**Check box setting for the Confidential parameter**
Public clients	The **client_id** parameter is used to perform client validation.	• Unauthenticated ACL on token endpoint is required. • Token endpoint port must match the WebSEAL port.	Must be selected.

Configuring an authenticated token endpoint with WebSEAL as the point of contact

Configure an authenticated token endpoint with WebSEAL as the point of contact to delegate authentication of the client to WebSEAL. Note that basic authentication can be completed without configuration of WebSEAL as the point of contact.

Before you begin

When you want WebSEAL to do client authentication, you must attach an authenticated ACL on the token endpoint. You can use the `isam_mobile_anyauth` ACL that you can create by using the `oauth_config` REST API. See "Configuring a reverse proxy for OAuth and an OIDC Connect provider" on page 129.

You must also know how to enable Basic Authentication and Certificate Authentication. For more information, see Basic authentication and Client-side certificate authentication.

About this task

Use separate WebSEAL instances for the token and authorization endpoints to enforce authentication at WebSEAL for the token endpoint. Clients can authenticate with authentication mechanisms, such as Basic Authentication and Client Certificates. At the same time, users can authenticate by using forms authentication at the authorize and clients manager endpoints.

Procedure

1. Log in to the pdadmin utility with the `sec_master` account.
2. Attach the `isam_mobile_anyauth` ACL to the token endpoint `/WebSEAL/<WebSEAL_instance_name>/mga/sps/oauth/oauth20/token`.

   For example,

   ```
   acl attach /WebSEAL/server-default/mga/sps/oauth/oauth20/token
   isam_mobile_anyauth
   ```

3. Enable Basic Authentication, Certificate Authentication, or both.
4. Ensure that the point of contact contains the client ID and client secret within its user registry by running the following command:

   ```
   user list * 0
   ```

5. Verify the configuration:
   a) Ensure that the token endpoint is protected.
   For example, run the following command and verify that you get a login form:

   ```
   curl -kv https://server:445/mga/sps/oauth/oauth20/token
   ```

   b) If you enabled Basic Authentication or Certificate authentication, ensure that you can authenticate to the point of contact with the Basic Authentication header or Client Certificate.

For example, run the following commands and ensure that you can reach the token endpoint:

Basic Authentication

```
curl -kv https://server:445/mga/sps/oauth/oauth20/token
--basic -u jHTzyil9lQAcFsJu9Dw3:CDrQlexadocQ6FwTzEUG
```

Certificate Authentication

```
curl -kv https://server:445/mga/sps/oauth/oauth20/token
--cert /path/to/cert.pem
```

Token Exchange Implementation

There is a sample token exchange mapping rule that is provided in **Federation** > **OIDC** > **Mapping Rules**.

Currently, the out-of-the-box support for token exchange grant type is based on JSON Web Token (JWT), although this can be extended for other token types. Implementation is done by using a combination of Javascript and STS Chains. See STS Chains.

- `doTokenExchangePre(useSTSforTokenGenerate, store_db)`
- `doTokenExchangePost()`

These two functions are wrapped in the `oauth_20_token_exchange.js` which should be imported and called within other mapping rules. For example:

```
importMappingRule("Oauth_20_TokenExchange");   // import the mapping rule
    /*
     * Config option to generate the token from this pre mapping rule.
     * ISVA will issue a regular access token if the varialbe set to false.
     * If set to true, STS chain will be called to generate the token.
     */
    var useSTSforTokenGenerate = false;

    /*
     * Config option to stored the token which generated through this mapping rule to DB. This
should be set
     * to true if need to store the token into the oauth20_token_cache and set to flase if not.
     * This variable is ignored if not using the STS to generate the token.
     */
    var store_db = false;
doTokenExchangePre(useSTSforTokenGenerate, store_db); // call the mapping rule
```

To implement the token exchange, see the following steps:

1. Validation of the incoming tokens
2. Extraction of information
3. Gathering information for new (requested) token
4. Issuing of the new (requested) token

Validating the incoming tokens

Validate the incoming "subject_token" and "actor_token" (optional).

Procedure

1. Validate the OAuth/OIDC opaque token.

   The "subject_token" or "actor_token" with `urn:ietf:params:oauth:token-type:access_token` or `urn:ietf:params:oauth:token-type:refresh_token` might be an OAuth/OIDC opaque token that is generated by the authorization server.

   You can use utilities like `OAuthMappingExtUtils.getToken(tokenId)` to verify if such token exists in the token cache and use

`OAuthMappingExtUtils.retrieveAllAssociations(stateId)` to retrieve any other attributes that are associated with the opaque token.

2. Use the STS Chain to validate "subject_token" and/or "actor_token".

   Use STS Chains to validate many kind of tokens. Verify Access supports validation of token like `IvCred`, `SAML`, `STSUU`, and `JWT`. For more information about creating STS Chain, see Configuring STS modules.

   To use the STS Chain to validate a token, refer to the following example:

   ```
   var claims =
       LocalSTSClient.doRequest("http://schemas.xmlsoap.org/ws/2005/02/trust/Validate",
           actor_token_type,
           issuer,
           baseElement,
           null);
   ```

   You can determine the `issuer` and `appliesTo` of the STS Chains as required. You can set the `issuer` as the token issuer and set the `appliesTo` as the `` `subject_token_type` `` or `actor_token_type`.

   In Verify Access, for example, to extract the issuer you can use `OAuthMappingExtUtils.extractIssuer(token, token_type)`. This tool currently only supports JWT (extracted from `iss` claim) and SAML (extract from `Issuer` node).

3. Throw exception.

   When you validate the incoming token, there might be validation errors and when an error is returned from the call to the STS, the exception should be thrown. For example, `signature invalid` and STS `Chain` does not exist. You can throw exception for such scenarios by using the following example:

   ```
   OAuthMappingExtUtils.throwSTSCustomUserPageException("The subject_token verification
   failed.", 400, "invalid_request");
   ```

   The same method can also be used if you choose not to support the resource or audience specified. For example:

   ```
   OAuthMappingExtUtils.throwSTSCustomUserPageException("The audience or resource is not
   valid.", 400, "invalid_target");
   ```

Extracting information

Different tokens might have different names under which the information of interest resides. Map the different attributes into a common name to enable application of any business logic.

Procedure

1. When you working with different kind of token, the information may exist under many different names. A pre-defined json which contain token type and original name and universal name mapping can be provided:

   ```
   var universalNameMapJson = {
       "urn:ietf:params:oauth:token-type:jwt": {
           "sub": "uni_sub",
           "aud": "uni_aud",
           "exp": "uni_exp",
           "iss": "uni_iss",
           "scope": "uni_scope",
           "act": "uni_act"
       },
     "urn:ietf:params:oauth:token-type:saml2": {
       "subject": "uni_sub",
       "audience": "uni_aud",
       "expire": "uni_exp",
       "issuer": "uni_iss"
     }
   };
   ```

2. Put all the information with common name into a JSON. For example:

```
var actClaimsJson = JSON.parse(
    OAuthMappingExtUtils.parseSTSUUToJson(act_stsuu, actor_token_type,
JSON.stringify(universalNameMapJson))
);
```

Gathering information for new (requested) token

Decide whether the new token can be issued and gather the claims that are associated with the issued token.

Procedure

1. Gather claims for the newly issued token. For a JWT example, set the claims in the attribute container under the type "urn:ibm:jwt:claim":

```
var req_stsuu = new STSUniversalUser();
req_stsuu.addAttribute(new Attribute("act", "urn:ibm:jwt:claim", actClaimsJson.uni_sub));
```

2. In the delegation flow, add the "act" claims into the STSUU and save it in the database in the post mapping rule.

```
stsuu.addContextAttribute(new Attribute("act",
"urn:ibm:names:ITFIM:oauth:body:param", JSON.stringify(actClaimsJson.uni_act)));
```

Issuing of the new (requested) token

The new token is generated.

Procedure

1. Use the default Implementation.

   The default implementation of token exchange generates an opaque access token, and a refresh token (optional). To execute the default implementation, at the end of pre-mapping rule execution, ensure that access_token context attribute type, urn:ibm:names:ITFIM:oauth:response:attribute does not exist.

   Note: Since the subject_token can be any kind of token (SAML, IvCred, JWT, opaque, STSUU, LTPA), the default implementation will require you to extract and set the username that will be associated with the issued access token. This username will be the sub of the opaque access token. Do the following:

```
var username=<extracted from subject_token>;

stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute("username",
"urn:ibm:names:ITFIM:oauth:rule:decision", username));
```

2. Use the STS Chain to issue token.

   Use the STS Chains to issue many kind of tokens. Verify Access supports issuance of token like IvCred, SAML, STSUU, JWT. For more information about creating STS Chain, see Configuring STS modules.

   To use the STS Chain to issue the token, refer to the following example:

```
var rsp = LocalSTSClient.doRequest("http://schemas.xmlsoap.org/ws/2005/02/trust/Issue",
    requested_token_type, // Based on the 'requested_token_type'
    target, // Based on the 'audience' or 'resource' requested
    base_element, // claims for the issued token
    null);
```

   You can determine the issuer and appliesTo of the STS Chains as required. You can set the issuer as the input requested_token_type and set the appliesTo as the `audience` or resource input parameter.

After you issue the new token, set the following context attributes so that the default implementation will not be executed and uses the issued token in Javascript.

```
stsuu.addContextAttribute(new Attribute("access_token",
"urn:ibm:names:ITFIM:oauth:response:attribute", issuedToken));
stsuu.addContextAttribute(new Attribute("issued_token_type",
"urn:ibm:names:ITFIM:oauth:response:attribute", requested_token_type)); // set it to
appropriate value
stsuu.addContextAttribute(new Attribute("token_type",
"urn:ibm:names:ITFIM:oauth:response:attribute", "Bearer"));
stsuu.addContextAttribute(new Attribute("expires_in",
"urn:ibm:names:ITFIM:oauth:response:attribute", "3600"));
```

3. Optional: Persist issued token into Token Cache table.

   By default, if you issue a token in the pre-token mapping rule, it is not stored in the token cache table. The main reason is that the token that is produced might not be OAuth/OIDC token. Since it is not an OAuth/OIDC token, OAuth/OIDC will not support such token introspection or revocation, so there's no point to store it into token cache.

   However if you choose to do so, you can do the following:

   ```
   stsuu.addContextAttribute(new Attribute("urn:ibm:ITFIM:oauth20:custom:token:access_token",
   "urn:ibm:ITFIM:oauth20:custom:token", issuedToken));
   stsuu.addContextAttribute(new Attribute("urn:ibm:ITFIM:oauth20:custom:token:access_token",
   "urn:ibm:ITFIM:oauth20:custom:token:persistent", "true"));
   stsuu.addContextAttribute(new Attribute("issued_token_type",
   "urn:ibm:names:ITFIM:oauth:response:attribute", requested_token_type)); // set to
   appropriate value
   ```

   This way, the default implementation will be executed, however it will not generate opaque access token, but use the custom token provided.

   Note: The token cache table column size may not fit to store a lengthy token. You can workaround it by enabling the hashing when storing the token.

4. Optional: Issue the refresh token as result of token exchange.

   This is a unique scenario, when the `requested_token_type` is `urn:ietf:params:oauth:token-type:refresh_token`, it is not advisable to generate your own refresh token in the Javascript. What you can do here is to let the default implementation to be executed but then you need to set the following context attribute to generate refresh token.

   ```
   stsuu.addContextAttribute(new Attribute("issued_token_type",
   "urn:ibm:names:ITFIM:oauth:response:attribute", requested_token_type));
   ```

5. Track actor information.

   As part of the delegation scenario, we need to track the chain of actors for the issued token. Some token like JWT or SAML can easily contain such information inside the token itself. However for the opaque token, it is tracked inside the EXTRA_ATTRIBUTE table. The tricky part is this actor information can be nested, and EXTRA_ATTRIBUTE column size is only 256 characters. So, when storing the actor information, it will be stored as multiple indexed keys `act:<idx>`.

   For example, the "act" claims is:

   ```
   {
       "act": {
           "sub": "https://service16.example.com",
            "act": {
                "sub": "https://service77.example.com"
            }
        }
   }
   ```

   The oauth20_token_extra_attribute will be stored as:

state_id	attr_name	attr_value
id	act:0	https://service16.example.com

state_id	attr_name	attr_value
id	act:1	https:// service77.example.com

Verify Access provides a special utility to store and retrieve actor information from EXTRA_ATTRIBUTE table.

See: `OAuthMappingExtUtils.storeJwtActor(String act, String stateId)` and `OAuthMappingExtUtils.retrieveActor(String stateId)`. However the support currently limited for JWT token.

For other token type, the specification does not clarify how the actor is going to be represented. For token type like IvCred, for example, which is only key value pair, probably you can represented is just like using indexed keys as well.

State management

The `state_id` parameter in the STSUniversalUser module is used as a key to store or retrieve state information for each invocation of the trust chain of an OAuth flow.

Advance Access Control provides sample mapping rules. These sample mapping rules use state management API and are applicable to OAuth 2.0 protocols. You can get the sample mapping rules from the **File downloads** section.

OAuth 2.0

OAuth 2.0 tokens, such as grants, access tokens, and refresh tokens, have a `state_id` parameter that is used in Security Token Service mapping rules. The `state_id` parameter maintains state between associated Security Token Service calls in an OAuth 2.0 flow.

The OAuth 2.0 mapping rule uses the `state_id` as the key to issue an authorization grant. The key is used to add the token storage time to a cache. The storage time is then retrieved from the cache during a request for a protected resource.

Figure 2 on page 127 shows a section of the sample JavaScript mapping rule for OAuth 2.0.

```
...
var request_type = null;
var grant_type = null;

// The request type - if none available assume 'resource'
temp_attr = stsuu.getContextAttributes().getAttributeValuesByNameAndType("request_type", "urn:ibm:names:ITFIM:oauth:request");
if (temp_attr != null && temp_attr.length > 0) {
        request_type = temp_attr[0];
} else {
        request_type = "resource";
}

// The grant type
temp_attr = stsuu.getContextAttributes().getAttributeValuesByNameAndType("grant_type", "urn:ibm:names:ITFIM:oauth:body:param");
if (temp_attr != null && temp_attr.length > 0) {
        grant_type = temp_attr[0];
}

/* The following demonstrates the use of the state management API.
 *
 *      request_type = 'authorization' ==> Store the UTC time of the request into a cache
                                with state_id as key [authorization_code, implicit]
 *      request_type = 'access_token' && grant_type = 'client_credentials' ==> Store the UTC time of the request
                                into a cache with state_id as key [client_credentials]
 *      request_type = 'access_token' && grant_type = 'password' ==> Store the UTC time of the request into a cache
                                with state_id as key [password]
 *      request_type = 'resource' ==> Retrieve the stored time and put it into an attribute named recovered_state
 *
 *      It also stores the flow type we are in be used later to detect if this is a client_credentials two-legged flow or not.
 */
if (request_type == "authorization" || (request_type == "access_token" &&
                                ( grant_type == "client_credentials" || grant_type == "password" ))) {
        var curr_utc_time = "State storage time was: " + IDMappingExtUtils.getCurrentTimeStringUTC();
        IDMappingExtUtils.getIDMappingExtCache().put(state_id, curr_utc_time, 1000);
} else if (request_type == "resource") {
        var recovered_state = IDMappingExtUtils.getIDMappingExtCache().get(state_id);

        if (recovered_state != null) {
                var state_arr = java.lang.reflect.Array.newInstance(java.lang.String, 1);
                state_arr[0] = recovered_state;
                stsuu.addContextAttribute(new Attribute("recovered_state",
                                                "urn:ibm:names:ITFIM:oauth:response:attribute", state_arr));
        }
}
...
```

Figure 2. OAuth 2.0 JavaScript sample code with state management

Trusted clients management

Advanced Access Control stores trusted client information that is based on the decisions of a resource owner on which clients to trust.

In an OAuth 2.0 flow, the resource owner is asked to provide consent on the scopes that are requested by a client to access the protected resource. The resource owner can either grant permission or deny the client from its access request.

The OAuth server or authorization server uses the trusted clients manager to manage information about trusted clients.

Administrators can configure the behavior of the trusted clients manager in the API protection page. They can configure whether a resource owner is prompted for consent in the Authorization code flow or the Implicit grant flow.

The following configuration options are available:

- Never prompt a resource owner for consent - Resource owners are never prompted for consent and the authorization decision defaults to allow access to the resource.
- Always prompt a resource owner for consent - Resource owners are always prompted for consent even if the client was previously allowed to access the resource.
- Prompt the resource owner once and remember consent - Resource owners are prompted once for consent and later allows access to the resource.

Note: For the `Prompt once and remember` configuration options, the trusted client manager verifies whether the resource owner previously provided consent on the scopes that are requested by a client.

Proof Key for Code Exchange support

You can configure support for Proof Key for Code Exchange for OAuth clients.

Proof Key for Code Exchange (PKCE) support is a capability (defined in RFC 7636) that adds security when performing the authorization code flow on a mobile device. It addresses a possible security problem that can occur when the following conditions are true:

- There is no client secret.
- The browser or operating system is being used to perform the authentication request.
- A native mobile application is consuming the redirect from the authentication request, and performing an exchange of code for access tokens at the token endpoint.

PKCE support aims to mitigate the risk of a bad actor on the mobile device intercepting the redirect back to native app, and maliciously using the authorization code and the returned access tokens. For a detailed explanation of the scenario, see the Internet Engineering Task Force (IETF) Request for Comments (RFC) 7636: https://tools.ietf.org/html/rfc7636

PKCE requires the OAuth client to generate a random string and perform a hash (SHA256 + BASE64URL) on this string. The initial string must be persisted for use at /token, and both the hash and the hash method are presented at /authorize. The authorization server, upon receiving the hash and the method, persists this value against the issued authorization code. When the authorization code is presented at /token, along with the initially generated string, the hash method is applied to the presented string and checked against the string presented at /authorize. If the two match, the request to /token is successful. If they do not match, the request is rejected.

The processing flow is as follows:

1. Client generates a `code_verifier`, and computes `code_challenge` using `code_challenge_method`.
2. Client makes request to /authorize.
3. Authorization server performs standard OAuth request validation for /authorize.
4. Authorization server checks for presence of `code_challenge` and `code_challenge_method`.
5. Authorization server stores `code_challenge` and `code_challenge_method` against authorization code.
6. Authorization server returns authorization code response.
7. Client presents authorization code to /token including the additional `code_verifier`.
8. Authorization server performs standard OAuth request validation for /token.
9. Authorization server generates its own `code_challenge`, using the presented `code_verifier`, and the stored `code_challenge_method`.
10. Authorization server compares its generated `code_challenge`, to the value which was presented in the initial request to /authorize(and stored against the authorization code).
11. If the two match, then an access_token is issued. If the two do not, the request is rejected.

Note: The IETF specification contains a diagram of the above flow. See https://tools.ietf.org/html/rfc7636#section-1.1.

To use the IBM Security Verify Access support for PKCE, you must configure the OAuth client to set the **`requirePkce`** property to `true`. When this property of the OAuth client is set to `true`, the following conditions apply:

- A new parameter is required in the request to /token.

  code verifier
  A cryptographic string of sufficient entropy such that an attacker cannot predict or guess its value, as specified in section 4.1 of the RFC. This value is used with the `code_challenge_method` presented in the /authorize request, to produce the value to check against the `code_challenge`, which is also presented at /authorize.

- Two new parameters are required in the request to /authorize.

  code_challenge

  The product of the `code_verifier` and the `code_challenge_method`. Must be the product of the SHA256 + BASE64URL encode, as specified in section 4.2 of the RFC.

  code_challenge_method

  The method applied to the `code_verifier` as presented at /token, which is used to check the value of `code_challenge`. The value of `code_challenge_method` must be S256, as specified in section 4.2 of the RFC.

Reverse proxy configuration for OAuth and OIDC provider

You can run an automated configuration of a reverse proxy for OAuth and OIDC provider, and view a log of the configuration steps. To remove the reverse proxy configuration, follow the instructions in this section.

Configuring a reverse proxy for OAuth and an OIDC Connect provider

Use a wizard to perform automated configuration of a reverse proxy appliance for OAuth and an OIDC Connect provider.

Before you begin

The reverse proxy server that you want to use for your OAuth or OIDC Connect provider must already be configured. See Configuring an instance.

Procedure

1. From the local management interface, select **Web** > **Manage** > **Reverse Proxy**.

   A list of reverse proxy instances displays.
2. Select the reverse proxy instance name from the list.
3. Select **Manage** > **OAuth and OIDC provider Configuration**. A window opens where you can select the OIDC Provider.
4. Select **AAC and Federation Runtime based provider** or **ISVA OIDC Container based provider.** A windows opens where you provide configuration details.
5. For AAC and Federation Runtime based provider, Enter the configuration details.

   The **OAuth modes** section lists supported modes. You can select more than one mode.

   The modes are options that extend a basic OAuth configuration. A basic configuration sets up the junction, loads the runtime certificate, and provides access to the API Protection endpoints: /token, /userinfo, /introspect, /revoke, /metadata, and /jwks. The base configuration is sufficient if you are doing only a resource or password credentials flow. In this case, you cannot do any API enforcement, but you can get tokens issued. In this scenario, you do not need to select either of the OAuth modes.

   If you want to use of the authorization code flow, or implicit flows, which go via a user agent, or if you want to get a user session using the /session endpoint, then you must select **Configure for browser interaction**. If you want this reverse proxy to protect resources with access tokens you must select **Configure for API protection**. The two options are not mutually exclusive; you can select both.

Table 6. OAuth modes

Mode	Description
Configure for browser interaction	When configured for browser interaction, the /authorize and /session endpoints are accessible. Also, EAI authentication is enabled for /session. This configuration option is required for the authorize or implicit code flows.

Table 6. OAuth modes (continued)	
Mode	**Description**
Configure for API Protection	When this option is selected, an access token can be presented to WebSEAL, and an authenticated session retrieved. The use of cookies is not required; the authorization header is used as the session index. Selecting this option configures `oauth-auth` and `oauth-cluster` in the `[oauth]` stanza in the WebSEAL configuration file. **Note:** If you select **Configure for API protection** and do not select **Configure for browser interaction**, the configuration parameter **`forms-auth`** is disabled.

Table 7. Reverse proxy instance	
Parameter	**Description**
Host name	The host name or IP address of the runtime server. This field is required.
Port	The SSL port number of the runtime server. This field is required.
User name	The user name that is used to authenticate with the runtime server. This field is required.
Password	The password that is used to authenticate with the runtime server. This field is required.
Junction	The junction for the reverse proxy instance. The default is `/mga`.

The **Reuse Actions** section indicates reuse of existing access control lists (ACLs) and certificates.

Table 8. Reuse configuration	
Parameter	**Description**
Reuse Certificates	Select to reuse the SSL certificate if it was already saved. If this check box is not selected, the certificate is overwritten.
Reuse ACLs	Select to reuse any existing ACLs with the same name. If this check box is not selected, the ACLs are replaced.

6. Click **Finish**.
7. When prompted, deploy the pending changes.
8. Restart the reverse proxy.
9. For ISVA OIDC Container based provider, Enter the following details

Table 9. Reverse proxy instance	
Parameter	**Description**
Host name	The host name or IP address of the ISVA OIDC provider server. This field is required.

Table 9. Reverse proxy instance (continued)	
Parameter	**Description**
Port	The SSL port number of the ISVA OIDC provider server. This field is required. The default is 8436.
Junction	The junction for the reverse proxy instance. The default is `/isvaop`.

The **Reuse Actions** section indicates reuse of existing access control lists (ACLs) and certificates.

Table 10. Reuse configuration	
Parameter	**Description**
Reuse Certificates	Select to reuse the SSL certificate if it was already saved. If this check box is not selected, the certificate is overwritten.
Reuse ACLs	Select to reuse any existing ACLs with the same name. If this check box is not selected, the ACLs are replaced.

10. Click **Finish**.
11. When prompted, deploy the pending changes.
12. Restart the reverse proxy.

What to do next

You can examine a log file to view the results of the auto-configuration. See "Viewing a reverse proxy log for an automated configuration" on page 131

Viewing a reverse proxy log for an automated configuration

You can view a log file to see the steps taken during the automated configuration of a reverse proxy, such as changes to the reverse proxy configuration file and execution of Security Verify Access **pdadmin** administration commands.

About this task

Use the LMI to view the log that was created when you ran the automated configuration of the reverse proxy for one of the following uses:

- OAuth and OIDC Connect Provider
- Mobile Multi-Factor Authentication (MMFA)
- Federation

The log files typically show configuration of the junction, such as `/mga`, and creation of the required ACLs, plus additional steps as required.

Procedure

1. Select **Web** > **Reverse Proxy** > **Manage** > **Logging**.
2. Select the log file you want to view.
   The following log files are supported:

Table 11. Auto-configuration log files	
Log file	**Description**
`autoconfig__oauth.log`	Automated configuration of the reverse proxy instance with AAC and Federation Runtime based OAuth or an OIDC Connect provider.
`autoconfig__mmfa.log`	Automated configuration of the reverse proxy instance with MMFA, including configuration of the junction and creation of the required ACLs.
`autoconfig__federation.log`	Automated configuration of a federation on a reverse proxy server, to set up access between the federation and reverse proxy appliances.
`autoconfig__oauth2verifyoidcprovider.log`	Automated configuration of the reverse proxy instance with ISVA OIDC Conatiner based OAuth or an OIDC Connect provider.

3. Click **View**.

   The log file displays in a new window. You can take the following actions:

   - View log output by scrolling through the display.
   - Select **Number of lines to view** at one time.
   - Select **Starting from line** to narrow the range of log file entries to view at one time.
   - Click **Reload** to update the display after completion of another configuration.
   - Click **Export** to save the log output to a file.

Example

To view example log file output, see “Example reverse proxy log for OAuth and OIDC configuration” on page 132.

Example reverse proxy log for OAuth and OIDC configuration

The log file for the automated configuration of a reverse proxy instance lists the configuration actions taken.

Sample output:

- Junction creation

```
Performing pdadmin cmd:
     server task default-webseald-server create -t ssl -h localhost -p 443
          -b ignore -c all -j -J inhead -k -r -e utf8_uri -f /mga
Created junction at /mga
```

- Reverse proxy configuration file changes

```
setting stanza value:
     [server] http-method-disabled-remote = TRACE,CONNECT
setting stanza value:
     [eai] eai-auth = https
setting stanza value:
     [eai] retain-eai-session = yes
setting stanza value:
     [eai] eai-redir-url-priority = yes
adding stanza value:
     [eai-trigger-urls] trigger = /mga/sps/oauth/oauth20/session*
adding stanza value:
     [eai-trigger-urls] trigger = /mga/sps/auth*
adding stanza value:
     [eai-trigger-urls] trigger = /mga/sps/authservice/authentication*
setting stanza value:
     [azn-decision-info] HTTP_HOST_HDR = header:host
```

```
setting stanza value:
     [azn-decision-info] HTTP_REQUEST_SCHEME = scheme
setting stanza value:
     [azn-decision-info] HTTP_REQUEST_METHOD = method
setting stanza value:
     [azn-decision-info] HTTP_REQUEST_URI = uri
setting stanza value:
     [azn-decision-info] HTTP_AZN_HDR = header:authorization
setting stanza value:
     [azn-decision-info] HTTP_CONTENT_TYPE_HDR = header:content-type
setting stanza value:
     [azn-decision-info] HTTP_TRANSFER_ENCODING_HDR = header:transfer-encoding
setting stanza value:
     [oauth] oauth-auth = https
setting stanza value:
     [oauth] default-fed-id = https://localhost/sps/oauth/oauth20
setting stanza value:
     [oauth] fed-id-param = FederationId
setting stanza value:
     [oauth] cluster-name = oauth-cluster
setting stanza value:
     [oauth] user-identity-attribute = username
setting stanza value:
     [tfim-cluster:oauth-cluster] handle-pool-size = 10
setting stanza value:
     [tfim-cluster:oauth-cluster] handle-idle-timeout = 240
setting stanza value:
     [tfim-cluster:oauth-cluster] timeout = 240
```

```
setting stanza value:
     [tfim-cluster:oauth-cluster] server = 9,
            https://localhost:443/TrustServerWS/SecurityTokenServiceWST13
```

```
setting stanza value:
     [tfim-cluster:oauth-cluster] basic-auth-user = easuser
setting stanza value:
     [tfim-cluster:oauth-cluster] basic-auth-passwd = ####
setting stanza value:
     [tfim-cluster:oauth-cluster] ssl-keyfile = /var/pdweb/shared/keytab/pdsrv.kdb
setting stanza value:
     [tfim-cluster:oauth-cluster] ssl-keyfile-stash = /var/pdweb/shared/keytab/pdsrv.sth
setting stanza value:
     [session] require-mpa = no
setting stanza value:
     [session] user-session-ids = yes
setting stanza value:
     [session-http-headers] Authorization = https
```

- Creating or modifying an ACL

```
Performing pdadmin cmd:
     acl create isam_mobile_anyauth
Performing pdadmin cmd:
     acl modify isam_mobile_anyauth description OAuth_Auto_Configuration
Performing pdadmin cmd:
     acl modify isam_mobile_anyauth set user sec_master TcmdbsvaBRrxl
Performing pdadmin cmd:
     acl modify isam_mobile_anyauth set group iv-admin TcmdbsvaBRrxl
Performing pdadmin cmd:
     acl modify isam_mobile_anyauth set group webseal-servers Tgmdbsrxl
Performing pdadmin cmd:
     acl modify isam_mobile_anyauth set any-other Tr
Performing pdadmin cmd:
     acl modify isam_mobile_anyauth set unauth T
Performing pdadmin cmd:
     acl create isam_mobile_nobody
Performing pdadmin cmd:
     acl modify isam_mobile_nobody description OAuth_Auto_Configuration
Performing pdadmin cmd:
     acl modify isam_mobile_nobody set user sec_master TcmdbsvaBRrxl
Performing pdadmin cmd:
     acl modify isam_mobile_nobody set group iv-admin TcmdbsvaBRrxl
Performing pdadmin cmd:
     acl modify isam_mobile_nobody set group webseal-servers Tgmdbsrxl
Performing pdadmin cmd:
     acl modify isam_mobile_nobody set any-other T
```

```
Performing pdadmin cmd:
     acl modify isam_mobile_nobody set unauth T
```

- Attaching an ACL

```
Performing pdadmin cmd:
        acl attach /WebSEAL/isam-default/mga/sps/oauth/oauth20/session isam_mobile_unauth
Performing pdadmin cmd:
        acl attach /WebSEAL/isam-default/mga/sps/oauth/oauth20/token isam_mobile_unauth
Performing pdadmin cmd:
        acl attach /WebSEAL/isam-default/mga/sps/static isam_mobile_unauth
Performing pdadmin cmd:
        acl attach /WebSEAL/isam-default/mga/sps/wssoi isam_mobile_anyauth
Performing pdadmin cmd:
        acl attach /WebSEAL/isam-default/mga/sps/xauth isam_mobile_anyauth
```

Removing reverse proxy configuration for OAuth and OIDC provider

You must manually remove the configuration of OAuth and OIDC provider from a reverse proxy instance.

About this task

You can accomplish the manual steps by using the **pdadmin** command and by editing the WebSEAL configuration file.

You can use the appliance Local Management Interface (LMI) to edit the WebSEAL configuration file. On the Reverse Proxy management page, select the appropriate WebSEAL instance and click **Manage** > **Configuration** > **Edit Configuration File** to open the Advanced Configuration File Editor. You can use this editor to directly edit the WebSEAL configuration file.

For information on **pdadmin**, see pdadmin commands.

Procedure

1. Remove the following ACLS:
   - `isam_oauth_anyauth`
   - `isam_oauth_unauth`
   - `isam_oauth_nobody`
   - `isam_oauth_rest`

   You can use the **pdadmin** command to remove ACLs. See acl detach and acl delete.
2. If your deployment has no further need for the junction, delete it.

   Note: Ensure that the junction is not used for any function other than configuration of OAuth and OIDC provider. If you are not certain about whether junction is used for other configurations, you can skip this step.

   The junction name is the value you specified when you created the junction. The default junction name is `/mga`.

   You can use the **pdadmin** command to delete junctions. See server task delete.
3. If OAuth was configured for API protection, disable `oauth-auth` in the `[oauth]` stanza.

   To disable the property, edit the WebSEAL configuration file. See oauth-auth and [oauth] stanza.
4. If OAuth was configured for Browser flows:
   a. Remove the trigger URI `/<jct>/sps/oauth/oauth20/session`

      Note: In the URI, `/<jct>` refers to the WebSEAL junction that you configured. You assigned it a unique name or accepted the default name of `/mga`.
   b. If no other Verify Access services are configured, remove the following trigger URIs:
      - `/<jct>/sps/auth*`
      - `/<jct>/sps/authservice/authentication`

c. If all triggers are removed, disable `eai-auth` in the `[eai]` stanza.

To remove trigger URLs, edit the WebSEAL configuration file. See [eai-triggers-url] stanza and [eai] stanza.

5. If OAuth was configured for API protection but OAuth was **not** configured for browser flows, re-enable `forms-auth` in the `[forms]` stanza.

   To modify the property, edit the WebSEAL configuration file. See [forms] stanza and forms-auth.

Configuring API protection

The API protection uses the OAuth 2.0 protocol. To configure the API protection, you must create a definition and a client.

You must then attach the API protection definition to a resource.

Creating an API protection definition

Create API protection definitions to configure the settings that dictate the behavior of how resources are accessed. The configuration settings protect the resources from unauthorized access.

Procedure

1. Log in to the local management interface.
2. Click either **AAC** > **Policy** > **OpenID Connect and API Protection** or **Federation** > **Manage** > **OpenID Connect and API Protection**.
3. Click **Definitions**, and click .
4. In the **Name** field, type a unique name for the definition.

   Note: The name must begin with an alphabetic character. Do not use control characters, leading and trailing blanks, and the following special characters ~ ! @ # $ % ^ & * ( ) + | ` = \ ; : " ' < > ? , [ ] { } / anywhere in the name.
5. In the **Description** field, provide a brief description about the definition.
6. If you want to enforce an access policy, select the policy from the menu for the **Access Policy** field.

   Note: The menu shows Access Policies that are currently defined. To use an access policy with **OpenID Connect and API Protection**, you must define the policy prior to running the configuration wizard. See Access policies.
7. Click **Grant Types** and select at least one grant type.

   The grant type **Authorization code** is enabled by default. For information on grant types, see “OAuth 2.0 and OIDC workflows” on page 111.
8. Click **Token Management**.

   Specify values for the token properties. For descriptions of each property, see “API Protection token management properties” on page 136.
9. Click **Trusted Clients and Consent** and select when you want the user to be prompted to consent to an authorization grant.
10. If you want to protect an OpenID Connect Provider, click **OpenID Connect Provider** and select **Enable OpenID Connect** .

    Specify OpenID Connect Provider settings as needed for your deployment. For descriptions of each property, see “API Protection OpenID Connect Provider properties” on page 138
11. Click **Save**.

What to do next

- Register an API protection client.

- Deploy the pending changes. See Chapter 15, “Deploying pending changes,” on page 221

Managing API protection definitions

An API protection definition is a set of configurations that define how resources are accessed.

About this task

You can add, modify, and delete definitions.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **OpenID Connect and API Protection**.
4. Click **Definitions**.
5. Perform one or more of the following actions:

   Add definitions

   Click . See “Creating an API protection definition” on page 135 for details.

   Modify definitions

   a. Select a definition in the list of definitions.

   b. Click .

   c. Complete the properties for the definition.

   Note:

   You cannot modify the definition name and you can add new grant types. See “Creating an API protection definition” on page 135 for details.

   d. Click **Save**.

   Delete definitions

   a. Select a definition or press Ctrl and select multiple definitions in the definition list.

   b. Click . Confirm the deletion. Click **OK** to continue or click **Cancel**.

   Note: A definition cannot be deleted if there are clients associated with it or it is attached to a resource.
6. Click **Save**.
7. When you add, modify or delete a definition, a message indicates that there are changes to deploy. If you are finished with the changes, deploy them.

   For more information, see Chapter 15, “Deploying pending changes,” on page 221.

API Protection token management properties

When you configure API Protection for OAuth and OpenID Connect, you must specify properties for token management.

The local management interface (LMI) page **OpenID Conect and API Protection** has a section that prompts for settings for token management. Refer to the following list of properties to determine the appropriate value, for your deployment, for each property.

For configuration task instructions, see “Creating an API protection definition” on page 135.

Access token lifetime (seconds)
Specifies the number of seconds an access token is valid. When the access token becomes invalid, the client cannot use it to access the protected resource.

Default value: 3600 seconds.

Minimum value: 1 second.

Access token length
Specifies the number of characters in an access token.

Default value: 20 characters.

Minimum value: one character.

Maximum value: 500 characters.

Enforce single-use authorization grant
If enabled, all the authorization grant tokens are revoked after an access token is validated. If enabled, resource requests that involve redirects fail because the access token is validated multiple times.

Default value: disabled

Authorization code lifetime (seconds)
Specifies the number of seconds that an authorization code is valid.

This option applies only to an authorization code grant type. The authorization server generates an authorization code and sends it to the client. The client uses the authorization code in exchange for an access token.

Default value: 300 seconds.

Minimum value: 1 second.

Authorization code length
Specifies the number of characters in an authorization code.

Default value: 30 characters.

Minimum value: one character.

Maximum value: 500 characters.

Issue refresh token
Specifies whether a refresh token is sent to the client. A refresh token obtains a new pair of access and refresh tokens. This option is only applicable to the Authorization code and Resource owner password credentials grant types.

Maximum authorization grant lifetime (seconds)
Specifies the maximum number of seconds that the resource owner authorizes the client to access the protected resource.

This option is available only if you enable the **Issue refresh token** option.

The value for this lifetime must be greater than the values specified for the authorization code and access token lifetimes.

When this lifetime expires the associated grants will be deleted in the next cycle and the resource owner must reauthorize the client to obtain an authorization grant to access the protected resource.

Default value: 604800 seconds.

Minimum value: 1 second.

Refresh token length
Specifies the number of characters in a refresh token. This option is available only if you enable the **Issue refresh token** option.

Default value: 40 characters.

Minimum value: 1 characters.

Maximum value: 500 characters.

Enforce single access token per authorization grant
If enabled, all previously granted access tokens are revoked after a new access token is generated presenting the refresh token to the authorization server.

This option is available only if you enable the **Issue refresh token** option.

Default value: enabled

Enable multiple refresh tokens for fault tolerance

Specifies how refresh tokens are handled. When this option is enabled, and a refresh request is made, the initially-used refresh token remains active (assuming it was initially active), even after a successful refresh request is made and a new token pair (access token and refresh token) is returned. Only upon the subsequent use of the new access token or new refresh token will the initially presented refresh token be invalidated. If the initially used refresh token is presented again, the tokens issued on the first refresh request (Pair 1) are revoked, and another token pair (access token and refresh token) is issued. This new pair (Pair 2) is valid, and Pair 1 is invalid.

This option is available only if you enable the **Issue refresh token** option.

Default value: disabled

Enable PIN policy
Provides more protection during the exchange of a refresh token fro a new pair of access and refresh tokens.

This option is available only if you enable the **Issue refresh token** option. If enabled, you must configure the PIN length.

PIN Length
Specifies the number of characters in a PIN. This option is available only if you enable the **Enable PIN policy** option. You can use the **`runtime.hashAlgorithm`** runtime parameter to configure the algorithm that is used to hash the PIN before it is stored. For more information, see Advanced configuration properties.

Default value: 4 characters.

Minimum value: 3 characters.

Maximum value: 12 characters.

Token character set
By default, a set of alphanumeric characters is displayed. You can specify the set of characters used to generate tokens in the following methods:

- Manually enter characters
- Select from a pre-defined character set from the drop-down list
- Edit the characters in the field after selecting from a set from the drop-down list

The configured token character set is applicable for all token types. If this parameter is left blank, all available alphanumeric characters are used to generate the token.

Maximum number for characters allowed: 200

API Protection OpenID Connect Provider properties

When you configure API Protection for OAuth and OpenID Connect, and you enable OpenID Connect , you must specify properties for the OIDC Provider.

The local management interface (LMI) page **OpenID Connect and API Protection** has a section that prompts for settings for OpenID Connect Provider. Refer to the following list of properties to determine the appropriate value for each property.

For configuration task instructions, see “Creating an API protection definition” on page 135.

Issuer Identifier
This entry identifies the issuing entity. It must be a valid URL with the protocol prefix `https://`. For example, `https://ibm.com` or `https://accounts.google.com`. It must not include fragment or query portions. The Issuer Identifier is defined by the OIDC specification. See http://openid.net/specs/openid-connect-core-1_0.html#IssuerIdentifier

Point of Contact Prefix
The Point of Contact Prefix is used to correctly populate the URLs on the metadata page. It must include the host, port, and path information of the reverse proxy junction to the runtime. For example: `https://isam.myidp.ibm.com:443/mga/` . Note that is not a field from the OIDC standard.

Metadata URI
A location where you can view your metadata. Metadata is useful to discover the capabilities of an OP. The metadata includes all other URIs. This field is read-only.

id_token Lifetime
Time in seconds for which the id_token is valid. The value is the difference between the values in the `iat` and `exp` claims of the issued JSON Web Token (JWT). You can use a pre-token mapping rule to overload this value at runtime.

Default: 3600 seconds.

Signing Algorithm
The algorithm that is used to sign the JWT. This setting is the `alg` claim in the JWT. Use the menu to select the appropriate value. You can use a pre-token mapping rule to overload this value at runtime.

Default: RS256.

Key Database for Signing
The Key database that is used to source the private key for signing the ES/RS signature algorithms. You can use a pre-token mapping rule to overload this value at runtime.

Default: rt_profile_keys

Certificate Label for Signing
The label of the key in the selected keystore that is used as the private key for ES/RS signing. You can use a pre-token mapping rule to overload this value at runtime.

Default: server

Encrypt ID token
Boolean value to indicate whether this JWT must be encrypted. Select the check box to encrypt the token and configure encryption settings. You can use a pre-token mapping rule to overload this value at runtime.

Key Agreement Algorithm
The encryption algorithm that is used for JWT key agreement. This setting is the `alg` claim in the encrypted JWT. You can use a pre-token mapping rule to overload this value at runtime.

Default: RSA-OAEP-256

Encryption Algorithm
The encryption algorithm that is used for JWT payload encryption. This setting is the `enc` claim in the encrypted JWT. You can use a pre-token mapping rule to overload this value.

Default: A128CBC-HS256

Attribute Mapping

You can use the Attribute Mapping section to define attributes that can be used to customize claims from attribute sources. Attribute sources can be: Fixed, Credential, or LDAP.

When you select **Enable OpenID Connect**, the **New** and **Delete** icons are activated for attribute mapping. To create, select **New** and enter **Attribute Name**. Select **Attribute Source** type.

To remove an existing **Attribute Name**, select the attribute and click **Delete**.

If you do not select **Enable OpenID Connect**, you cannot create new attribute mappings.

Enable client registration
Check this check box to allow users to register dynamic clients.

Issue Client Secret
If dynamic clients are enabled, check this check box if you want them to be confidential clients.

PIN policy

Advanced Access Control extends OAuth 2.0 capabilities with a PIN policy.

The PIN policy provides the capability of protecting a refresh token with a PIN provided by the API protection client. An administrator can configure the API protection definition to enable the PIN policy for the grant types that issue a refresh token. The two grant types that issue a refresh token are Authorization code and the Resource owner password credentials.

When enabled, the client is required to send a PIN as a parameter in the first access token request. The parameter name is **`pin`**. The parameter value consists of digits of the length that is configured in the API protection definition. The client must submit the same PIN on subsequent requests when exchanging a refresh token for a new access token.

The PIN policy can be configured to use various hash algorithms to hash and store the PIN. Use the **`runtime.hashAlgorithm`** configuration parameter to specify the hash algorithm. For more information about configuring the hash algorithm, see *Runtime properties* in Advanced configuration properties

Registering an API protection client

Register OAuth API protection clients in the **Clients** panel. Clients are the entities against which OAuth access and refresh tokens are granted at runtime.

About this task

API Protection clients now have a dynamic data field when they are configured. This allows storage of arbitrary data against the client which can be accessed at runtime (for example, in the consent page or in mapping rules).

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **OpenID Connect and API Protection**.
4. Click **Clients**.
5. Click .
6. Specify the following information:

Client name
Specify a meaningful client identifier for each client registration. You can use this value to search for client registrations.

API definition
Specifies the related Definition, which owns and defines the client. A Definition can own many client registrations but a client registration can belong to only one Definition. When you create a client, a list of available Definitions are available. When a client is created, this value cannot be modified.

Confidential
Specify whether the client type is confidential. A confidential client type requires a client secret. Enable this feature if you want the client to require a client secret.

Client secret
This field is enabled only if the client is indicated as confidential. Specify a client secret that is used to authenticate an OAuth client at runtime. It is mandatory for all clients that belong to API

protection definitions where the client type is Confidential and the client credentials grant type is enabled. Click **Generate** to have a client secret that is generated for you or specify your own secret.

Redirect URI (Optional)
Click **New** to specify the redirect URI to use for the client. You can create multiple redirect URI entries. Each URL must be unique.

Company name
Specify the name of the company for this client.

Company URL (Optional)
Specify the URL of the company website.

Contact name (Optional)
Specify a name of the contact person for this client.

Email address (Optional)
Specify the email address of the contact person for this client.

Telephone number (Optional)
Specify the telephone number of the contact person for this client.

Contact type (Optional)
Select the contact type from the list:

- Administrative
- Support
- Technical
- Billing
- Other

Other information (Optional)
Specify extra information about the client contact.

Require PKCE (RFC 7636)
Requires Proof Key for Code Exchange, which adds security when performing the authorization code flow on a mobile device. See “Proof Key for Code Exchange support” on page 128.

JWKS endpoint

This endpoint allows retrieval for a client's public key when encryption is used.

JWT Encryption keystore
The database that is used in key agreement when using an asymmetric JWT encryption algorithm. You can use a pre-token mapping rule to overload this value at runtime.

This field is enabled if OIDC is enabled for the selected API Definition.

JWT Encryption certificate
The label of the key in the keystore that is used in key agreement, when you use an asymmetric JWT encryption algorithm. You can use a pre-token mapping rule to overload this value at runtime.

This field is enabled only if a valid encryption keystore is selected from the drop-down list for **JWT Encryption keystore**.

7. Enter any dynamic data on the **Extension Properties** tab.
8. Click **OK**.

Managing registered API protection clients

Manage registered OAuth API protection clients.

About this task

You can search and delete clients. You can search for API protection clients based on the following values:

- Client name
- Client ID
- API protection definition

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **OpenID Connect and API Protection**.
4. Click **Clients**.
5. Perform one or more of the following actions:

View and filter clients

You can filter for client name, client ID, and API protection definition.

Take any of the following actions to filter your view:

- Select the **Details View** to view client name, client ID, and API protection definition.
- Select the **List View** to view only the name of the client.
- Type a term, such as an client name, client ID, and API protection definition in the **Filter** field to list clients that use that term. Any part of the values for client name, client ID, or API protection definition that match is applied by the filter and is displayed in the search results. Click **x** to clear the **Filter** field.
- Sort the client list by column with the up or down arrow on each column. For example, you can view the list of clients that are sorted by the **Clients** column in ascending order by clicking the up arrow.

Modify clients

Attention: Ensure that the modification does not affect a current policy or configuration. If you modify a client that is in-use, the policy or configuration that uses the client might stop working.

a. Select the client you want to modify.

b. Click

c. Complete the properties for the clients.

d. Click **OK**.

Delete clients

a. Select a client or press and hold the Ctrl key and select multiple clients to remove.

b. Click . Confirm the deletion. Click **OK** to continue or click **Cancel**.

When you delete a client:

- The client registration is removed from the database.
- All tokens issued against that client is removed.

6. When you add, modify or delete a client, a message indicates that there are changes to deploy. If you are finished with the changes, deploy them.

   For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Managing policy attachments

Attach policies or API protection definitions to resources so that the policies and definitions can be enforced.

Before you begin

You must create policies, policy sets, or API protection definitions.

When you create policies, policy sets, or API protection definitions you cannot use them until you publish them to resources. Once policies, policy sets, or API protection definitions are published, they are enforced during the evaluation of access requests.

About this task

You can:

- Add a resource
- Add a policy or API protection definition attachment to a resource
- Remove a policy or API protection definition attachment from a resource
- Delete a resource
- Publish a policy or API protection definition attachment

When a deployment is fully configured, the **Resources** panel displays three levels of entries. The top-level entry is the web container that contains the protected object space for a server instance. The second level shows the resources in the protected object space. The third level lists the policies and API protection definitions that are attached to each resource.

Tip: The user interface provides a quick filter feature for use on the top-level entry. Use the quick filter to search for a specific top-level entry. Enter the first few characters of the web container, and the list displays only the entries that contain the specified characters.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Access Control**.
4. Click **Resources**.
5. Perform one or more of the following actions:

   Add a resource

   a. Click .

      Note: When you add a resource for the first time, the system prompts you to enter the user name, password, and domain for the Security Verify Access policy server. The entered information is cached and used by default when you add a resource again. If you want to change this domain, click **Change Domain** and then enter the new user name, password, and domain information. This new information replaces the old cached values.

   b. Select the resource type in the **Type** field.

      - If you select the **Reverse Proxy** type:

        i) In the **Proxy Instance** field, click the down arrow icon to display a list of proxy instances. Select an entry.

For example, the list of proxy instances is the WebSEAL protected object space that is defined directly under `/WebSEAL`.

ii) Specify a resource by entering its name or browsing for it. When you browse, you can expand the list of resources. The list hierarchy is based on the structure of the WebSEAL protected object space.

- In some cases, not all resources are displayed because the WebSEAL protected object space is a sparse tree. For example, you might see only the resource `/myserver-jct/benefits`. You can select this resource and click **OK** to add it to the **Protected Path**. You can then add `/myserver-jct/benefits/medical`.
- In some cases, you cannot view the object space for the web server junction. For example, if the administrator did not install the IBM Security Verify Access **`querycontents`** script on the application server, you cannot see the junction contents. In these cases, you can enter the resource path manually.

- If you select the **Application** type:

i) Select an application ID from the list or click **Add New** to add a new application ID.

ii) Enter the resource ID.

c. Click **Save**.

d. Attach a policy to the resource.

Attach a policy or API protection definition to a resource

a. Select a resource node and click Attach.

b. In the **Attach Policies** panel, select **Policies** or **Policy Sets** or **API Protection**.

c. From the displayed list, select one or more policies or policy sets or API protection definitions.

Tip: You can type the name of the applicable policy or policy set or API protection definition in the quick filter.

Notes:

- You can attach both individual policies, policy sets, or API protection definitions.
- You cannot attach policies or policy sets to a resource where that resource already has API protection definitions attached.
- You cannot attach API protection definitions to a resource where that resource already has policies and policy sets attached.

d. Click **OK** to save your changes.

Note: The policy or API protection definition remains inactive until you publish it.

Remove a policy or API protection definition attachment

a. To remove a policy or API protection definition attachment from a resource, select the policy node and click .

b. When prompted, confirm the deletion.

Note: You must publish the change.

Delete a resource

a. To delete a resource and all attached policies or API protection definitions, select the resource node and click .

b. When prompted, confirm the deletion.

When you delete a resource:

- You cannot delete the server node.
- You do not have to manually publish the change. The deletion is automatically published.

Publish a policy or API protection definition

Select a resource in the resource hierarchy and click Publish. When the publication completes, the status column for the resource indicates the status and time of the publication.

Note: Activation of the published policy or API protection definition could take up to a minute to complete.

Modify Resource

Note: You can only use this function if policy or policy sets are attached to the given resource.

a. Select a resource node and click .

b. In the **Modify Resource** panel, you can modify the **Policy Combining Algorithm**. Choose the preferred algorithm:

- **Deny access if any attached policy returns deny**

  This algorithm means that if multiple policies or API protection definitions are attached to a resource, and any one of those policies or API protection definitions returns `Deny`, then the access request is denied.

- **Permit access if any attached policy returns permit**

  This algorithm means that if multiple policies or API protection definitions are attached to a resource, and any one of those policies or API protection definitions returns `Permit`, then the access request is permitted.

Using oauthScope attributes in an access control policy

You can use the subject and resource **`oauthScope`** attributes as part of an access control decision for a resource.

Before you begin

1. Create a reverse proxy instance.
2. Run the **`isamcfg`** tool. You must configure access control policies and API protection capabilities.
3. Determine the access control resources that your policies must be attached to. If the resources do not exist, add them.

About this task

To use the OAuth attributes in an access control decision, you must attach the access control policy and API protection definition in the proper locations in the protected object space.

Procedure

1. Create an access control policy. Specify the **`oauthScopeResource`** attribute, the **`oauthScopeSubject`** attribute, or both, in one or more rules for this policy. See Creating an access control policy.
2. Attach the access control policy to an object in the protected object space. See “Managing policy attachments” on page 143.
3. Create an API protection definition. See “Creating an API protection definition” on page 135.
4. Register an API client that uses the API protection definition you created in step “3” on page 145. See “Registering an API protection client” on page 140.
5. Attach the API protection definition to an object in the protected object space. See “Managing policy attachments” on page 143.

When you attach the definition to a resource, the resource must be at a level lower than where the access control policy is attached in step “2” on page 145. The term *lower* means farther away from the root of the protected object space.

For example, in the resource tree `jct/dir1/dir2/protected_resource`, you can attach the access control policy to `/jct`. Then, attach the API protection definition to `/jct/dir1`.

6. Deploy the pending changes.

Results

The access decision for a resource at or below the API protection definition involves the **oauthScope** attributes that were defined in the access control policy.

Uploading OAuth response files

Use the local management interface to upload your own custom OAuth response files.

Procedure

1. From the top menu, select **Secure Reverse Proxy Settings** > **Manage** > **Reverse Proxy**.
2. Select a reverse proxy.
3. Select **Manage** > **Management Root**.
4. Select the **oauth** folder.
5. Select **Manage** > **Import**.
6. Click **Browse**.
7. Browse to the file you want to import.
8. Click **Open**.
9. Click **Import**.

OAuth introspection

An Introspection URL implemented to the spec of RFC 7662 allows for information about an access token to be returned. This allows OAuth clients to query a token to identify if the token exists and is valid. Extensions to this endpoint have been made to also include some information about the token, beyond whether the token is valid.

The introspection URL is enabled by default. To disable it, set the advanced configuration **`oauth20.introspectEndpointEnabled`** to `false`.

A usual introspection response for a valid token includes the following values:

```
{
“active”:true,
“username”:”jessica”,
“client_id”:”yb98la1”,
“scope”:”email profile”,
“iat”: 1487744340,
“exp”: 1487747940
}
```

`active`
Signifies this token is valid.

`scope`
The scope of the access token.

`username`
The username of the user token was granted by.

`client_id`
The client this token was granted to.

iat
The UNIX timestamp for when this token was granted.

exp
The UNIX timestamp for when this token will expire.

A usual introspection response for an invalid token includes the following values:

```
{
"active":false
}
```

active
Signifies this token is invalid.

The RFC articulates that the introspection endpoint must be authenticated with client credentials. These credentials can be provided as post parameters '`client_id`' and '`client_secret`', or they can be provided as a Basic Authentication (BA) header. The authentication using BA can occur at the point of contact (reverse proxy) or by the introspection endpoints itself (similar to the token endpoint). The client may also authenticate using an access token issued to this client.

This client authentication is performed in the pre-token mapping rule (with the default rule). This out of the box rule does not allow non-confidential clients to introspect tokens. However, by modification of the rule, non-confidential clients may be able to make use of this endpoint. The RFC articulates security concerns when allowing non-confidential clients to introspect tokens (DOS, crawling the possible token space. See section 4. https://tools.ietf.org/html/rfc7662#section-4). A non-confidential client can provide client credentials using BA or post parameters. When using BA, the credentials should present a password of empty string ("").

The introspection endpoint can allow clients to introspect the tokens of each other. By default, this is not allowed. However, a change to the POST token rule can be made to enable it. See the out of the box rule for details.

URL:

```
https://<Reverse proxy host/port/junction> /sps/oauth/oauth20/introspect
```

HTTP Request Example:

```
POST /mga/sps/oauth/oauth20/introspect HTTP/1.1
     Host:  server.oauth.com
     Accept: application/json
     Content-Type: application/x-www-form-urlencoded

     client_id=yb98la1&client_secret=4531959525657&token=2YotnFZFEjr1zCsicMWpAA
```

The introspection endpoint supports use of the **'token_type_hint'** as per section 2.1 (https://tools.ietf.org/html/rfc7662#section-2.1). This allows an optimization in the time of the token lookup. This does not limit the breadth of the search for the token in the token cache. Any token type will still be found even when its type is not the same as the hint.

For example:

```
POST /sps/oauth/oauth20/introspect HTTP/1.1
Content-Type: application/x-www-form-urlencoded

token=&client_id=aClient&client_secret=aSecret&token_type_hint=access_token
```

Valid values for **token_type_hint** are **'access_token'** and **'refresh_token'**.

If using custom tokens that are not stored in the token cache, the pre-mapping rule can be used to inform the runtime that the token provided was valid. To do this, add a context attribute with the name **'active'** and the type **'urn:ibm:names:ITFIM:oauth:rule:decision'**. The response attribute

type can also be used. If this parameter is provided, the runtime will do no further work, and the post-rule will be invoked. For example:

```
stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute("active",
"urn:ibm:names:ITFIM:oauth:rule:decision", "true"));
```

OAuth revocation endpoint

You can use a revocation endpoint to ensure that tokens are revoked.

Security Verify Access supports use of an OAuth revocation endpoint. This endpoint enables clients to inform an authorization server that a specified token is no longer used, and must be revoked. The support is compliant with RFC 7009.

The revocation URL is enabled by default and cannot be disabled.

A typical revocation response returns a 200 response, with an empty body. You can modify a mapping rule to add response attributes.

The RFC states that the revocation endpoint must be authenticated with client credentials. You can provide these credentials as post parameters *client_id* and *client_secret*, or provide them as a Basic Authentication (BA) header. The authentication that uses BA can occur at the point of contact (reverse proxy) or by the revocation endpoint itself (similar to the OAuth token endpoint). The client can also authenticate by using an access token that was issued to this client.

The RFC states that the revocation endpoint can revoke only tokens that were generated by the client that is requesting the revocation.

URL

```
https://<Reverse proxy host/port/junction> /sps/oauth/oauth20/revoke
```

HTTP Request Example

```
POST /mga/sps/oauth/oauth20/revoke HTTP/1.1
     Host:
server.oauth.com
     Content-Type: application/x-www-form-
urlencoded
     client_id=yb98la1&client_secret=4531959525657&token=2YotnFZFEjr1zCsicMWpAA
```

token_type_hint

The revocation endpoint supports use of the `token_type_hint`. Use of the hint optimizes the lookup time for the token. Use of the hint does not limit the breadth of the search for the token in the token cache. Token types are found even if a token's type is not the same as the hint.

For example:

```
POST /sps/oauth/oauth20/revoke HTTP/1.1
Content-Type: application/x-www-form-urlencoded

token=&client_id=aClient&client_secret=aSecret&token_type_hint=access_token
```

Valid values for `token_type_hint` are `access_token` and `refresh_token`.

Mapping rule variables

Table 12. Mapping rule variable for OAuth revocation	
Variable	**Description**
`only_allow_conf_client_revoke`	You can use the pre-mapping rule to specify whether non-confidential clients can revoke tokens. By default, only confidential clients can revoke tokens. To enable non-confidential clients to revoke tokens, set this parameter to `false`. Default: `var only_allow_conf_client_revoke = true;`

OIDC Claims customization

You can customize the OIDC claims that contain information about the user and about the authentication event.

The OIDC specification describes standards for creating and processing claims. OpenID defines a standard set of basic profile Claims. You can use specific scope values to access pre-defined sets of Claims. You can also request individual Claims by using the `claims` request parameter.

The specification outlines the following structure for defining and handling claims:

- There are about twenty standard claims, such as `name`, `picture`, `gender`, and so on.
- You can use the `scope` parameter to request Claims. There are well defined scopes, each of which translates to a collection of standard claims such as `profile`, `email`, `phone`, and `address`.
- You can also request claims individually by using the `claims` request parameter.
- When an access token exists, claims are returned in `UserInfo`. When there is no access token, claims are returned in `ID Tokens`.
- `UserInfo` is returned at the `/userinfo` endpoint. ID Tokens are returned at either the `/authorize` or `/token` endpoints, depending on which OIDC flow is executed.
- There are additional request parameters that can affect the claims. Examples of these include `max_age`, `acr_values`, and `claims_locales`.

OIDC does not perform authentication itself, but relies on an authentication module to authenticate the user. This means that the OIDC protocol cannot provide claims values, because it has no knowledge of what user information is available, and how to the data is stored. For example, perhaps only the user `name` information is available, but is stored in LDAP as the attribute `cn`.

As a result, Security Verify Access supports the customization of claims values. For ID Tokens, you can customize claims values through a pre-token mapping rule. For UserInfo, you can customize claims in a post-mapping rule.

In Security Verify Access, when you create a new OIDC Definition, default pre-token and post-token mapping rules are created. These mapping rules contain examples of how the claims can be resolved.

Note: To review the OIDC specification, see http://openid.net/specs/openid-connect-core-1_0.html#Claims

UserInfo endpoint

The OIDC specification recommends the use of the UserInfo endpoint. The UserInfo endpoint is useful, for example, when a Relying Party cannot parse a JWT Token to obtain information about the authenticated user.

Without the use of customization, the /userinfo endpoint contains only the field `sub`. This is the subject identifier for the end-user at the issuer.

The specification mandates to output the claims as much as possible at the /userinfo endpoint, except when an access token is not generated. Also, in some cases the ID Token is generated at both /authorize and /token endpoint. The Security Verify Access will not impose any restriction of which claims must be output to ID Token or User Info. Likewise, there are no restrictions that the same claims must be returned at /authorize and /token. Based on the needs of your deployment, you can choose not to output some claims in certain flows even though the claims are requested.

The /userinfo endpoint is protected by an access token. You can access it by an HTTP GET or POST. See the following links:

- http://openid.net/specs/openid-connect-core-1_0.html#UserInfoRequest
- https://tools.ietf.org/html/rfc6750#section-2

An `unauth` ACL is attached for this endpoint.

Claims List

Many parameters can contribute to a claims list. For example, parameters specified by a scope are often used to build a list. By parsing the claims parameter, you can also retrieve individual claims and determine which claims are for UserInfo and which claims are for ID Tokens.

Security Verify Access builds a claims list and makes it available in the Security Token Service Universal User (STSUU) as a list of voluntary and essential claims. This list is produced only for OIDC requests that have scope `openid` against an OIDC-enabled provider.

The processing sequence is:

1. The `scope` parameter is processed first, since all claims requested through it are voluntary claims. The specification defines only profile, address, email, and phone scopes as well-defined scopes. These translate into a list of standard claims. However, if the scope contains other scopes that are not well-defined, it is treated as an individual claim.
2. Next the claims parameter is processed. Either UserInfo or ID Token is processed, depending on the endpoint.

Table 13. Claims types

Claim	**Type**
Voluntary claims	`urn:ibm:names:ITFIM:oidc:claim:voluntary`
Essential claims	`urn:ibm:names:ITFIM:oidc:claim:essential`

For example, given a request with `scope="openid phone organization"` and a `claims` parameter that is the described in the following JavaScript Object Notation (JSON):

```
{
   "userinfo":  {
        "given_name": {"essential": true},
        "email": {"essential": true},
        "email_verified": {"essential": true},
        "http://example.info/claims/groups": null
    },
   "id_token": {
        "nickname": null,
        "auth_time": {"essential": true},
        "acr": {"values": ["urn:mace:silver"] }
    }
}
```

At the /authorize or /token endpoint where the ID Token can be generated, the following is available in the STSUU context:

```
<stsuuser:ContextAttributes>
        // from scope: phone and organization
<stsuuser:Attribute name="organization" type="urn:ibm:names:ITFIM:oidc:claim:voluntary"/>
        <stsuuser:Attribute name="phone_number"
type="urn:ibm:names:ITFIM:oidc:claim:voluntary"/>
        <stsuuser:Attribute name="phone_number_verified"
                type="urn:ibm:names:ITFIM:oidc:claim:voluntary"/>
        // from id_token claims parameter
        <stsuuser:Attribute name="nickname" type="urn:ibm:names:ITFIM:oidc:claim:voluntary"/>
        <stsuuser:Attribute name="auth_time" type="urn:ibm:names:ITFIM:oidc:claim:essential"/>
        <stsuuser:Attribute name="acr" type="urn:ibm:names:ITFIM:oidc:claim:voluntary">
            <stsuuser:Value>urn:mace:silver</stsuuser:Value>
        </stsuuser:Attribute>
</stsuuser:ContextAttributes>
```

At the /userinfo endpoint, the following is available in the STSUU context:

```
<stsuuser:ContextAttributes>
        // from scope: phone and organization
        <stsuuser:Attribute name="organization"
type="urn:ibm:names:ITFIM:oidc:claim:voluntary"/>
        <stsuuser:Attribute name="phone_number"
type="urn:ibm:names:ITFIM:oidc:claim:voluntary"/>
        <stsuuser:Attribute name="phone_number_verified"
             type="urn:ibm:names:ITFIM:oidc:claim:voluntary"/>
        // from userinfo claims parameter
        <stsuuser:Attribute name="given_name" type="urn:ibm:names:ITFIM:oidc:claim:essential"/>
        <stsuuser:Attribute name="email" type="urn:ibm:names:ITFIM:oidc:claim:essential"/>
        <stsuuser:Attribute name="email_verified"
              type="urn:ibm:names:ITFIM:oidc:claim:essential"/>
        <stsuuser:Attribute name="http://example.info/claims/groups"
              type="urn:ibm:names:ITFIM:oidc:claim:voluntary"/>
</stsuuser:ContextAttributes>
```

Retrieving Claim Values

You can use the function `associate()` and **`UserLookupHelp`** to retrieve claim values. Security Verify Access allows you to also retrieve claim values by using attribute sources. The Federation support in Security Verify Access includes management of attribute sources, in the LMI under Advanced Access Control.

You can provide mappings between a specific attribute name and an attribute source, as part of configuring an OIDC Definition. During runtime, this mapping is resolved and made available in the STSUU.

For example, assume the attribute sources in the following table are configured.

Table 14. Example configuration of Attribute Sources

Attribute Name	**Value**	**Type**
CredentialNickName	AZN_CRED_PRINCIPAL_NAME	Credential
FixedOrganization	www.ibm.com	Fixed
LDAPMail	mail	LDAP

Assume also that you have created the following attribute mapping in the OIDC Definition configuration.

Table 15. Attribute Mapping

Attribute Name	**Attribute Source**
email	LDAPMail
nickname	CredentialNickName
organization	FixedOrganization

Then, during runtime, in the STSUU the following attributes can be found:

```
<stsuuser:AttributeList>
        <stsuuser:Attribute name=“nickname" type="urn:ibm:names:ITFIM:5.1:accessmanager">
            <stsuuser:Value>test1</stsuuser:Value>
        </stsuuser:Attribute>
        <stsuuser:Attribute name=“organization" type="urn:ibm:names:ITFIM:5.1:accessmanager">
            <stsuuser:Value>www.ibm.com</stsuuser:Value>
        </stsuuser:Attribute>
        <stsuuser:Attribute name="email" type="urn:ibm:names:ITFIM:5.1:accessmanager">
            <stsuuser:Value>test1@iswga.com</stsuuser:Value>
        </stsuuser:Attribute>
</stsuuser:AttributeList>
```

The resolution of attribute sources during runtime is dependent on the context. The context is the list of attributes that are available in the STSUU at that moment. The following conditions apply:

- For fixed attribute source, there is no restriction on attribute source resolution.
- For a credential type attribute source, resolution occurs best at the /authorize endpoint. This is because since the entire authentication information (and credential) is available at that time.
- For LDAP type attribute source, if you are using a macro for the search filter or baseDN, resolution also depends on the context. The information might be available in STSUU, but in a different context it might be available under a different name. This means it can be difficult to create one LDAP attribute source that fits all contexts.

  The common use of a macro is to retrieve information based on the username that is being authenticated. Security Verify Access includes an attribute `oidc_username` which contains the authenticated username in all contexts: whether at /authorize, /token or /userinfo endpoints. For example, you can create a common LDAP Attribute Source, as shown in the following table.

Table 16. LDAP Attribute Source example

Type	**LDAP**
Attribute Name	`LDAPMail`
LDAP Attribute	`mail`
Server Connection	`TestLDAP`
Scope	`Subtree`
Selector	`uid`
Search filter:	`(uid={oidc_username})`
Base DN:	`dc=iswga`

Saving Values or Parameters

Security Verify Access enables you to save values or parameters that are related to the claims at the /authorize endpoint.

For example, some request parameters can be specified at the /authorize endpoint, but the claims might be produced at the /token or /userinfo endpoint. The claims need to be saved so that they can be available at the /token or /userinfo endpoint. An example of this is the `claims_locales` request parameter.

Another example is the existence of values, such as credential information, that are available at the /authorize endpoint, but need to be output at the /token or /userinfo endpoint. An example of this is the values that are used in the credential type attribute sources. You can save these values. This overcomes the limitation of the attribute source such that for the credential-type attribute source, the context exists only at the /authorize endpoint, and if the values are not saved, the context is not available at any other endpoint.

You can do this by creating a context attribute in the STSUU of the type `urn:ibm:names:ITFIM:oidc:claim:parameter` for parameter or `urn:ibm:names:ITFIM:oidc:claim:value` for value.

The difference between these two types is that, during runtime, the claim value is put back into STSUU Attribute List under type `urn:ibm:names:ITFIM:5.1:accessmanager`, but the claim parameter is put in the STSUU context under type `urn:ibm:names:ITFIM:oidc:claim:parameter`.

Note that these saved values or parameters exist as long as the grant exists. When the grant is removed or expires, the saved values and parameters are removed.

For example, we man modify the pre-token mapping rule and add the following code to save the `AZN_CRED_PRINCIPAL_NAME` attribute.

```
var saveValue = stsuu.getAttributeContainer()
         .getAttributeValueByNameAndType("AZN_CRED_PRINCIPAL_NAME",
         "urn:ibm:names:ITFIM:5.1:accessmanager");
if (saveValue != null) {
    var attro = new com.tivoli.am.fim.trustserver.sts.uuser.Attribute("AZN_CRED_PRINCIPAL_NAME",
        "urn:ibm:names:ITFIM:oidc:claim:value", saveValue);
    stsuu.getContextAttributes().setAttribute(attro);
}
```

By doing this, the `CredentialNickName` attribute source (as shown in the example earlier in this article) can be resolved in the /token or /userinfo endpoint.

Customizing claims

Security Verify Access provides, in pre-token and post-token mapping rule, examples of how to customize the claims.

For ID Tokens, customization is done in a pre-token mapping rule. You must enable the sample by setting the `customize_id_token` variable to `true`. For UserInfo, customization is done in a post-token mapping rule.

For the example, the algorithm used is the same. The first step is to retrieve the claim list. You might want to process essential claims and voluntary claims separately.

To resolve claims, the `produceClaim()` method is called. If an expected value, as specified by the claim, is found, use it. Next, try to find an attribute that has been resolved using Attribute Source mapping, and has the same name as the claim. Next, if still there is no value, for essential claims, you can set some value or optionally throw an STS exception. Note, however, that the OIDC specification does not recommend throwing an error even if an essential claim cannot be fulfilled.

For the final step, if the claim value exists, it is put into the STSUU. The type must be set correctly, in order to included as part of ID Token or UserInfo. For ID Token, the type must be `urn:ibm:jwt:claim`. For UserInfo, the type must be `urn:ibm:names:ITFIM:oauth:response:attribute`.

Special parameter for UserInfo

You can customize UserInfo by using a special attribute. You can create an attribute in the STSUU Context, with name `userinfo` and type `urn:ibm:names:ITFIM:oauth:rule:userinfo`, with the value as a JSON string.

The purpose of this special parameter is to allow you to provide a complex value for UserInfo, in situations where the limitations of the STSUU structure prevent support for the value. For example, the following JSON defines an `address` that consists of two parts:

```
{"firstname":"John",
  "lastname":"Doe",
  "address":{
     "zipcode":34234
     "city":"Newark"
  }
}
```

The JSON string provided in this parameter serves as the base JSON structure, and is added with other customization attributes, if they exist, to the output of the /userinfo endpoint.

Another use of the special parameter is when you want to generate UserInfo in JWT format. By default, the Security Verify Access implementation produces UserInfo in JSON format. If you need to produce UserInfo in JWT format, there is an example in the post-mapping rule.

To use the example in the post-mapping rule, complete the following steps:

1. Create an STS chain that includes the modules in the table below.

Table 17. Chain modules for JWT format	
Module	**Mode**
Default STSUU Module Instance	Validate
Default Jwt Module	Issue
Default STSUU Module Instance	Issue

   For more information on creating STS templates and chains, see Managing trust chains.

2. In the post mapping-rule, set `produce_jwt_userinfo` to `true`:

```
var produce_jwt_userinfo = true;
```

Client authentication to /token through an incoming JSON Web Token

Security Verify Access OIDC Providers support client authentication to `/token` through an incoming JSON Web Token (JWT).

Some deployment scenarios, such as Open Banking, require the use of a signed assertion as a method to replace `client_id` and `client_secret`. To view the implementer requirements for client authentication, see https://www.openbanking.org.uk/read-write-apis/security-profile/id1-0-1/.

Security Verify Access OIDC Providers support client authentication to `/token` through an incoming JSON Web Token (JWT). Security Verify Access support of client assertions satisfies RFC 7523. See https://tools.ietf.org/html/rfc7523.

Note: Support for authentication to `/token` with a JWT is different from support for request JWTs that are presented to `/authorize`. For `/authorize`, see “Passing parameters through JWT in a request to /authorize” on page 155.

When an incoming client assertion is detected by the presence of the parameters `client_assertion_type` (of a valid value) and `client_assertion`, the OAuth delegate invokes a token exchange. This token exchange is to a well-known (predictable) set of `issuer` and `appliesTo` values.

The JWT must contain the following claims:

iss
: The issuer of the JWT. This value must be that of the security entity that created this JWT. Its presence is validated, but explicit validation of the value must be completed in the STS chain.

sub
: Subject Identifier. This value must be the `client_id` you want to authenticate.

aud
: Intended audiences for the ID Token. It must be a value that represents this entity, such as the API Protection definition name.

exp
: Expiration time on or after which the JWT is not accepted for processing.

The parameter **nbf**, if present, is validated. This parameter is the "not before" claim that identifies the time before which the JWT is not accepted for processing.

You can create a Secure Token Service (STS) chain with modules to handle client assertions through incoming JWTs during authentication. To configure an STS chain that is compatible with incoming client assertions, the chain must ensure:

1. No token type is set.
2. RequestType of Validate is accepted.

Examples of ISSUER and APPLIESTO fields that handle all presented client assertions are as follows:

```
ISSUER="REGEXP:(urn:ietf:params:oauth:client-assertion-type:jwt-bearer:.*)"
APPLIESTO=https://localhost/sps/oauth/oauth20
```

Note: In the example above, all clients match with this chain. (Note the `.*` value in the `regexp` for the Issuer.) If a particular chain is needed, then use the `issuer:urn:ietf:params:oauth:client-assertion-type:jwt-bearer:`*`myClient`* where *myClient* is the `client_id` of the interested client.

- The `issuer` is a combination of the assertion type plus the client identifier.
- The `appliesto` is the federation name. For Security Verify Access, the federation name is always:

  ```
  https://localhost/sps/oauth/oauth20
  ```

The client configured `secret` and `jwks_uris` are included in the request to the STS through WS-Trust claims. To view how the JWT module supports validation, see Validate mode.

After the JWT is validated, OAuth expects a Secure Token Service Universal User (STSUU) in return, as follows:

- The `sub` claim is populated with the `client_id` of the incoming request.
- The `aud` field is checked against the configured issuer identifier of the API definition.

  Note: The values of `iss` and `aud` must be validated. This validation can be done through the STS chain configuration, or in a map module in the STS chain, or in the pre-token mapping rule. Validation within the chain is easiest when the values of `iss` and `aud` are static.

All the claims in the JWT are mapped into the STSUU attribute list, with the type similar to `urn:ibm:oauth20:client:assertion`.

To implement this set of features, you must configure an STS chain with the following modules:

- JWT module in Validate mode >
- An optional JavaScript mapping rule >
- STSUU module in Issue mode

Following is an example of code for retrieving the values:

```
var sub = stsuu.getAttributeContainer().getAttributeValueByName("sub");
var aud = stsuu.getAttributeContainer().getAttributeValueByName("aud");
var iss = stsuu.getAttributeContainer().getAttributeValueByName("iss");
IDMappingExtUtils.traceString("sub: " + sub + " aud: " + aud + " iss: " + iss);
```

Passing parameters through JWT in a request to /authorize

Security Verify Access OIDC Providers support passing request parameters by way of a JWT in a request to `/authorize`.

The support satisfies the requirements in Section 6.1 of the OpenID Connect Core specification https://openid.net/specs/openid-connect-core-1_0.html.

Deployments such as web banking applications require integration with strong authentication as offered by a third party. This scenario requires that clients avoid providing claims directly in a query string. By

sending the claims in a JSON Web Token (JWT), the client proves that it signed them with an established secret. Security Verify Access supports this function by providing decryption of OIDC ID tokens that are received with the authorization code grant flow from a third-party OpenID Provider. The received tokens are signed (for example, by presenting a JWT that uses the JWS algorithm RS256) and encrypted (for example, by use of the content encryption algorithm AES128CBC-HS256 and key agreement algorithm of RSA-OEAP). See https://tools.ietf.org/html/rfc7518.

A request JWT can be used to provide incoming request parameters. The specification requires that the OAuth request parameters must still contain `client_id` and `response_type`, but all other parameters, such as `redirect_uri`, and `scope`, can be provided only in the request JWT. The `client_id` and `response_type` can also be presented in the request JWT, but the values of each must match those that are provided in the OAuth request parameters.

To configure an STS chain that is compatible with incoming JWT request parameters, the chain must meet the same requirements as required for handling client assertions:

1. No token type is set.
2. RequestType of Validate is accepted.

Examples of `ISSUER` and `APPLIESTO` fields that handle all presented client assertions are as follows:

```
ISSUER="REGEXP:(urn:ibm:ITFIM:oauth20:client_request:.*)"
APPLIESTO=https://localhost/sps/oauth/oauth20
```

Note: In the example above, all clients match with this chain. (Note the `.*` value in the `regexp` for the Issuer.) If a particular chain is needed, then use the `issuer:urn:ietf:params:oauth:client-assertion-type:jwt-bearer:`*`myClient`* where *myClient* is the `client_id` of the interested client.

- The `APPLIESTO` is the federation ID.
- The `ISSUER` must be the string "`urn:ibm:ITFIM:oauth20:client_request:`", and the `clientId` that is included in the request.

The claims are mapped into the request. Validation occurs on `request_type` and `client_id`, as required by the specification:

- Validating JWT-based Requests

  When the `request` authorization parameter is used, the JWT is passed to the auxiliary chain, and the returned claims are mapped back into the request STSUU. The response type of the auxiliary chain must be STSUU. If signature validation fails, the request is rejected.

- Request Parameter Assembly and Validation

  The Authorization Server must assemble the set of Authorization Request parameters to be used from the Request Object value and the OAuth 2.0 Authorization Request parameters (minus the request parameters). If the same parameter exists both in the Request Object and the OAuth Authorization Request parameters, the parameter in the Request Object is used. Using the assembled set of Authorization Request parameters, the Authorization Server then validates the request in the normal manner for the flow that is being used.

Mapping rules for OAuth and OIDC

Security Verify Access provides default mapping rules that you can use and customize for your OAuth or OIDC deployment.

Managing OAuth 2.0 and OIDC mapping rules

Use the mapping rules to customize the methods for the OAuth 2.0 or OIDC flow.

About this task

The OAuth 2.0 and OIDC mapping rules are JavaScript code that run during the OAuth 2.0 or OIDC flow. You can view, export, and replace OAuth or OIDC mapping rules.

View the mapping rule if you want to see the content and structure of the mapping rule. Export the mapping rule if you want to save a copy of the mapping rule. You can also edit this copy. Replace a mapping rule if you want to use a new mapping rule.

Procedure

1. Log in to the local management interface.
2. Click **AAC** > **Policy** > **OpenID Connect and API Protection** or **Federation** > **Manage** > **OpenID Connect and API Protection**.
3. Click **Mapping Rules**.
4. Perform one or more of the following actions:

   View a mapping rule

   a. Select a mapping rule.

   b. Click . The **View Mapping Rule** panel opens. The content of the mapping rule is displayed.

   c. Click **OK** to close the panel.

   Export a mapping rule

   a. Select a mapping rule.

   b. Click .

   c. Choose a location and save the file.

   Replace a mapping rule:

   Note: Use an existing mapping rule as the basis for the updated mapping rule.

   a. Select a mapping rule that you want to replace.

   b. Click . The **Replace Mapping Rule** panel opens.

   c. Click the field or **Browse** and select a file.

   d. Click **OK** to upload the mapping rule.
5. When you replace a mapping rule, the appliance displays a message that there are undeployed changes. If you are finished with the changes, deploy them.

   For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Related reference

“OAuth 2.0 and OIDC mapping rule methods” on page 157
You can use Java methods to customize the `PreTokenGeneration` and `PostTokenGeneration` mapping rules.

OAuth 2.0 and OIDC mapping rule methods

You can use Java methods to customize the `PreTokenGeneration` and `PostTokenGeneration` mapping rules.

The sample mapping rules are `oauth_20_pre_mapping.js` and `oauth_20_post_mapping.js`.

You can access the sample mapping rules from the LMI. Navigate to **System** > **Secure Settings** > **File Downloads**. Continue to either of the following locations:

- **access_control** > **examples** > **mapping rules**
- **federation** > **examples** > **mapping rules**

The following limitations affect the attribute keys and values that are associated with the `state_id` by using the `OAuthMappingExtUtils` class:

- Keys cannot be null or empty.
- Values cannot be null but can be empty.

- Associated key-value pairs are read and write-allowed and not-sensitive.
- Some keys are reserved for system use and cannot be modified by this utility. For example, the keys and values for the API PIN protection.

For more information, see the Javadoc. In the LMI, navigate to **System** > **Secure Settings** > **File Downloads**. Continue to either **access_control** > **doc** or **federation** > **doc**.

See also "JavaScript Allowlist" on page 339.

OAuth and OIDC mapping rules files

In OAuth and OpenID Connect deployments, you can use mapping rules to customize your use of Security Verify Access features.

Security Verify Access provides template mapping rules that you can use when configuring OAuth and OpenID Connect deployments. For OIDC, the rules are automatically included when you create an OIDC API Protection definition. One mapping rule is used pre-token generation. The other mapping rule is used post-token generation.

Note: If you created API definitions in a prior release of Security Verify Access, and updated to Version 9.0.4, you have the option to enable OIDC. However, enabling OIDC and saving the definition does not update the mapping rules. You can manually update the mapping rules by following the instructions in "Updating mapping rules when enabling OIDC" on page 165.

Table 18. Mapping Rules

Mapping Rule	Supported Actions
oauth_20_pre_mapping.js	• Use a user registry for verification of the username and password for the ROPC scenario. Optionally, force sourcing the ROPC password validation config from ldap.conf. • Show an example of the ROPC scenario using an external service for verification of the username and password. • Limit the number of tokens per user per client, and specify the algorithm to use. • Customize ID Token • Specify whether to only allow confidential clients to introspect or revoke tokens • Discover the request_type and the grant type. • Limit the number of grants per user per client. • Enable a token lookup example. • Enable custom tokens • Enable assertion grants • Calling additional STS chains

Table 18. Mapping Rules (continued)	
Mapping Rule	**Supported Actions**
oauth_20_post_mapping.js	• Associate attributes • Deletetokens • Makean HTTP(S) callout • Update a token • Register an Authenticator for MFA • Enforce that clients are only introspecting their own tokens • UserInfo Customization • Produce JWT UserInfo • Call additional STS chains • Return additional attributes to the user via response attributes.

OAuth and OIDC mapping rules actions

You can modify mapping rules to perform actions that you need for your OAuth or OIDC deployment.

This topic provides details for some of the actions you can take to modify the mapping rules. For information on more actions, see the comments in the code for each mapping rule.

Note that for certain grant types, some actions must be performed in the pre-token mapping rule.

See "Managing OAuth 2.0 and OIDC mapping rules" on page 156 for instructions on replacing a mapping rule after you make the updates to the file.

Resource owner password credentials (ROPC) grant type flow

For the ROPC flow, the pre-token mapping rule is responsible for performing validation of the user name and password. This validation can be performed in various ways. The pre-defined rule that is included with the appliance provides the following examples:

- Use UserLookupHelper to validate a user name and password against a configured LDAP. You can also use the java class **`PluginUtils`** but it is limited.

  To configure the LDAP to be used, see "Configuring username and password authentication" on page 48.
- Validate the user name and password through an HTTP callout. The mapping rule sends the user name and password to a web service. As the format of the messages is not fixed, various services (for example, REST, SOAP, SCIM) can be used for this purpose. Javadoc on the HTTP client and all other exposed Java classes available in mapping rules can be downloaded from the appliance **File Downloads** page under the path **access_control** > **doc** > **ISAM-javadoc.zip**.

JWT and SAML bearer grant type flow

For the JWT or SAML assertion bearer grant type flows, the pre-token mapping rule must perform the following actions:

- Validate the assertion, including but not limited to:
  - Validate the signature (if signed).
  - Decrypt the assertion (if encrypted).
  - Check the expiry and "not before" value of the assertion.
  - Ensure that the issuer is a trusted party.
- Extract the subject from the assertion and set the **USERNAME** field of the STSUU.

The **USERNAME** field of the STSUU can be set via a call, for example:

```
// username is a variable containing the subject of the assertion

stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute
("username","urn:ibm:names:ITFIM:oauth:rule:decision", username));
```

The validation of the assertion can be performed in various ways:

– HTTP callout to a web service. Use the HTTP client to perform this.

– WS-Trust request to the Secure Token Service (STS).

- A chain must be configured to consume the assertion and return the required information.
- The **STSClientHelper** will be called to invoke the STS via HTTP. For more information about this class, see the Javadoc that is embedded in the appliance.

Any attributes of the assertion can be extracted and associated to the OAuth grant to be used later. For more information about associating attributes, see "OAuth 2.0 and OIDC mapping rule methods" on page 157.

- The type of the username attribute added must be `"urn:ibm:names:ITFIM:oauth:rule:decision"` to ensure that only a value populated from the rule is used.

OAuth 2.0 token limits

You can define limits on the number of OAuth tokens per user per definition so that the high-volume database does not go beyond capacity.

Security Verify Access for Mobile has a thread that runs at a specified interval defined by the advanced configuration property, `oauth20.tokenCache.cleanupWait`. This property defines the amount of time, in seconds, to wait before it performs another cleanup of expired grants and tokens in the OAuth 2.0 token cache.

Depending on the interval and use of OAuth grants and tokens, there is a possibility that the capacity of the high-volume database can be reached before the cleanup process runs. If this happens, the appliance can be negatively impacted.

To prevent issues such as this, the OAuth PreTokenGeneration mapping rule, by default, limits the number of OAuth tokens per user per client definition. When a user requests an OAuth token, the current number of tokens for that user and the specified client definition will be compared to the maximum allowed. If the maximum is exceeded, an error message is returned to the user.

An additional algorithm implements least recently used (LRU) and, if the maximum is exceeded, the least recently used token determined by the date last used for that user and client definition will be removed from the high-volume database.

You can set the limit and algorithm to use, which are controlled by variables in the mapping rule file. Two algorithms are implemented in this mapping rule:

- Strictly enforce the limit.
- When the limit is reached, remove the least recently used tokens for the user per client.

Update the OAuth PreTokenGeneration mapping rule, `oauth_20_pre_mapping.js` to modify the algorithms. See the comments in the code for an explanation of the values you can modify.

See "Updating PreTokenGeneration to limit OAuth tokens" on page 6 so that any API protection definitions you created in versions prior to 8.0.1.2 can take advantage of these limits.

Customizing OAuth tokens by updating the sample PreTokenGeneration mapping rule

You can customize the format of the tokens that are issued by your OAuth definition.

The OAuth tokens can be customized by modifying the sample PreTokenGeneration mapping rule. Enable the PreTokenGeneration mapping rule on the appliance by setting the variable *enable_custom_tokens* to true.

When custom token formats are used, the tokens must remain unique. Otherwise, users might become authenticated with another user's credential. Thus, it is recommended that custom tokens always contain a nonce of reasonable entropy.

To customize the authorization code, insert a context attribute into the STSUU with the type `"urn:ibm:ITFIM:oauth20:custom:token"` and the name `"urn:ibm:ITFIM:oauth20:custom:token:authorization_code"`. The provided value will be used as the authorization code if an authorization code would have been issued in this request.

To customize the access token, insert a context attribute into the STSUU with the type `"urn:ibm:ITFIM:oauth20:custom:token"` and the name `"urn:ibm:ITFIM:oauth20:custom:token:access_token"`. The provided value will be used as the access token if an access token would have been issued as part of this request.

To customize the refresh token, insert a context attribute into the STSUU with the type `"urn:ibm:ITFIM:oauth20:custom:token"` and the name `"urn:ibm:ITFIM:oauth20:custom:token:refresh_token"`. The provided value will be used as the refresh token if a refresh token would have been issued as part of this request.

Returning additional attributes in responses

If you want to return additional attributes to an OAuth response, modify the pre or post token mapping rule to add an attribute with the name and value of the desired response attribute, and specify the well-known type `urn:ibm:names:ITFIM:oauth:response:attribute`. You can also use the post token mapping rule to modify any response attributes which are already included.

Here is an example of adding a new response attribute in JavaScript.

```
stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute
("myAdditionalAttribute" ,"urn:ibm:names:ITFIM:oauth:response:attribute", "myValue"));
```

If you want to return a multi-valued attribute, provide a Java array as the value. Here is an example of constructing and returning a multi-valued response attribute.

```
  var javaArray = java.lang.reflect.Array.newInstance(java.lang.String, 1);
  javaArray[0] = 'myValue';
  stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute
    ("myAdditionalAttribute" ,"urn:ibm:names:ITFIM:oauth:response:attribute", javaArray));
```

Here is an example of an access_token response using the same examples:

```
{
  "access_token": "afcddfegeedffdeeabb",
  "refresh_token": "cbbdegfcgcffgffdcbdeafadaccegaebeebeaagd",
  "scope": "scope1",
  "myAdditionalAttribute": "myValue",
  "token_type": "bearer",
  "expires_in": 3589
}

{
  "access_token": "gdbafbcgffcggfgeccb",
  "refresh_token": "dfgagecdgbeddeebbedcdacegdacccccfafabcee",
  "scope": "scope1",
  "myAdditionalAttribute": [
    "myValue",
    "mySecondValue"
  ],
  "token_type": "bearer",
  "expires_in": 3589
}
```

This action is commonly performed for the response types:

- authorize
- access_token
- introspect

- userinfo
- revoke

  Note: when used for revoke, JSON will be returned rather than a 200 with no body.

Customize ID Tokens

For OIDC deployments, the post-mapping rule `oauth_20_pre_mapping.js` provides examples for how to customize ID tokens. When populating an ID token, the rule processes essential claims and voluntary claims separately so that they are treated appropriately if they have no value. In the STSUU, the attribute's name is the claim name and the attribute's value(s) are the expected value of the claim. See the mapping rule for more information.

Customize UserInfo

For OIDC deployments, the post-mapping rule `oauth_20_post_mapping.js` provides examples for how to customize Userinfo based on OIDC `scope` and `claims` request parameters. In the STSUU context, the claims are listed in terms of essential and voluntary claims. When `AttributeSources` are configured in the definition, they too are resolved and available in the STSUU. This is one way of doing customization.

Produce JWT Userinfo

For OIDC deployments, the post-mapping rule `oauth_20_post_mapping.js` provides examples for how to produce JWT UserInfo. In the STSUU context, the signing and encryption data (based on the OP Definition) are available. To create JWT, you can call an STS Chain which has 2 modules: 1) Default STSUU validation module, 2) Default JWT issuer module. You must create this chain, it is not supplied by default. The chain passes the signature and encryption data and all the JWT claims. The JWT token result then needs to be set back in the STSUU under specific name and type. See the mapping rule file for more information.

Modifying JWT signing and encryption parameters in the pre-token mapping rule

This action applies only when OIDC is enabled.

When using OIDC, the JSON Web Token (JWT) configuration is sourced from the OAuth definition. However, an administrator may want to write logic which at runtime augments how a JWT is formed. For example, specifying a different certificate when signing JWTs for a specific client or specific type of client. You can take this action within the pre-token mapping rule for the definition.

The JWT STS module is used to build the JWT that is returned in the OIDC flow. This module allows a well-known set of claims to be provided at runtime. For documentation on those values, see Issue mode.

When making use of the issue context attributes defined in the JWT STS module, the values must be provided by using a different and specific attribute type. When calling the STS, the STS Universal User (STSUU) that is provided is just for a JWT. For OIDC, the STSUU is an encapsulation of the HTTP request. To provide a custom property for building a JWT, set a context attribute with the name and attribute as described in the "Issue mode" link, but use the attribute type `urn:ibm:oidc10:jwt:create`. If you want to set a JWT claim or header claim (not how the actual JWT is formed), use the types `urn:ibm:jwt:claim` or `urn:ibm:JWT:header:claim`, respectively.

Note: The Security Token Service Universal User (STSUU) document is an XML representation of a request that passes through a trust module chain in the STS. The three elements in the STS Universal User document are Principal, AttributeList, and RequestSecurityToken. For more information on the role of the STSUU in identity mapping, see Security Token Service Universal User document.

The following example ensures that the JWT that is issued uses HS256 signing with the provided key. This action overrides the configuration in the OAuth definition.

```
stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute(
          "signing.alg", "urn:ibm:oidc10:jwt:create", "HS256"));
stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute(
          "signing.symmetricKey", "urn:ibm:oidc10:jwt:create", "myKey"));
```

The following code adds an extra header to the JWT (in this case, the `cty` field).

```
stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute("cty",
         "urn:ibm:JWT:header:claim", "JWT"));
```

The following code adds a static claim to the JWT claims.

```
stsuu.addAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute("myClaim" ,
         "urn:ibm:jwt:claim", "claimValue"));
```

Here is a raw JWT produced with all 4 of the above examples enabled.

```
eyJjdHkiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJub25jZSI6InNvbWVOb25jZTE0
NzUxIiwiaWF0IjoxNTA2NDkyNTAyLCJpc3MiOiJodHRwczovL3Rlc3REZWYuY29tI
iwic3ViIjoidGVzdHVzZXIiLCJleHAiOjE1MDY0OTYxMDIsIm15Q2xhaW0iOiJjbG
FpbVZhbHVlIiwiYXVkIjoibXl0ZXN0Q2xpZW50In0.ZJdBmJtVw_Ti3Qjnpi21HWl
Yk-asu72UnosYBZXeRn4
```

The decoded header:

```
{
  "cty": "JWT",
  "alg": "HS256"
}
```

The claims:

```
{
  "nonce": "someNonce14751",
  "iat": 1506492502,
  "iss": "https://testDef.com",
  "sub": "testuser",
  "exp": 1506496102,
  "myClaim": "claimValue",
  "aud": "mytestClient"
}
```

Retrieve Clients

You can retrieve the static and dynamic client data in the pre_token and post_token mapping rule, by using the *oauth_client* variable.

For example:

```
//The oauth_client varible will be unavailable during dynamic client registration in the
pre_token mapping rule.

//Returns the client id of the client
var client_id = oauth_client.getClientId();
//Returns the client secret of the client
var client_secret = oauth_client.getClientSecret();
//Returns the extended data associated with the client
var extendedData = oauth_client.getExtendedData();
```

To customize the `client_id` and secret during a dynamic client registration flow, see “OIDC Dynamic Clients- Custom Identifiers” on page 185.

Dynamic Client Registration Flow

During dynamic client registration, the `client id` and `client secret` are either generated or can be customized.

A variable is available in the pre and post token mapping rule to access the registered client and its attributes.

For example:

```
//Returns the client id of the dynamically registered client
var client_id = oauth_client.getClientId();
//Returns the client secret of the dynamically registered client
var client_secret = oauth_client.getClientSecret();
```

```
//Returns the extended data associated with the dynamically registered client
var extendedData = oauth_client.getExtendedData();
```

Customizing OAuth tokens by updating the sample PreTokenGeneration mapping rule

You can customize the format of the tokens that are issued by your OAuth definition.

The OAuth tokens can be customized by modifying the sample PreTokenGeneration mapping rule. Enable the PreTokenGeneration mapping rule on the appliance by setting the variable *enable_custom_tokens* to true.

When custom token formats are used, the tokens must remain unique. Otherwise, users might become authenticated with another user's credential. Thus, it is recommended that custom tokens always contain a nonce of reasonable entropy.

To customize the authorization code, insert a context attribute into the STSUU with the type `"urn:ibm:ITFIM:oauth20:custom:token"` and the name `"urn:ibm:ITFIM:oauth20:custom:token:authorization_code"`. The provided value will be used as the authorization code if an authorization code would have been issued in this request.

To customize the access token, insert a context attribute into the STSUU with the type `"urn:ibm:ITFIM:oauth20:custom:token"` and the name `"urn:ibm:ITFIM:oauth20:custom:token:access_token"`. The provided value will be used as the access token if an access token would have been issued as part of this request.

To customize the refresh token, insert a context attribute into the STSUU with the type `"urn:ibm:ITFIM:oauth20:custom:token"` and the name `"urn:ibm:ITFIM:oauth20:custom:token:refresh_token"`. The provided value will be used as the refresh token if a refresh token would have been issued as part of this request.

To customize the device code, insert a context attribute into the STSUU with the type `"urn:ibm:ITFIM:oauth20:custom:token"` and the name `"urn:ibm:ITFIM:oauth20:custom:token:device_code"`. The provided value will be used as the device_code in the device flow.

To customize the user code, insert a context attribute into the STSUU with the type `"urn:ibm:ITFIM:oauth20:custom:token"` and the name `"urn:ibm:ITFIM:oauth20:custom:token:user_code"`. The provided value will be used as the user_code in the device flow. Customizing the user_code is particularly important, as the end user will be required to key this into a user agent –potentially on a mobile device, where entering long strings can be cumbersome. There is an out of the box example of this configured be default to make the format of the user code xxxx-xxxx.

OpenID Connect mapping rules

Mapping rules allow users to customize the information that is propagated from an OpenID Connect Provider or what is consumed by a Relying Party.

These mapping rules can either be JavaScript, which is invoked internally via the STS, or the mapping can be performed externally via a HTTP request.

OpenID Connect Provider mapping rules

When you write mapping rules for a provider, the primary goal is to augment the claims that are included in the ID token.

After mapping rule execution, all attributes in the STSUU will be added to the id_token as a claim, where the attribute key is the key in the id_token, and the value is the value of the attribute. If there are several attributes with the same key, then an array containing each attribute will be added to the claim. Some context information is made available to the user when writing mapping rules; the context attributes of

the passed in STSUU will contain attributes with the type “urn:ibm:ITFIM:oidc:provider:context”, which can be used to make decisions on what claims are added, or if any other actions are performed.

These context attributes include:

- The client ID of the client making the request.
- The federation name of the provider servicing the request.
- The redirect URI sent in the request.
- The response type of the request.
- The state parameter of the request.
- The user-consented scopes for the request.

OpenID Connect Relying Party mapping rules

When you write mapping rules for a Relying Party, the resulting STSUU is turned into a PAC that is used to authenticate the user to a Reverse Proxy via EAI.

The attributes that are included in that PAC will be the attributes of the STSUU, and the principal will be the first principal which was in the STSUU. When writing mapping rules for a Relying Party, the values of the `id_token` will be made available as Attributes in the STSUU. Some additional context is made available to the user via the STSUU's context attributes. These attributes will have the types “urn:ibm:ITFIM:oidc:client:idtoken:param” and “urn:ibm:ITFIM:oidc:client:token:param”.

These context attributes include:

- All of the claims inside the `id_token`.
- The raw JWT.
- Any issued access or refresh tokens.
- All of the properties of the issued bearer token if an authorization code flow is used.
- All of the parameters issued in the response if an implicit flow is used.

Attribute sources

Both OpenID Connect Providers and Relying Parties can be configured to use an attribute source.

For an OpenID Connect Provider, this can be used instead of a mapping rule. However for an OpenID Connect Relying Party a mapping rule must still be present, this mapping rule is required to construct the principal used in the `iv-cred`.

For more information about attribute sources, see Managing attribute sources.

Updating mapping rules when enabling OIDC

You can update the default mapping rules for OIDC to enable and customize mapping actions.

About this task

Security Verify Access provides mapping rules for use with OAuth 2.0 and OIDC deployments. You can access these files from the File Downloads section of the LMI. You can then update these files as appropriate for your deployment.

For Version 9.0.4, Security Verify Access supports new OIDC request types, as described in the following table.

Table 19. New request types		
Request type	**Associated endpoint**	**Description**
userinfo	`https://server.oauth.com/mga/sps/oauth/oauth20/userinfo`	See “OAuth 2.0 endpoints” on page 108 and “OIDC Claims customization” on page 149
revoke	`https://server.oauth.com/mga/sps/oauth/oauth20/revoke`	See “OAuth 2.0 endpoints” on page 108 and “OAuth revocation endpoint” on page 148
introspect	`https://server.oauth.com/mga/sps/oauth/oauth20/introspect`	Support for introspect was added in Version 9.0.3.See “OAuth 2.0 endpoints” on page 108 and “OAuth introspection” on page 146

Procedure

1. In the LMI, go to **System** > **File Downloads**
2. Expand either **federation** > **examples** > **mapping rules** or **access_control** > **examples** > **mapping rules**
3. Select one or more of the following files and click **Export**.
   - oauth_20_pre_mapping.js
   - oauth_20_post_mapping.js
4. Edit the mapping rule as appropriate for your deployment.
5. Import the revised mapping rule into your OIDC API Protection definition.
   a. Select either **AAC** > **Policy** > **OpenID Connect and API Protection** or **Federation** > **Manage** > **OpenID Connect and API Protection**.
   b. Select the **Mapping Rules** sub-menu.
   c. Click **Import** to add a new mapping rule. Or, to use an edited mapping rule to replace an existing mapping rule, highlight the existing mapping rule and click **Replace**.

Device flows verification_uri

The device flow requires the client be presented with a `verification_uri`.

The `verification_uri` value needs to be changed per deployment because the exact details of the point of contact are not known by the authorization server and the response is written back in JSON not HTML. In order to update the `verification_uri` shown in the response from `device_authorize`, use the Post Token mapping rule and update the variable `webseal_portion` to be the new protocol, hostname, port, and junction to user in the URI.

OAuth 2.0 template files

The OAuth process relies on HTML pages to interact with users, such as displaying errors or prompting users to provide information. You can customize these pages through the OAuth template files.

For information about OAuth template files, see Template files.

OAuth 2.0 template page for consent to authorize

The authorization server uses this page to determine and store user consent information about which OAuth clients are authorized to access the protected resource. This page also indicates scopes that the OAuth client requests.

The Security Verify Access for Mobile provides an HTML page template called `user_consent.html`. The macros in the template are specifically for an OAuth 2.0 flow.

Note: You can use a separate template for each API definition. To add a template for a specific definition, create a directory with the same name as the definition under `oauth20` and add the `user_consent.html` template there.

Security Verify Access for Mobile stores the decisions made by the resource owner about which OAuth clients to trust. The resource owner is not prompted every time the same OAuth client requests authorization to access the protected resource.

The authorization request from the OAuth client shows a list of approved scopes, and a list of scopes to be approved. These lists are shown in the consent page and can be of indeterminate length. The template supports multiple copies of stanzas that are repeated once for each scope in either list.

This template file provides several replacement macros:

@OAUTH_AUTHORIZE_URI@
This macro is replaced with the URI for the authorization endpoint.

@OAUTH_CLIENT_COMPANY_NAME@
This macro is replaced with the display name of the client that is requesting access the protected resource.

@CLIENT_ID@
This macro is replaced with the `client_id` parameter specified in the authorization request.

@REDIRECT_URI@
This macro is replaced with the redirect URI that the authorization server uses to send the authorization code to. The value depends on the following items:

- Redirect URI that is entered during partner registration
- `oauth_redirect` parameter specified in the authorization request

@STATE@
This macro is replaced with the `state` parameter specified in the authorization request.

@RESPONSE_TYPE@
This macro is replaced with the `response_type` parameter specified in the authorization request.

@OAUTH_CLIENT_DATA_MACRO@
This macro is replaced with the client data in JSON format, which contains values that are entered at configuration time such as:

- Company name
- Company URL
- Contact name
- Email address
- Telephone number
- Contact type
- Other information

This macro is also the dynamic data of the client. This includes any statistically configured client values such as **Company name**, and any dynamic values, regardless of whether they are from a dynamically registered client or from an extended client portion. For example, `tos_uri`

The fields are sanitized through a filter list. To populate or filter a specific value, change the advanced configuration **`oauth20.clientDataToInclude`**.

@USERNAME@
This macro is replaced with the Security Verify Access for Mobile user name.

@OAUTH_OTHER_PARAM_REPEAT@
A multi-valued macro that belongs inside a `[RPT oauthOtherParamsRepeatable]` repeatable replacement list. The values show the list of extra parameter names.

@OAUTH_OTHER_PARAM_VALUE_REPEAT@
A multi-valued macro that belongs inside a `[RPT oauthOtherParamsRepeatable]` repeatable replacement list. The values show the list of extra parameter values.

@OAUTH_TOKEN_SCOPE_REPEAT@
A multi-valued macro that belongs either inside `[RPT oauthTokenScopePreapprovedRepeatable]` or `[RPT oauthTokenScopeNewApprovalRepeatable]` repeatable replacement lists. The values inside the `[RPT oauthTokenScopePreapprovedRepeatable]` show the list of token scopes that have been previously approved by the resource owner. Alternatively, the values inside the `[RPT oauthTokenScopeNewApprovalRepeatable]` show the list of token scopes that have *not* yet been approved by the resource owner.

@CONSENT_FORM_VERIFIER@
This macro is replaced with a unique identifier for the `consent_form_verifier` parameter value. The `consent_form_verifier` parameter value is automatically generated by the authorization server. The parameter name and value must not be modified.

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
 "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
  <head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
    <title>OAuth 2.0 - Consent to Authorize</title>
    <link rel="stylesheet" type="text/css" href="/sps/static/styles.css" />
  </head>
  <body>
      <div class="header">
        <div class="brandingLogo"><img src="/sps/static/ibm-logo.png" /></div>
      </div>
    <div class="content">
        <div class="contentHeader">
          <h1 class="pageTitle">OAuth 2.0 - Consent to Authorize</h1>
          <div class="instructions"></div>
        </div>

        <div class="pageContent">
    <form action="@OAUTH_AUTHORIZE_URI@" method="post">

      <p>The following site is requesting access to an OAuth 2.0 protected resource:</p>
      <div class="sectionTitle">
      <p><b>@OAUTH_CLIENT_COMPANY_NAME@</b></p>
      </div>

      <p>The client type is: @CLIENT_TYPE@</p>
      <br/>
      <p>The client provided the following OAuth 2.0 request parameters:</p>
      <br/>
      <ul style="margin-left: 20px">
        <li>Client Id: @CLIENT_ID@</li>
        <li>Redirect URI: @REDIRECT_URI@</li>
        <li>State: @STATE@</li>
        <li>Response Type: @RESPONSE_TYPE@</li>
      </ul>
      <br/>
      <p>By approving this request you will be providing delegated authorization
      on behalf of:</p>
      <p><b>@USERNAME@</b></p>
      <br/>

      <p>The client provided the following extra request parameters:</p>
      <!-- START NON-TRANSLATABLE -->
      <ul style="margin-left: 20px">
      [RPT oauthOtherParamsRepeatable]
      <li>@OAUTH_OTHER_PARAM_REPEAT@=@OAUTH_OTHER_PARAM_VALUE_REPEAT@</li>
      <input type="hidden" name="@OAUTH_OTHER_PARAM_REPEAT@"
      value="@OAUTH_OTHER_PARAM_VALUE_REPEAT@" />
      [ERPT oauthOtherParamsRepeatable]
      </ul>
      <!-- END NON-TRANSLATABLE -->
      <br/>
      <p>The client requested the following token scopes that have been previously approved:</p>
      <!-- START NON-TRANSLATABLE -->
      <ul style="margin-left: 20px">
      [RPT oauthTokenScopePreapprovedRepeatable]
      <li>@OAUTH_TOKEN_SCOPE_REPEAT@</li>
      <input type="hidden" name="scope" value="@OAUTH_TOKEN_SCOPE_REPEAT@" />
      [ERPT oauthTokenScopePreapprovedRepeatable]
      </ul>
      <!-- END NON-TRANSLATABLE -->
      <br/>
      <p>The client requested the following token scopes that have not yet been approved:</p>
      <!-- START NON-TRANSLATABLE -->
      [RPT oauthTokenScopeNewApprovalRepeatable]
      <input type="checkbox" name="scope" value="@OAUTH_TOKEN_SCOPE_REPEAT@" checked="checked"/>
      <label>@OAUTH_TOKEN_SCOPE_REPEAT@</label><br />
      [ERPT oauthTokenScopeNewApprovalRepeatable]
      <!-- END NON-TRANSLATABLE -->

      <p/>
      <br />
      <p>Would you like to approve access to this scope?</p>
      <br/>
      <input type="hidden" name="consent_form_verifier" value="@CONSENT_FORM_VERIFIER@" />

            <!--
                The scope parameters can be:
                1. Requested as part of the redirect for authorization by the client
                   by appending them to the authorize URL as query string parameters, and/or
                2. If not requested by the client, and you know what authorization options
                   are valid for the protected resources being requested, you may
                   also manually prompt for them in this page template as demonstrated
                   by the following example scope's
            -->
            <!--
            <table>
                <tr>
                    <td>Scopes to be authorized: </td>
                    <td>Scope 1</td><td><input type="checkbox" name="scope" value="token_scope_1" /></td>
                    <td>:: Scope 2</td><td><input type="checkbox" name="scope" value="token_scope_2" /></td>
                    <td>:: Scope 3</td><td><input type="checkbox" name="scope" value="token_scope_3" /></td>
                </tr>
            </table>
            -->

      <table>
        <tr>
          <td>Permit </td>
          <td><input type="radio" name="trust_level" value="permit" checked /></td>
        </tr>
        <tr>
          <td>Deny </td>
          <td><input type="radio" name="trust_level" value="deny" /></td>
        </tr>
      </table>
      <br />

      <div class="controls">
      <input class="submitButton" type="submit" name="submit" value="Submit" style="width: 80px" />
      </div>
    </form>
</div>
</div>
  </body>
</html>
```

Figure 3. Template for user_consent.html

Error responses

An HTTP response indicates the type of error that has occurred when an action in an authorization process fails. The error responses described here are only applicable to Policy Enforcement Point (PEP) error responses.

For more information about OAuth 2.0 error responses for other endpoints, see the OAuth website: http://www.oauth.net.

In some circumstances, the following HTTP error responses must be returned to the client:

- 400 Bad Request
- 401 Unauthorized
- 502 Bad Gateway

For the 401 response, an additional `WWW-Authenticate` header is added to the response in the following format:

```
WWW-Authenticate: OAuth realm = <realm-name>
```

The HTML component of the responses is preinstalled from files that have been specified in the EAS configuration.

For details on how to configure the response template files for OAuth EAS, see Configuring WebSEAL to include OAuth decisions.

User self-administration tasks for OAuth

Administrators can configure OAuth to enable users to perform certain self-management tasks.

A common user task is to manage authorization grants. For example, users can view the attributes of an authorization grant. A user can also enable an authorization grant.

Managing OAuth 2.0 authorization grants

You can view your authorization grants and the tokens and attributes of each authorization grant.

About this task

You can complete the following tasks:

- View a list of your OAuth 2.0 authorization grants.
- View the OAuth 2.0 tokens and attributes of an authorization grant.
- Remove an OAuth 2.0 authorization grant.
- Enable an OAuth 2.0 authorization grant.
- Disable an OAuth 2.0 authorization grant.

Procedure

Take one of the following actions:

View your OAuth 2.0 authorization grants and the tokens and attributes of each authorization grant

a. Log in to `http://`*`hostname`*`/mga/sps/mga/user/mgmt/html/device/device_selection.html`.

b. Click the ID from the table to view the tokens and attributes of that authorization grant.

Note: You can also use the following URL to go directly to the tokens and attributes of a specific authorization grant: `http://`*`hostname`*`/mga/sps/mga/user/mgmt/html/device/grant_attributes.html?id=`*`x`*.

The query string, `id=x`, indicates the authorization grant that you are trying to access. The *x* represents the ID of the authorization grant.

Remove an OAuth 2.0 authorization grant

a. Log in to `http://`*hostname*`/mga/sps/mga/user/mgmt/html/device/device_selection.html`.

b. Click **Remove** next to the authorization grant that you want to remove.

Enable an OAuth 2.0 authorization grant

a. Log in to `http://`*hostname*`/mga/sps/mga/user/mgmt/html/device/device_selection.html`.

b. Select the **Enabled** box next to the authorization grant that you want to enable.

Disable an OAuth 2.0 authorization grant

a. Log in to `http://`*hostname*`/mga/sps/mga/user/mgmt/html/device/device_selection.html`.

b. Clear the **Enabled** box next to the authorization grant that you want to disable.

Note: Authorization grants can be enabled, disabled, or removed in the authorization grant attribute page too.

APIs for managing OAuth 2.0 authorization grants

There are two API endpoints that are available to manage a user/s grants. These endpoints are useful for building an SPA or custom USC.

The first endpoint allows listing all of a user's grants.

Issue a HTTP GET to: `http://server.oauth.com/mga/sps/mga/user/mgmt/grant`. The API responds with:

```
{
  "grants": [
    {
      "id": "uuid8f63b7ee-0169-1c05-a78c-af253b6a2308",
      "isEnabled": true,
      "clientId": "client1",
      "tokens": [
        {
          "type": "authorization_grant",
          "subType": "refresh_token",
          "dateCreated": "2019-03-18T06:01:11Z",
          "lifetime": 604799,
          "lastUsed": "2019-03-18T06:01:11Z",
          "scope": "openid,email"
        }
      ],
      "attributes": [
        {
          "name": "attribute1",
          "readonly": false,
          "sensitive": false,
          "value": "123"
        },
        {
          "name": "attribute2",
          "readonly": false,
          "sensitive": false,
          "value": "456"
        }
      ],
      "clientName": "client1"
    },
    ...
  ],
  "username": "testuser"
}
```

The second endpoint allows operations on a per grant basis. This endpoint requires the grant-id to be known, the API documented above includes the grantId.

To use this endpoint, issue a HTTP GET to: `http://server.oauth.com/mga/sps/mga/user/mgmt/grant/{grantId}`. The API responds with the grant:

```
{
      "id": "uuid8f63b7ee-0169-1c05-a78c-af253b6a2308",
      "isEnabled": true,
      "clientId": "client1",
      "tokens": [
        {
          "type": "authorization_grant",
          "subType": "refresh_token",
          "dateCreated": "2019-03-18T06:01:11Z",
          "lifetime": 604799,
          "lastUsed": "2019-03-18T06:01:11Z",
          "scope": "openid,email"
        }
      ],
      "attributes": [
        {
          "name": "attribute1",
          "readonly": false,
          "sensitive": false,
          "value": "123"
        },
        {
          "name": "attribute2",
          "readonly": false,
          "sensitive": false,
          "value": "456"
        }
      ],
      "clientName": "client1"
    }
```

This endpoint also supports a HTTP DELETE to remove a grant. Issue a HTTP delete to `http://server.oauth.com/mga/sps/mga/user/mgmt/grant/{grantId}`.

The attributes can also be updated when they are not read-only. Issue a HTTP PUT to `http://server.oauth.com/mga/sps/mga/user/mgmt/grant/{grantId}` , with the body:

```
{
  "isEnabled": true,
  "attributes": [
    {
      "name": "attribute1",
      "value": "newvalue1"
    },
    {
      "name": "attribute2",
      "value": "newvalue2"
    }
  ]
}
```

OAuth STS Interface for Authorization Enforcement Points

Use the WS-Trust interface to directly contact an OAuth Security Token Service (STS) trust chain in Security Verify Access to validate a request for an OAuth protected resource. An OAuth enforcement point intercepts requests for OAuth protected resources. The OAuth enforcement point also validates the request with Security Verify Access, and passes the request through, if it is valid. If the request is not valid, the enforcement point denies access to the protected resource.

OAuth STS overview

You can develop your own customized policy enforcement point to work with the Security Token Service (STS) trust chain through the STS interface. Some examples of existing customized policy enforcement points are WebSphere® Servlet Filter, Trust Association Interceptor (TAI), and a reverse proxy such as WebSEAL. As Security Verify Access supports OAuth 2.0 federations, you can develop customized policy

enforcement points to work with OAuth 2.0 federations. The following diagram illustrates the relationship between the OAuth STS trust chain and other OAuth components.

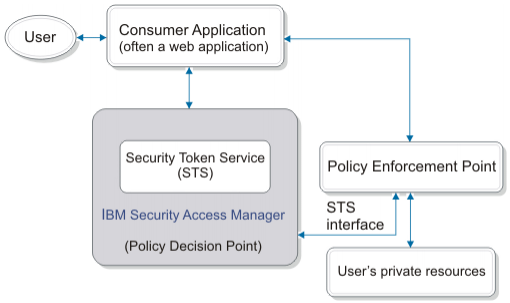


Figure 4. OAuth STS trust chain workflow

This section describes the process an OAuth enforcement point undertakes to transform an HTTP request for an OAuth protected resource into a WS-Trust message.

The transformation makes it possible for the STS to validate the request. It also describes the possible responses an enforcement point can receive from the STS and how to deal with them.

The following information about the policy decision point in Security Verify Access must be made available to the enforcement point:

- The absolute URL of the Security Verify Access STS trust service endpoint. (For example: `https://isam.com/TrustServer/SecurityTokenService`)
- The basic authentication user name and password for the Security Verify Access STS trust service (if required).
- The ProviderID of the Security Verify Access federation the client belongs to, which is used as the AppliesTo address for WS-Trust requests. Optionally, the enforcement point accepts a provider ID from the OAuth client as a request parameter to serve more than one federation concurrently.

Authorization decision request

Configuration

For OAuth 2.0 requests, the enforcement point must know the Security Verify Access OAuth 2.0 issuer address prefix (`urn:ibm:ITFIM:oauth20:token:`).

HTTP request

When an OAuth 2.0 client retrieves a protected resource with its access token, it constructs a request similar to any of the following examples. Each of these three examples is logically the same request. All that differs is the transmission mechanism (HTTP header, query string, post body) for sending the OAuth 2.0 bearer access token:

OAuth 2.0 Example 1 (Access token in authorization header)

```
POST /oauth/protectedresource.jsp
  Host: isam.com
  Authorization: Bearer YPxa78JggdW7hvcFRJph
  Content-Type: application/x-www-form-urlencoded

username=steve
```

OAuth 2.0 Example 2 (Access token in post body)

```
POST /oauth/protectedresource.jsp
  Host: isam.com
  Content-Type: application/x-www-form-urlencoded

username=steve&access_token=YPxa78JggdW7hvcFRJph
```

OAuth 2.0 Example 3 (Access token in query string)

```
POST /oauth/protectedresource.jsp?access_token=YPxa78JggdW7hvcFRJph
  Host: isam.com
  Content-Type: application/x-www-form-urlencoded

username=steve
```

Authorization decision request

The OAuth 2.0 enforcement point is responsible for the following actions:

- Transform HTTP requests into a WS-Trust SOAP message.
- Send the WS-Trust SOAP message to the Security Verify Access STS for request validation.

The HTTP request is transformed into the following WS-Trust SOAP message:

OAuth 2.0 Token Validate Request (Request Security Token)

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <SOAP-ENV:Body>
        <wst:RequestSecurityToken xmlns:wst="http://schemas.xmlsoap.org/ws/2005/02/trust">
            <wst:RequestType xmlns:wst="http://schemas.xmlsoap.org/ws/2005/02/trust">
                http://schemas.xmlsoap.org/ws/2005/02/trust/Validate
            </wst:RequestType>
            <wst:Issuer xmlns:wst="http://schemas.xmlsoap.org/ws/2005/02/trust">
                <wsa:Address xmlns:wsa="http://schemas.xmlsoap.org/ws/2004
                /08/addressing">
                    urn:ibm:ITFIM:oauth20:token:bearer
                </wsa:Address>
            </wst:Issuer>
            <wsp:AppliesTo xmlns:wsp="http://schemas.xmlsoap.org/ws/2004
            /09/policy">
                <wsa:EndpointReference xmlns:wsa="http://schemas.xmlsoap
                .org/ws/2004/08/addressing">
                    <wsa:Address>https://localhost/sps/oauth/oauth20/</wsa:Address>
                </wsa:EndpointReference>
            </wsp:AppliesTo>
            <wst:Base xmlns:wst="http://schemas.xmlsoap.org/ws/2005/02/trust">
                <stsuuser:STSUniversalUser xmlns:stsuuser="urn:ibm:names:ITFIM:1.0:stsuuser">
                    <stsuuser:Principal/>
                    <stsuuser:AttributeList/>
                    <stsuuser:ContextAttributes>
                        <stsuuser:Attribute name="access_token"
                          type="urn:ibm:names:ITFIM:oauth:param">
                            <stsuuser:Value>YPxa78JggdW7hvcFRJph</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="username"
                          type="urn:ibm:names:ITFIM:oauth:body:param">
                            <stsuuser:Value>steve</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="port"
                          type="urn:ibm:names:ITFIM:oauth:request">
                            <stsuuser:Value>9443</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="method"
                          type="urn:ibm:names:ITFIM:oauth:request">
                            <stsuuser:Value>POST</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="path"
                          type="urn:ibm:names:ITFIM:oauth:request">
                            <stsuuser:Value>/oauth/protectedresource.jsp</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="scheme"
                          type="urn:ibm:names:ITFIM:oauth:request">
                            <stsuuser:Value>https</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="host"
                          type="urn:ibm:names:ITFIM:oauth:request">
                            <stsuuser:Value>isam.com</stsuuser:Value>
                        </stsuuser:Attribute>
                    </stsuuser:ContextAttributes>
                </stsuuser:STSUniversalUser>
            </wst:Base>
        </wst:RequestSecurityToken>
```

```
    </soapenv:Body>
</soapenv:Envelope>
```

The following attributes are defined by the WS-Trust specification. They are used by Security Verify Access to identify the federation that is associated with this request and to identify the type of OAuth 2.0 access token being used.

- The Issuer address element (highlighted in **bold**) must be set to the Security Verify Access OAuth 2.0 issuer address prefix (`urn:ibm:ITFIM:oauth20:token:`). The token type must be appended at the end and separated by a colon. Currently, the only token supported type is *bearer*, which means the issuer address must be set to `urn:ibm:ITFIM:oauth20:token:bearer`.
- The AppliesTo address element (highlighted in *italics*) must match the Provider ID of the API Protection Definition within Security Verify Access. The general form is `https://localhost/sps/oauth/oauth20/{id}`.

The **access_token** attribute with type `urn:ibm:names:ITFIM:oauth:param` is mandatory in the WS-Trust message sent to Security Verify Access. It must be appended to the **ContextAttributes** section of the **STSUniversalUser** within the WS-Trust Request Security Token.

If **access_token** attribute is missing from the request from the OAuth 2.0 client, the enforcement point does not validate the request with Security Verify Access STS. It can instantly return an HTTP 400 Bad Request status code and optionally can include a description of the error in the body.

Note: If the access token is included in the authorization header in the `Authorization: Bearer <token>` format, the token must still be added to the **ContextAttributes** section of the STSUU. The same format must be used as if the access token was sent through a query string or post body.

The following attributes are not mandatory in the WS-Trust message that is sent to Security Verify Access STS for OAuth 2.0. However, they might be useful to a custom mapping rule that is executed by Security Verify Access.

It is recommended to append the following attributes to the **ContextAttributes** section of the **STSUniversalUser** within the WS-Trust Request Security Token and set the attribute type to `urn:ibm:names:ITFIM:oauth:request`.

- **method** - the HTTP method of the request (GET/POST)
- **scheme** - (http/https)
- **host** - host header from the request
- **port** - the port number on the host (only if it is a non-standard port. For example, not 80 if the method is HTTP or not 443 if the method is HTTPS)
- **path** - the requested path

Append any additional parameters that the OAuth 2.0 enforcement point finds in the request, such as query or post body parameters that are not of OAuth 2.0, to the **Context Attribute** section of the **STSUniversalUser** within the WS-Trust Request Security Token. The type value is determined by the following table.

In OAuth 2.0 requests, these parameters are not required. However, they might be useful to a custom mapping rule that is executed by Security Verify Access. So it is recommended that you append them.

HTTP Parameter Location	Attribute Type Value
URL Query String Parameters	`urn:ibm:names:ITFIM:oauth:query:param`
HTTP Request Body Parameters	`urn:ibm:names:ITFIM:oauth:body:param`

Post body parameters must be included only if the following conditions are met:

- The entity-body is single-part.
- The entity-body follows the encoding requirements of the "application/x-www-form-urlencoded"content-type as defined by [W3C.REC-html40-19980424].

- The HTTP request entity-header includes the "Content-Type" header field set to "application/x-www-form-urlencoded".

Authorization decision response

The SOAP message response from Security Verify Access (regardless of OAuth version) echoes all the context attributes sent in the original request and some extra response context attributes.

OAuth Token Validate Response (RSTR)

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <SOAP-ENV:Body>
        <wst:RequestSecurityTokenResponse wsu:
        Id="uuid56a54e7c-012f-1207-9133-c24cad886d75"
        xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
        xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
        xmlns:xsd="http://www.w3.org/2001/XMLSchema"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xmlns:wst="http://schemas.xmlsoap.org/ws/2005/02/trust"
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401
        -wss-wssecurity-utility-1.0.xsd">
            <wsp:AppliesTo xmlns:wsa="http://schemas.xmlsoap.org/ws/2004
            /08/addressing"
            xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy">
                <wsa:EndpointReference>
                    <wsa:Address>https://localhost/sps/oauth/oauth20/</wsa:Address>
                </wsa:EndpointReference>
            </wsp:AppliesTo>
            <wst:RequestedSecurityToken>
                <stsuuser:STSUniversalUser xmlns:stsuuser="urn:ibm:names
                :ITFIM:1.0:stsuuser">
                    <stsuuser:Principal/>
                    <stsuuser:AttributeList/>
                    <stsuuser:ContextAttributes>
                        <stsuuser:Attribute name="authorized"
                        type="urn:ibm:names:ITFIM:oauth:response:decision">
                            <stsuuser:Value>TRUE</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="expires" type="urn:ibm
                        :names:ITFIM:oauth:response:decision">
                            <stsuuser:Value>2011-04-22T00:52:18Z</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="scope" type="urn:ibm
                        :names:ITFIM:oauth:response:attribute">
                                <stsuuser:Value>email</stsuuser:Value>
                                <stsuuser:Value>first</stsuuser:Value>
                                <stsuuser:Value>last</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="username" type="urn:ibm
                        :names:ITFIM:oauth:response:attribute">
                            <stsuuser:Value>wasadmin</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="username_is_self"
                        type="urn:ibm:names:ITFIM:oauth:response:attribute">
                            <stsuuser:Value>FALSE</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="oauth_token" type="urn:ibm
                        :names:ITFIM:oauth:response:attribute">
                            <stsuuser:Value>YPxa78JggdW7hvcFRJph</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="recovered_state" type="urn:ibm
                        :names:ITFIM:oauth:response:attribute">
                            <stsuuser:Value>State storage time was:
                            2011-04-15T00:52:18Z</stsuuser:Value>
                        </stsuuser:Attribute>
                        <stsuuser:Attribute name="state_id" type="urn:ibm
                        :names:ITFIM:oauth:state">
                            <stsuuser:Value>2cJsZ3QhXV5rDVZHNePp</stsuuser:Value>
                        </
stsuuser:Attribute>
                    </stsuuser:ContextAttributes>
                    <stsuuser:AdditionalAttributeStatement id=""/>
                </stsuuser:STSUniversalUser>
            </wst:RequestedSecurityToken>
            <wst:Status>
                <wst:Code>http://schemas.xmlsoap.org/ws/2005/02/trust/status
```

```
                /valid</wst:Code>
            </wst:Status>
        </wst:RequestSecurityTokenResponse>
    </soapenv:Body>
</soapenv:Envelope>
```

The following context attributes returned to the enforcement point by Security Verify Access relate to the authorization decision. It also has the attribute type `urn:ibm:names:ITFIM:oauth:response:decision` highlighted in *italics* in the previous RSTR example. It is up to the enforcement point to decide whether to down-stream these attributes to the OAuth protected resource.

These attributes are primarily for the use of the enforcement point itself to determine the authorization status.

Context attributes	Description
authorized	The value is set to TRUE if the OAuth request is valid and authorized; FALSE if otherwise.
expires	The UTC time when the access token that is used in the request is no longer valid.

The following context attributes returned to the enforcement point by Security Verify Access must be down-streamed from the enforcement point to the OAuth protected resource. They might be appended to the original HTTP request in any way deemed suitable by the enforcement point and the protected resource. This way, the protected resource can retrieve them (for example, as additional HTTP headers).

These context attributes have the attribute type `urn:ibm:names:ITFIM:oauth:response:attribute` (highlighted in **bold** in the previous RSTR example).

Custom mapping rules that are executed after the OAuth trust chain might also append attributes with this type. Therefore, any attribute with this type must be down-streamed to the requested protected resource.

Context attributes	Description
access_token	The OAuth access token that is used in the protected resource request.
client_type	The type of client that this token was issued to, can be either public or confidential. Public clients are clients that do not have client credentials and therefore cannot authenticate to the authorization server.
oauth_token_client_id	The unique identifier of the client to which the current access token was issued.
scope	A list of strings that represents the resource scope that is authorized by the user at the OAuth resource owner authorization step. The OAuth protected resource can use this attribute to determine which resources to return in the response. This attribute is only present for OAuth flows that include a user authorization step.
username	The name of the user who authorized the OAuth token to access their protected resources on their behalf. With OAuth flows that do not involve a separate resource owner, this value is the client identifier.

Additional attributes with the type `urn:ibm:names:ITFIM:oauth:response:attribute` are sometimes appended by a custom mapping rule, such is the case with **recovered_state** and **username_is_self** in the example.

The **state_id** context attribute returned to the enforcement point by Security Verify Access is used by a custom mapping rule that is executed after the OAuth trust chain. It has the attribute type

`urn:ibm:names:ITFIM:oauth:state` (highlighted with an underline) and can be ignored by the enforcement point.

The **state_id** attribute is a unique identifier for the current OAuth token that is used to store state information.

If the **state_id** attribute is required by the OAuth protected resource, a custom mapping rule can be implemented to make a copy of this attribute. The type can be changed to `urn:ibm:names:ITFIM:oauth:response:attribute` from the custom mapping rule to ensure that it is down-streamed to the resource.

Error responses

You can customize the amount of OAuth request validation that the enforcement point performs. Any validation it performs is repeated by Security Verify Access. Doing some validation before sending an authorization request to Security Verify Access might improve performance. The following validation must be performed by the enforcement point before sending a request to Security Verify Access.

- Validate that some OAuth data is present. If not, return an HTTP 401 Unauthorized status code.
- Validate that none of the required OAuth parameters are missing. If any of them are not present in the request, return an HTTP 400 Bad Request status code.
- Validate that none of the required OAuth parameters occur more than once in the request. They must also occur only in the one component of the request; for example, the query string or the authorization header. If the validation fails, return an HTTP 400 Bad Request status code.

The enforcement point must return an HTTP 401 Unauthorized status code to the OAuth client if the following scenario occurs:

- The enforcement point receives a SOAP message with an authorized context attribute that has a value of FALSE.

The enforcement point must return an HTTP 503 Service Unavailable status code to the OAuth client if the following scenarios occur:

- Security Verify Access encounters an error.
- Security Verify Access does not return a constructed SOAP message or the SOAP message does not contain an authorized context attribute.

The enforcement point might also optionally return a WWW-Authenticate HTTP header to indicate its support for OAuth.

Flow chart

The following chart shows the expected workflow of an OAuth authorization enforcement point.

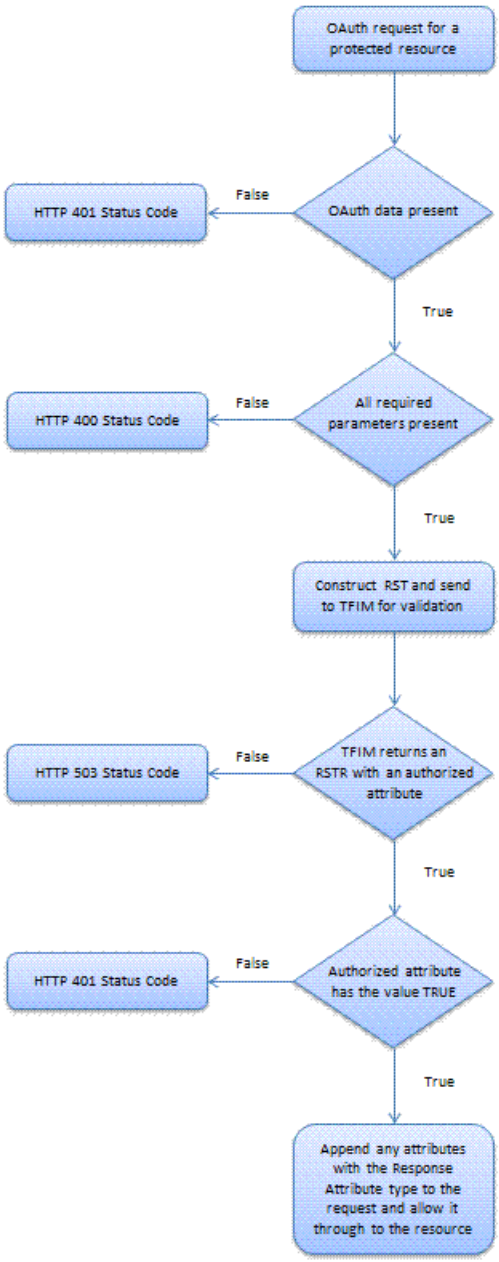


Figure 5. OAuth authorization enforcement point workflow

API Protection form post response mode

With the form post response mode, a client can make an OAuth authorization request and receive a self-posting form rather than a 302 response.

For more information about the form post response mode, see https://openid.net/specs/oauth-v2-form-post-response-mode-1_0.html.

The form post template page contains a form that is populated with the action URI as the redirect URI presented on the authorization request. There is also a repeating macro inside the form, containing name and value macros.

Macros:

@ACTION@

The validated redirect URI presented in the authorization request.

Repeating macros:

The following macros must be used inside the repeating macro block `'oauth_form_post'`. For example:

```
[RPT oauth_form_post]
<input type="hidden" name="@OAUTH_HIDDEN_NAME@" value="@OAUTH_HIDDEN_VALUE@" />
[ERPT oauth_form_post]
```

@OAUTH_HIDDEN_NAME@

Parameter name of the form post body. Default values include (depending on `response_type`) :

```
scope, state, expires_in, access_token, token_type, code
```

@OAUTH_HIDDEN_VALUE@

Parameter value in the form post body. This value corresponds to the **@OAUTH_HIDDEN_NAME@** macro value.

Access policy for OAuth or OIDC

Access policy is used to enable advanced authentication scenarios when performing an OAuth flow.

For details on access policy, see Access policies.

When using access policy for OAuth or OIDC, the consent decision can be made by the access policy.

Making an OAuth or OIDC consent decision using access policy

You can use an access policy to prompt the user to enter further information via a web page or redirect the user to another website. This logic could be used to perform the consent step when advanced logic beyond "prompt once", "always prompt", or "never prompt" is required.

This advanced logic is undefined. But it is assumed that as a result of it, the author of the policy will be able to decide whether the user has consented, and if they have consented, which scopes the user has granted the client.

The following snippet can be used to set the list of scopes consented:

```
// Get the protocol Context:
var pctx = context.getProtocolContext();
// Construct our array of scopes
var scopes = java.lang.reflect.Array.newInstance(java.lang.String,2);
// Set the values
scopes[0] = "scope1";
scopes[1] = "scope2";
// Add this to the context
pctx.setConsentDecision(scopes);
```

If consent has been performed but no scope was granted, then the follow snippet can be used:

```
// Get the protocol Context:
var pctx = context.getProtocolContext();
var scopes = java.lang.reflect.Array.newInstance(java.lang.String,1);
scopes[0] = "";
// Add this to the context
pctx.setConsentDecision(scopes);
```

OIDC Dynamic Clients

OpenID Connect (OIDC) publishes a specification that allows registration of a client to an OpenID Connect Provider.

This enables someone to onboard their application to an OpenID Connect provider through a standard well-formed API. See the specification https://openid.net/specs/openid-connect-registration-1_0.html.

The primary information that an application administrator is required to provide is the redirect URI that the application uses when requesting an identity.

To use dynamic client registration, you must be using an OIDC-enabled definition and have the option **`Enable Client Registration`** set to true. See “Creating an API protection definition” on page 135.

OIDC Dynamic Clients- Authentication and deployment

There are considerations to take when you are deploying a definition that allows the registration of clients through a public API.

Consider the following factors:

Do you require authentication to register a client?

If you do not require authentication for when a client is registered, there is no way of identifying who owns a client application.

CAUTION: This is a higher risk deployment pattern than if you require authentication.

You can control the access to the registration endpoint with an Access Control List (ACL). The reverse proxy OAuth configuration API then configures the ACLs with the **Require authentication to register a client** option. Group based requirements might also be added to ensure that only administrators or trusted users can register clients. The authenticated users credential information is available in the STSUniversalUser attribute list during the registration. This information can be associated with the registered client for use during the consent step, informing the end user who the application administrator is.

What consent challenges are sent to the resource owner?

Since dynamic clients are inherently less trusted than an administrator-registered client, the emphasis on the users consent in the delegated authorization is increased. When and how consent might be performed depends on who is able to register a client. Dynamic client parameters such as **`client_uri`** are available on the consent page as a macro. you can use this parameter and other values (For example, **`tos_uri`**, **`log_uri`**, **`policy_uri`**) to allow the user to identify, discover, and verify who a client is before granting them access.

Will you issue a client secret?

A client secret allows access to the client centric API endpoints such as **`/token`** and **`/introspect`**, as well as allows the client to perform HMAC signing of JWTs. Without a client secret, an authorization code flow cannot be performed. When the configuration property **`issue client secret`** is enabled, a client secret is issued when the registration is made by an authenticated party.

OIDC Dynamic Clients- Register a client

To register a client, issue a HTTP POST to the `Client Registration Endpoint`.

See “OAuth 2.0 endpoints” on page 108.

Any values which are posted in the JSON body are stored such that both standard values and custom values can be kept. These values are available in mapping rules and in a macro on the consent page.

Previously the status code for a successful registration is 200, but the specification mandates a 201. Currently, the dynamic client registration returns a 201 status code for a successful registration to ensure compliance with specifications. The following example is an example request to register a client:

```
POST_DATA='{"redirect_uris": [ "https://app.com"],
     "tos_uri":"https://app.com/tos",
     "company_name":"Applications Inc"}'

curl https://myisam.com/mga/sps/oauth/oauth20/register/mydefinition-d "$POST_DATA" -H "Accept:
application/json" -H "Authorization: Bearer myAccessToken" -H "Content-type: application/json"

HTTP/1.1 201 OK
Content-Type: application/json

{
```

```
"client_secret_expires_at": 0,
"owner_username": "testuser",
"company_name": "Applications Inc",
"registration_client_uri": "https://myisam.com/mga/sps/oauth/oauth20/register/testDef?
client_id=myClient",
"client_secret": "mySecret",
"tos_uri": "https://app.com/tos",
"client_id_issued_at": 1522139359,
"redirect_uris": "https://app.com",
"registration_access_token": "myClientAccessToken",
"client_id": "myClientId"
}
```

An HTTP transformation rule can be used to return a 200 instead to retain the old behavior. See Dynamic client registration.

In IBM Security Verify Access version 10.0.4, to register a client, issue a HTTP POST to the `Client Registration Endpoint` with a signed JSON Web Token as the input. This is to support Dynamic Client Specification for UK Open Banking and other specification that requires it.

The following demonstrates how to register a client by issuing a HTTP POST to the `Client Registration Endpoint` with a signed JSON Web Token as the input:

```
POST_DATA=
eyJhbGciOiJQUzI1NiIsImtpZCI6Im9ZY1puQmpMQlR5TXhwUHJiMUNQVW91bDJhQWdrRV8zTnJyOG15bXN3Q1UiLC
J0eXAiOiJKV1QifQ.eyJhcHBsaWNhdGlvbl90eXBlIjoid2ViIiwiYXVkIjoiSUJNIiwiZXhwIjoxNjQ0Mzk4NzYwLC
JncmFudF90eXBlcyI6WyJhdXRob3JpemF0aW9uX2NvZGUiLCJjbGllbnRfY3JlZGVudGlhbHMiXSwiaWF0IjoxNjQ0Mz
k1MTYwLCJpZF90b2tlbl9zaWduZWRfcmVzcG9uc2VfYWxnIjoiUFMyNTYiLCJpc3MiOiI2NWQxZjI3Yy00YWVhLTQ1ND
ktOWMyMS02MGU0OTVhN2E4NmYiLCJqdGkiOiI5MGFmYmNhOC00Y2UyLTQ4MDYtOGJlMS02MmIzZTdkNDFiMDkiLCJyZW
RpcmVjdF91cmlzIjpbImh0dHBzOi8vd3d3Lm15c3AuaWJtLmNvbS9pc2FtL3Nwcy9vaWRjL3JwL2lzYW1ycC9raWNrb2Z
mL3BhcnRuZXIiXSwicmVxdWVzdF9vYmplY3Rfc2lnbmluZ19hbGciOiJQUzI1NiIsInJlc3BvbnNlX3R5cGVzIjpbImNv
ZGUiLCJjb2RlIGlkX3Rva2VuIl0sInNjb3BlIjoiYWNjb3VudHMgb3BlbmlkIiwic29mdHdhcmVfc3RhdGVtZW50IjoiZ
XlKcmFXUWlPaUp2V1dOYWJrSnFURUpVZVUxNGNQnlZakZEVUZWdmRXd3lZVUZuYTBWZk0wNXljamh0ZVcxemQwTlZJaX
dpWVd4bklqb2lVRk15TlRZaWZRLmV5SnpiMlowZDJGeVpWOWxiblpwY205dWJXVnVkQ0k2SW5CeWIyUjFZM1JwYjI0aUx
DSmhkV1FpT2lKMFpYTjBZWFZrSWl3aWMyOW1kSGRoY21WZmFXUWlPaUkyTldReFpqSTNZeTAwWVdWaExUUTFORGt0T1dN
eU1TMDJNR1UwT1RWaE4yRTROObVlpTENKemIyWjBkMkZ5WlY5dGIyUmxJam9pYkdsMlpTSXNJbTl5WjE5cFpDSTZJbUUxTT
JFMlpqazNMV1V3TjJNdE5ESTBNQzFoTURSbUxXRXdZV1kyT1RZek1XUTVaaUlzSW5OdlpuUjNZWEpsWDJwM2EzTmZaVzVr
Y0c5cGJuUWlPaUpvZEhSd2N6b3ZMekU1TWk0eE5qZ3VOREl1TWpBekwzTndjeTlxZDJ0eklpd2ljMjltZEhkaGNtVmZjbV
ZrYVhKbFkzUmZkWEpwY3lJNklsdGNJbWgwZEhCek9pOHZkM2QzTG0xNWMzQXVhV0p0TG1OdmJTOXBjMkZ0TDNOd2N5OXZhV
1JqTDNKd0wybHpZVzF5Y0M5cmFXTnJiMlptTDNCaGNuUnVaWEpjSWl4Y0ltaDBkSEJ6T2k4dmQzZDNMbTE1YzNBdWFXS
nRMbU52Yl5cGMyRnRMM053Y3k5dmFXUmpMM0p3TDJsellXMXljQzlyYVdOcmIyWm1MM0JoY25SdVpYSXlYQ0pkSW
l3aWMyOW1kSGRoY21WZlkyeHBaVzUwWDI1aGJXVWlPaUpQY0dWdVFtRnVhMmx1WnlCRGJHbGxiblF4SUU1aGJXVWlM
Q0pwYzNNaU9pSlBjR1Z1UW1GdWEybHVaeUJVWlhOME1TSXNJbk52Wm5SM1lYSmxYMk5zYVdWdWRGOXBaQ0k2SWs5d1pX
NUNZVzVyYVc1bklFTnNhV1Z1ZERFaUxDSmxlSEFpT2pFMk5ETTRNamt6TnpNc0ltcDBhU0k2SW1SclRrRlpaMFJWV0ZJ
aUxDSnBZWFFpT2pFMk5ETTRNamczTnpNc0ltNWlaaUk2TVRZME16ZzJPRGd6TTMwLk1Jc1RlS2R3RWZreVJKR2JORDMx
aDU3U1Y4WWxyZF9JNGlodExHaVllUi1pSjhPRVZ3VHRsQ1NkNC1FQUZMd0NBVkt1TjVQb2o3ampYWTlONEVIWVFSYnlM
V2Qtekd1V0tnNC14Rm81YVdvUmpGb3UtUzF4aGlOcTdkRndLaTM3Z09jcUthS3ZsMkgxZFlrVnlydmdBX2o0akxXGdK
MUJSWU1NWEt3WlZrX1JfWUFOUkhvNVNRcFdVeXhwcGRTbHhJY2NqNUhSNkZKSmZjNDlXc0N0U1RqbGVPRU90ZWxJeWNF
TzFzSVhNNFYwdnF0UmdBcFUxSnBWZ1EzbUh0eEVzLWtIdmpJNUQyeUJYcElwU2lyRjJjWmR3SWtDWld1OXN4elhJMGJw
alhIWDNwd2FnQ3A5UjBpOWV1dDJ3a0RKdjlGNWJENVRlNHFPMUs1ZWVPMHRFQSIsInRsc19jbGllbnRfYXV0aF9zdWJq
ZWN0X2RuIjoiNjVkMWYyN2MtNGFlYS00NTQ5LTljMjEtNjBlNDk1YTdhODZmIiwidG9rZW5fZW5kcG9pbnRfYXV0aF9tZX
Rob2QiOiJ0bHNfY2xpZW50X2F1dGgifQ.KTg6vNIERJoLRnDtrmGjF_Fri8diVN7hMfwSntdhbWatcFzUgyTB3GsyadisH
5g3MVagTRplFC83nDNoFbGIj5HFYGddhsQdcveGQ0SWN__GYJHPEOt4p8XdemGQlf9KheNF_eRNM-qI3VBEnvGBPOaWlXVB
FpIYQ-1XMQF-xzvGlglPCnGDVC2gbEO6k9zzl1f-5U78mDPVP4A_s4GWwabXIB-Wp0Jq2Y0jipyJtGci2E35dK_vTaaf7ZS
qM0rQZuH4EbXdqDmHPuuW4AMFc-ZyUXlF8JXggn33poObWZMa_fFkid7Suk7-fV_8hqhDVK6msEfE5x-vRE6AF5CBBw


curl https://myisam.com/mga/sps/oauth/oauth20/register/mydefinition-d "$POST_DATA" -H "Accept:
application/json" -H "Authorization: Bearer myAccessToken" -H "Content-type: application/jose"

{
  "application_type": "web",
  "aud": "IBM",
  "exp": 1644398760,
  "grant_types": [
    "authorization_code",
    "client_credentials"
  ],
  "iat": 1644395160,
  "id_token_signed_response_alg": "PS256",
  "iss": "65d1f27c-4aea-4549-9c21-60e495a7a86f",
  "jti": "90afbca8-4ce2-4806-8be1-62b3e7d41b09",
  "redirect_uris": [
    "https://www.mysp.ibm.com/isam/sps/oidc/rp/isamrp/kickoff/partner"
  ],
  "request_object_signing_alg": "PS256",
  "response_types": [
    "code",
    "code id_token"
```

```
  ],
  "scope": "accounts openid",
  "software_statement": "eyJraWQiOiJvWWNabkJqTEJUeU14cFByYjFDUFVvdWwyYUFna0VfM05ycjhteW1
                         zd0NVIiwiYWxnIjoiUFMyNTYifQ.eyJzb2Z0d2FyZV9lbnZpcm9ubWVudCI6InBy
                         b2R1Y3Rpb24iLCJhdWQiOiJ0ZXN0YXVkIiwic29mdHdhcmVfaWQiOiI2NWQxZjI3
                         Yy00YWVhLTQ1NDktOWMyMS02MGU0OTVhN2E4NmYiLCJzb2Z0d2FyZV9tb2RlIjoib
                         Gl2ZSIsIm9yZ19pZCI6ImE1M2E2Zjk3LWUwN2MtNDI0MC1hMDRmLWEwYWY2OTYzMW
                         Q5ZiIsInNvZnR3YXJlX2p3a3NfZW5kcG9pbnQiOiJodHRwczovLzE5Mi4xNjguNDIu
                         MjAzL3Nwcy9qd2tzIiwic29mdHdhcmVfcmVkaXJlY3RfdXJpcyI6IltcImh0dHBzOi8
                         vd3d3Lm15c3AuaWJtLmNvbS9pc2FtL3Nwcy9vaWRjL3JwL2lzYW1ycC9raWNrb2ZmL3B
                         hcnRuZXJcIixcImh0dHBzOi8vd3d3Lm15c3AuaWJtLmNvbS9pc2FtL3Nwcy9vaWRjL3Jw

L2lzYW1ycC9raWNrb2ZmL3BhcnRuZXIyXCJdIiwic29mdHdhcmVfY2xpZW50X25hbWUiOiJP
                         cGVuQmFua2luZyBDbGllbnQxIE5hbWUiLCJpc3MiOiJPcGVuQmFua2luZyBUZXN0MSIsI

nNvZnR3YXJlX2NsaWVudF9pZCI6Ik9wZW5CYW5raW5nIENsaWVudDEiLCJleHAiOjE2NDM4NjkzNzMsImp

0aSI6ImRrTkFZZ0RVWFIiLCJpYXQiOjE2NDM4Njg3NzMsIm5iZiI6MTY0Mzg2ODgzM30.MIsTeKdwEfk
                         yRJGbND31h57SV8Ylrd_I4ihtLGiYeR-iJ8OEVwTtlCSd4-
EAFLwCAVKuN5Poj7jjXY9N4EHYQRbyLWd-
                         zGuWKg4-xFo5aWoRjFou-
S1xhiNq7dFwKi37gOcqKaKvl2H1dYkVyrvgA_j4jLWXgJ1BRYMMXKwZVk_R_YA

NRHo5SQpWUyxppdSlxIccj5HR6FJJfc49WsCtSTjleOEOtelIycEO1sIXM4V0vqtRgApU1JpVgQ3mHtxEs-

kHvjI5D2yBXpIpSirF2cZdwIkCZWu9sxzXI0bpjXHX3pwagCp9R0i9eut2wkDJv9F5bD5Te4qO1K5eeO0tEA",
  "tls_client_auth_subject_dn": "65d1f27c-4aea-4549-9c21-60e495a7a86f",
  "token_endpoint_auth_method": "tls_client_auth"
}
```

The signed JSON Web Token is handled by exposing an OOTB STS chain called `OIDC_DCR Request JOSE`. The issuer is `validate/dcr/issuer` and it applies to `Validate/dcr/appliesto`. The default mapping rule is `DCR_ValidateJWT_RequestJWT.js`.

The **`software_statement`** in the request represents a signed JSON Web Token that asserts metadata values about the client software. The signature of the request is validated against the jwks information in the **`software_statement`**. The following is an example of the **`software_statement`**:

```
{
  "software_environment": "production",
  "aud": "testaud",
  "software_id": "65d1f27c-4aea-4549-9c21-60e495a7a86f",
  "software_mode": "live",
  "org_id": "a53a6f97-e07c-4240-a04f-a0af69631d9f",
  "software_jwks_endpoint": "https://softare_company1/jwks",
  "software_redirect_uris": "[\"https://www.mysp.ibm.com/isam/sps/oidc/rp/isamrp/kickoff/
partner\",\"https://www.mysp.ibm.com/isam/sps/oidc/rp/isamrp/kickoff/partner2\"]",
  "software_client_name": "OpenBanking Client1 Name",
  "iss": "OpenBanking Test1",
  "software_client_id": "OpenBanking Client1",
  "exp": 1643869373,
  "jti": "dkNAYgDUXR",
  "iat": 1643868773,
  "nbf": 1643868833
}
```

The validation of the **`software_statement`** is done by using another OOTB STS chain called `OIDC_SSA_JWT_STSChain`. The issuer is `validate/ssa/issuer` and it applies to `validate/ssa/appliesto`. The STS chain exposes a mapping module to facilitate validation of the **`software_statement`** for region-specific information.

The default STS mapping rule is called `DCR_ValidateSSA_SSAJWT.js`.

The signature of the **`software_statement`** is validated and in the mapping rule, the signature algorithm, expiry, and certificate-related information are validated.

The following example demonstrates the registration response upon successful registration of the client:

```
{
"software_mode": "live",
"software_redirect_uris": "[\"https://www.mysp.ibm.com/isam/sps/oidc/rp/isamrp/kickoff/
partner\",\"https://www.mysp.ibm.com/isam/sps/oidc/rp/isamrp/kickoff/partner2\"]",
"application_type": "web",
"software_client_name": "OpenBanking Client1 Name",
"owner_username": "__$mtls$__",
"iss": "65d1f27c4aea45499c21",
```

```
"tls_client_auth_subject_dn": "CN=www.myidp.ibm.com",
"registration_client_uri": "https://www.myidp.ibm.com/mga/sps/oauth/oauth20/register/
OIDCDefinition/bx9XOis7F12VUJbjQ8Ft",
"registration_access_token": "Sf6omEzVHJP9Kqg0r1jptffE5SHzRPfL",
"token_endpoint_auth_method": "tls_client_auth",
"client_id": "bx9XOis7F12VUJbjQ8Ft",
"software_statement":
"eyJraWQiOiJvWWNabkJqTEJUeU14cFByYjFDUFVvdWwyYUFna0VfM05ycjhteW1zd0NVIiwiYWx

nIjoiUFMyNTYifQ.eyJzb2Z0d2FyZV9lbnZpcm9ubWVudCI6InByb2R1Y3Rpb24iLCJhdWQiOiJ0

ZXN0YXVkIiwic29mdHdhcmVfaWQiOiI2NWQxZjI3YzRhZWE0NTQ5OWMyMSIsInNvZnR3YXJlX21vZ

GUiOiJsaXZlIiwib3JnX2lkIjoiYTUzYTZmOTctZTA3Yy00MjQwLWEwNGYtYTBhZjY5NjMxZDlmIiw

ic29mdHdhcmVfandrc19lbmRwb2ludCI6Imh0dHBzOi8vOS4xMjcuMTMuMzMvc3BzL2p3a3MiLCJzb2Z0

d2FyZV9yZWRpcmVjdF91cmlzIjoiW1wiaHR0cHM6Ly93d3cubXlzcC5pYm0uY29tL2lzYW0vc3BzL29pZGM

vcnAvaXNhbXJwL2tpY2tvZmYvcGFydG5lclwiLFwiaHR0cHM6Ly93d3cubXlzcC5pYm0uY29tL2lzYW0vc3Bz

L29pZGMvcnAvaXNhbXJwL2tpY2tvZmYvcGFydG5lcjJcIl0iLCJzb2Z0d2FyZV9jbGllbnRfbmFtZSI6Ik9

wZW5CYW5raW5nIENsaWVudDEgTmFtZSIsImlzcyI6IjY1ZDFmMjdjNGFlYTQ1NDk5YzIxIiwic29md

HdhcmVfY2xpZW50X2lkIjoiT3BlbkJhbmtpbmcgQ2xpZW50MSJ9.lRuFpHfg8SWaNcK6SMyRBrxul2an3ead2
                    jcVxyy3QAyEIZL8qWYuC-HiyCjlmMXRU-DMW_WaQdl6SUDTEzPM57h-
djWsyRRlbA0FgoEf4-8eKEo1lclIDy57n

Ck92zmPmBsdDg4pnfCRbd8SEmRp3EMpWjugW3jgBfBBNZ0jKdWLao3km5B9dHF2ErzCghem3Y2w6sgAQIIW2yhCbtk-

33jDuhKoXFRQuvMobmRg4aZYzgSzhQiyMVJY3FjqpZzp6soyb_pRGZ8vyeoloNMSYl45hzMGOt5BL6UZOrApAXJ
                    Qosqxbo41px1ZsPkXNwEo0eyRfX2OQEZx122rqqTgoQ",
"software_id": "65d1f27c4aea45499c21",
"scope": "accounts openid",
"software_environment": "production",
"client_id_issued_at": 1647835807,
"exp": 1647839407,
"iat": 1647835807,
"jti": "8373d3c0-4d64-44e2-85c8-73b5f656fa74",
"id_token_signed_response_alg": "PS256",
"grant_types": [
"authorization_code",
"client_credentials"
],
"software_client_id": "OpenBanking Client1",
"redirect_uris": [
"https://www.mysp.ibm.com/isam/sps/oidc/rp/isamrp/kickoff/partner"
],
"software_jwks_endpoint": "https://company.com/jwks",
"aud": "testaud",
"org_id": "a53a6f97-e07c-4240-a04f-a0af69631d9f",
"request_object_signing_alg": "PS256",
"response_types": [
"code",
"code id_token"
]
}
```


If the FAPI compliant flag for the registered client is enabled, the format of the `registration_client_uri` response is modified.

This is achieved by using a mapping rule modification in the `post_token mapping rule`. For example:

```
var registration_client_uri =
stsuu.getContextAttributes().getAttributeValueByNameAndType("registration_client_uri","urn:ibm:names:I
TFIM:oauth:response:attribute");

var client_id =
stsuu.getContextAttributes().getAttributeValueByNameAndType("client_id","urn:ibm:names:ITFIM:oauth:response:attribute");

IDMappingExtUtils.traceString("Original registration_client_uri : "+registration_client_uri);

if(request_type == "client_register"){

if(registration_client_uri != null && client_id != null){

stsuu.getContextAttributes().removeAttributeByNameAndType("registration_client_uri","urn:ibm:names:ITF
IM:oauth:response:attribute");

var new_registration_uri = registration_client_uri.split("\\?")[0] + "/" + client_id;

IDMappingExtUtils.traceString("New registration_client_uri : "+new_registration_uri);

stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute("registration_client_uri","urn:ibm:names:ITFIM
:oauth:response:attribute",new_registration_uri));
```

```
}
}
```

OIDC Dynamic Clients- Retrieve a dynamic client

When a client is registered, a `registration_client_uri` is returned in the payload.

This endpoint can be used to perform the following actions:

- Retrieve the registered clients definition
- Delete the client

Note: You must authenticate as either the client, or the user who was authenticated at the time of client registration in order to view or delete the client.

To view the client, issue an HTTP GET request and include the **`client_id`** parameter. For example:

```
$ curl https://myisam.com/mga/sps/oauth/oauth20/register/mydefinition?client_id=myClient -H
Accept:application/json -H "Authorization: Bearer myClientAccessToken"
HTTP/1.1 200 OK
Content-Type: application/json

{
"client_secret_expires_at": 0,
"owner_username": "testuser",
"company_name": "Application Inc",
"registration_client_uri": "https://myisam.com/mga/sps/oauth/oauth20/
register/myDefinition?client_id=myClient",
"client_secret": "hunter2",
"tos_uri": "https://app.com/tos",
"client_id_issued_at": 1522137286,
"redirect_uris": "https://app.com",
"client_id": "myClient"}
```

Update the HTTP-transformation configuration stanza to accept requests from the dynamic client with the format, `https://www.myidp.ibm.com/mga/sps/oauth/oauth20/register/OIDCDefinition/{clientId}`. See OIDC Dynamic Client - Updating URL format.

OIDC Dynamic Clients- Custom Identifiers

You can customize the value of the **`client_id`**, **`client_secret`** and **`registration_access_token`** issued to the application.

There is an example of this in the out-of-the-box PreToken mapping rule. Look for the variable *custom_client_id_secret*.

If a custom *client_secret* is set then it is issued, regardless of whether it is enabled in the definition configuration and whether or not the request is made by an authenticated party

To customize the *registration_access_token*, see “Customizing OAuth tokens by updating the sample PreTokenGeneration mapping rule” on page 164.

API Protection clients now have a dynamic data field when they are configured. This allows storage of arbitrary data against the client which can be accessed at runtime (For example, from the consent page and in mapping rules).

OIDC Dynamic Clients- Update a client

To update a client, issue a HTTP PUT to the clients management endpoint.

About this task

When you are updating a dynamic client, the client must authenticate as the OAuth client or the owner of the OAuth client. The following attributes in the payload are ignored when you are updating a dynamic client:

- `client_id`

- owner_username
- registration_access_token

Any user or administrator provided values in the client metadata that are not presented in the update request is removed from the client metadata.

If the client has a secret, the client_secret **must** be presented and match the current secret.

When an update occurs, a new client secret and registration_access_token are issued to the client.

Example of updating a dynamic client:

```
$ curl https://www.myidp.ibm.com/mga/sps/oauth/oauth20/register/testDef?
client_id=VWM3W8zxlagRrgsnmFGd -H "Accept:application/json" -H "content-type: application/json"
-d
'{

   "client_id": "VWM3W8zxlagRrgsnmFGd",
   "client_secret":"as9r83nfo312o",
   "client_name": "A dynamic client",
   "grant_types": [
      "authorization_code"
   ],
   "redirect_uris": [
      "https://myapp.com"
   ],  "new_property": "new_value",
       "company_name": "ORG"
}' -X PUT -H "Authorization: Bearer registrationAccessToken"


HTTP/1.1 200 OK
Content-Type: application/json

{
   "registration_client_uri": "https://www.myidp.ibm.com/mga/sps/oauth/oauth20/register/testDef?
client_id=VWM3W8zxlagRrgsnmFGd",
   "registration_access_token": "newRegistrationAccessToken",
   "client_id": "VWM3W8zxlagRrgsnmFGd",
   "client_id_issued_at": 1537328443,
   "client_name": "A dynamic client",
   "client_secret": "newClientSecret",
   "grant_types": [
         "authorization_code"
   ],
   "redirect_uris": [
        "https://myapp.com"
   ],
    "new_property": "new_value",
    "company_name": "ORG"
}
```

Update the HTTP-transformation configuration stanza to accept requests from the dynamic client with the format, https://www.myidp.ibm.com/mga/sps/oauth/oauth20/register/OIDCDefinition/{clientId}. See OIDC Dynamic Client - Updating URL format.

OIDC Dynamic Clients- Delete a client

To delete a dynamic client, issue a HTTP DELETE to the client management endpoint.

About this task

OAuth dynamic clients can only be deleted by themselves or their owner.

For example,

```
$ curl -k myisam.com/mga/sps/oauth/oauth20/register/mydefinition?
client_id=myClient -H Accept:application/json -H 'Authorization:
Bearer registrationAccessTokenValue' -X DELETE
HTTP/1.1 204 OK
```

The default response is a 204. Response attributes can be added in the post-mapping rule. If they are added the status code is 200 and the JSON payload.

Dynamic clients can also be managed from the LMI. See the web services documentation on how to do so. See REST API documentation.

Update the HTTP-transformation configuration stanza to accept requests from the dynamic client with the format, `https://www.myidp.ibm.com/mga/sps/oauth/oauth20/register/OIDCDefinition/{clientId}`. See OIDC Dynamic Client - Updating URL format.

OIDC Dynamic Clients – Migrating client

If a dynamic client needs to be used in a cluster-less architecture it needs to be migrated.

To understand the cluster-less architecture, see Federation Specific Configuration.

Note: This step must be performed only if the appliance is being upgraded from an older version of IBM Security Verify Access. Fresh installation works without modifications.

Migrating a Single Dynamic Client

The following example is a request to migrate a specific dynamic client called **myClient**.

The input required for this is `definitionName` and the `definitionId` of the API definition. This can be retrieved from the LMI.

```
POST_DATA='{"definitionName":"myDefinition","definitionId": 1}'

curl https://myisam.com/iam/access/v8/dynamic_client_migration/myClient -d "$POST_DATA" -H
"Accept:
application/json" -H "Authorization: Basic lmilogincredentials" -H "Content-type: application/
json"

HTTP/1.1 204 OK
```

Migrating all Dynamic Clients that belong to an API Protection Definition

The following example is a request to migrate all dynamic client that belong to a specific API Protection Definition in this case **myDefinition**.

The input required for this is `definitionName` and the `definitionId` of the API definition. This can be retrieved from the Local Management Interface.

```
POST_DATA='{"definitionName":"myDefinition","definitionId": 1}'

curl https://myisam.com/iam/access/v8/dynamic_client_migration -d "$POST_DATA" -H "Accept:
application/json" -H "Authorization: Basic lmilogincredentials" -H "Content-type: application/
json"

HTTP/1.1 200 OK
Content-Type: application/json

{"totalSuccess":100,"totalFailed":0,"totalUpdated":100}
```

OIDC Dynamic Client - Updating URL format

In the Open Banking Standard (UK) specification Dynamic Client Registration, the URL format to access clients is in this format, `https://www.myidp.ibm.com/mga/sps/oauth/oauth20/register/OIDCDefinition/{client_id}`. Use this URL format to access clients.

To view, update, and delete the client, issue an HTTP request with **`client_id`** in the URL. For example: `https://www.myidp.ibm.com/mga/sps/oauth/oauth20/register/OIDCDefinition/abc123`, where **abc123** is the **`client_id`**

Use the following HTTP transformation to update the URL format:

```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">

   <xsl:strip-space elements="*" />

   <xsl:template match="/">
      <HTTPRequestChange>
         <xsl:apply-templates />
      </HTTPRequestChange>
   </xsl:template>
   <!--
OIDC Conformance-Example 1.7
Replacing the URI '/mga/sps/oauth/oauth20/register/OIDCDefinition/*' with
'/mga/sps/oauth/oauth20/metadata/OIDCDefinition?client_id=*'
-->
   <xsl:template match="//HTTPRequest/RequestLine/URI">
      <xsl:variable name="output">
         <xsl:call-template name="string-replace-all">
            <xsl:with-param name="text" select="node()" />
            <xsl:with-param name="replace" select="'/mga/sps/oauth/oauth20/register/
OIDCDefinition/'" />
            <xsl:with-param name="by" select="'/mga/sps/oauth/oauth20/register/OIDCDefinition?
client_id='" />
         </xsl:call-template>
      </xsl:variable>
      <URI>
         <xsl:value-of select="$output" />
      </URI>
   </xsl:template>
   <xsl:template match="//HTTPRequest/Scheme">
      <!--  Is the request http or https -->
   </xsl:template>
   <xsl:template name="string-replace-all">
      <xsl:param name="text" />
      <xsl:param name="replace" />
      <xsl:param name="by" />
      <xsl:choose>
         <xsl:when test="contains($text, $replace)">
            <xsl:value-of select="substring-before($text,$replace)" />
            <xsl:value-of select="$by" />
            <xsl:call-template name="string-replace-all">
               <xsl:with-param name="text" select="substring-after($text,$replace)" />
               <xsl:with-param name="replace" select="$replace" />
               <xsl:with-param name="by" select="$by" />
            </xsl:call-template>
         </xsl:when>
         <xsl:otherwise>
            <xsl:value-of select="$text" />
         </xsl:otherwise>
      </xsl:choose>
   </xsl:template>
</xsl:stylesheet>
```

Update the following configurations in the **[http-transformations]** configuration stanza:

```
[http-transformations]
DynamicClientRUD = DynamicClientRUD

[http-transformations:DynamicClientRUD]
request-match = request:GET /mga/sps/oauth/oauth20/register/OIDCDefinition/*
request-match = request:DELETE /mga/sps/oauth/oauth20/register/OIDCDefinition/*
request-match = request:PUT /mga/sps/oauth/oauth20/register/OIDCDefinition/*
```

Chapter 11. Mobile Multi-Factor Authentication

The IBM Security Verify Access Advanced Access Control component supports authenticator applications. Such support is built around the OAuth 2.0 protocol.

Authenticator applications are mobile-based applications that enable users to authenticate with minimal reliance on passwords. Mobile devices and biometric characteristics are used to support authentication and reduce the threat of unauthorized access to sensitive resources.

The IBM Verify application, which is available for download in major mobile application stores, is natively supported by the Advanced Access Control component. The authenticator application is built on the Mobile Access SDK, which is available for download from the IBM Security App Exchange website. The Mobile Access SDK can also be used to create custom applications.

For instructions on configuring and using the IBM Verify application, see the IBM Verify User Guide.

The authenticators framework can be integrated with context-based access and authentication policies. Security Verify Access provides several pre-defined authentication policies to enable combinations of mobile and biometric mechanisms.

The authenticator application registration is built around an OAuth grant that is issued to the mobile device. The grant is used to identify the authenticator in future requests.

Authenticator registration

The IBM Verify application uses the OAuth authorization grant flow to perform registration, which is launched by the user in a browser.

A button to initiate the registration flow is available in the `device_selection.html` page, which is an example page that demonstrates how the registration might be initiated. This page is available from the appliance **File Downloads** area at the path `access_control/pages/C/mga/user/mgmt/device/device_selection.html`.

When the button is clicked, it calls the OAuth authorize endpoint to obtain an authorization code. The user is then presented with a QR code that can be scanned by the IBM Verify application to complete registration. The following steps illustrate a typical authenticator registration flow.

1. The user downloads and installs the IBM Verify application.
2. The user logs in to the Security Verify Access User Self Care (USC) with a desktop browser and clicks a button on the page that is presented by USC to initiate the registration flow.
3. The browser starts the OAuth authorization code flow.
4. Security Verify Access responds with a QR code.
5. The user scans the QR code with the IBM Verify application.
6. The IBM Verify application completes the registration automatically.

The Security Verify Access SDK supports registration without the need for browser initiation in custom applications and also supports the OAuth ROPC flow.

Authentication registration is completed when an OAuth flow is completed with the scope set to "**`mmfaAuthn`**". Other attributes that can be included and saved via the OAuth mapping rule are:

- Push token ID
- Application ID
- Device Name
- Device Type
- OS Version
- Fingerprint support included

- Front camera support included
- Tenant ID

Authentication method enrollment

After an authenticator is registered, the user is prompted to enroll authentication methods.

Supported authentication methods include fingerprint and simple user presence.

Enrollment is performed through the System for Cross-Domain Identity Management (SCIM) API. For more information, see SCIM Configuration.

Configuring Mobile Multi-Factor Authentication

Follow these steps to configure Mobile Muli-Factor Authentication.

Before you begin

The following pre-requisites must be met:

- The IBM Security Verify Access Platform and Advanced Access Control Module are activated.
- The runtime component and a reverse proxy instance are configured.
- Basic User support is enabled on the local LDAP.
- Transparent path junction to **/scim** on localhost is configured.
  - BA with easuser enabled
  - **isam_mobile_rest** ACL attached to **/scim** (ACL won't exist until step 2)
- Username Password Mechanism is configured.
- Server connection to local LDAP is set up.
- SCIM is configured with local LDAP server connection **dc=iswga** suffix.

Procedure

1. Create an API Protection definition and client with:
   - Authorization code and ROPC enabled
   - Redirect URI: `https://<webseal_hostname>:<port>/mga/sps/mmfa/user/mgmt/html/mmfa/qr_code.html?client_id=<client_ID>`

   Note:

   The redirect URI is essential so that when a user clicks the **Register Authenticator** button in the USC UI, the user is correctly redirected to the QR Code page.
2. Run the Reverse Proxy MMFA Config API.

   This step configures the /mga junction and creates the required ACLs.

   ```
   curl -ki -H 'Accept: application/json' -H
   'Content-type:application/json' --user 'admin:XXXX' -X POST https://
   192.168.124.130/wga/reverseproxy/default/mmfa_config -d
   '{"lmi":{"hostname":"192.168.124.130", "port":443, "username":"admin",
   "password":"XXXX"}, "runtime":{"hostname":"localhost", "port":443,
   "username":"easuser", "password":"XXXX"}, "reuse_certs":false,
   "reuse_acls":false, "reuse_pops":false}'
   ```
3. Run the AAC MMFA Config API.

   This step configures the reverse proxy details into a location where the AAC code can access it.

   ```
   curl -ki -H 'Accept: application/json' -H
   'Content-type: application/json' --user 'admin:XXXX' -X POST
   ```

```
https://192.168.124.130/iam/access/v8/mmfa-config -d
'{"client_id":"AuthenticatorClient",
"hostname":"192.168.124.140",
"port":443, "junction":"/mga"}'
```

Configuring a Mobile Multi-Factor Authentication (MMFA) Authenticator Mechanism

This authentication mechanism can be used to initiate and correlate results for a range of mobile multi-factor authentication techniques.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Mechanisms**.
5. Click **MMFA Authenticator**.
6. Click .
7. Click the **Properties** tab.
   a) Select the property that you want to configure.
   b) Click .
   c) Enter the value for that property.
   d) Click **OK**.
8. Take note of the following property for the mechanism:

   Signing Attributes
   This property defines a comma separated list of context attributes that is added to a new JSON value attribute that is passed as a new pending attribute to the target mobile device. If supported by the device, this JSON value is used to extract the various messages that is displayed to the end user. The MMFA server also uses this JSON value during signature validation.

   Note:

   - The value that is set here can be overridden when the **`signAttributeList`** property is set in a specific MMFA authentication policy. See Authentication Policy Parameters and Credentials
   - The supported **`SigningAttributelist`** values are only `contextMessage` and `pushMessage`.
9. Click **Save**.

What to do next

When you configure the mechanism, a message indicates that the changes are not deployed. Deploy the changes when you are finished. See Deploying Pending Changes.

MMFA mapping rule methods

Customize the OAuth **`PreTokenGeneration`** and **`PostTokenGeneration`** mapping rules by using these methods.

Sample mapping rules are available from **System** > **Secure Settings** > **File Downloads** under the **access_control** > **examples** > **mapping rules** directory.

The following limitations affect the attribute keys and values that are associated with the **`state_id`** by using the **`MMFAMappingExtUtils`** class:

- Keys cannot be null or empty.

- Values can only be null or empty when specified.
- Associated key-value pairs are read-only and not case sensitive.
- The push token is read-only and case sensitive.

registerAuthenticator

```
public static String registerAuthenticator(
      String stateId
      )
```

This method performs the final steps of registering an authenticator. Use the following parameters:

stateId

The state ID of the authorization grant. This parameter cannot be null or empty.

These responses come from the runtime after registration.

- The new authenticator's ID if successful.
- Null if not successful.

savePushToken

```
public static boolean savePushToken(
      String stateId,
      String pushToken,
      String applicationID
      )
```

This method saves the push token and application ID with the authorization grant state ID. Use the following parameters:

stateId

The state ID of the authorization grant. This parameter cannot be null or empty.

pushToken

The push token the authenticator application has received from its push notification service provider. This parameter cannot be null or empty.

applicationID

The application ID of the authenticator application. This parameter can be null or empty.

These responses come from the runtime.

- True if successful.
- False if not successful.

savePushToken

```
public static boolean savePushToken(
      String stateId,
      String pushToken
      )
```

This method saves the push token and application ID with the authorization grant state ID. Use the following parameters:

stateId

The state ID of the authorization grant. This parameter cannot be null or empty.

pushToken

The push token the authenticator application has received from its push notification service provider. This parameter cannot be null or empty.

These responses come from the runtime.

- True if successful.
- False if not successful.

saveDeviceAttributes

```
public static boolean saveDeviceAttributes(
      String stateId,
      String deviceName,
      String deviceType,
      String osVersion,
      String fingerprintSupport,
      String frontCameraSupport,
      String tenantId
      )
```

This method saves various device attributes with the authorization grant state ID. Use the following parameters:

stateId

The state ID of the authorization grant. This parameter cannot be null or empty.

deviceName

The name of the device the authenticator is installed on. This parameter can be null or empty. If empty, the value is cleared.

deviceType

The type of the device the authenticator is installed on. This parameter can be null or empty. If empty, the value is cleared.

osVersion

The OS version of the device the authenticator is installed on. This parameter can be null or empty. If empty, the value is cleared.

fingerprintSupport

The type of fingerprint sensor that is supported by the device. This parameter can be null or empty. If empty, the value is cleared.

frontCameraSupport

flag that indicates if the device has a front facing camera. This parameter can be null or empty. If empty, the value is cleared.

tenantId

The tenant ID for this registration, if the authenticator application is multi-tenant. This parameter can be null or empty. If empty, the value is cleared.

These responses come from the runtime.

- True if successful.
- False if not successful.

Chapter 12. FIDO and WebAuthn Support

The IBM Security Verify Access Advanced Access Control component provides support for FIDO and WebAuthn.

FIDO2 Server Endpoints

Endpoints provide FIDO2 clients the ability to communicate with the FIDO2 server.

Table 20. FIDO2 Server Endpoints

Endpoint Name	Description	Example
Credential Creation Options	The attestation options request is the first step of registration. The options returned by the server are intended to be used with WebAuthn's `navigator.credentials.create()`.	`https://server.com/mga/sps/fido2/<relying_party>/attestation/options`
Authenticator Attestation Response	The attestation result request is the second step of registration. The result of the `navigator.credentials.create()` request is sent to the server, which validates the challenges, origins, signatures, and the rest of the request. If validation passes, the registration is saved.	`https://server.com/mga/sps/fido2/<relying_party>/attestation/result`
Credential Get Options	The assertion options request is the first step of authentication. The options returned by the server are intended to be used with WebAuthn's `navigator.credentials.get()`.	`https://server.com/mga/sps/fido2/<relying_party>/assertion/options`
Authenticator Assertion Response	The assertion result request is the second step of authentication. The result of the `navigator.credentials.get()` request is sent to the server, which validates the assertion. If validation passes, the authentication was successful	`https://server.com/mga/sps/fido2/<relying_party>/assertion/result`

Concepts

The FIDO alliance is an open industry association that produces authentication standards and certifications for password-less scenarios.

There are currently three sets of specifications that have been published:

- FIDO Universal Second Factor (FIDO U2F). See "Configuring a FIDO Universal 2nd Factor authentication mechanism" on page 65.
- FIDO Universal Authentication Framework (FIDO UAF)
- FIDO2

The FIDO2 specification includes the W3C's Web Authentication (WebAuthn) specification and FIDO Client to Authenticator Protocol (CTAP). The WebAuthn specification defines the interactions between a Client and a Relying Party, whereas the CTAP protocol is between an Authenticator and a Client.

The Relying Party is the service that is requesting authentication.

A Client is a web browser or operating system.

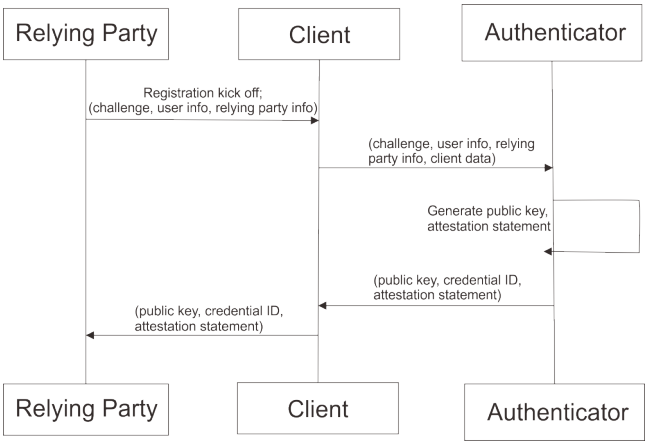
An Authenticator can be a device or program that performs cryptographic operations to provide verification for a user.

WebAuthn Ceremonies

The WebAuthn spec defines two ceremonies that are performed between the user, authenticator, client and relying party: Registration and Authentication

Registration Ceremony

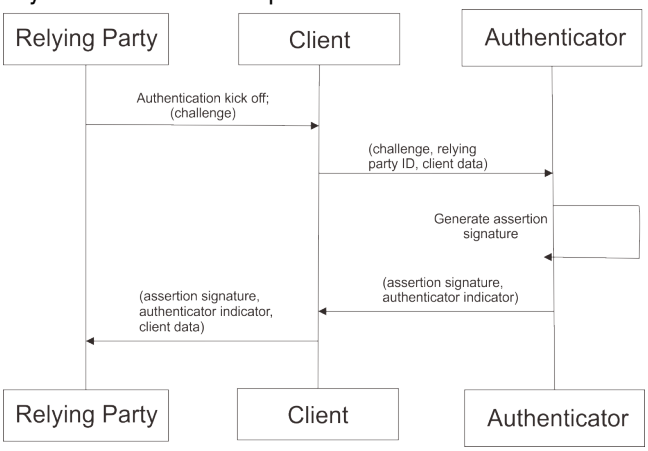
The registration ceremony consists of up of five steps:



1. When registration is requested, the Relying Party provides a challenge and other information to the Client.
2. The Client sends the information from step 1 along with extra client data to the Authenticator.
3. The Authenticator generates a public key, optionally performs user presence or verification, and produces an attestation statement based on the given challenge.
4. The public key and attestation statement sent back to the Client.
5. The Client sends the information to the Relying Party, which validates the attestation statement against the original challenge, and if successful, saves the public key to the user's account.

Authentication Ceremony

The authentication ceremony consists of five steps:



1. When authentication is requested, the Relying Party provides a challenge to the Client.
2. The Client sends the information from step 1 along with extra client data to the Authenticator.
3. The Authenticator generates an assertion signature using the stored private key and optionally performs user presence or verification.
4. The assertion signature and extra authenticator data is sent back to the Client.

5. The Client sends the information to the Relying Party, which validates the assertion signature against the original challenge, and if successful, marks the user as authenticated.

Attestation

Attestation is a step within the registration flow that allows a relying party to establish whether an authenticator is authentic and can be trusted.

This is achieved through the attestation statement sent by the authenticator back through to the relying party. The attestation statement contains a signature which is the combination of the credential public key and the provided challenge, and optionally a certificate which contains the attestation public key.

There are several types of attestations which indicate how the signature was generated:

Basic Attestation
The attestation key pair is specific to the authenticator model, and authenticators of the same model may share the same key pair.

Self Attestation
The authenticator may not have an attestation key pair, so the credential private key is used.

Attestation CA
The authenticator can generate multiple attestation key pairs from an Attestation CA, a trusted third party.

Elliptic Curve based Direct Anonymous Attestation (ECDAA)
The authenticator receives direct anonymous attestation (DAA) credentials from a single DAA-Issuer. The DAA credentials are used with blinding to sign the attested credential data.

Anonymization CA
The attestation key pair is generated externally to the authenticator by a trusted third party to preserve privacy.

No attestation statement (None)
No attestation information is made available.

During registration the relying party can indicate a preference regarding how the attestation statement is generated.

There are attestation statement formats which indicate the syntax of the statement:

Packed Attestation Statement Format
Attestation Type supported: Basic, Self, AttCA

This is a WebAuthn optimized attestation format. Packed attestation statement format uses a very compact but still extensible encoding method.

TPM Attestation Statement Format
Attestation Types supported: AttCA

The TPM statement format is for authenticators that use a Trusted Platform Module as their cryptographic engine.

Android Key Attestation Statement Format
Attestation Types Supported: Basic

This attestation statement format is for when the authenticator is provided by the Android platform, version “N” and later. In this case the attestation statement is produced by a component in a secure operating environment, but the authenticator data for the attestation is produced outside this environment.

Android SafetyNet Attestation Statement Format
Attestation Types Supported: Basic

This attestation statement format is for when the authenticator is provided by certain Android platforms and is based on the SafetyNet API. With this statement format the authenticator data is completely controlled by the Android application which invokes the SafetyNet API.

FIDO U2F Attestation Statement Format
Attestation Types Supported: Basic, AttCA

This attestation statement format is user with FIDO U2F authenticators using formats defined in the FIDO U2F specification.

Apple Platform Attestation Statement Format
Attestation Types Supported: AnonCA

Used exclusively by Apple for Apple devices that support WebAuthn with a platform authenticator.

None Attestation Statement Format
Attestation Types Supported: None

Used to replace any authenticator-provided attestation statement when a Relying Party indicates it does not require attestation information.

Public Key Algorithms

The list of preferred algorithms is provided to an authenticator when you are creating a credential, and an authenticator makes a best-effort to create the most preferred credential that it can.

There are several cryptographic algorithms for which a Relying Party might specify a preference.

The following algorithms are currently supported in IBM Security Verify Access:

Description	COSE Identifier
SHA256 with ECDSA	-7
SHA384 with ECDSA	-35
SHA512 with ECDSA	-36
SHA1 with RSA	-65535
SHA256 with RSA	-257
SHA384 with RSA	-258
SHA512 with RSA	-259

Metadata

Vendor metadata files contain characteristics of authenticators as a metadata statement by using a specific syntax.

FIDO2 metadata statement files describe one or more authenticators such that they can be used by the relying parties to validate authenticator attestation and prove the genuineness of the device model.

IBM Security Verify Access provides two methods by which metadata can be provided to the relying party engine.

Static Upload
One or more metadata files are uploaded to Verify Access and can be applied to a relying party.

Metadata Services
The locations and connection details of external FIDO metadata services are configured. This provides a dynamic method to download an up-to-date metadata statement. One or more of these can be applied to the relying party.

Each of these is an optional configuration parameter when creating a relying party and they can also be provided together to act in a complimentary manner. If both are provided and contain common data, there is a configuration property (`preferMdsOverStatic`) that will define whether to use the static content or the dynamic metadata service content.

The order in which multiple metadata services is also important. If common data is provided by multiple metadata services, the data that is contained in the higher priority service is used first.

Static metadata

Vendor metadata files contain characteristics of authenticators as a metadata statement by using a specific syntax.

The following formats and their corresponding syntax are supported:

FIDO metadata statement
This metadata statement is JSON and follows the format as outlined by the FIDO Alliance.

Yubico metadata
Yubico have established their own metadata format (file extension `.yubico`).

PEM Certificate
PEM certificates (file extension `.pem`) do not provide any of the user experience advantages that other metadata statements do. However, they can be used to verify an attestation statement.

Upon registration, a device provides the server with its attestation certificate during the attestation ceremony. This certificate can be (optionally with metadata enforcement) used to verify the authenticity of the device against a metadata file.

Metadata Services

A metadata service (MDS) is a centralized repository of the metadata statement that is used by the relying parties to validate authenticator attestation and prove the genuineness of the device model.

It provides a method to ensure the metadata statement that is used by the relying parties is up to date and is not expired.

Multiple different metadata services can be configured and used together (along with static files) by the relying party.

Verify Access internally uses the HTTPClientV2 class to make the connection and retrieve the metadata from the MDS. Some of the configuration of the client can be set when you are creating the metadata service. See Adding a new metadata service. The HTTPClientV2 advanced configuration is used for other entries and for entries that are not overridden. See Advanced configuration properties.

Note: The metadata blob that is returned by the metadata service requires a certificate to verify the signature. This certificate must be loaded into the truststore that is configured for the metadata service. For example, to use the fidoalliance metadata service, the certificate from `valid.r3.roots.globalsign.com` must be loaded into the truststore.

The following MDS-specific configuration properties can be set:

URL
The location for the metadata service where the metadata can be downloaded.

Retry Interval
If the downloaded metadata has expired, the relying party attestation validation attempts to download a new version from the metadata service. If the attempt fails, the download does not retry until the retry interval is reached. For example, if a relying party is making many validation calls, rather than each of these attempting to retrieve a new metadata statement the download does not occur again until the retry interval is passed.

Prefer metadata service over static metadata
If metadata exists for the same device in both the static metadata and dynamic metadata service, this determines whether the static file entry (false) or the metadata service entry (true) is used. If the same entry exists multiple times in either the static files or the dynamic metadata, the first entry that is found is used.

Registration

There are several user self care REST services available for managing FIDO2/WebAuthn registered authenticators.

Note: The user must authenticate to use the REST services capability.

REST services usage scenarios

Note: None of the REST services below require a JSON payload in the request.

Method	URL	Response	Response type

GET	https://*hostname*/mga/sps/fido2/registrations	<pre>[
		{"credentialId":*credentialId*,
		"rpId":rpId,
		"username":*username*,
		"version": *1 or 2*,
		"present":*true or false*,
		"verified":*true or false*,
		"usageCount":*usageCount*,
		"nickname":*nickname*,
		"lastUsed":*dateLastUsed*,
		"created":*dateCreated*,
		"enabled": *true or false*,
		"metadata":{
		"description":
		descriptionFromMetadata,
		"icon": *icon*,
		"backupEligibility": *true or false*,
		"backupState": *true or false*
		}
		]</pre> If the request completes successfully, the HTTP response code is 200.
		If the request does not complete successfully, the HTTP response is 500.
			application/json

GET	https://*hostname*/mga/sps/fido2/registrations/{*credentialId*}	<pre>{
		"credentialId":*credentialId*,
		"rpId":*rpId*,
		"username":*username*,
		"version":*1 or 2*,
		"present":*true or false*,
		"verified":*true or false*,
		"usageCount":*usageCount*,
		"nickname":*nickname*,
		"lastUsed":*dateLastUsed*,
		"created":*dateCreated*,
		"enabled": *true or false*,
		"metadata":{
		"description":
		descriptionFromMetadata,
		"icon": *icon*,
		"backupEligibility": *true or false*,
		"backupState": *true or false*
		}</pre> If the request completes successfully, the HTTP response code is 200.
		If the request does not complete successfully, the HTTP response is 500.
			application/json

DELETE	https://*hostname*/mga/sps/fido2/registrations/{*credentialId*}	If the request completes successfully, the HTTP response code is 204. If the request does not complete successfully, the HTTP response is 500.	application/json

U2F Migration

The WebAuthn specification includes backwards compatibility support for FIDO U2F.

To allow previously registered U2F tokens to authenticate with the FIDO2/WebAuthn mechanisms and delegates, the U2F registration data must be migrated.

Note: Not all WebAuthn scenarios are supported as FIDO U2F authenticators are unable to store a user handle.

IBM Security Verify Access offers two ways to migrate data by using the U2F Migration section of the FIDO2 Configuration screen. Select **AAC** > **Manage** > **FIDO2 Configuration** > **U2F Migration**.

Manual migration in batches
: In this section, the number of unmigrated U2F registrations is displayed. An IBM Security Verify Access administrator can choose the batch size, and whether to migrate a single batch or all batches that are available.

Auto-migration on use
: U2F registrations will be migrated when WebAuthn authentication is attempted.

  When auto-migration is enabled and a WebAuthn authentication flow is attempted, the server checks if a user has any WebAuthn registrations. If a user does not have WebAuthn registrations, the server checks if a user has any U2F registrations, and migrates any that it finds.

  The server then resumes the authentication flow.

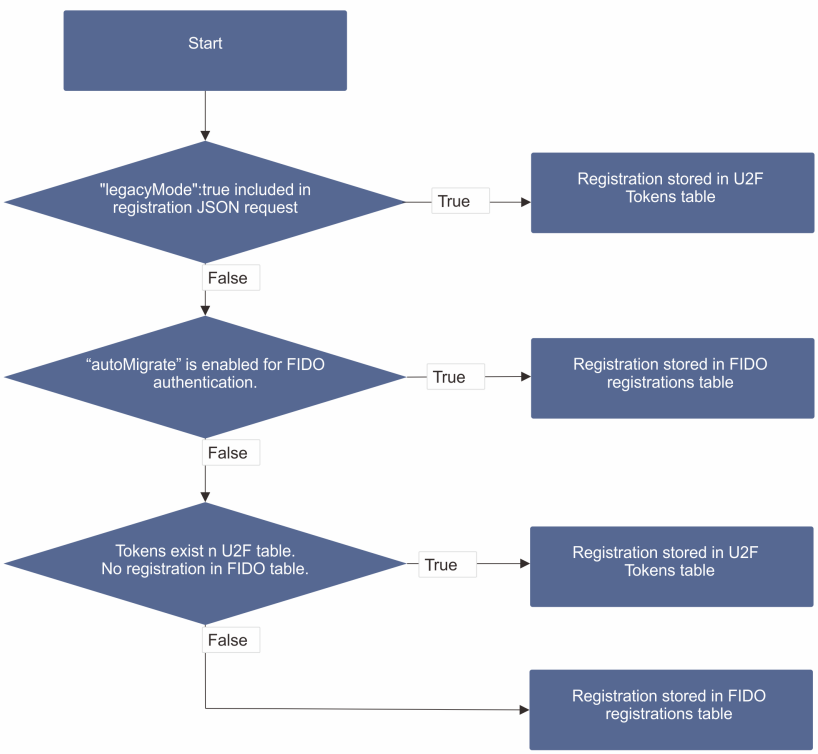
New U2F Registrations

IBM Security Verify Access decides which HVDB table is used to store new U2F token registrations based on a number of factors. This applies only to new U2F tokens that are added by the FIDO Universal 2nd Factor mechanism.

Firstly, the mechanism checks if the registration JSON request includes a parameter called `legacyMode`. If the parameter is present and set to `true`, the new registration is stored in the U2F table.

If `legacyMode` is not set to `true`, the mechanism then checks if **Auto-migration on use** is enabled for U2F Migration. If enabled, the new registration is stored in the FIDO table.

Finally, if neither `legacyMode` or **Auto-migration on use** are set to `true`, the mechanism checks for existing registrations in the two tables. New registrations are stored in the U2F table if tokens already exist in the U2F table and there are no registrations in the FIDO table. Otherwise all new U2F registrations are automatically stored in the FIDO table.



This enables an administrator to have complete control over which table is used to store new registrations, while also allowing existing systems that use U2F to continue as they were.

Note: If a U2F registration exists in the U2F table, it can only be used for authentication with the FIDO Universal 2nd Factor mechanism. If the U2F registration has been migrated to the FIDO table, or was stored in the FIDO table on creation because of the logic above, it can be used for authentication in both the FIDO Universal 2nd Factor mechanism and the FIDO2 WebAuthn Authenticator mechanism.

FIDO2 Configuration

This topic provides the description of the parameters each option sets.

Create a FIDO2 Relying Party

When you are creating a FIDO2 Relying Party there are two distinct configuration modes, each resulting in a FIDO2 Relying Party being configured and functional.

FIDO2 Relying Party Configuration is accessed through **AAC** > **Manage** > **FIDO2 Configuration**.

Simple Configuration

Creating a FIDO2 Relying Party using the Simple Configuration results in a relying party with most out of the box configuration defaults selected.

Values need to be specified for the following parameters

Name
this is the display name for the FIDO2 Relying Party.

Relying Party ID
The Relying Party ID is a valid domain string that identifies the WebAuthn Relying Party. When an authenticator is registered to a Relying Party, that registration is only valid for authenticating to that Relying Party. An example Relying Party ID is “example.com”.

The following Relying Party ID examples are invalid:

`https://example.com`
Protocol is not included in the Relying Party ID

`example.com/example_path`
Path is not included in the Relying Party ID

Advanced Configuration

Creating a FIDO2 Relying Party by using the Advanced Configuration results in a fully customized relying party using the options specified.

Values need to be specified for the following parameters:

Name
this is the display name for the FIDO2 Relying Party.

Relying Party ID
The Relying Party ID is a valid domain string that identifies the WebAuthn Relying Party. When an authenticator is registered to a Relying Party, that registration is only valid for authenticating to that Relying Party. An example Relying Party ID is “example.com”.

The following Relying Party ID examples are invalid:

- `https://example.com`- protocol is not included in the Relying Party ID
- `example.com/example_path`- path is not included in the Relying Party ID

Administrative Group
Requests made to the FIDO2 server attestation and assertion endpoints usually contain username information in the message payload. Verify Access enforces that this message payload user information matches the authenticated session user (for example, currently logged in user via Verify Access session cookie) **UNLESS** the currently authenticated Verify Access user is a member of this administrative group. Membership of this administrative group is intended for application service identities acting on behalf of users they have authenticated locally.

WebAuthn Specification Enforcement
The WebAuthn Specification enforces user presence as a requirement during attestation and assertion.

FIDO Attestation and Assertion Timeout
The timeout (in seconds) that is applied to FIDO attestation and assertion requests.

Attestation Types
See “Attestation” on page 197.

Attestation Statement Format
See “Attestation” on page 197.

Public Key Algorithms
See “Public Key Algorithms” on page 198.

Android SafetyNet Options
When Android SafetyNet is selected in **Attestation Statement Formats**, there are several options to specify values for.

Attestation Max Age
The maximum age in milliseconds of an attestation that is using the Android SafetyNet Statement Format.

Clock Skew
The amount of allowed variance in milliseconds when validating an attestation statement on the appliance.

Metadata
See “Attestation” on page 197.

More than one Metadata file and/or Metadata service can be selected for this FIDO2 Relying Party. The selections are used together by the relying party during attestation validation.

If metadata exists for the same device in both the static metadata and dynamic metadata service, the prefer metadata service over static metadata configuration flag determines whether the static file entry (`false`) or the metadata service entry (`true`) is used. If the same entry exists multiple times in either the static files or the dynamic metadata, the first entry found is used.

Static Metadata
The following formats are valid FIDO2 Metadata file formats:

- FIDO MDS document (.json file extension)
- Yubico Metadata (.yubico file extension)
- PEM Certificate (.pem file extension)

Metadata Services
If required, select one or more metadata services for the relying party. The selected metadata services can be ordered by priority by moving the selection up or down in the grid. If the same entry exists in the metadata provided by multiple metadata services, the higher priority selection will be used first. Metadata services can be added by clicking the Add button or configured from the Metadata page. See Metadata Services.

Metadata Enforcement
When Metadata Enforcement is enabled for a FIDO2 Relying Party, the authenticator metadata is validated against the set of Metadata files enabled for this Relying Party, and the registration fails if this validation fails.

When Metadata Enforcement is disabled for a FIDO2 Relying Party, the authenticator metadata is still validated, however if this validation fails, the registration could still be allowed to succeed.

Metadata Service Refresh Period
When a metadata service is set for this relying party, the refresh period (in seconds) determines the interval that the downloaded metadata is checked for expiration and updated if required. A value of -1 disables automatic updates from the metadata service. If automatic updates are disabled and the metadata download fails, it is not attempted again until the runtime server is restarted or reloaded.

Mediator Mapping Rules
See “FIDO2 Mediation” on page 204.

Leaving the selection as **None** disables FIDO2 Mediation from occurring on this FIDO2 Relying Party.

Origins
Specifies a list of permitted origin URI’s . A FIDO message from a client must contain an origin from this list for the message to be validated. Typically, the origin is the domain name of the website performing FIDO authentication by using `https://schema`, with the optional addition of a port number.

For more information on FIDO2 Metadata and FIDO2 Mediation, see “Concepts” on page 195 and “FIDO2 Mediation” on page 204.

FIDO2 Mediation

When you are deploying FIDO2/WebAuthn it might be necessary to implement specific business controls during authentication and registration ceremonies. FIDO2 Mediators can be used to add this extra validation, as well as insert additional data into the server responses.

Mediators take the form of a JavaScript mapping rule which runs in four places

1. As part of the initiation of a registration attempt (a call to the attestation options endpoint).
2. As part of a completion of a registration attempt after all FIDO2 and WebAuthn checks have passed, but before the registration is considered validated (a call to attestation result).
3. As part of the initiation of an authentication attempt (a call to the assertion options endpoint).
4. As part of the completion of an authentication attempt (a call to the assertion result endpoint).

Mediation also occurs as part of an authentication service flow by using FIDO2/WebAuthn as an authentication mechanism.

The capabilities of mediation are as follows:

1. During any mediation, FIDO2 processing can be halted with a custom message and status. To do this, populate the error field:

```
error.put("status", "authenticator_denied");
error.put("message", "An administrator has disabled your authenticator type from being
used");
```

2. During mediation of an attestation options request, modified options can be returned to client. Update attestation options with:

```
attestation_options.put("mediated_attribute", {"test":true});
```

3. During mediation of an attestation result request, additional variables can be saved in the “attributes” parameter of the new registration. Add to the “attributes” parameter with:

```
attributes.put("exampleAttribute", "exampleValue");
```

   Note: Only String attributes can be stored with the registration.

   These attributes can be accessed later in authentication mediation flows as the registration data, including these attributes, is made available as part of the mediator's context variables.

4. During mediation of an assertion option request, modified options can be returned to client. Update assertion options with:

```
assertion_options.put(“example_attribute”, “example_value”);
```

5. During mediation of an attestation result or assertion result call, additional values can be returned to the client:

```
responseData.put("did_user_verify", context.requestData.registration.userVerified);
```

   The response is returned to the client to let it act based on the authenticator and its registration. For example, this could be used to return the model name of the authenticator.

6. During mediation of an attestation result or assertion result call, additional identity data can be returned which can be added to the users session:

```
credentialData.put("authenticator_friendly_name", context.requestData.registration.friendlyName);
credentialData.put("credentialList", ["list", "of", "credentials"]);
```

   Credential data returned indicates the users identity. Credential data is returned to the relying party in an API call to `/attestation/result` or `/assertion/result`, or when the authentication service is used to perform the assertion result, credentialData attributes are added to the user's Verify Access credential. Only String and Lists of strings should be used.

The mediator context

The context variable available in mediation contains several essential pieces of information about the request.

1. `context.requestType`- Identifies which one of the following mediation is occurring:
   - `attestation_options`
   - `attestation_result`
   - `assertion_options`
   - `assertion_result`
2. If enabled, HTTP request context (such as headers) are made available under:

- `context.requestData.headers`
- `context.requestData.cookies`

  Note: HTTP context is not enabled by default, enable the advanced configuration entry `sps.httpRequestClaims` to include headers and cookies in the context. See "Advanced configuration properties" on page 233.

3. `context.requestData.options`- In the case of an assertion options or attestation options request, the `context.requestData.options` property contains the properties to be returned to the browser. In the case of an assertion result or attestation result request, the `context.requestData.options` property indicates the options which were provided to the client as part of this FIDO2/WebAuthn ceremony.
4. `context.requestData.registration` - The registration that is used (in the case of an assertion result), or the registration about to be saved (in the case of an attestation result).
5. `context.rawRequestData.clientDataJSON` - In the case of an attestation result or assertion result request, the `context.rawRequestData.clientDataJSON` property contains the original request value for this parameter in its encoded format.
6. `context.rawRequestData.attestationObject` - In the case of an attestation result request, the `context.rawRequestData.attestationObject` property contains the original request value for this parameter in its encoded format.
7. `context.rawRequestData.authenticatorData` - In the case of an assertion result request, the `context.rawRequestData.authenticatorData` property contains the original request value for this parameter in its encoded format.

Other FIDO2 values such as the `attestationStatement`, `authData`, and `clientData` are also be available under `context.requestData`. The context object is native JavaScript, and can be accessed as an associative array.

When developing mediators the following line can be used to print the entire context variable:

```
IDMappingExtUtils.traceString(JSON.stringify(context));
```

Note: Ensure `com.tivoli.am.fim.trustserver.sts.utilities.*=ALL` trace is enabled.

Complete list of variables available in the mediator context

1. `stsuu`- The users current identity. Read only.
2. `context`- All of the context data. Read only. Native JSON.
3. `responseData`- Java HashMap, writable. Available only in attestation result and assertion result requests. Responses are returned to the client.
4. `credentialData`- Java HashMap, writable. Available only in attestation result and assertion result requests. Values are returned to the client in the same manner as responseData attributes, however, in the case of the authentication mechanism being used, it is the client and the credentialData attributes will be added to the user's credential directly.
5. `attributes`- Java HashMap, writable. Values are stored in the registration. Only available in attestation result requests. On assertion result mediation, attribute values are available in the variable `requestData.registration.attributes`.
6. `attestation_options`- Java HashMap, writable. Only available in attestation options requests. MapIs a copy of the options requested by a user. If any of the options in this map are modified the resulting options returned to the caller are updated accordingly.
7. `assertation_options`- Java HashMap, writable. Only available in assertion options requests. MapIs a copy of the options requested by a user. If any of the options in this map are modified the resulting options returned to the caller are updated accordingly.
8. `error`- Java HashMap, writable, Available in all options or results requests. If the `message` and `status` keys are populated they are returned to the caller as an error.

The traditional Verify Access Java helpers area available in the mediator context, such as `UserLookupHelper`, `LocalSTSClient`, `IDMappingExtUtils`, and `OAuthMappingExtUtils`.

FIDO Client Manager

A FIDO2 Client Manager is added to the default variables that are available in an InfoMap authentication mechanism. The FIDO2 Client manager allows administrators to make FIDO2 attestation and assertion requests without using a HTTP client.

Creating LocalFIDOClient

The context variable `fido2ClientManager` has a single public method `getClient(String)` which takes the rpId of the desired Relying Party as a string argument. It returns a client which can be used to make attestation and assertion requests to the corresponding relying party.

Local FIDO Client

An instance of the LocalFIDOClient class is returned by a `fido2ClientManger.getClient("rp.id")` and has several methods available.

`client.attestationOptions(String options)`

- Request an attestation challenge
- If no attestation options are provided, the client will fall back to the Relying Party's default values
- A timeout value for this specific request can be set in the attestation options JSON string.

`client.attestatonResult(String attestation)`

- Validate an attestation response after calling `attestationOptions`
- Returns a status of ok for successful attestations or failed for error cases

`client.assertionOptions(String options)`

- Request an assertion challenge
- If no assertion options are provided, the client will fall back to Relying Party's default values
- A timeout value for this specific request can be set in the assertion options JSON string.

`client.assertionResult(String assertion)`

- Validate an assertion response after calling `assertionOptions`
- Returns a status of ok for successful assertions or `failed` for error cases

Each method above takes a JSON String (`JSON.stringify` in JavaScript) and returns a JSON String (which can be parsed using `JSON.parse` in JavaScript). InfoMap users are required to check the returned `status` field to check if requests were successful.

`LocalFIDOClient.getRPconfigId(String rpId)`

- A static method that can be used to fetch the configuration ID of the Relying Party (RP) with the given Relying Party ID (rpId)
- The configuration ID is required to invoke the FIDO server endpoints

Using the Local FIDO Client

To use the client, call one of the four available methods (`attestationOptions`, `attestationResult`, `assertionOptions`, `assertionResult`) and populate a template page with values returned from the Relying Party.

An example InfoMap rule can be found in `access_control/examples/mapping_rules` directory of the file downloads section of an ISAM appliance.

Authentication Service Mechanism

The WebAuthn authentication ceremony (“WebAuthn Ceremonies” on page 196) is integrated to the Authentication Service by using an authentication mechanism.

This provides out of the box template pages for the authentication flow, and the ability to be integrated into Context Based Access Policies.

Both step up authentication and username-less authentication are supported by WebAuthn. However username-less is highly dependent on the authenticator and browser being used.

Prerequisites

Before the FIDO2/WebAuthn Authentication Mechanism can be configured, a relying party must be defined. See “FIDO2 Configuration” on page 202.

WebAuthn includes support for authentication with existing U2F registrations. Before U2F registrations can be used with the FIDO2/WebAuthn authentication mechanism, the registration data must be migrated. See “U2F Migration” on page 201.

Request Flow

When the FIDO2/WebAuthn mechanism is triggered, IBM Security Verify Access returns a pending page to the user. This allows IBM Security Verify Access to provide the options required to trigger the browser to prompt the user for their authenticator. Once the user completes the required user presence and optional user verification steps, the browser sends the assertion result back to IBM Security Verify Access with the following request:

```
POST /mga/sps/authsvc
{
   "StateId":"...",
   "operation": "verify",
   "id": "LFdoCFJTyB82ZzSJUHc-
c72yraRc_1mPvGX8ToE8su39xX26Jcqd31LUkKOS36FIAWgWl6itMKqmDvruha6ywA",
   "rawId": "LFdoCFJTyB82ZzSJUHc-
c72yraRc_1mPvGX8ToE8su39xX26Jcqd31LUkKOS36FIAWgWl6itMKqmDvruha6ywA",
   "authenticatorData": "SZYN5YgOjGh0NBcPZHZgW4_krrmihjLHmVzzuoMdl2MBAAAAAA",
   "signature": "MEYCIQCv7EqsBRtf2E4o_BjzZfBwNpP8fLjd5y6TUOLWt5l9DQIhANiYig9newAJZYTzG1i5lwP-
YQk9uXFnnDaHnr2yCKXL",
   "userHandle": "",
   "clientDataJSON":
"eyJjaGFsbGVuZ2UiOiJ4ZGowQ0JmWDY5MnFzQVRweTBrTmM4NTMzSmR2ZExVcHFZUDh3RFRYX1pFIiwiY2xpZW50RXh0ZW5
zaW9uc
yI6e30sImhhc2hBbGdvcml0aG0iOiJTSEEtMjU2Iiwib3JpZ2luIjoiaHR0cDovL2xvY2FsaG9zdDozMDAwIiwidHlwZSI6I
ndlYmF1dGhuLmdldCJ9",
   "type": "public-key"
}
```

IBM Security Verify Access validates the assertion result and either allows the user to continue as expected, or returns an error.

Note: Unlike the FIDO2 Server Endpoints, the relying party ID is not consumed from the address path, but instead is obtained from mechanism or policy level configuration.

Manage Metadata Services

This section contains information on adding and modifying metadata services.

Adding a metadata service

Add a metadata service.

Procedure

1. Log in to the local management interface.

2. Click **AAC** > **FIDO2 Configuration** > **Metadata**.
3. Under **Metadata Services**, click **Add**.
4. Configure the metadata service with the following properties:

   URL
   The URL used to connect to the metadata service.

   JWS Truststore

   The name of the truststore used to verify the signature of the metadata blob that is downloaded from the metadata service. If not specified the truststore that is configured in the Truststore property is used.

   Truststore
   The name of the truststore to use. If not specified and an HTTPS connection is specified, the truststore that is configured in the HTTPClientV2 advanced configuration is used. See Advanced configuration properties.

   The truststore that is specified has the following purposes:

   a. The truststore is used to set up the SSL connection with the metadata service.
   b. If the JWS Truststore is not set, the truststore must contain the certificate that is used to verify the signature of the metadata blob that is downloaded from the metadata service.

   Protocol
   The SSL protocol to use for the HTTP connection. Valid values are TLS, TLSv1, TLSv1.1, and TLSv1.2. If not specified, the protocol that is configured in the HTTPClientV2 advanced configuration is used. See Advanced configuration properties.

   Timeout
   Specifies the request timeout (seconds). A value of 0 results in no timeout. If not specified, the connect timeout that is configured in the HTTPClientV2 advanced configuration is used. See Advanced configuration properties.

   Show advanced request options
   Click **Next** or select the **Request Overrides** tab to reveal more optional configuration items.

   Username
   Specifies the basic authentication username. If not specified, basic authentication is not used. If the username is specified, provide the password.

   Password
   Specifies the basic authentication password. If not specified, basic authentication is not used. If the password is specified, provide the username.

   Keystore
   Specifies the client keystore. If not specified, client certificate authentication is not used. If the keystore is specified, provide the certificate.

   Certificate
   Specifies the client key alias. If not specified, client certificate authentication is not used. If the certificate is specified, provide the keystore.

   Proxy
   The URL of the proxy server that is used to connect to the metadata service (including the protocol).

   HTTP Request Headers
   Click **Add** to add HTTP headers to the HTTP request.
5. Click **OK** to save the configuration.

Modifying a metadata service

Modify a metadata service.

Procedure

1. Log in to the local management interface.
2. Click **AAC** > **FIDO2 Configuration** > **Metadata**.
   Under **Metadata Services** is a list of existing metadata services.
3. Select the metadata service to modify.
4. Click **Edit**.
5. Modify the configuration properties:

   URL
   The URL used to connect to the metadata service.

   JWS Truststore
   The name of the truststore used to verify the signature of the metadata blob that is downloaded from the metadata service. If not specified the truststore that is configured in the Truststore property is used.

   Truststore
   The name of the trust store to use. If not specified and an HTTPS connection is specified, the truststore that is configured in the HTTPClientV2 advanced configuration is used. See Advanced configuration properties.

   The truststore that is specified has the following purposes:

   a. The truststore is used to set up the SSL connection with the metadata service.
   b. If the JWS Truststore is not set, the truststore must contain the certificate that is used to verify the signature of the metadata blob that is downloaded from the metadata service.

   Protocol
   The SSL protocol to use for the HTTP connection. Valid values are TLS, TLSv1, TLSv1.1, and TLSv1.2. If not specified, the protocol that is configured in the HTTPClientV2 advanced configuration is used. See Advanced configuration properties.

   Timeout
   Specifies the request timeout (seconds). A value of 0 results in no timeout. If not specified, the connect timeout that is configured in the HTTPClientV2 advanced configuration is used. See Advanced configuration properties.

   Show advanced request options
   Click **Next** or select the **Request Overrides** tab to reveal more optional configuration items.

   Username
   Specifies the basic authentication username. If not specified, basic authentication is not used. If the username is specified, provide the password.

   Password
   Specifies the basic authentication password. If not specified, basic authentication is not used. If the password is specified, provide the username.

   Keystore
   Specifies the client keystore. If not specified, client certificate authentication is not used. If the keystore is specified, provide the certificate.

   Certificate
   Specifies the client key alias. If not specified, client certificate authentication is not used. If the certificate is specified, provide the keystore.

   Proxy
   The URL of the proxy server that is used to connect to the metadata service (including the protocol).

HTTP Request Headers
Click **Add** to add HTTP headers to the HTTP request.

6. Click **Save** to save the configuration.

Deleting a metadata service

Delete a metadata service.

Procedure

1. Log in to the local management interface.
2. Click **AAC** > **FIDO2 Configuration** > **Metadata**.
   Under **Metadata Services** is a list of existing metadata services.
3. Select the metadata service to delete.
4. Click **Delete**.

Limitations

Registration of authenticators with the SCIM API is not supported.

Registrations can only be performed by using the attestation endpoint or a registration mechanism. See “FIDO2 Server Endpoints” on page 195.

FIDO2 auditing is not supported by the previous version of IBM Security Verify Access.

Chapter 13. Access control policies

An access control policy is a set of conditions that, after they have been evaluated, determine access decisions.

Defining a custom application for policy attachments

There are two types of Access Control Resources, Reverse Proxy or Application.

A Reverse Proxy resource defines a server instance with a protected object space, and a specific resource in that protected object space. An application resource describes an application server and resource that you would like to protect that is not in a Reverse Proxy object space.

Ensure that the application ID is unique. The application ID is case-sensitive; for example "`ClaimApplication`" and "`claimapplication`" are considered to be unique names.

Note: Avoid control characters, leading and trailing blanks, and special characters such as ! @ # $ % ^ & * [ ] ; , < >

Application IDs and resources are used as either URL paths or URI scheme names and therefore must consist of a sequence of any combination of lowercase letters, numbers, or any of the following special characters: plus ("+"), period ("."), or hyphen ("-").

If a URL path is used, the ID must begin with a forward slash ("/"). If a URI scheme name is used, the ID must being with a lowercase letter.

For an application resource with an Application ID `/myapp` and Resource ID `/myresource`, the corresponding XACML JSON would be:

```
{
    "Request": {
        "Action": {
            "Attribute": [
                {
                    "AttributeId": "urn:oasis:names:tc:xacml:1.0:action:action-id",
                    "DataType": "string", "Value": "GET"
                }
            ]
        },
        "Resource": {
            "Attribute": [
                {
                    "AttributeId": "urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                    "DataType": "string", "Value": "/myresource"
                }
            ]
        },
        "Environment": {
            "Attribute": [
                {
                    "AttributeId": "ApplicationId", "DataType": "string", "Value":
                    "/myapp", "Issuer": "http://security.tivoli.ibm.com/policy/distribution",
                }
            ]
        }
    }
}
```

Invoking the RTSS XACML engine

The RTSS XACML engine can be invoked directly to retrieve policy decisions.

Both Reverse Proxy or Application resources can be used in an RTSS request. A JSON endpoint that roughly adheres to the XACML JSON specification can be accessed via:

```
https://{runtime_hostname}/rtss/rest/authz/json
```

To determine which policy to evaluate, the engine will lookup configured policy attachments via a policy key. The key corresponds to the concatenation of the resource server and `resourceUri`. For example,a policy attachment with server `isam.ibm.com-default` and `resourceURI /protected` will be referenced by the key `isam.ibm.com-default/protected`. This key is required when sending the JSON request.

The engine will attempt to find the policy key via the `Request.Environment` attributes `ContextId` or `ApplicationId`, and if neither are set then the `Request.Resource` `resource-id` attribute will be used.

ContextId JSON example

The `ContextId` attribute must contain the full policy key, that is the server and the `resourceUri`.

For a reverse proxy resource with the server `isam.ibm.com-default` and `resourceUri /protected`, the corresponding XACML JSON request would be:

```
{
    "Request": {
        "Action": {
            "Attribute": [
                {
                    "AttributeId": "urn:oasis:names:tc:xacml:1.0:action:action-id",
                    "DataType": "string", "Value": "GET"
                }
            ]
        },
        "Resource": {
            "Attribute": [
                {
                    "AttributeId": "urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                    "DataType": "string", "Value": "/protected"
                }
            ]
        },
        "Environment": {
            "Attribute": [
                {
                    "AttributeId": "ContextId", "DataType": "string", "Value":
                    "/WebSEAL/isam.ibm.com-default/protected", "Issuer":
                    "http://security.tivoli.ibm.com/policy/distribution",
                }
            ]
        }
    }
}
```

If the policy attached to isam.ibm.com-default/protected results in a Permit decision, the XACML JSON response would be:

```
{
    "Response": [
        {
            "Status": {
                "StatusCode": {
                    "Value":"urn:oasis:names:tc:xacml:1.0:status:ok"
                }
            },
            "Decision":"Permit"
        }
    ]
}
```

ApplicationId JSON example

The `ApplicationId` attribute must only contain the server part of the full policy key. The `resourceUri` is then retrieved from the `Request.Resource resource-id` attribute and concatenated on the `ApplicationId`.

For an application resource with an Application ID `/myapp` and two resources, `/myresource1` and `/myresource2`, two policy keys would be generated, `/myapp/myresource1` and `/myapp/myresource2`.

This allows two separate policies to be evaluated within the one JSON request.

The corresponding XACML JSON would be:

```
{
    "Request": {
        "Action": {
            "Attribute": [
                {
                    "AttributeId": "urn:oasis:names:tc:xacml:1.0:action:action-id",
                    "DataType": "string", "Value": "GET"
                }
            ]
        },
        "Resource": [
            {
                "Attribute": [
                    {
                        "AttributeId": "urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                        "DataType": "string", "Value": "/myresource1"
                    }
                ]
            },
            {
                "Attribute": [
                    {
                        "AttributeId": "urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                        "DataType": "string", "Value": "/myresource2"
                    }
                ]
            }
        ],
        "Environment": {
            "Attribute": [
                {
                    "AttributeId": "ApplicationId", "DataType": "string",
                    "Value": "/myapp", "Issuer":
                    "http://security.tivoli.ibm.com/policy/distribution",
                }
            ]
        }
    }
}
```

If the policy attached to `/myapp/myresouce1` results in a Permit decision and the policy attached to `/myapp/myresouce2` results in a Deny decision, the XACML JSON response would be:

```
{
    "Response": [
        {
            "Status": {
                "StatusCode": {
                    "Value":"urn:oasis:names:tc:xacml:1.0:status:ok"
                }
            },
            "Attribute": [
                {
                    "AttributeId":"urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                    "Value":"\/myresource1"
                }
            ],
            "Decision":"Permit"
        },
        {
            "Status": {
                "StatusCode": {
```

```
                    "Value":"urn:oasis:names:tc:xacml:1.0:status:ok"
                }
            },
            "Attribute": [
                {
                    "AttributeId":"urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                    "Value":"\/myresource2"
                }
            ],
            "Decision":"Deny"
        }
    ]
}
```

resource-id JSON example

When neither the `ContextId` or `ApplicationId` attributes are set, the `Request.Resource resource-id` attribute is used as the policy key.

This allows two separate policies to be evaluated within the one JSON request.

The corresponding XACML JSON would be:

```
{
    "Request": {
        "Action": {
            "Attribute": [
                {
                    "AttributeId": "urn:oasis:names:tc:xacml:1.0:action:action-id",
                    "DataType": "string", "Value": "GET"
                }
            ]
        },
        "Resource": [
            {
                "Attribute": [
                    {
                        "AttributeId": "urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                        "DataType": "string", "Value": "/WebSEAL/isam.ibm.com-default/
protected"
                    }
                ]
            },
            {
                "Attribute": [
                    {
                        "AttributeId": "urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                        "DataType": "string", "Value": "/myapp/myresource1"
                    }
                ]
            }
        ],
        "Environment": {
            "Attribute": [
            ]
        }
    }
}
```

If the policy attached to `isam.ibm.com-default/protected` results in a Permit with Obligation decision and the policy attached to `/myapp/myresouce1` results in a NotApplicable decision, the XACML JSON response would be:

```
{
    "Response": [
        {
            "Status": {
                "StatusCode": {
                    "Value":"urn:oasis:names:tc:xacml:1.0:status:ok"
                }
            },
            "Obligations": [
                {
                    "Id":"ObligationId"
                }
            ],
```

```
            "Attribute": [
                {
                    "AttributeId":"urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                    "Value":"/WebSEAL/isam.ibm.com-default/protected"
                }
            ],
            "Decision":"Permit"
        },
        {
            "Status": {
                "StatusCode": {
                    "Value":"urn:oasis:names:tc:xacml:1.0:status:ok"
                }
            },
            "Attribute": [
                {
                    "AttributeId":"urn:oasis:names:tc:xacml:1.0:resource:resource-id",
                    "Value":"\/myapp\/myresource1"
                }
            ],
            "Decision":"NotApplicable"
        }
    ]
}
```

Chapter 14. Defining a custom domain for policy attachments

The administrator can specify a custom domain to separate metadata in a registry. For example, your company might possess metadata that belongs to several companies, and it is a security demand that the data does not overlap.

About this task

The policy attachment credential automatically selects the default management domain in all supported versions of IBM Tivoli® Access Manager when you integrate it with the IBM Security Verify Access local management interface. You must choose one domain to use for policy attachments.

Procedure

1. Log in to the local management interface.
2. Specify the Tivoli Access Manager administrator credentials when you create a new reverse proxy instance:
   a. Select **Web** > **Manage** > **Reverse Proxy**> **New**.
   b. Select the **IBM Security Verify Access** tab.
   c. Specify the following administrator credentials. These credentials must be the same as the ones that you use to attach a policy to a domain other than the default.
      - **Administrator Name**
      - **Administrator Password**
      - **Domain**

   Note: You can choose to specify a custom secure domain in the **IBM Security Verify Access** tab. However, if you choose not to specify a domain, the domain field defers to the default.
3. Select **AAC** >**Policy**> **Access Control** > **Resources**.
4. Click .
5. Enter the information that you specified in “2.c” on page 219 at **Policy Server Login**.

What to do next

You can reset the credentials that you just defined with the **`setCredential`** parameter under the following conditions:

- You upgrade to IBM Security Verify Access, version 8.0.0.4 or later.
- You want to manage a domain name other than the default.

Before you reset the **`setCredential`** parameter, remove all current resources and their corresponding policy attachments. For more information about this command, go to the REST API documentation and select **Policy Attachments** > **Resources** > **Authenticate with Security Verify Access**.

Chapter 15. Deploying pending changes

Some configuration and administration changes require an extra deployment step.

About this task

When you use the graphical user interface on the appliance to specify changes, some configuration and administration tasks take effect immediately. Other tasks require a deployment step to take effect. For these tasks, the appliance gives you a choice of deploying immediately or deploying later. When you must make multiple changes, you can wait until all changes are complete, and then deploy all of them at one time.

When a deployment step is required, the user interface presents a message that says that there is an undeployed change. The number of pending changes is displayed in the message, and increments for each change you make.

Note: If any of the changes require the runtime server to be restarted, the restart occurs automatically when you select **Deploy**. The runtime server will then be unavailable for a period of time until the restart completes.

Procedure

1. When you finish making configuration changes, select **Click here to review the changes or apply them to the system**.

   The **Deploy Pending Changes** window is displayed.
2. Select one of the following options:

Option	Description
Cancel	Do not deploy the changes now. Retain the undeployed configuration changes. The appliance user interface returns to the previous panel.
Roll Back	Abandon configuration changes. A message is displayed, stating that the pending changes were reverted. The appliance user interface returns to the previous panel.
Deploy	Deploy all configuration changes. When you select **Deploy**, a system message is displayed, stating that the changes were deployed. If any of the changes require the runtime server to be restarted, the restart occurs automatically when you select **Deploy**. The runtime server will then be unavailable for a period of time until the restart completes.

Chapter 16. Options for handling session failover events

Advanced Access Control offers several solutions to the challenge of providing sharing of session state across multiple servers in a clustered environment.

The following sections describe the options available for handling failover events in clustered environments:

- No handling of failover events
- The Distributed Session Cache

Option 1: No handling of failover events

Failover events are rare when WebSEAL or Web Reverse Proxy instance is configured to maintain session affinity in a stateful junction to Advanced Access Control.

This scenario is applicable in the case of using the **isamcfg** tool to configure the junction.

When failover events do occur, session state is lost and clients might be required to restart their current transaction.

This option is configured by default. However, there is a risk of a poor user experience when:

- The server containing Advanced Access Control becomes unavailable
- The WebSEAL or Web Reverse Proxy cannot maintain session affinity

Option 2: The distributed session cache

The distributed session cache (DSC) can be used for session storage by all Security Verify Access appliances in a cluster.

When a fail over event occurs, Security Verify Access appliance retrieves the session data of the user from the DSC. It therefore maintains the existing session state.

Within Security Verify Access, the DSC is part of the cluster configuration. For more information about turning on or turning off this feature, see the Distributed Session Cache section in Advanced configuration properties and Managing Distributed Session Cache.

Chapter 17. Branching Authentication Policies

The ability to complete different mechanisms based on custom conditions is necessary to complete complex scenarios. With the addition of decisions and branches in AAC Authentication Policies, it is now easier to implement these scenarios.

To add a branching workflow to a policy, a Decision can be added to the policy workflow steps. The Decision contains references to:

- A mapping rule
- An optional template page
- A list of branches

When a Decision is reached in the runtime policy flow, the following occurs:

- The decision mapping rule is run.
- If the mapping rule returns false, a template page is returned to the user for input.
- If the mapping rule returns true, the state is checked for a decision and the corresponding branch is entered.

Once each step in the branch has been completed, the policy completes or continues to the next common step.

A Decision can contain one or more branches and each branch can contain one or more steps.

The template page configuration is optional to enable scenarios where the decision should not be presented to the end user, but instead based off data available to the mapping rule.

There are no limitations on the number of decisions in a policy, or whether they can be proceeded or followed by normal steps. The only limitation is that a decision cannot be nested within another decision.

Scenarios

Various scenarios are provided as examples that are ready for immediate use. Policies for these scenarios can be configured by using a Wizard on the new Scenarios screen. It is available at **AAC** > **Authentication** > **Scenarios**.

Five potential scenarios can be configured. The wizard prompts for the information that is needed to generate each policy.

Generic Decision Policy

Prompts the user to choose from a generic list of branches based on the branch name.

Example **Branching_Generic** mapping rule includes:

```
BranchingHelper.js
state.put("decision", branch);
```

Note: Overwrites @BRANCHES@ macro

Second Factor Authentication Policy

Prompts the user to choose a second factor method to complete. The list of available second factor methods is based on their enrollments.

Example **Branching_SecondFactor** mapping rule includes:

```
BranchingHelper.js
state.put("decision", branch);
```

Username-less Login Policy

Prompts the user to complete QR Code Login by initially sending them to the QR Code branch with no input. On the **QR Code Login** page, the user can choose to perform FIDO2/WebAuthn username-less or standard username and password authentication instead.

Example **Branching_Usernameless** mapping rule includes:

```
BranchingHelper.js
state.put("decision", branch);
state.get("wasReset");
state.put("operation", "verify");
```

MMFA with TOTP Fallback Policy

Similar to Username-less, the user is not offered a choice and is initially prompted to complete Mobile Multi-Factor authentication. While on the MMFA pending page, the user can choose to perform TOTP authentication instead. This policy supports the scenario where a user might not have internet connectivity on their device.

Example **Branching_MMFAWithTOTP** mapping rule includes:

```
BranchingHelper.js
state.put("decision", branch);
state.get("wasReset");
```

FIDO2 PAIR Policy

The pattern that is configured by this scenario is the solicited enrollment and then productive use of the FIDO2 capable UVPA (User Verifying Platform Authenticator) in browser-based scenarios. Similar to Username-less, the user is not initially offered a choice and is prompted to complete a traditional username and password authentication. After authentication, the policy detects whether the browser and device in use can enroll the UVPA. For example, TouchID or Windows Hello. If UVPA is available on the device, the user is prompted to perform FIDO2 registration. On subsequent authentication flows the policy detects that the user previously enrolled through this policy, and offer to authenticate them with FIDO2 in place of username and password authentication.

Example **FIDO2PAIR_Authn_Decision** and **FIDO2PAIR_Reg_Decision** mapping rules include:

```
BranchingHelper.js
state.put("skipDecision","true");
state.put("decision",branch);
```

Identifier First Authentication (IFA) Policy

This scenario initially prompts the user only for their username. The decision mapping rule then examines the authentication methods set by the administrator in the scenario wizard, and the methods that the user has enrolled, to display a choice to the user. If enrolled, the user can choose between FIDO2/WebAuthn authentication, MMFA authentication, or standard username/password authentication. Alternatively, the username can be checked against a regular expression and redirected to a configured URL.

After successful authentication, attributes of the registration used to perform authentication are added to the user's credential by the **IFA Credential Complete** InfoMap mechanism.

If configured, the user can then be prompted to complete the registration step of the FIDO2 PAIR policy. The **IFA_Prep_FIDO2_PAIR** mapping rule contains the logic that determines if the user is prompted. The registration prompt will only trigger if the following conditions are met:

1. The user did not complete FIDO2/WebAuthn authentication with a platform authenticator
2. The user has not previously chosen to always skip FIDO2 PAIR
3. The user has not previously completed FIDO2 PAIR in the current browser
4. The browser has reported that there is a user-verifying platform authenticator available

Example **Branching_IdentiferFirstAuth** mapping rule includes:

```
BranchingHelper.js
state.put("skipDecision", "true");
state.put("decision", branch);
```

Decision

The underlying implementation of the Decision is achieved through an Authentication Mechanism that is similar to the InfoMap mechanism, **Decision JavaScript**.

However the mapping rule and template configuration is not associated with the mechanism, but rather at the policy level. Another differentiator is that the **Decision JavaScript** mechanism cannot be added as a Step in the policy workflow.

In the policy workflow configuration screen, the Mapping Rule field is a drop-down that is populated with mapping rules in the new category Decision. Several out-of-the-box mapping rules exist in the new category.

Completing a Decision

To complete a decision, set the `decision` attribute in the mapping rule state variable to the name of the branch that has been chosen.

```
state.put("decision", "BranchName");
```

Example:

A decision has been configured with one branch named TOTP Branch which contains one step TOTP One-time Password.

Mapping rule:

```
importClass(Packages.com.tivoli.am.fim.trustserver.sts.utilities.IDMappingE
xtUtils);
importPackage(Packages.com.ibm.security.access.user);
importMappingRule("BranchingHelper");
// checkLogin and getLocale are methods from BranchingHelper

var username = checkLogin();
var totpEnrolled = MechanismRegistrationHelper.isTotpEnrolled(username,
getLocale());
if(totpEnrolled) {
    // TOTP is enrolled, set the decision to the
    // TOTP branch name
    state.put("decision", "TOTP Branch");
} else {
    // Since we have decided this is optional step up,
    // set skip decision
    state.put("skipDecision", "true");
}
result = true;
success.setValue(result);
```

Note: A decision can be skipped entirely with the “skipDecision” state variable. This action should always be server controlled, and never based off user input. The policy continues as if the decision was completed successfully.

Returning to the Decision

The policy flow can be returned to the Decision if “Allow return to decision” is configured on the policy. This enables backward progression through the policy based off user input. To trigger the return during runtime policy flow, use the operation `returnToDecision`.

```
POST/PUT
{"operation": "returnToDecision"
}
```

This operation only takes effect if “Allow return to decision” is true, and the currently running mechanism is in a branch.

If all the steps within a branch have been completed, the decision is considered to be completed and the policy flow can not return to the decision point.

The mapping rule state variable `wasReset` is populated after `returnToDecision` is performed. The variable can be fetched with `state.get("wasReset")`.

Example:

A decision was configured with two branches, **FIDO2 Branch** and **Username Password Branch**. The FIDO2 Branch contains one step, **FIDO2 WebAuthn Authenticator**. The Username Password branch contains one step, **Username Password**.

Mapping Rule:

```
importClass(Packages.com.tivoli.am.fim.trustserver.sts.utilities.IDMappingE
xtUtils);
importPackage(Packages.com.ibm.security.access.user);

// Has the flow returned to this decision from a branch?
var decisionWasReturned = state.get("wasReset");
if(decisionWasReturned) {
    // User has chosen to fallback to
    // username/password
    state.put("decision", "Username Password Branch");
} else {
    // Make user try FIDO2 first
    state.put("decision", "FIDO2 Branch");
}
result = true;
success.setValue(result);
```

HTML page:

```
...

<form id="operationForm" method="POST" action="@ACTION@">
             <input type="hidden" name="operation"
value="returnToDecision">
</form>

...
```

Branches

The layout of the branches is made available at runtime in the following format:

```
[{
  "name": "TOTP Branch",
  "steps": [
    {
      "id": "step1",
      "mechanism":
"urn:ibm:security:authentication:asf:mechanism:totp"
    }
  ]
},
{
  "name": "MMFA Branch with EULA",
  "steps": [
    {
      "id": "step1",
      "mechanism":
"urn:ibm:security:authentication:asf:mechanism:mmfa"
    },
    {
      "id": "step2",
      "mechanism":
"urn:ibm:security:authentication:asf:mechanism:eula"
    }
  ]
}]
```

Two macros are populated with this data: `@BRANCHES@` and `[RPT branches]`:

@BRANCHES@
Populated with the Stringified JSON representation of the branches

[RPT branches]
Populated with the multi-valued macro map representation

The Stringified representation should be used in HTML templates and mapping rules.

HTML template usage
```
var branchesMacro ="@BRANCHES@";
```

Mapping rule usage
```
macros.get("@BRANCHES@");
```

The multi-valued macro map representation should be used in JSON templates.

Structured JSON template usage:

```
"branches": [
    [RPT branches]
    {
        "name": "@BRANCH_NAME@",
        "steps": [
            [RPT steps]
            {
                "id": "@STEP_ID@",
                "mechanism": "@STEP_URI@"
            }
            [ERPT steps]
         ]
     }
     [ERPT branches]
]
```

Compact JSON template page:

```
"branches": [[RPT branches] {"name": "@BRANCH_NAME@",
"steps": [[RPT steps] {"id": "@STEP_ID@", "mechanism":
"@STEP_URI@"} [ERPT steps]] } [ERPT branches]]
```

Note: The steps macro `[RPT steps]` is also populated for use by `[RPT branches]`.

RPT and ERPT denote the start and end of the object that is repeated. The surrounding square brackets should not be confused with these tags, as they are the JSON syntax for the arrays.

Steps

The steps within a branch can be any of the available authentication mechanisms.

Macros
While a step is running within a branch, the following macros are universally available:

@IN_BRANCH@
The name of the currently running branch.

@RETURN_ENABLED@
A flag indicating whether “Allow return to decision” is enabled on the decision.

Operation Skipping
When most authentication mechanisms are started, the mechanism first performs initialization before returning to the user for input. The input is then returned to the mechanism for processing with the `operation` field set to `verify`.

In the decision mapping rule, the operation of the first step in the chosen branch can be overwritten in the state variable.

```
state.put("operation": "verify");
```

This is useful for the case where the decision is intelligent enough to have already collected the information that the mechanism requires. The out-of-the-box Username-less Login Policy makes use of this functionality.

When the user is prompted to complete QR Login, they can choose to perform Username Password Authentication instead. The QR Login page is able to collect the username and password input from the user before returning to the authentication service, and to the decision mapping rule. The decision mapping rule then sets `operation` to `verify` to indicate to the first mechanism in the branch (**Username Password**) that it should attempt the verification step after initialization, instead of returning to the user for input.

Note: Overriding the operation may result in different outcomes based on the specific mechanism that is being run.

Chapter 18. Global settings

You can use the LMI to access an administrative menu to configure global settings that are used by both Federation and Advanced Access Control.

The Local Management Interface (LMI) has a user interface page for administering each major feature in IBM Security Verify Access. Since some features are used by multiple licensing levels for the product, the administration page for these features can be accessed through multiple user interface menu paths.

You can use either of the following LMI menus to access the global settings:

- **AAC** > **Global Settings**
- **Federation** > **Global Settings**

You can use the global settings menus to configure the following features:

- Advanced Configuration

  Some of the advanced configuration properties are common to Advanced Access Control and Federation. Others are specific to one of the licensing levels.
- User Registry

  Use these settings to administer users and group memberships for the user registry that is used by the runtime applications. Management tasks are common to Advanced Access Control and Federation.
- Runtime Parameters

  You can use the Runtime Parameters menu to view runtime status, tune runtime parameters, and set tracing on the runtime. These functions are common to Advanced Access Control and to Federation.

  In addition, the runtime tracing feature can be set in the LMI through **Monitor > Logs > Runtime Tracing > .**.

  The topic for Runtime Parameters is also included in the appliance troubleshooting section of the IBM Knowledge Center. See Tuning runtime application parameters and tracing specifications
- Template Files

  Template files are HTML pages that are presented to your users. You can customize the content of the pages for your deployment by setting supported macros, or by adding JavaScript scripting. Template pages are used in multiple scenarios.

  – Customizing the authentication process, such as error messages
  – Specifying settings for the supported authentication mechanisms
  – Customizing error messages for authentication attempts
  – Obtaining consent for registering devices
  – Specifying authorization parameters for OAuth 2.0
  – Configuring user self-care tasks
- Mapping Rules

  Mapping rules are JavaScript code that runs during the authentication flow for Advanced Access Control and Federation. Mapping rules can be used for multiple purposes. For Advanced Access Control, you can modify rules for the Authentication Service, OTP, and OAuth 2.0. For Federation, you can modify mapping rules to manage identities for OIDC and SAML 2.0.
- Distributed Session Cache

  The Distributed Session Cache is supplied by the Web Reverse Proxy and is used with all activation levels. The management windows in the LMI can also be accessed through **Web** > **Manage** > **Distributed Session Cache**.

For an overview of the Distributed Session Cache, and a review of advanced configuration options, see: Distributed Session Cache.

- Server Connections

  Advanced Access Control and Federations both use the IBM Security Verify Access appliance to connect to external data sources. For Advanced Access Control, you can use the server connections menus to configure LDAP or database server connections so that you can set up policy information points. For Federation, you can configure an LDAP server as an attribute source for attribute mapping.

- Point of Contact

  IBM Security Verify Access provides servers, such as WebSEAL, that function as point of contact servers for handling external requests for authentication and authorization. You can configure a point of contact profile to specify the information that is needed for the runtime to communicate with a specific point of contact server. Security Verify Access provides three Point of Contact profiles that are ready for use. You can specify callback parameters and values for these profiles.

- Access Policies

  You can use access policies to perform step-up and re-authentication during a single sign-on flow based on contextual information. Access policies can be enforced at a federation or at API Protection for OAuth and OpenID Connect.

Note: The LMI mega-menu for the **Web** licensing level also presents a set of tasks under a **Global Settings** heading. These tasks are different from the tasks under the **Global Settings** menu for **AAC** and **Federation**. The **Web > Global Settings** LMI menus are not used with **AAC** and **Federation** .

Managing advanced configuration

Adjust configuration settings in supported configuration files.

About this task

The advanced configuration includes both properties and files. The properties configuration panel displays a table of configuration settings. Some can be modified and some are read-only. Each setting is displayed as a row in the table. The name of the setting is listed in the *key* column. The current value of the key is listed in the *value* column. You can locate a setting by using one of the following methods:

- Scroll through the list until you see the setting.

  By default, all configuration settings are included in the list.

- Filter the list by entering a string in the **Filter** field.

  When you enter a string, the list is modified to show only the settings that contain the specified string.

- Filter the list by selecting a category from the **Filter by Category** menu.

For descriptions of the categories and properties, see “Advanced configuration properties” on page 233.

Procedure

1. Select the menu entry for your licensing level:
   - If using an Advanced Access Control license, select **AAC** > **Global Settings** > **Advanced Configuration**.
   - If using a Federation license, select **Federation** > **Global Settings** > **Advanced Configuration**
2. To edit a property key, select the edit icon for the key.

   Note: You cannot edit keys that are marked with the read-only icon: .

   When you choose to edit a key, a new window displays the name of the key and the current value.

   a) Edit the value of your deployment.

b) Click **OK**.

3. To manage an advanced configuration file click the Files link in the page header and click the required file in the table.
   a) To edit the file click the **Edit** button to make the required changes. Click **Save**.
   b) To replace the existing file click the **Import** button in the Manage drop down, select the new file in the dialog and click Import.
   c) To export the existing file click the **Export** button in the Manage drop down.
4. Click **OK**.
5. Deploy the changes.

Advanced configuration properties

Modify the advanced configurations for Advanced Access Control or Federation to meet the requirements of your organization.

Category filter

The category filter displays names of grouping of configuration settings. The groupings correspond to functional areas. When you select a category, the user interface displays only the settings for the category.

Table 21. Filter by Category

Category	**Displays values for:**
All	All keys
poc.websealAuth	“WebSEAL Authenticate Callback” on page 234
poc.websealSignout	“WebSEAL Signout Callback” on page 234
poc.otpAuth	“One-time password Authenticate Callback” on page 235
poc.authPolicy	“Authentication-Policy Callback” on page 235
sps.httpRequestClaims	“SPS HTTP request claims” on page 235
distributedMap	“Distributed shared data storage” on page 236
userBehavior	“Attribute matcher properties” on page 236
ipReputation	“IP reputation PIP properties” on page 237
attributeCollection	“Attribute collector properties” on page 237
deviceRegistration	“Device registration properties” on page 238
runtime	“Runtime properties” on page 239
sps.page	“SPS page” on page 241
sps	“Single sign-on protocol service” on page 240
riskEngine	“Risk engine properties” on page 242
sps.authService	“Authentication service properties” on page 242
authsvc.stateMgmt	“Authentication service session store properties” on page 244
session	“Session” on page 245
distributedSessionCache	“Distributed session cache” on page 245
otp.retry	“TOTP and HOTP retry properties” on page 246

Table 21. Filter by Category (continued)	
Category	**Displays values for:**
oauth20	“OAuth20” on page 246
util.httpClient	“HTTP client” on page 249
util.httpClient v2	“HTTP Client version 2” on page 250
demo	“Demo” on page 255
knowledge.questions	“Knowledge questions properties” on page 255
kess	“Key encryption and signing service (KESS)” on page 255
jwks	“JSON Web Key” on page 257
pip	“Policy information point (PIP)” on page 257
sts	“Security token service (STS)” on page 257
mmfa	Mobile Multi-Factor Authentication (MMFA)
wsfed	“WS-Federation” on page 260
saml20	“SAML 2.0” on page 261
demo	“Demo” on page 255
saml11	“SAML 1.1” on page 260
oidc	“OIDC” on page 262
js	“Rhino Javascript Engine” on page 262
basicLdapUser	“Basic LDAP User” on page 262
consentDeviceRegistration	“Consent Device Registration” on page 263
fido2	“FIDO2” on page 263
httpSession	“HTTP Session” on page 263
infomap	“Info Map” on page 263
poc.webseal.poc	“WebSEAL POC” on page 264
username	“Username” on page 264

WebSEAL Authenticate Callback

`poc.websealAuth.authLevel`
The authentication level of the callback.

Data type: Integer

Example: 1

WebSEAL Signout Callback

`poc.websealSignout.terminate`
When `forceauth=true` is specified, `poc.websealSignout.terminate` determines which mechanism is used to force an authentication interaction in WebSEAL. A value of `true` (default) means use `eai-server-task` terminate session which will logout of WebSEAL. User will be prompted to login. The original WebSEAL session is destroyed (including any managed cookies).

A value of `false` means use `eai-server-task force-reauthenticate` session which will result in user being prompted to re-authenticate to WebSEAL. The original WebSEAL session including managed cookies are preserved on re-authentication.

Data type: Boolean

Example: `true`

One-time password Authenticate Callback

`poc.otp.authLevel`
The authentication level of the callback.

Data type: Integer

Example: 2

`poc.otp.backwardCompatibilityEnabled`
Indicates whether the one-time password authentication mechanism should run in backward compatibility mode. The default value is `false` if it is a new installation. The default value is `true` if the installation is an upgrade.

Data type: Boolean

Example: `true`

Authentication-Policy Callback

`poc.authPolicy.allowRequestOverride`
Whether the authentication level, the authentication mode, and the authentication type of the callback can be overwritten by query string parameters.

Data type: Boolean

Example: `true`

`poc.authPolicy.authLevel`
The authentication level of the callback.

Data type: Integer

Example: 1

`poc.authPolicy.authType`
The authentication type of the callback.

Data type: String

Example: `COMPLEMENTARY`, `HIERARCHICAL`

SPS HTTP request claims

`sps.httpRequestClaims.enabled`
Whether HTTP request information is sent to STS as `HTTPRequestClaims`. This flag additionally makes HTTP Request attributes (Headers, Cookies and Parameters) available to administrators in OIDC, OAuth, and SAML (see "HTTP Claims in OIDC, OAuth and SAML JavaScript Mapping Rules" on page 359), Authsvc and InfoMap (see "HTTP Claims in Authsvc and InfoMap JavaScript Mapping Rules" on page 360) and FIDO2 (see "HTTP Claims in FIDO2 Mediator JavaScript Mapping Rules" on page 360) JavaScript Mapping rules.

Data type: Boolean

Example:`false`

`sps.httpRequestClaims.filterSpec`
The filter that specifies the HTTP request information that is sent to STS as `HTTPRequestClaims`.

Data type: String

Example: `cookies=*:headers=*`

Distributed shared data storage

distributedMap.cleanupWait
The amount of time, in milliseconds, to wait before it performs another cleanup against the distributed map.

Distributed map clean up can be disabled by setting the `cleanupWait` to `0`.

Data type: Integer

Example: `10000`

distributedMap.defaultTTL
The amount of time, in seconds, that the entries in the distributed map must live when no lifetime is specified for an entry.

Data type: Integer

Example: `3600`

distributedMap.getRetryDelay
The amount of time, in milliseconds, to wait before it performs another retrieval against the distributed map. The default is `0`.

Data type: Integer

Example: `500`

distributedMap.getRetryLimit
The number of retrievals that is done against the distributed map before it returns that the retrieved data is not in the distributed map. The default is `0`.

Data type: Integer

Example: `10`

distributedMap.store
Specifies storage location for distributed shared data.

- `Redis`: stores the DMAP instance into Redis.
- HVDB: stores the DMAP instance into the HVDB.

You can configure the parameter for AAC or Federation in one of the following screens in the LMI:

- **AAC** > **Global Settings** > **State Persistence**
- **Federation** > **Global Settings** > **State Persistence**

Allowed Values: `Redis`, HVDB

Example: `Redis`

distributedMap.redisServerConnectionName
Specifies the Redis server connection to use for the runtime.

This parameter must be specified when the `distributedMap.store` is set to `Redis`. See “distributedMap.store” on page 236.

You can configure the parameter for AAC or Federation in one of the following screens in the LMI:

- **AAC** > **Global Settings** > **State Persistence**
- **Federation** > **Global Settings** > **State Persistence**

Attribute matcher properties

userBehavior.minimumUsageHistoryRequired
Minimum usage data records required for any usage data analysis; used by LoginTimeMatcher.

Data type: Integer

Example: 8

userBehavior.ipAddressRequestAttribute
The XACML request attribute to read from the IP address.

Data type: String

Example: `urn:ibm:security:subject:ipAddress`

IP reputation PIP properties

ip.reputation.ipAddressAdverseReputationThreshold
The value that an IP classification score must be at or above for an IP address to be considered as that classification.

Data type: Integer

Example:`50`

ipReputation.dbConnectionTimeout
Indicates the number of seconds that the IP reputation policy information point (PIP) waits for a connection to the IP reputation database. The `ipReputation.dbConnectionTimeout` property defaults to `120`.

Data type: Integer

Example: `60`

Attribute collector properties

attributeCollection.cookieName
Correlation ID used by the attribute collector.

Data type: String

Example: `ac.uuid`

attributeCollection.requestServer
Request server for attribute collector. A list of the allowable hosts where the ajaxRequest can be sent from.

Data type: String List

Example: `https://rbademo.example.com,https://rbaemo2.example.com`

attributeCollection.serviceLocation
Location of the attribute collector.

Data type: String List

Example: `http://rbademo.example.com/mga`

attributeCollection.sessionTimeout
Number of seconds in which sessions stored in context-based access will automatically expire, unless updated. If any attribute in the session is updated, the session expiry is extended by the specified number of seconds configured in this property. The default is `1800` seconds.

Data type: Integer

Example: `1800 seconds`

attributeCollection.enableGetAttributes
Enables the REST GET method to return attributes.

Data type: Boolean

Example: `false`

attributeCollection.getAttributesAllowedClients
A comma-separated list of clients that are allowed to access the ACS REST GET method.

If this property is not set and `attributeCollection.enableGetAttributes` is set to `true`, anyone can access the GET method. If this property is set but `attributeCollection.enableGetAttributes` is set to `false`, this property is ignored.

Data type: String List

Example: `hostname1, hostname2`

attributeCollection.hashAlgorithm
The algorithm that is used to create the hash.

Data type: String

Example: SHA256

attributeCollection.attributesHashEnabled
A comma-separated list of attribute URI values configured for hashing.

Attention: Do not hash the following attributes:

- `ipAddress`
- `geoLocation`
- `accessTime`

Data type: String List

Example:

```
urn:ibm:security:environment:http:userAgent,
urn:ibm:security:environment:deviceFonts,
urn:ibm:security:environment:browserPlugins
```

attributeCollection.authenticationContextAttributes
A comma-separated list of attribute names to collect during an authentication service obligation. The maximum number of characters for this property is 200.

Data type: String List

Example: `authenticationLevel, http:host`

attributeCollection.hashedAuthenticationContextAttributes

A comma-separated list of attribute names to collect during an authentication service obligation. The attribute values that are collected are hashes of the real value. The maximum number of characters for this property is 200.

Data type: String List

Example: `authenticationLevel, http:host`

Device registration properties

deviceRegistration.allowIncompleteFingerprints
Specifies to allow the device registration obligation to store fingerprints where all the fingerprint attributes are not available on the session information.

Data type: Boolean

Example: `false`

deviceRegistration.checkForExpiredDevices
Determines whether registered devices are inactive or expired. If the `deviceRegistration.checkForExpiredDevices` property is set to `true`, the risk engine checks whether a device is inactive or expired. The `deviceRegistration.checkForExpiredDevices` property defaults to `false`, which means that users can use any of the devices that are registered.

Date type: Boolean

Example: `true`

deviceRegistration.cleanupThread.batchSize
Specifies if batch delete is enabled for expired devices and how many records are deleted per batch.

If the value is defined as `0` or is blank, batch delete is not enabled and all expired devices are deleted using one SLQ delete statement.

If the value is defined as an integer greater than `0`, batch delete is enabled. The number that you specify determines how many records are deleted in each batch. The batch delete continues until all of the expired devices are deleted. The batch process is useful for deleting a large quantity of expired devices.

Data type: Integer

Example: `1000` (Batch delete is enabled, with a batch size of 1000 records.)

deviceRegistration.deviceMatchThreshold
The risk score threshold where an existing fingerprint is considered to match the incoming device fingerprint.

Data type: Integer

Example: `20`

deviceRegistration.inactiveExpirationTime
Specifies the number of days that a device must be inactive for it to expire. The `deviceRegistration.inactiveExpirationTime` property defaults to `90`.

Date type: Integer

Example: `100`

deviceRegistration.maxRegisteredDevices
Maximum device fingerprint count. The default is `10`. Valid values are `1` to `100`.

Data type: Integer

Example: `10`

deviceRegistration.maxUsageDataPerUser
Maximum number of historical usage attribute records stored per user. The default is `200`. Valid values are `1` to `5000`.

Data type: Integer

Example: `1000`

deviceRegistration.permitOnIncompleteFingerprints
Specifies to permit access to the resource if the fingerprint collected by the device registration obligation does not include all fingerprint attributes.

Data type: Boolean

Example: `false`

Runtime properties

runtime.dbLoggingEnabled
Enables fine-grained logging for database SQL statements.

Data type: Boolean

Example: `false`

runtime.hashAlgorithm
The algorithm that is used for hashing. The supported algorithms are:

- SHA-1
- SHA-256
- SHA-384
- SHA-512

The `runtime.hashAlgorithm` property defaults to `SHA-256`.

Data type: String

Example: `SHA-256`

runtime.verificationHashAlgorithms
Defines the hashing algorithms that are used to verify a hashed value. The value is typically a comma separated list of hashing algorithms.

Data type: String

Example: `SHA-256, SHA-1`

Single sign-on protocol service

sps.setCookiesAsSecure
Determine whether to flag the cookies set by Security Verify Access as secure.

The default value is `false`.

Data type: Boolean

Example: `false`

sps.targetURLWhitelist

Specifies a list of allowed target URLs for SAML 2.0, OpenID Connect, and the authentication service. Use this property to prevent an attacker from redirecting a user to malicious target URLs.

The value of this advanced configuration property is a comma-separated string, where each string is a target URL in the form of a regular expression. The regular expression must not contain commas, and spaces between regular expressions are ignored.

- For SAML 2.0 SSO flows, you can specify a Target URL when you configure the initial URL in flows that are initiated by either the Identity Provider or the Service Provider. For more information, see SAML 2.0 profile initial URLs.
- For Open ID Connect flows, you can specify a Target URL when you configure the initial URL for Relying Party initiated single sign-on. For more information, see Relying Party SSO initiation endpoint.
- For the authentication service, you can specify a Target URL when you configure the authentication service trigger URL. For more information, see “Configuring authentication” on page 34.

The default value is “.*”.

Data type `String`

Example

```
(http|https)://www.app.ibm.com/.*, (http|https)://www.myidp.ibm.com/.*
```

sps.illegalUrlSubstrings
A comma-separated list of strings, the single sign-on service stops processing the request if the request URL query parameters contain any of the strings.

The default value is "".

Data type: String

Example:

```
"<script"
```

sps.doNotSendXFrameOptionsHeader
Specifies whether an X-Frame-Options header with value SAMEORIGIN must be returned from the SPS endpoints for browser based flows. When this property is set to `true`, no X-Frame-Options header is sent.

Note: The `sps.doNotSendXFrameOptionsHeader` property defaults to false.

Data type: Boolean

Example: False

SPS page

sps.page.htmlEscapedMacros
A comma-separated list of macros that is HTML-escaped when it is rendered in pages that are sent to the browser.

Data type: String

Example:

```
@REQ_ADDR@,
@DETAIL@,
@EXCEPTION_STACK@,
@EXCEPTION_MSG@,
@OTP_METHOD_ID@,
@OTP_METHOD_LABEL@,
@OTP_HINT@,
@ERROR_MESSAGE@,
@MAPPING_RULE_DATA@
```

sps.page.exceptionMacros
A comma-separated list of `classname:macro` pairs. `Classname` is the fully qualified name of the exception class. Macro is the name of the macro to which the class maps.

Data type: String

Example:

```
com.tivoli.am.fim.otp.deliveries.OTPDeliveryException:@OTP_DELIVERY_EXCEPTION@,
com.tivoli.am.fim.otp.providers.OTPProviderException:@OTP_PROVIDER_EXCEPTION@
```

sps.page.notEscapedMacros
A comma-separated list of macros that are **not** HTML-escaped when they are rendered in pages that are sent to the browser. Macros that do not appear in this list or the Macros in the **htmlEscapedMacros** list are HTML-escaped.

Data type: String

Example:

```

@COOKIE_NAME@,
@SERVER_NAME@,
@JUNCTION@
```

sps.page.hiddenMacros
A comma-separated list of macros that are not rendered in the pages that are sent to the browser. The default value is `@EXCEPTION_STACK@`.

Data type: String

Example: `@EXCEPTION_STACK@`

sps.page.allowedLocales
A comma separated list of locales, which are allowed to be returned when you are requesting a page or message. Each locale listed must be a valid locale identifier. For example, en, ja_JP, pt_BR, es, de.

The default value is all.

Data type: String

Example: en, de_DE, pt_BR, ja

sps.page.defaultLocale
The default locale to return if the requested locale identifier is not in the `sps.page.allowedLocales` list. This value must have a corresponding entry in the `sps.page.allowedLocales` list to be valid.

The default value is en.

Data type: String

Example: en

sps.page.strictLocaleMatching
A flag that controls whether the locale matching algorithm should be strict for matching the requested locale to the available template files/messages, as well as the allowed locales list.

When set to `true`, both the base language code (for example, en, pt) and the region code (for example, US, BR) must exactly match.

When set to `false`, an exact match of base language and region code is preferred, but if no exact match is found, an approximate match of only the base language code is accepted.

The default value is `false`.

Data type: Boolean

Example: `false`

sps.page.junctionMacro
Specifies the junction name used by the Advanced Access Control runtime.

The default value is `/mga`.

Data type: String

Example: `/jct/mga`, `/mga`

Risk engine properties

riskEngine.reportsEnabled
Enables the generation of risk calculation reports.

Data type: Boolean

Example: `false`

riskEngine.reportsMaxStored
Specifies the maximum number of reports to store.

Data type: Integer

Example: 5

riskEngine.useRoundingMethod
Specifies whether the generated risk percentage is rounded to the nearest whole number.

Default value: false

Data type: Boolean

Example: `true`

Authentication service properties

sps.authService.reauthenticationEnabled
Specifies that the authentication service performs authentication even if the user already has an authenticated session at the required authentication level.

Data type: Boolean

Example: `true`

sps.authService.policyKickoffMethod
Specifies whether the URLs `/sps/authsvc` and `/sps/apiauthsvc` can be invoked with the **policyId** query string parameter.

If set to `query`, the authentication service endpoints continue to accept **policyId** as a query or post parameter.

If set to `path`, authentication service endpoints are changed to:

- `/sps/apiauthsvc/policy/<shortPolicyId>`

- /sps/authsvc/policy/<shortPolicyId>

  Where <shortPolicyId> is the value that comes after the prefix urn:ibm:security:authentication:asf:

  When set to both, either the path or query parameter can be used to initiate an authentication service flow.

  By default, the value is set to path.

sps.authService.stateIdSource.authsvc
Specifies whether the URL /sps/authsvc can be invoked with the **StateId** query string parameter.

If set to **Body and Query**, the authentication service endpoint continues to accept StateId as a query or body parameter.

If set to **Body Only**, the authentication service endpoint only accepts the StateId as a body parameter (POST or PUT).

Data type: String

Default: Body and Query

Example: Body only

sps.authService.stateIdSource.apiauthsvc
Specifies whether the URL /sps/apiauthsvc can be invoked with the **StateId** query string parameter.

If set to **Body and Query**, the API authentication service endpoint continues to accept StateId as a query or body parameter.

If set to **Body Only**, the API authentication service endpoint only accepts the StateId as a body parameter (POST or PUT).

Data type: String

Default: Body and Query

Example: Body Only

sps.authService.password.pwdFailCountLDAPAttribute
Specify the LDAP attribute which is used to store the number of failed login attempts using the password attribute. If null and login failure persistent is enabled, the default secPwdFailures attribute is used.

Example: secPwdFailures

Default: null

sps.authService.password.lastLoginLDAPAttribute
Specify a LDAP attribute which is used to store the last successful login using the password attribute. If null the and password last use is enabled, the default secPwdLastUsed attribute is used.

Example: secPwdLastUsed

Default: null

sps.authService.reCAPTCHA.serviceLocation
Specifies the URL for the external reCAPTCHA service.

Default: https://www.google.com/recaptcha/api/siteverify

Data type: URL

Example: https://www.google.com/recaptcha/api/siteverify

Authentication service session store properties

authsvc.stateMgmt.cookieless
Enables the server side storage of session data for the authentication service. If enabled, this removes the need for the JSESSIONID cookie.

Data type: Boolean

Example: `true`

Default value: `true`

authsvc.stateMgmt.store
Specifies the storage type that is used by the Authentication service to cache user session data. The authentication service can be supported by the DSC, the DMap, or stored in Memory.

Note: For clustered environments, storage in Memory does not replicate between nodes.

Data type: String

Example: `Memory`

Default value: `DMap`

authsvc.stateMgmt.lifetime
Length of time in seconds that a session is cached for. Once this time period is exceeded, the user's session is removed from the session store. If this value is less than 0, the default lifetime of 3600 seconds (1 hour) is enforced for Memory, and 600 seconds (10 minutes) is enforced for DMap. This configuration option applies only to session stores supported by the DMap or Memory.

Data type: Integer

Example: 60 (1 minute)

Default value: `3600`

authsvc.stateMgmt.memory.maxSessions
Maximum number of user sessions to be cached at any point in time. If the number of sessions in the store exceeds this value, the oldest session is invalidated. This configuration option only applies to the Memory session store.

Data type: Integer

Example: `10000`

Default value: `1000`

authsvc.stateMgmt.memory.cleanupWait
Frequency (in seconds) that expired or excess sessions are removed from the session store. Setting this entry to -1 disables the cleanup thread. This configuration option only applies to the Memory session store.

Data type: Integer

Example: `30`

Default value: `120`

authsvc.stateMgmt.memory.cleanupThread.batchSize
Maximum number of expired sessions which are removed in a single cleanup operation. If the value is defined as 0 or is blank, batch delete is not enabled. All expired sessions are deleted by using one SQL delete statement. If the value is defined as an integer greater than 0, batch delete is enabled. The number that you specify determines how many sessions are deleted in each batch. The batch delete continues until all of the expired sessions are deleted. This configuration option only applies to sessions that are stored in Memory.

Data type: Integer

Example: `1000`

Default value: `0`

Session

`session.dbCleanupInterval`
Specifies the interval, in seconds, that the database cleanup thread runs to remove expired data in the runtime database. The default is `86400`. The minimum value for this property is `3600`. For more information, see Runtime database tuning parameters

Session database clean up can be disabled by setting the `dbCleanupInterval` to 0. This is not overridden by the minimum value.

Data type: Integer

Example: `90000`

`session.store`
Specifies the user session store.

Note: This configuration is dependent on `distributedSessionCache.enabled`.

You can configure the parameter for AAC or Federation in one of the following screens in the LMI:

- **AAC** > **Global Settings** > **State Persistence**
- **Federation** > **Global Settings** > **State Persistence**

Allowed values: `unset`, `In-Memory`, `DSC`, `DMap`

Example: `unset`

Distributed session cache

`distributedSessionCache.localCacheSize`
The number of sessions to be stored on the client as a local cache. A value of 0 or less means that any number of sessions can be cached by the client. A low number requires more connections to the distributed session cache if there are many active sessions. A high number runs the risk of running out of memory if many sessions are locally cached. All sessions are still stored on the distributed session cache when it is enabled.

Data type: Integer

Example: `4096`

`distributedSessionCache.externalServers`

A list of locations of the distributed session cache servers in weighted order.

Syntax:

```
<primary_address>:<port>[:<ssl>];<secondary_address>:<port>[:<ssl>],...
```

`<address>`

The IP address of the distributed session cache server. For example, 10.150.21.80.

`<port>`

The port for the distributed session cache. For example, 2126.

`<ssl>`

Whether SSL communication with the distributed session cache is required. The default value is false.

Data type: String

Example:

```
10.150.21.80:2126:true;10.150.21.81:2126:false,10.150.21.82:2126
```

distributedSessionCache.localCacheEnabled
A switch that dictates whether a local cache of distributed sessions is maintained. If this setting is disabled a higher load is placed on the distributed session cache server. The local cache should only be enabled if all requests from the same client is guaranteed to be sent to the same runtime server (otherwise known as stickiness). Session inconsistencies might occur if the local cache is enabled and stickiness is not maintained. All sessions are still stored in the distributed session cache when it is enabled.

Data type: Boolean

Example: False

distributedSessionCache.enabled

Note: This is a legacy configuration. It is recommended that this configuration be set to `false` and use session.store instead.

You can configure the parameter for AAC or Federation in one of the following screens in the LMI:

- **AAC** > **Global Settings** > **State Persistence**
- **Federation** > **Global Settings** > **State Persistence**

A switch that dictates if the distributed session cache is used for session failover. If this setting is not enabled, the distributed session cache server still runs as a service, but the client does not use it.

Data type: Boolean

Example: `false`

TOTP and HOTP retry properties

otp.retry.enabled
Whether the retry protection is enabled.

Data type: Boolean

Example: `true`

otp.retry.maxNumberOfAttempts
The maximum number of strikes the users can have before they are prevented from logging in.

Data type: Integer

Example: 5

otp.retry.otpRetryTimeout
The number in seconds a strike lasts.

Data type: Integer

Example: `600`

OAuth20

oauth20.clientDataToInclude
Specifies the OAuth client information to be returned as JSON data. This property is a comma-separated list of the JSON Keys. Valid values are:

```
contact_type
email_address
contact_person
company_name
company_url
phone_number
other_info
```

You can specify one or more of these keys for this property.

Note: The `oauth20.clientDataToInclude` property defaults to `contact_type, email_address, contact_person, company_name, company_url, phone_number, other_info`.

Data type: String

Example: `contact_type, email_address, company_name`

oauth20.doNotSendXFrameOptionsHeader
Specifies whether an X-Frame-Options header with value `SAMEORIGIN` must be returned from the OAuth 2.0 endpoints. When set to `true`, no X-Frame-Options header is sent.

Note: The `oauth20.doNotSendXFrameOptionsHeader` property defaults to `false`.

Data type: Boolean

Example: `false`

oauth20.hashedTokenStorageEnabled
Enables hashed storage when set to `true`. The Security Verify Access appliance can persist OAuth 2.0 tokens in the clear text form or in the more secure hashed form.

The hashing algorithm set in the `runtime.hashAlgorithm` property will be used. When verifying hashed tokens, the `runtime.verificationHashAlgorithms` property will be used. The algorithms listed in the `runtime.verificationHashAlgorithms` property will be tried in the specified order. This mechanism allows for upgrading of the hashing algorithm while continuing to support old tokens.

Note: The `oauth20.hashedTokenStorageEnabled` property defaults to `false`, and the OAuth 2.0 tokens will be stored as-is.

Data type: Boolean

Example: `false`

oauth20.sessionEndpointEnabled
Enables the ability to return an authenticated session at the point-of-contact when the `oauth20.sessionEndpointEnabled` property is set to `true`.

Note: The `oauth20.sessionEndpointEnabled` property defaults to `false`.

Data type: Boolean

Example: `false`

oauth20.tokenCache.cleanupWait
The amount of time, in seconds, to wait before it performs another cleanup of expired tokens in the OAuth 2.0 token cache.

Note: The `oauth20.tokenCache.cleanupWait` property defaults to `120`.

OAuth token clean up can be disabled by setting the `cleanupWait` value to `0`.

Data type: Integer

Example: `120`

oauth20.legacyAttributeHandling
Changes how associated attributes function across the API Protection and OpenID Connect solution. This includes:

- `OauthMappingExtUtils.retrieveAllAssociations()` `OauthMappingExtUtils.getAssociation()` calls in mapping rules
  - When it is set to **True**, it does not return READONLY or SENSITIVE attributes.
  - When it is set to **False**, it returns READONLY or SENSITIVE attributes.
- The user self care endpoint `/mga/sps/mga/user/mgmt/grant/`
  - When it is set to **True**, attributes that are both READONLY and SENSITIVE are returned
  - When it is set to **False**, attributes that are both READONLY and SENSITIVE are not returned.

- Attributes which are saved from attribute sources when performing identity enrichment.
  - When it is set to **True**, attributes are saved against the grant as neither READONLY or SENSITIVE.
  - When it is set to **False**, attributes are saved against the grant as READONLY. The post token rule can be used to update this value if necessary.

oauth20.authorize.stateRequired
Specifies *state* as a required parameter in authorization code flow.

Data type: Boolean

Default: `true`

Note: For OIDC conformance, set to `false`.

oauth20.support.chunked.transfer.encoding
Specifies if Transfer-Encoding *chunked* is supported as a request header by */token* and */introspect* endpoint.

Data type: Boolean

Default: `false`

oauth20.backwardCompatibilityEnabled
Specifies whether the `redirect_uri` is read in the decoded format or raw format. When set to `true`, it is read in the decoded format.

Note: The `oauth20.backwardCompatibilityEnabled` property defaults to `false`.

Data type: Boolean

Example: `false`

oauth20.clientCacheLifetime
Length of time in seconds that a specific client instance is cached for. Once this time period is exceeded, the client instance is removed from the cache. Setting it to 0 will default it to 60 secs for dynamic clients.

Note: The `oauth20.clientCacheLifetime` property defaults to 5.

Data type: Integer

Example: `20`

oauth20.deviceFlow.slowDownThreshhold
Specifies the length in seconds of the slow down threshold of polling interval during Device Flow.

Note: The `oauth20.deviceFlow.slowDownThreshhold` property defaults to 2.

Data type: Integer

Example: 5

oauth20.tokenCache.allowDBConnectExceptionEnable
Specifies if HTTP Status Code 502 Bad Gateway should be returned by the authorization server due to database connection issue or HTTP Status Code 400 Bad Request during an Exception.

Note: The `oauth20.tokenCache.allowDBConnectExceptionEnable` property defaults to `false`.

Data type: Boolean

Example: `false`

oauth20.tokenCache.cleanupOnlyOnPrimaryMaster
In a clustered environment, specifies if the cleanup thread should run only on the master node.

Note: The `oauth20.tokenCache.cleanupOnlyOnPrimaryMaster` property defaults to `false`.

Data type: Boolean

Example: `false`

PostgreSQL

postgresdb.fetchsize
Specifies the PostgreSQL database fetch size.

Data type: Integer

Example: 50

HTTP client

util.httpClient.defaultTrustStore
Stores the default truststore that HTTPS connections in HTTP client uses.

Note: The util.httpClient.TrustStore property defaults to rt_profile_keys.

Data type: String

Example: rt_profile_keys

util.httpClient.defaultSSLProtocol
Stores the default SSL protocol configuration that HTTPS connections in HTTP client uses.

Note: The util.httpClient.defaultSSLProtocol property defaults to TLS.

Data type: String

Example: TLS

util.httpClient.maxActiveConnections
Specifies the maximum number of HTTP and HTTPS connections, per host, between the appliance runtime and other modules. In a multiple host environment, the runtime might need to establish many HTTP/HTTPS connections at the same time. By specifying this property, you can limit the number of active connections for each host. This setting ensures that each host can obtain their fair share of HTTP/HTTPS connections without being forced to wait for other hosts to release connections.

- Data type: String
- Default: An unlimited number of HTTP/HTTPS connections are permitted

You can specify the maximum number of active connections in one of two ways:

- Specify a maximum number to apply to every host. Syntax:

```
"*=<count>"
```

- Specify a maximum number on a per host basis. Syntax:

```
"<host1>:<port1>=<count>,<host2>:<port2>=<count>,*=<count>"
```

<host>
The host value can be either an IP address, a hostname or domain name as specified in the Endpoint URL. Specify the host value based on the URL format. For example:

– IP Address: 192.168.102.192

– Hostname or domain name: www.server1.com

<port>=<count>
The communication port on the host. For example, to limit port 80 to only 100 connections, enter 80=100.

***=<count>**
The count limit for servers that are not specified by a *<host>* value in this property. When set to zero (*=0) there is no limit on the number of HTTP/HTTPS connections that can be created to other servers. When set to an integer greater than zero, the integer specifies the maximum number of HTTP/HTTPS connections that can be created to each of the other servers.

Note: Ensure that <count> is specified as a value of type *integer*. Do not use values of type *string* for <count>.

Example 1: Specifying a maximum number to apply to every host

For example, your deployment must establish connections to two servers. You want to limit the number of connections to 100 per server. You also want to ensure that when you add additional servers, the number of connections to each additional server is limited to 100.

Use the syntax "*=<count>". For this example:

```
"*=100"
```

Example 2: Specifying maximum numbers on a per host basis

For example, your deployment must establish connections to two servers. You want to limit the number of connections for one server to 100, but allow the other server to have 200 connections. In addition, you do not want to limit the number of connections for any additional servers.

Use the syntax: "<host1>:<port1>=<count>,<host2>:<port2>=<count>,*=<count>"

For example, the runtime might need to establish the connections to the following URLs, for an SMS OTP flow and an OIDC flow:

- http://www.server1.com/isam/sms_otp
- https://192.168.102.192/isam/oidc_sts

Example configuration entry:

```
"www.server1.com:80=100,192.168.102.192:443=200,*=0"
```

The example configuration entry specifies:

- The maximum number of HTTP/HTTPS connections that can be created to `www.server1.com` at a time (on port 80) is 100.
- The maximum number of HTTP/HTTPS connections that can be created to `192.168.102.192` at a time (on port 443) is 200.
- There is no limit on the number of HTTP/HTTPS connections that can be created to other hosts.

HTTP Client version 2

`util.httpClientv2.getConnectionTimeout`
Specifies the timeout for retrieving a connection from the connection pool. Value is in seconds.

Note: The `util.httpClientv2.getConnectionTimeout` property defaults to 5 seconds for every host (*=5)

Data type: String

Example: *=5

You can specify the timeout by using one of the following methods:

- Specify a timeout that applies to every host and port.

  ```
  “*=<timeout>”
  ```

- Specify a timeout on a per host and port basis

  ```
  “<host1>:<port1>=<timeout>,<host2>:<port2>=<timeout2>,*=<timeout3>
  ```

`util.httpClientv2.connectTimeout`
Specifies the timeout for establishing a connection with the remote host. Value is in seconds.

Note: The `util.httpClientv2.connectTimeout` property defaults to 5 seconds for every host (*=5).

Data type: String

Example: (*=5)

You can specify the timeout by using one of the following methods:

- Specify a timeout that applies to every host and port.

```
"*=<timeout>"
```

- Specify a timeout on a per host and port basis

```
"<host1>:<port1>=<timeout>,<host2>:<port2>=<timeout2>,*=<timeout3>
```

util.httpClientv2.connectionInactiveValidate
Specifies the period of inactivity in milliseconds after which pooled connections must be re-validated prior to being reused. Value is in seconds.

Note: The `util.httpClientv2.connectionInactiveValidate` property defaults to 2 seconds for every host (*=2).

Data type: String

Example: *=2

You can specify the value by using one of the following methods:

- Specify a value that applies to every host and port.

```
"*=<value>"
```

- Specify a value on a per host and port basis

```
"<host1>:<port1>=<value>,<host2>:<port2>=<value2>,*=<value3>
```

util.httpClientv2.connectionTimeToLive
Specifies the maximum time a connection stays open. After which it automatically closes. Value is in seconds.

Note: The `util.httpClientv2.connectionTimeToLive` property defaults to no timeout.

Data type: String

Example: *=30

You can specify the value by using one of the following methods:

- Specify a value that applies to every host and port.

```
"*=<value>"
```

- Specify a value on a per host and port basis

```
"<host1>:<port1>=<value>,<host2>:<port2>=<value2>,*=<value3>
```

util.httpClientv2.socketTimeout
Specifies the timeout to wait for packets to arrive on an established connection. Value is in seconds.

Note: The `util.httpClientv2.socketTimeout` property defaults to 5 seconds for every host (*=5).

Data type: String

Example: *=5

You can specify the timeout by using one of the following methods:

- Specify a timeout that applies to every host and port.

```
"*=<timeout>"
```

- Specify a timeout on a per host and port basis

```
“<host1>:<port1>=<timeout>,<host2>:<port2>=<timeout2>,*=<timeout3>
```

util.httpClientv2.defaultSSLProtocol
Specifies the default SSL protocol configuration that HTTPS connections in HTTP client uses.

The following values are valid:

- TLSv1
- TLSv1.1
- TLSv1.2
- TLS (This value enables all of the above protocols)

Note: The `util.httpClientv2.defaultSSLProtocol` property defaults to TLS.

Data type: `String`

Example: TLS

util.httpClientv2.defaultTrustStore
Specifies the default truststore that HTTPS connections in HTTP client uses.

Note: The `util.httpClientv2.defaultTrustStore` property defaults to `rt_profile_keys`.

Data type: `String`

Example: `rt_profile_keys`

util.httpClientv2.disableAutoRetries
Specifies whether or not to disable automatic request recovery and re-execution.

Note: The `util.httpClientv2.disableAutoRetries` property defaults to `false` for every host (*=false).

Data type: String

Example: `*=false`

You can specify the value by using one of the following methods:

- Specify a value that applies to every host and port.

```
“*=<value>”
```

- Specify a value on a per host and port basis

```
“<host1>:<port1>=<value>,<host2>:<port2>=<value2>,*=<value3>
```

util.httpClientv2.enableHostNameVerification
Specifies whether or not to enable hostname verification. If enabled it verifies that the target hostname matches the names that are stored inside the server’s X.509 certificate once the connection is established.

Note: The `util.httpClientv2.enableHostNameVerification` property defaults to `true` for every host (*=host).

Data type: String

Example: `*=true`

You can specify the value by using one of the following methods:

- Specify a value that applies to every host and port.

```
“*=<value>”
```

- Specify a value on a per host and port basis

```
"<host1>:<port1>=<value>,<host2>:<port2>=<value2>,*=<value3>
```

util.httpClientv2.disablePublicSuffixVerification

Specifies whether or not to disable hostname verification using the list of valid public suffixes. HttpClient uses the public suffix list to ensure that wildcards in SSL certificates cannot be misused to apply to multiple domains with a common top-level domain. The HTTP Client ships with a copy of the list retrieved at the time of the release. The local copy is a configuration file named `local-copy-effective_tld_names.dat` and can be updated following the instructions at Managing advanced configuration.

Note: The `util.httpClientv2.disablePublicSuffixVerification` property defaults to `false` for every host (*=false).

Data type: String

Example: `*=false`

You can specify the value by using one of the following methods:

- Specify a value that applies to every host and port.

```
"*=<value>"
```

- Specify a value on a per host and port basis

```
"<host1>:<port1>=<value>,<host2>:<port2>=<value2>,*=<value3>
```

util.httpClientv2.disableRedirectHandling

Specifies whether or not the HTTP Client automatically handles redirects.

Note: The `util.httpClientv2.disableRedirectHandling` property defaults to `false` for every host (*=false).

Data type: String

Example: `*=false`

You can specify the value by using one of the following methods:

- Specify a value that applies to every host and port.

```
"*=<value>"
```

- Specify a value on a per host and port basis

```
"<host1>:<port1>=<value>,<host2>:<port2>=<value2>,*=<value3>
```

util.httpClientv2.maxConnections

Specifies the maximum number of connections that are created in each connection pool.

Note:

- There is a separate connection pool that is created for each unique SSL connection key. This key is generated by using the URL hostname and port, truststore, client keystore, client key alias, protocol, and proxy server values that are specified in the HTTP Client V2 usage.
- The `util.httpClientv2.maxConnections` property defaults to 200 for every host (*=200).

Data type: String

Example: `*=200`

You can specify the value by using one of the following methods:

- Specify a value that applies to every host and port.

```
"*=<value>"
```

- Specify a value on a per host and port basis

```
“<host1>:<port1>=<value>,<host2>:<port2>=<value2>,*=<value3>
```

util.httpClientv2.maxRouteConnections
Specifies the maximum number of connections in a connection pool that are available for each unique route.

Note:

The `util.httpClientv2.maxRouteConnections` property defaults to 20 for every host (*=20).

Data type: String

Example: `*=20`

You can specify the value by using one of the following methods:

- Specify a value that applies to every host and port.

```
“*=<value>”
```

- Specify a value on a per host and port basis

```
“<host1>:<port1>=<value>,<host2>:<port2>=<value2>,*=<value3>
```

util.httpClientv2.proxyHost
Specifies the hostname of the proxy server if requests must go through a proxy.

To disable the use of a proxy, leave this value, proxyPort and/or proxyProtocol empty.

Note: The `util.httpClientv2.proxyHost` defaults to none.

Data type: `String`

Example: `test.com`

util.httpClientv2.proxyPort
Specifies the port of the proxy server if requests must go through a proxy.

To disable the use of a proxy, leave this value, proxyHost and/or proxyProtocol empty.

Note: The `util.httpClientv2.proxyPort` property defaults to none.

Data type: Integer

Example: 443

util.httpClientv2.proxyProtocol
Specifies the protocol for the proxy server if requests must go through a proxy.

To disable the use of a proxy, leave this value, proxyHost and/or proxyPort empty.

Note: The `util.httpClientv2.proxyProtocol` property defaults to none.

Data type: `String`

Example: `test.com`

util.httpClientv2.proxyUsername
Specifies the username used to authenticate to the proxy server if requests must go through a proxy. If no authentication is required, leave this value and proxyPassword as empty.

Note: The `util.httpClientv2.proxyUsername` property defaults to none.

Data type: `String`

Example: `admin`

util.httpClientv2.proxyPassword
Specifies the password used to authenticate to the proxy server if requests must go through a proxy. If no authentication is required, leave this value and proxyUsername as empty.

Note: The `util.httpClientv2.proxyPassword` property defaults to none.

Data type: `String`

Example: `passw0rd`

Demo

`live.demos.enabled`
Enables the mobile demonstration application.

Data type: Boolean

Example: `False`

`live.demos.settings`
This setting can be used to pre-populate the settings of the mobile demo. This is a comma separated set of key, value pairs that match what is submitted on the settings form.

Data type: `String`

Example: `lmiHostAndPort=lmi.host.com, lmiAdminId=admin, lmiAdminPwd=admin, acHostAndPort=127.0.0.1, websealHostNameAndPort=webseal.host.com`

Knowledge questions properties

`knowledge.questions.AnswerValidationRegEx`
Specifies the regular expression used to validate the knowledge question answer value provided during a knowledge question management operation. The assigned value is the list of invalid characters to match against to determine if the supplied value is valid.

Note: At a minimum, this property must include the following characters: `<>:"`

Data type: RegEx

Example: `[\[()<>,;:\\/\"\]=]`

`knowledge.questions.QuestionValidationRegEx`
Specifies the regular expression used to validate the knowledge question text value provided during a knowledge question management operation. The assigned value is the list of invalid characters to match against to determine if the supplied value is valid.

Note: At a minimum, this property must include the following characters: `<>:"`

Data type: RegEx

Example: `[\[()<>,;:\\/\"\]=]`

Key encryption and signing service (KESS)

`kess.crlEnabled`
Checks the certificate revocation list. Checking is done by the key encryption and signature service (KESS) for all functions that use an external certificate, except for the audit syslog. If your configuration does not require CRL checking, you can disable it. For example, if you use if an internal certificate authority (CA), you might want to disable CRL checking. The `kess.crlEnabled` property defaults to `true`.

CRL site unavailability scenario
If you have `kess.crlEnabled` set to `true` and a CRL site becomes unavailable, you cannot determine the revocation status of the certificate. In this situation, the single sign-on flow will fail.

Confirm a CRL site unavailability issue by looking for the message "`FBTKJK056E The CRL site could not be determined.`" in the runtime `trace.log` file.

As a temporary workaround, set the CRL checking to `false` to keep the single sign-on flow running. As soon as the CRL site is working again, set `kess.crlEnabled` to `true` so that the single sign-on flow contains the CRL check.

CAUTION: If you do stop CRL checking as a temporary workaround, be aware that the certificate might have already been revoked by the CA. If this type of certificate is allowed to pass the validation, it creates security issues. Therefore, ensure that you enable CRL checking to avoid potential security issues such as this.

Data type: Boolean

Example: `true`

`kess.crlInterval`

The amount of time, in seconds, between successive CRL checks. Using an interval of time between CRL checks reduces the performance impact of doing the checks every time a certificate needs to be validated.

A value less than or equal to zero means that the runtime performs a CRL check every time it wants to use a certificate. The default is `0` seconds.

If `kess.crlEnabled` is set to `false`, this value is ignored.

Data type: Integer

Example: `86400`

This value means that a CRL check on a certificate is performed once per day.

`kess.hostnameValidationDisabled`

Determine whether to disable host name verification when establishing an SSL connection. Host name verification is performed when the host name of the server does not match the CN of the certificate of the server.

In a test environment, you might want to disable the validation. In a production environment, you might want to enable validation.

The default value is `False`.

Data type: Boolean

Example: `False`

`kess.keySelectionCriteria`

Specify which key or certificate to use for signing, validating, encrypting, or decrypting various messages. If there are multiple keys or certificates with the same Subject DN as the key or certificate with the specified alias, this setting determines which one to use. Use one of the following selection methods:

only.alias
Alias only: The selected key only, without Auto rollover. If the key is invalid, the software indicates failure. Configure the property to use the value.

shortest.lifetime
Shortest lifetime: For signing, a valid key with the shortest available lifetime. For validation, key lifetime availability runs from shortest to longest.

longest.lifetime
Longest Lifetime: For signing, a valid key with the longest available lifetime. For validation, key lifetime availability runs from longest to shortest.

Data type: String

Example: `only.alias`

`kessjksservice.exclude.inclusive.namespace.prefixes`

Specifies a comma-separated list of prefix names. When this is set, the prefixes in the list are not added to the InclusiveNamespaces list that is in the Signature Element.

Data type: String

Example: ds

`kess.validateCertPath`

Specifies whether to validate certificate paths when performing certificate validation.

The default value is `false`.

Data type: Boolean

Example: `true`

JSON Web Key

`jwks.encryption.keystore`

Defines the name of the encryption keystore to be used by the jwks endpoint for the runtime. These certificates will have their public keys exposed, with the 'use' value 'enc'.

Default value: `rt_profile_keys`

`jwks.signing.keystore`

Defines the name of the signing keystore to be used by the jwks endpoint for the runtime. These certificates will have their public keys exposed, with the 'use' value 'sig'.

Default value: `rt_profile_keys`

`jwks.encryption.enabled`

Specifies whether or not the jwks endpoint for the runtime will use the encryption keystore.

Default value: `true`

Data type: Boolean

Example: `true`

Policy information point (PIP)

`pip.uncachedAttributes`

Defines a comma-separated list of attributes that are generated by a policy information point (PIP) that you do not want to be cached.

Data type: String list

Example: `urn:ibm:security:jdbc:city, urn:ibm:security:ldap:priviledgeUser`

Security token service (STS)

`sts.ivcred.unauthenticated.user.name`

Set to a special user account for unauthenticated user tokens when using IVCRED STS module in `validate` mode. The Default value is "".

Data type: `String`

Example: `guest`

`sts.ivcred.unauthenticated.user.registry.id`

In addition to the user name set in `sts.ivcred.unauthenticated.user.name`, a user's registry id can also be added when using IVCRED STS module in `validate` mode. The Default value is "".

This parameter is optional.

Data type: `String`

Example: `cn=guest,o=ibm,c=us`

`sts.ivcred.unauthenticated.user.uuid`

In addition to the user name set in `sts.ivcred.unauthenticated.user.name`, a user's UUID can also be added when using IVCRED STS module in `validate` mode. The Default value is "".

This parameter is optional.

Data type: `String`

Example: 81a2a65e-0018-0150-8080-3f83b0f74f4c

sts.ldapAttributeCache.TTL
Specifies a time-to-live (TTL) value, in seconds, for the amount of time to keep an LDAP attribute in the cache. Specify 0 to disable.

The default value is 60.

Data type: Integer

Example: 60

sts.wstrust.error.shortexception
Set this parameter to True to provide a short exception in the 'wst:Reason' for STS exceptions. When this parameter is set to False, the entire exception stack is provided in 'wst:Reason'.

Type: Boolean

Default: False

Example: False

sts.uuser.attributes.donottrim.list
Specifies a space-separated list of STS universal user attributes that keep whitespace in the value when retrieved. All other attributes are trimmed and set as null if empty.

The default value is None.

Data type: String

Example: value1 value2 value3

Mobile Multi-Factor Authentication (MMFA)

mmfa.authenticator.cleanupWait

The amount of time, in seconds, to wait before another cleanup of expired authenticators is performed.

MMFA authenticator clean up can be disabled by setting cleanupWait to 0.

The default value is 3600.

Data type: Integer

Example: 3600

mmfa.transactionArchival.maxCompletedPerUser

The number of historical transactions in a completed state to keep in the HVDB before archival to the audit log. The oldest transactions will be removed first. A value of -1 will indicate that no archival should be performed.

The default value is 50.

Data type: Integer

Example: 50

mmfa.transactionArchival.maxPendingPerUser

The number of transactions to keep in a pending state. Transactions over this number will have their status set to "fail". The oldest transactions will be aborted first. A value of -1 will indicate that no archival should be performed.

The default value is 1.

Data type: Integer

Example: 1

mmfa.transactionPending.minAgeBeforeAbort

The minimum number of seconds a transaction is in the pending state before being aborted via a cleanup thread. Due to the cleanup thread interval, the total time a transaction can be in the pending state can be between `minAgeBeforeAbort` and (`minAgeBeforeAbort` + `cleanupInterval`) - `1`

The default value is `300`.

Data type: Integer

Example: `300`

mmfa.transactionPending.cleanupInterval

The number of seconds between each run of the pending transactions cleanup thread.

The default value is `150`.

Data type: Integer

Example: `150`

mmfa.transaction.cleanupOnlyOnPrimaryMaster

Indicates whether transaction cleanup should be run on all nodes in a cluster, or only on the primary master. This applies to pending transaction cleanup as well as transaction archival.

The default value is `false`.

Data type: Boolean

Example: `false`

mmfa.devicePrompt.skipIfOneDevice

Indicates whether to skip the device selection page in an MMFA flow if the user only has one device or authenticator registered.

The default value is `false`.

Data type: Boolean

Example: `true`

mmfa.silentpush.enabled

Indicates whether the IBM Verify silent push payload is enabled or disabled. For more information see: Push notification registration.

The default value is `true`.

Data type: Boolean

Example: `false`

mmfa.transactionArchival.cleanupInterval

The number of seconds between each run of the transaction archival clean-up thread. Only applies to `mmfa.transactionArchival.maxCompletedPerUser`. A value of -1 causes the thread to poll for configuration changes, but not perform any clean-up.

The default value is `120`

Data type: Integer

Example :`120`

mmfa.completionResponse.legacyBehaviour

If a transaction completes before the login wait page is returned older versions used to return a JSON success payload. This process was changed to ensure that the login wait page is returned at least once. If this property is set to true, the behavior will revert to the returning of the JSON success payload.

The default value is `false`

Data type: Boolean

Example :`true`

`mmfa.devicePrompt.validateChosen`
Specifies whether or not to validate that the device performing verification is the same device that was chosen at the device selection step. If set to false a different device than the one selected by the user can be used to verify the transaction.

The default value is `true`

Data type: Boolean

Example:`true`

WS-Federation

`wsfed.idp.rstr.excluded.elements`
Specifies a comma-separated list of elements to exclude from the WS-Federation request security token response. Can optionally contain a federation realm and federation partner realm, to indicate the federation or federation partner that uses the property values.

The default value is `default=Forwardable,Delegatable,Status,Renewing`.

The syntax for specifying federation and federation partner is:

```
default=<comma_separated_list_of_elements>:<federation_realm>=<comma_separated_list_of_elements>:
            <federation_realm>%<partner_realm>=<comma_separated_list_of_elements>
```

Data type: String

Example:

```
default=Forwardable,Delegatable,Status,Renewing:fed1-REALM=Forwardable,Delegatable:
fed1-REALM%partner1-REALM=Status
```

SAML 1.1

saml.use.legacy.clockskew.default
IBM Security Verify Access can add a clock skew of 60 seconds when validating the SAML assertion timestamps. To enable the 60 second clock skew, add the custom property:

`saml.use.legacy.clockskew.default = true`

Default value = False

- Value type: Boolean
- Example value: True

Note: This custom property is also applicable for SAML 2.0

saml.allowDebugMessages
When specified as true, and a SAML artifact resolution failure occurs, the SystemOut.log and SystemErr.log contains an informational message. In addition, the message contains extra debug information about the request that contained the failed artifact and provides a reason for the event.

Note: This message is only available in English.

Default value: False

- Value type: Boolean
- Example value: SAML.allowDebugMessage = True

saml.allowNoRecipient
Use this custom property if a SAML 1.x service provider needs to accept a samlp:Response that does not contain a Recipient attribute.

Default value: False

saml.assertion.IncludeNSPrefixList.DS
When this custom property is specified as true, ds is included in the Prefix List attribute of the InclusiveNameSpaces in the SAML assertion.

Default value: False

- Value type: Boolean
- Example value: True

Note: This custom property is also applicable for SAML 2.0

saml.allowSpecificInvalidArtifactMessages
When this custom property is specified as true, and a SAML artifact resolution failure occurs, *identity provider sends a SAML Response with specific invalid message to tell the service provider that there is no assertion available. The specific invalid message is* **FBTSML276E**. If not specified, by default it is false, and the invalid message send back to service provider is **FBTSML013E**.

Default value: False

- Value type: Boolean
- Example value: True

SAML 2.0

`saml20.enableSubjectInAuthnRequest`

Set to `true` if the Subject element is required for the SAML 2.0 AuthnRequest. The Subject element is set to the userid of the existing authenticated session. The Default value is `false`.

Data type: `Boolean`

Example: `true`

`saml20.idp.acsurlpattern`
IBM Security Verify Access uses an exact string comparison between the AssertionConsumerService URL in the AuthnRequest message and the protocol endpoint specified in metadata.

This custom property allows regular expression matching for the AssertionConsumerService URL and the protocol endpoint, so that a dynamic AssertionConsumerService URL that matches the regular expression can be provided in the AuthnRequest.

Data type: String

Note: The binding can be omitted if the configuration applies to all the bindings for that specific federation and partner.

Format:

```
<FederationId>%<PartnerId>
%<Binding>=<RegularExpression>,<FederationId2>%<PartnerId2>
=<RegularExpression2>
```

Example:

```
https://www.myidp.ibm.com/isam/sps/saml20idp/saml20%https://www.mysp.ibm.com
/isam/sps/saml20sp/saml20%urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST=https://.*.ibm.com/
isam/sps/.*
```

`saml20.sessionStore`
Specifies the SAML 2.0 session footprint store.

SAML session footprint can be stored in HVDB, Redis or DSC. Select **Distributed Map (DMap)** if the SAML session needs to be stored in HVDB or Redis. When the option is switched to DSC, the SAML session gets stored in Distributed Session Cache.

Data type: String

Note: The selection for the SAML 2.0 session footprint store is drop-down list with the following options:

- DMap
- DSC

Example: DMap

Note: This configuration affects SAML 1.1 and SAML 2.0.

saml20.authn.request.provider.name.enabled
Set to true to add ProviderName value to SAML2.0 AuthnRequests.

Data type: Boolean

Example: False

Note: The default value is `False`.

saml20.signatureValidation.policy
Allowed Values: `LENIENT/STRICT`

Example: `STRICT`

Note: The default value is `STRICT`.

If `STRICT` is specified, the signature must be included in the received request and it will be validated. If `LENIENT` is specified, the signature, if it exists, will be validated and if no signature is included in the request, no error is reported.

OIDC

oidc.rp.idToken.validationSkew
The number of seconds of skew allowed on the 'nbf' and 'exp' claims of an idToken when it is being processed by an OpenID Connect relying party. For instances where the clocks of two systems are not perfectly synchronized.

Note: This advanced configuration does not apply to legacy OpenID Connect relying parties or Reverse Proxy Relying parties.

Default value: 0

Rhino Javascript Engine

js.version
Specifies the Rhino Javascript version.

Supported values: Context.VERSION_ES6, Context.VERSION_1_7, Context.VERSION_1_8

Default value: Context.VERSION_ES6

Data type: String

Example: `Context.VERSION_ES6`

js.optimizationLevel
Specifies the Rhino Java optimization level.

Default value: 0

Data type: String

Example: `0`

Basic LDAP User

basicLdapUser.ldap.minBinds
Specifies the minimum number of binds to the LDAP server.

Default value: 1

Data type: Integer

Example: 1

basicLdapUser.ldap.maxBinds
Specifies the maximum number of binds to the LDAP server.

Default value: 1

Data type: Integer

Example: 1

Consent Device Registration

consentDeviceRegistration.authLevelHeaderEnabled
Specifies whether to add the authentication level header to the value set in the consentDeviceRegistration.authLevelHeaderValue. This property is in the response of the Consent Register Device authentication policy.

Default value: false

Data type: Boolean

Example: `true`

consentDeviceRegistration.authLevelHeaderValue
Specifies the value to set in the authentication level header in the response of the Consent Register Device authentication policy if the consentDeviceRegistration.authLevelHeaderEnabled property is set to true.

Default value: 2

Data type: Integer

Example: 1

FIDO2

fido2.u2fMigration.autoMigrate
Specifies whether to auto migrate a user's U2F device registrations to FIDO2/WebAuthn.

Default value: false

Data type: Boolean

Example: `true`

HTTP Session

httpSession.disableSerialization
Specifies whether to disable serialization in the HTTP session.

Default value: true

Data type: Boolean

Example: `true`

Info Map

infomap.email.smtpStartTls
Specifies whether to use the StartTLS protocol command for communication with the SMTP server.

Default value: false

Data type: Boolean

Example: `true`

infomap.email.smtpTlsProtocol
Specifies the TLS protocol that is used for communication with the SMTP server.

Default value: None

Data type: String

Example: TLS

WebSEAL POC

poc.webseal.poc.sms.enabled
Specifies whether SMS is enabled on the point of contact environment.

Default value: false

Data type: Boolean

Example: `true`

Username

username.legacyBehavior
Specifies whether usernames that are retrieved from a database record are handled as is (true) or converted to lowercase (false). For more information, see https://www.ibm.com/support/pages/advanced-access-control-username-case-sensitivity.

Default value: false

Data type: Boolean

Example: `true`

Managing user registries

The appliance runtime profile has a user registry associated. Use the User Registry management page to administer the users and group memberships. The user registry in discussion here is the one used by the runtime applications, not the one used by the management interface.

Before you begin

Note: From version 9.0.7 and above, these characters "& | \ > < ; " are not allowed for passwords in the AAC or Federation user registry.

Procedure

1. From the top menu, select the user interface panel for your licensing level.
   - **AAC** > **Manage** > **User Registry**
   - **Federation** > **Manage** > **User Registry**

   A list of all the current users in the registry is displayed. You can filter and reorder the list of users.
2. Select **Users** (current page) or **Groups** to manage users or groups, respectively.
3. To manage users, perform one or more of the following actions as needed:

   Create a user in the registry

   a. Click **New**.
   b. In the **Create User** window, enter the user name and password for the new user.
   c. Click **OK**.

   Delete a user from the registry

   a. Select the user to delete.
   b. Click **Delete**.

c. In the **Delete User** window, click **Yes** to confirm the delete operation.

Change the password of a user in the registry

a. Select the user for which you want to change password.

b. Click **Set Password**.

c. In the **Set Password** window, enter the password in the **New Password** and **Confirm Password** fields.

d. Click **OK**.

Manage group memberships of a user

a. Select the user of interest. The group memberships that are associated with this user are displayed under the **Group Membership** section.

b. You can add the user to a group or delete the user from a group in the registry.

Add the user to a group

i) In the **Group Membership** section, click **Add**.

ii) In the **Add to Group** window, select the group to add this user to.

Note: Only a single group can be selected.

iii) Click **OK**.

Remove the user from a group

i) In the **Group Membership** section, select the group to remove the user from.

ii) Click **Delete**.

iii) In the **Remove from Group** window, click **Yes** to confirm the removal.

4. To manage groups, perform one or more of the following actions as needed:

Create a new group in the registry

a. Click **New**.

b. In the **New Group** window, enter the group name for the new group.

c. Click **OK**.

Delete a group from the registry

a. Select the group to delete.

b. Click **Delete**.

c. In the **Delete Group** window, click **Yes** to confirm the delete operation.

Manage group members

a. Select the group of interest. The users that are currently members of this group are displayed under the **Group Members** section.

b. You can add a user to the group or delete a user from the group in the registry.

Add a user to the group

a. In the **Group Members** section, click **Add**.

b. In the **Add to Group** window, select the user to add to the group.

Note: Only a single user can be selected.

c. Click **OK**.

Remove a user from the group

a. In the **Group Members** section, select the user to remove from the group.

b. Click **Remove**.

c. In the **Remove from Group** window, click **Yes** to confirm the removal.

Tuning runtime application parameters and tracing specifications

To manually tune selected runtime application parameters and tracing specifications, use the **Runtime Parameters** management page.

About this task

Warning: Enabling trace for Oracle components “oracle.*” might result in the Oracle database administrator password being logged in clear text.

Procedure

1. From the top menu, select **AAC** > **Global Settings** > **Runtime Parameters** or **Federation** > **Global Settings** > **Runtime Parameters**.

   This page contains three panels: **Runtime Status**, **Runtime Tuning Parameters**, and **Runtime Tracing**.
2. Perform one or more of the following actions to tune your runtime.

   Note: Certain changes might require a restart of the runtime before they can take effect.

   Disable automatic restart of the runtime

   By default, the runtime is automatically restarted after certain changes are made. You can disable this automatic restart function if you prefer manual restarts.

   a. On the **Runtime Tuning Parameters** panel, select **Auto Restart**.

   b. Click **Edit**.

   c. In the **Auto Restart** window, define the value as **False**.

   d. Click **OK**.

   View the status of the runtime and restart the runtime

   a. Select the **Runtime Status** panel. The status of local and clustered runtimes are displayed.

   - Under **Local Runtime Status**, you can view the runtime operational status, when it was last started, and whether a restart is outstanding. If the value of the **Restart Required** field is **True**, it means that the runtime must be restarted for some changes to take effect.
   - Under **Clustered Runtime Status**, all nodes in the cluster are listed.
     - The **Master** column indicates whether a node is the cluster master.
     - The **Runtime Status** column indicates whether a node is running or stopped.
     - The **Changes Active** column indicates whether changes made to the cluster configuration are active on this node. Having a green indicator in this column means that all changes made are already active. Having a yellow indicator in this column means that this node must be restarted before some changes can take effect.

   b. Depending on which runtime you want to restart, click **Restart Local Runtime** or **Restart All Clustered Runtimes**.

   Modify the maximum or initial heap size

   These parameters indicate the maximum and initial heap size in megabytes for the runtime Java virtual machine.

   a. On the **Runtime Tuning Parameters** panel, select **Max Heap Size** or **Initial Heap Size**.

   b. Click **Edit**.

   c. In the **Max Heap Size** or **Initial Heap Size** window, enter the heap size value as needed.

   d. Click **OK**.

   Modify the minimum or maximum threads

   These parameters indicate the minimum number of core threads that the runtime server starts with and the maximum number of threads that can be associated with the runtime server.

If the minimum value is not set or is set as -1, a default value is calculated based on the number of hardware threads on the system.

If the maximum value is not set or is set as 0 or less, a default value of unbounded is used.

The minimum **cannot** be set to a value larger than the maximum.

a. On the **Runtime Tuning Parameters** panel, select **Min Threads** or **Max Threads**.
b. Click **Edit**.
c. In the **Min Threads** or **Max Threads** window, enter the required value.
d. Click **OK**.

Modify whether to suppress sensitive trace

Enabling this parameter prevents sensitive information from being exposed in log and trace files. Examples of such sensitive information include bytes received over a network connection.

a. On the **Runtime Tuning Parameters** panel, select **Suppress Sensitive Trace**.
b. Click **Edit**.
c. In the **Suppress Sensitive Trace** window, select or clear the check box as needed.
d. Click **OK**.

Modify console log level

Console log level controls the granularity of messages that go to the `console.log` file.

a. On the **Runtime Tuning Parameters** panel, select **Console Log Level**.
b. Click **Edit**.
c. In the **Console Log Level** window, select the new value from the list.
d. Click **OK**.

Set whether to accept client certificates

This parameter controls whether the server accepts client certificates as a form of authentication.

a. On the **Runtime Tuning Parameters** panel, select **Accept Client Certificates**.
b. Click **Edit**.
c. In the **Accept Client Certificates** window, select or clear the check box as needed.
d. Click **OK**.

Maximum Session Count

This parameter defines the maximum number of sessions that is maintained in memory.

Note: The default setting is 250000. When this setting is used, the maximum number of sessions is 250000.

a. On the **Runtime Tuning Parameters** panel, select **Maximum Session Count**.
b. Click **Edit**.
c. In the **Maximum Session Count** window, define the value.
d. Click **OK**.

Set session invalidation timeout

This parameter defines the amount of time a session can remain unused before it is no longer valid.

Note: The default setting is `1200`. When this setting is used, the session invalidation timeout is 1200 seconds.

a. On the **Runtime Tuning Parameters** panel, select **Session Invalidation Timeout**.
b. Click **Edit**.

c. In the **Session Invalidation Timeout** window, define the value in seconds.

d. Click **OK**.

Set session reaper poll interval

This parameter defines the wake-up interval in seconds for the process that removes invalid sessions. The minimum value is 30 seconds.

The default setting is **Unset**. When this setting is used, or if a value less than the minimum is entered, an appropriate value is automatically determined and used. This value overrides the default installation value, which is 30 - 360 seconds, based on the session invalidation timeout value. Because the default session invalidation timeout is 1800 seconds, the reaper interval is usually between 120 and 180 seconds.

a. On the **Runtime Tuning Parameters** panel, select **Session Reaper Poll Interval**.

b. Click **Edit**.

c. In the **Session Reaper Poll Interval** window, define the value in seconds.

d. Click **OK**.

Set the keystore that is used by the runtime server

This parameter defines the key database that contains the runtime server's private key.

a. On the **Runtime Tuning Parameters** panel, select **Keystore**.

b. Click **Edit**.

c. In the **Keystore** window, select the key database from the list.

d. Click **OK**.

Set the truststore that is used by the runtime server

This parameter defines the key database that contains keys that are trusted by the runtime server

a. On the **Runtime Tuning Parameters** panel, select **Truststore**.

b. Click **Edit**.

c. In the **Truststore** window, select the key database from the list.

d. Click **OK**.

Configure an outbound HTTP proxy

You must specify values for the properties for the HTTP proxy. You might also need to import the root CA certificate from the proxy. See Table 1. HTTP proxy properties.

You must also set the JVM property `http.nonProxyHosts` by specifying the outgoing request that bypasses the HTTP proxy. The value must include the string `"localhost^|127.0.0.1*|127.0.0.1:2026"`. Set the value with the `runtime_profile.jvm_option` advanced tuning parameter.

For example,

```
runtime_profile.jvm_option -Dhttp.nonProxyHosts="*.mydomain.com|*.myotherdomain.com|
localhost^|127.0.0.1*|127.0.0.1:2026"
```

Table 22. HTTP proxy properties

Name	Sample Value	Description
`http.proxyHost`	`http.proxy.ibm.com`	The hostname or IP address of the HTTP proxy
`http.proxyPort`	3128	The port of the HTTP proxy
`https.proxyHost`	`https.proxy.ibm.com`	The hostname or IP address of the HTTPS proxy

Table 22. HTTP proxy properties (continued)		
Name	**Sample Value**	**Description**
`https.proxyPort`	3128	The port of the HTTPS proxy

a. For each property in the table above:

i) On the **Runtime Tuning Parameters** panel, select the property.

ii) Click **Edit**.

iii) In the property window, enter the value. See the sample values in the table.

iv) Click **OK**.

b. When all properties are set, follow the prompt to deploy the pending changes.

Certain functions, such as the OpenID connect single sign-on flow, require the root CA certificate of the outbound HTTP proxy to be imported to the Security Verify Access runtime keystore.

Complete the following steps:

a. Go to your HTTP Proxy application and obtain the necessary certificate for exchange. The exact steps to take are specific to the proxy application. Place the certificate on the local file system where it can be accessed by the appliance.

b. On the Security Verify Access system, log in to the local management interface and select **System** > **Secure Settings** > **SSL Certificates**

c. Select the `rt_profile_keys` keystore.

d. Select **Manage** > **Edit SSL Certificate Database**.

e. Select **Manage** > **Import**.

f. On the Signer Certificate panel, browse to locate the **Certificate File**. Enter a **Certificate Label**. Click **Import**.

g. Deploy the changes.

Delete the value of a parameter

Use this button to delete the existing value of a parameter.

a. Select the parameter to reset the value for.

b. Click **Delete**. The value of the parameter is then changed to `Unset`.

Manage the application interface on which the runtime listens

a. On the **Runtime Tuning Parameters** panel, under **Runtime Listening Interfaces**, you can add, edit, or delete a listening interface.

To add a listening interface

i) Click **Add**.

ii) In the **Runtime Listening Interfaces** window, select the listening interface from the list.

iii) Specify the listening port.

iv) Select the **SSL** check box if security is required.

v) Click **OK**.

To modify a listening interface

i) Select the listening interface to edit.

ii) Click **Edit**.

iii) In the **Runtime Listening Interfaces** window, edit the values as needed.

iv) Click **OK** to save the changes.

To delete a listening interface

i) Select the listening interface to delete.

ii) Select **Delete**.

iii) Confirm the deletion.

Manage tracing specification

Note: Setting trace for Oracle components "`oracle.*`" results in the underlying Oracle JDBC jar file being changed to a debugging jar file. This might have adverse effects on performance and as such Oracle tracing should only be enabled for debugging purposes and disabled once complete.

a. Select the **Runtime Tracing** link from the top of this page. You can also access this panel from the top menu by selecting **Monitor** > **Logs** > **Runtime Tracing**.

b. Use one of the following ways to edit the trace level of a component.

- Select the component name from the **Component** list. Select the ideal trace level for this component from the **Trace Level** list. Then, click **Add**. Repeat this process to modify trace levels for other components if needed. To clear all of the tracing levels, click **Clear**.

  To log all events, select `ALL` as the trace level.

  Note: This setting increases the amount of data in logs, so use this level when necessary.

```
com.tivoli.am.fim.authsvc.*
com.tivoli.am.fim.trustserver.sts.modules.*
```

Table 23. Valid trace levels. The following table contains the valid trace levels.

Level	Significance
`ALL`	All events are logged. If you create custom levels, `ALL` includes those levels and can provide a more detailed trace than `FINEST`.
`FINEST`	Detailed trace information that includes all of the details that are necessary to debug problems.
`FINER`	Detailed trace information.
`FINE`	General trace information that includes methods entry, exit, and return values.
`DETAIL`	General information that details sub task progress.
`CONFIG`	Configuration change or status.
`INFO`	General information that outlines the overall task progress.
`AUDIT`	Significant event that affects the server state or resources.
`WARNING`	Potential error or impending error. This level can also indicate a progressive failure. For example: the potential leaking of resources
`SEVERE`	The task cannot continue, but component, application, and server can still function. This level can also indicate an impending unrecoverable error.

Table 23. Valid trace levels. The following table contains the valid trace levels. *(continued)*	
Level	**Significance**
FATAL	The task cannot continue, and component, application, and server cannot function.
OFF	Logging is turned off.

- Enter the name and value of the trace component in the **Trace Specification** field. To modify multiple components, separate two strings with a colon (:). Here is an example.

```
com.x.y.*=WARNING:com.a.b.*=WARNING:com.ibm.isva.*=INFO
```

c. Click **Save**.

3. When you make changes, the appliance displays a message that there are undeployed changes. If you have finished making changes, deploy them.

Template files

Template files are HTML pages that are presented to your users during the authentication process. The pages prompt users for authentication information, such as user names and passwords, or present information to users, such as one-time passwords, status, or errors.

You can customize any of the HTML pages by exporting, modifying, and importing its corresponding template file. Each template file uses one or more specific macros.

Managing template files

Use the local management interface to manage files and directories in the template files.

About this task

You can run the following tasks on the template files:

- **New**- Use this option if you want to create a new file or directory.
- **Edit**- Use this option if you want to view or modify the template file.
- **Import**- Use this option if you to import a file to the template files root.
- **Export**- Use this option if you want to export a file from the template files root.
- **Rename**- Use this option if you want to rename a file or directory from the template files root.
- **Delete**- Use this option if you want to delete a file or directory from the template files root.
- **Import Zip**- Use this option if you want to import the template files from a compressed file.
- **Export Zip**- Use this option if you want to export the template files as a compressed file.

  Note: When you use this option to export template files as a compressed file, you cannot export an individual folder. The root directory, including all the sub-directories, is exported. To access the contents of a specific directory, export the entire template directory, and then view the directory from the extracted compressed file on your local workstation. Administrators can refer to `metadata.json` under file downloads after upgrades to check if there are new configuration parameters included for AAC related endpoints.

Procedure

1. Select **AAC** > **Global Settings** > **Template Files**
2. Work with all the management files and directories.

   Create a file or directory in the template files root

   a. Select the directory of interest or make no selection to create a directory at the root level.

b. Select **New**.

c. Select **File** or **Directory**.

d. Enter the name of the file or directory.

e. Click **Save**.

View or update the contents of a file in the template files root

a. Select the file of interest.

b. Select **Edit**. You can then view the contents of the file.

c. Edit the contents of the file.

d. Click **Save**.

Export a file from the template files root

a. Select the file of interest.

b. Select **Manage** > **Export**.

c. Confirm the save operation when your browser displays a confirmation window.

Rename file from the template files root

a. Select the file or directory of interest.

b. Select **Manage** > **Rename**.

c. Enter the new resource name.

d. Click **Save**.

Delete file from the template files root

a. Select the file or directory of interest.

b. Select **Manage** > **Delete**.

c. Click **Yes**.

Import a file to the template files root

Note: In order to support a new locale, the top level directory name within the compressed file must correspond to the locale identifier. For example, to add support for Swedish, the top level directory name must be `/sv` or `/sv_SE`.

- Select a file.

  a. Select **Manage** > **Import**.

  b. Click **Browse**.

  c. Browse to the file that you want to import the contents from.

  d. Click **Open**.

  e. Click **Import**.

- Select a folder.

  a. Select **Manage** > **Import**.

  b. Click **Browse**.

  c. Browse to the file that you want to import to the selected folder.

  d. Click **Open**.

  e. Click **Import**.

Export the template file as a compressed file

a. Select **Manage** > **Export Zip**.

b. Confirm the save operation when your browser displays a confirmation window.

Import the template files as a compressed file

Make sure that the files in the compressed file are in the same directory structure as the files in the root directory or appliance.

For example, if a file in the compressed file is in the `/C` directory of the appliance, the compressed file must contain the `C` folder and the file that you want to import. When you import a compressed file that contains:

- A file that exists in the appliance

  The file is replaced in the appliance.
- A file or directory that does not exist in the appliance

  The file or directory is created in the appliance. You can put these new files and directories in an existing non-root directory or add a new directory in the root.

  Note: You cannot delete a top level directory after you create it.

a. Select **Manage** > **Import Zip**.
b. Click **Browse**.
c. Browse to the file you want to import.
d. Click **Open**.
e. Click **Import**.

3. When you edit or import template files, the appliance displays a message that there are undeployed changes. If you finish the changes, deploy them.

   For more information, see Deploying pending changes.

Customizing the consent page

The consent page of an OpenID Connect Provider Federation can be changed with the Template Files page in the local management interface.

About this task

All OpenID Connect Provider (OP) federations can have their own unique consent pages. Follow these steps to set a consent page to be used by a specific federation.

Procedure

1. Log in to the local management console.
2. Select **Federation** > **Global Settings** > **Template Files**.
3. Expand the **C** locale.
4. Highlight the **oidc** folder.
5. Click **New** and select **Directory**.
6. Enter the **Federation Name** of the OpenID Connect Provider Federation to use the custom consent page.
7. Click **Save**.
8. Highlight the new directory.
9. Click **New** and select **File**.
10. Enter `consent.html` as the file name.
11. Populate the file contents.
12. Click **Save**.
13. Deploy the pending changes.

    Note: The deploy operation triggers a runtime restart.

Template page scripting

You can use JavaScript to add server-side scripting for Advanced Access Control and Federation template pages. You can use JavaScript functions, closures, objects, and delegations.

Usage

You can customize template files or pages on the server. For example, you can customize an error message that is displayed by the runtime server.

The template files menu is located under both the Federation and AAC menus.

To edit a Federation template file, go **Federation > Template Files**, select the specific template file, and click **Edit**.

To edit an AAC template file, go to **AAC > Template Files**, select the specific template file, and click **Edit**.

The JavaScript engine supports the following syntax:

- Insert JavaScript code between <% and %>.
- Embed JavaScript expressions between <%= and %>.

Example tasks

- Access whitelisted Java classes. For example,

```
var javaStr = new java.lang.String("Hello")
```

- Access all the macro variables through templateContext. The standard object to access a Java object is templateContext. For example,

```
templateContext.macros["@TIMESTAMP@"]
```

- Use the document.write function to write content to the output stream. For example,

```
templateContext.response.body.write("Hello")
```

Examples

Table 24. Example JavaScript

Template HTML	Output
<% var contents = {product:"Verify Access",department:"Lab",country:"SG",region:"Asia"}; templateContext.response.body.write(contents.product); %>	Verify Access

<%
var date = templateContext.macros["@TIMESTAMP@"].substring(0, 10);
templateContext.response.body.write(date);
%>
	2017-01-25

The following code example shows how to use repeatable macros. The following example shows an OAuth consent page.

```
<%
var test = templateContext.macros["oauthTokenScopeNewApprovalRepeatable"];
n = test.length;
for (i=0; i<n; i++){
        var scope = test[i]["@OAUTH_TOKEN_SCOPE_REPEAT@"];
        if (scope == "contacts"){
            label ="Do you grant permission to the client to access your phone book";
        }
```

```
        else if (scope == "photos"){
            label ="Do you grant permission to the client to access your photos";
        }
        else if (scope == "messages"){
            label ="Do you grant permission to the client to access your WhatsApp messages";
        }
        else{
            label ="Do you grant permission to the client to access your "+scope;
        }
%>
```

Setting an HTTP response header

You can use `templateContext.response.setHeader(HeaderName, HeaderValue)` to set an HTTP response header.

For example, you can set the `Content-Type` to support both a mobile-based browser and a traditional browser. A mobile-based browser might expect JSON format while a traditional browser expects forms-based HTML.

```
 <%
templateContext.response.setHeader("Content-Type","application/json");
var myObj = { "name":"John", "age":31, "city":"New York" };
templateContext.response.body.write(JSON.stringify(myObj));
%>
```

To set an HTTP header that uses forms-based HTML:

```
templateContext.response.setHeader("Content-Type","text/html");
```

Setting an HTTP status code

You can use `templateContext.response.setStatus(Code)` to set an HTTP response status code.

For example, if you want to set the status to `400` (standard code for a bad request):

```
templateContext.response.setStatus(400);
```

Setting a Redirect URL

You can use `templateContext.response.sendRedirect(URL)` to redirect the HTTP response to a different URL.

For example, when you configure single logout, you can redirect the response to a specific target page, based on the federation name. An example scenario is a deployment that has one SAML 2.0 federation with two partner federations. The partner federations are named `saml20app2` and `saml20sp`. The `saml20app2` federation uses an application that is named `jkebank`. The `saml20sp` federation uses an application that is named `jkeschool`. The page to display on logout is determined by the federation name.

```
var fedName = templateContext.macros[@FEDERATION_NAME@"];
if (fedName == "saml20app2")
{
    templateContext.response.sendRedirect("http://jkebank:1337");
}
else if
{
(fedName == "saml20sp")
{
    templateContext.response.sendRedirect("http://jkeschool:1400");
}
```

Obtaining a list of macros that are available for a template page

In some scenarios, you might want to write JavaScript based on configuration values in your deployment. For example, you might implement one action based on the authentication type, such as if the OTP type is TOTP. Another example is you might implement an action if the Federation name of the single sign-on partner matches a certain value.

Information such as the OTP type and partner name can be retrieved only through the template page macros. To use such information, you need to know which macros are used by the page. The JavaScript engine support provides a utility that can print the available macros for a page.

Use the following syntax to obtain a list of the available macros.

```
<%
var javaStr = new java.lang.String(JSON.stringify(templateContext.macros));
templateContext.response.body.write(javaStr.replaceAll('@','#'));
%>
```

For example, the following sample code prints the macros from a template page that ran a single sign-on flow with a partner that does not exist.

```
{

    "@PAGE_IDENTIFIER@": "/saml20/invalid_init_msg.html",
    "@TARGET@": "https://www.mysp.ibm.com/isam/mobile-demo/diag",
    "@PARTNER_ENTITY_ID@": "",
    "@ERROR_MESSAGE@": "FBTSML002E The value https://saml.partner.com for attribute PartnerId is not
valid.",
    "@FEDERATION_NAME@": "saml20idp",
    "@FEDERATION_ENTITY_ID@": "https://www.myidp.ibm.com/isam/sps/saml20idp/saml20",
    "@REQ_ADDR@": "/sps/saml20idp/saml20/logininitial",
    "@ERROR_CODE@": "FBTSML002E",
    "@EXCEPTION_STACK@": "",
    "@PARTNER_NAME@": "",
    "@TIMESTAMP@": "2017-06-22T03:34:39Z",
    "@SAMLSTATUS@": "<fim:FIMStatusCollection xmlns:fim=\"urn:ibm:names:ITFIM:saml\"
     xmlns:samlp=\"urn:oasis:names:tc:SAML:2.0:protocol\"><fim:FIMStatusCollectionEntry>
     <samlp:Status><samlp:StatusCode Value=\"urn:oasis:names:tc:SAML:2.0:status:Responder\"></
samlp:StatusCode>
     <samlp:StatusDetail><fim:FIMStatusDetail MessageID=\"invalid_attribute_value\">
     <fim:SubstitutionString>https://saml.salesforce.com</fim:SubstitutionString>
     <fim:SubstitutionString>PartnerId</fim:SubstitutionString></fim:FIMStatusDetail>
     </samlp:StatusDetail></samlp:Status></fim:FIMStatusCollectionEntry></fim:FIMStatusCollection>",
    "@EXCEPTION_MSG@": ""

}
```

The format is JSON `{ "name1":"value1","name2":"value2"}`

Limitations

- JavaScript validation is done only when a template file is edited (imported) or created. A template file that is imported as a part of an Import compressed file is not validated.
- You must restart the runtime manually to activate changes to OpenID Connect template files. In the administrative interface, click **Federation -> Runtime Tuning -> Restart Runtime**.
- When you access a variable, do not end the variable name with a semicolon. For example, in the following JavaScript, do not end <%=example%> with a semicolon <%=example;%>.

  ```
  <%var example = "Hello World"; %>
  <%=example%>
  ```

  The correct syntax is <%=example%>. Do not use the incorrect syntax <%=example;%>.

Template files reference

Template files are HTML pages that are presented to your users during the authentication process. The pages prompt users for authentication information, such as user names and passwords, or present information to users, such as one-time passwords, status, or errors.

Consent to register device template files

These files support consent to registering a device.

Consent to register device template files

These files support consent to registering a device.

Table 25. Default template files in the ac/ directory

Page name	File name and macros	Description
Attribute Collection JavaScript	`ac/info.js`	Detects the location of the device from which the requests are made. Collects the web browser attributes and sends them to the server for storing in the database. When the user logs out or when the current session times out, the script deletes the attributes from the database.
Dynamics Attributes JavaScript	`ac/javascript_rules/dynamic_attributes.js`	Runs after each request is processed by risk engine. Use it to capture attributes that do not get captured automatically. Captured attributes are stored either in the session storage or the behavior storage area of the risk-based component, or both. The risk profile configuration dictates where the attributes are stored.

User self-care template files

These files support user self-care tasks.

User self-care template files

These files support user self-care tasks.

Table 26. Default template files in the mga/ directory

Page name	File name and macros	Description
Common User Profile Management JavaScript	`mga/user/mgmt/common.js`	Used by one-time password pages and by device management pages. Contains functions and properties that are used for making calls to the user self-care REST services.

Table 26. Default template files in the mga/ directory (continued)		
Page name	**File name and macros**	**Description**
Device Attributes	`mga/user/mgmt/device/device_attributes.html`	Enables or disable devices. Renames or removes device. Displays all of the attributes for a device. For more information, see Managing your registered devices.
Device Attributes JavaScript	`mga/user/mgmt/device/device_attributes.js`	Processes values that are entered in the `device_attributes.html` template
Device Selection	`mga/user/mgmt/device/device_selection.html`	Displays device name, status (enabled or disabled), and time of last activity. For more information, see Managing your registered devices.
Device Selection JavaScript	`mga/user/mgmt/device/device_selection.js`	Processes data to display in the `device_selections.html` template
Authorization Grant	`mga/user/mgmt/device/grant_attributes.html`	Enables or disables an OAuth 2.0 authorization grant. Removes an OAuth 2.0 authorization grant. Displays the OAuth 2.0 tokens and attributes of an authorization grant. For more information, see Managing OAuth 2.0 Authorization Grants.
Authorization Grants JavaScript	`mga/user/mgmt/device/grant-attributes.js`	Processes data to display in the `grant_attributes.html` template.
HMAC OTP Shared Key	`mga/user/mgmt/otp/otp.html`	Resets TOTP and HOTP Secret Key. For more information, see Managing OTP secret keys.
HMAC OTP Shared Key JavaScript	`mga/user/mgmt/otp/otp.js`	Resets TOTP and HOTP Secret Key.
Knowledge Questions management	`mga/user/mgmt/questions/user_questions.html` Macros: • **@USERNAME @** • **@MAX_STORED_QUESTIONS@**	Displayed for the user to manage their knowledge questions. The user can select pre-configured questions or write their own questions.

Table 26. Default template files in the mga/ directory (continued)		
Page name	**File name and macros**	**Description**
Knowledge Questions JavaScript functions	`mga /user/mgmt/questions/user_questions.js`	Consists of the JavaScript functions that: • Display the knowledge questions. • Allow the user to manage their knowledge questions.

Authentication process

These files support the authentication process

Authentication process template files

These files support the authentication process. For more information, see Authentication.

Table 27. Default template files in the authsvc/ directory		
Page name	**File name and macros**	**Description**
Server Error	`authsvc/server_error.html` Macros: • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays general server errors.
User Error	`authsvc/user_error.html` Macros: • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during authentication policy execution that are caused by user input.

Authentication mechanisms

These files support the authentication mechanisms.

Authentication mechanisms

These files support the authentication mechanisms. For more information, see Authentication.

Table 28. Default template files in the otp/ directory

Page name	File name and macros	Description and link to file contents
Change PIN required	otp/change_pin.html Macros • **@ERROR_MESSAGE@** • **@MAPPING_RULE_DATA@** • **@DISPLAY_RESELECT_BUTTON@**	Enables the user to enter a new PIN.
OTP Email Delivery Message	otp/delivery/email_message.xml	Used by EmailOTPDelivery as the content of the email that it sends to the user. The template file must be a compliant XML file. The content can be plain text or HTML. Following is an example that uses HTML in the email template: `<?xml version="1.0" encoding="UTF-8"?>` `<root>` `<Subject>` `<Value>One-time Password</Value>` `</Subject>` `<Message>` **`<Value><![CDATA[<html>`** **`<body>`** **`<img src="https://www.example.com/images/logo.gif" />`** **` This is your HTML email one-time password @OTP_STRING@. `** **`<p>Thank you, `** **`The Example Co.</p>`** **`</body>`** **`</html>]]>`** **`</Value>`** `</Message>` `</root>` For more information about HTML formatting of email messages, see HTML format for OTP email messages.
OTP SMS Delivery Message	otp/delivery/sms_message.xml	Used by SMSOTPDelivery as the content of the SMS that it sends to the user. The template file must be a compliant XML file.

Table 28. Default template files in the otp/ directory (continued)

Page name	File name and macros	Description and link to file contents
One-Time Password Delivery Selection	otp/delivery_selection.html Macros • **@OTP_METHOD_CHECKED@** • **@OTP_METHOD_LABEL@**	Displays the list of methods for generating, delivering, and verifying the one-time password.
OTP General Error	otp/errors/allerror.html Macros • **@REQ_ADDR@** • **@TIMESTAMP@** • **@DETAIL@** • **@EXCEPTION_STACK@**	Displays general errors that happen during the one-time password flow.
OTP Validation Error	otp/errors/error_could_not_validate_otp.html Macros • **@REQ_ADDR@** • **@TIMESTAMP@** • **@DETAIL@** • **@EXCEPTION_STACK@**	Displays errors during the validation of the one-time password that the user submits.
OTP Generation Error	otp/errors/error_generating_otp.html Macros • **@REQ_ADDR@** • **@TIMESTAMP@** • **@DETAIL@** • **@EXCEPTION_STACK@**	Displays errors during the generation of a one-time password.
OTP Methods Retrieval Error	otp/errors/error_get_delivery_options.html Macros • **@REQ_ADDR@** • **@TIMESTAMP@** • **@DETAIL@** • **@EXCEPTION_STACK@**	Displays errors during the retrieval of the list of methods for delivering one-time password to the user.

Table 28. Default template files in the otp/ directory (continued)

Page name	File name and macros	Description and link to file contents
OTP Delivery Error	otp/errors/error_otp_delivery.html Macros • **@REQ_ADDR@** • **@TIMESTAMP@** • **@DETAIL@** • **@EXCEPTION_STACK@**	Displays errors during the delivery of a one-time password to the user.
OTP STS Invocation Error	otp/errors/error_sts_invoke_failed.html Macros • **@REQ_ADDR@** • **@TIMESTAMP@** • **@DETAIL@** • **@EXCEPTION_STACK@**	Displays errors during the invocation of the Security Token Service.
One-Time Password Login	otp/login.html Macros • **@ERROR_MESSAGE@** • **@MAPPING_RULE_DATA@** • **@DISPLAY_RESELECT_BUTTON@**	Displays the form where the user can enter the one-time password.
Enter Next OTP Form	otp/next_otp.html Macros • **@ERROR_MESSAGE@** • **@MAPPING_RULE_DATA@** • **@DISPLAY_RESELECT_BUTTON@**	Enables the user to enter the next one time password.

Table 29. Default template files in the authsvc/authenticator directory

Page name	File name and macros	Description
Authenticator Error Page	authsvc/authenticator/error.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@**	A generic authenticator error page.

Table 29. Default template files in the authsvc/authenticator directory (continued)		
Page name	**File name and macros**	**Description**
Authenticator Login Page	authsvc/authenticator/login.html Macros • **@USERNAME@** • **@JUNCTION@** • **@ACTION@**	A generic authenticator username and password login page.

Table 30. Default template files in the authsvc/authenticator/basicldapuser directory		
Page name	**File name and macros**	**Description**
Change Password	authsvc/authenticator/basicldapuser/change_password.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@USERNAME@** • **@ACTION@** • **@OLDPASSWORD@** • **@POLICYMESSAGE@**	Enables the user to change their LDAP password.
Username and Password Login	authsvc/authenticator/bascildapuser/login.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@**	Displays the form where the user can enter their username and password to log in.

Table 31. Default template files in the authsvc/authenticator/branching directory		
Page name	**File name and macros**	**Description**
Generic Decision	authsvc/authenticator/branching/generic_decision.html Macros • **@BRANCHES@** • **@JUNCTION@** • **@ACTION@**	Displays a form that allows the user to select an authentication branch to use from a list of available branches.

Table 31. Default template files in the authsvc/authenticator/branching directory (continued)

Page name	File name and macros	Description
Second Factor Decision	authsvc/authenticator/branching/second_factor_decision.html • **@MECHANISMS@** • **@ERROR_MESSAGE@** • **@METHODS@** • **@JUNCTION@** • **@MOBILE_NUM@** • **@EMAIL_ADDR@** • **@ACTION@**	Displays a form that allows the user to select a second factor authentication method to use from a list of available methods.
Identifier First Authentication Page	authsvc/authenticator/branching/identifier_first.html Macros: • **@FIDO_RP_ID@** • **@FIDO_TIMEOUT@** • **@FIDO_CHALLENGE@** • **@FIDO_USER_VERIFICATION@** • **@FIDO_STATUS@** • **@FIDO_ERROR_MESSAGE@** • **@STATE@** • **@ACTION@**	Displays a form that allows the user to submit their username or perform autofill FIDO authentication.
IFA Authentication Method Choice Page	authsvc/authenticator/branching/ifa_choice.html • **@ERROR_MESSAGE@** • **@IS_FIDO@** • **@IS_MMFA@** • **@FINGERPRINT_PREFERRED@** • **@STATE@** • **@ACTION@** • **@USERNAME@**	If enrolled, the user is prompted to choose between FIDO2/WebAuthn authentication, MMFA authentication, or standard username/password authentication.

Table 31. Default template files in the authsvc/authenticator/branching directory (continued)		
Page name	**File name and macros**	**Description**
IFA FIDO2 PAIR Registration Page	authsvc/authenticator/branching/ifa_fido2pair_reg.html Macros: • **@FIDO_ERROR_MESSAGE@** • **@STATE@** • **@FIDO_USER_NAME@** • **@ACTION@** • **@ERROR_MESSAGE@** • **@FIDO_INFOMAP_PARAM@** • **@CANCEL_ACTION@**	Displays a page that allows a user to register a FIDO2 device for authentication.
IFA Redirect Page	authsvc/authenticator/branching/ifa_redirect.html • **@ERROR_MESSAGE@** • **@IFA_REDIRECT_URL@** • **@USERNAME@**	Redirects the user to the configured Redirect URL, if the username matched a set regular expression.

Table 32. Default template files in the authsvc/authenticator/ci directory		
Page name	**File name and macros**	**Description**
Username and Password Login	authsvc/authenticator/ci/login.html Macros • **@USERNAME@** • **@JUNCTION@** • **@ACTION@**	Displays the form where the user can enter their username and password to log in.
Authenticate Page	authsvc/authenticator/ci/authenticate_dialog.html Macros • **@HIDE_TRANSIENT_IF_ENROLL@** • **@EXPAND_VERIFY_METHODS@** • **@JIT_ENROLLMENT@** • **@AUTH_METHODS@** • **@SIGNATURE_METHODS@** • **@TRANSIENT_METHODS@** • **@JUNCTION@** • **@ACTION@**	Displays a form that allows the user to select a method to use for two-step verification.

Table 32. Default template files in the `authsvc/authenticator/ci` directory (continued)

Page name	File name and macros	Description
Choose Method Page	`authsvc/authenticator/ci/choose_method.html` Macros • **@AUTH_METHODS@** • **@SIGNATURE_METHODS@** • **@TRANSIENT_METHODS@** • **@ACTION@**	Displays a form that allows the user to select a method to use for two-step verification.
Verify Page	`authsvc/authenticator/ci/verify.html` Macros • **@TYPE@** • **@ERROR_MESSAGE@** • **@CORRELATION@** • **@JUNCTION@** • **@ACTION@** • **@ID@**	Displays a form that allows the user to enter the access code that is used to authenticate the two-step verification.
Device Connected Page	`authsvc/authenticator/ci/device_connected.html` Macros • **@TYPE@** • **@DEVICE_NAME@** • **@JUNCTION@** • **@ACTION@**	Displays a confirmation page that a device was successfully connected and can now be selected as a method for two-step verification.
Enrollment Page	`authsvc/authenticator/ci/enrollment.html` Macros • **@TYPE@** • **@CORRELATION@** • **@JUNCTION@** • **@ACTION@**	Displays a form that is used to validate an OTP during an enrollment flow.
Error Page	`authsvc/authenticator/ci/error.html` Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@**	Displays errors during the CI authentication.

Table 32. Default template files in the `authsvc/authenticator/ci` directory (continued)

Page name	File name and macros	Description
JIT Enroll Page	`authsvc/authenticator/ci/jit_enroll.html` Macros • **@ERROR_MESSAGE@** • **@JIT_TYPE@** • **@JUNCTION@** • **@ACTION@**	Displays a form that allows a user with no existing device registrations to enroll a device during a CI authentication.
TOTP Enrollment Page	`authsvc/authenticator/ci/totp_enrollment.html` Macros • **@ERROR_MESSAGE@** • **@QRCODE@** • **@JUNCTION@** • **@ACTION@**	Displays a page that allows a user to enroll a device for TOTP authentication.
Push Notification Page	`authsvc/authenticator/ci/try_push.html` Macros • **@DEVICE_NAME@** • **@JUNCTION@** • **@ACTION@**	Displays a page that allows a device to be configured and tested to receive push notifications to authenticate the two-step verification.
User Self-Care Page	`authsvc/authenticator/ci/usc.html` Macros • **@ENABLED_METHODS@** • **@NAME@** • **@AUTH_METHODS@** • **@AUTHENTICATORS@** • **@EMAIL@** • **@USERNAME@** • **@DEVICE_COUNT@** • **@METHOD_COUNT@** • **@JUNCTION@** • **@ACTION@**	Displays a page that allows a user to manage their registered authentication devices.
Username Login Page	`authsvc/authenticator/ci/username.html` Macros • **@USERNAME@** • **@JUNCTION@** • **@ACTION@**	Displays the form where the user can enter their username to log in without a password.

Table 32. Default template files in the authsvc/authenticator/ci directory (continued)

Page name	File name and macros	Description
Verify Registration Page	authsvc/authenticator/ci/verify_registration.html Macros • **@QRCODE@** • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION**	Displays a page that allows a user to enroll a device to use IBM Verify for authentication.
Wait Page	authsvc/authenticator/ci/wait.html Macros • **@ACTION**	Displays a page while it waits between polls during an IBM Verify authentication.

Table 33. Default template files in the authsvc/authenticator/email_message directory

Page name	File name and macros	Description
Email Delivery Message	authsvc/authenticator/email_message/email_message.xml Macros • @ATTRIBUTE@	The email content that is sent to the SMTP server.
Error Page	authsvc/authenticator/email_message/error.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	The email content that is sent to the SMTP server.

Table 34. Default template files in the `authsvc/authenticator/fido` directory

Page name	File name and macros	Description
Assertion Page	`authsvc/authenticator/fido/assertion.html` Macros • **@FIDO_RP_ID@** • **@FIDO_TIMEOUT@** • **@FIDO_CHALLENGE@** • **@FIDO_USER_VERIFICATION@** • **@FIDO_USER_ID@** • **@FIDO_STATUS@** • **@FIDO_ERROR_MESSAGE@** • **@STATE@** • **@ACTION@** • **@FIDO_ALLOW_CREDENTIALS@** • **@FIDO_EXTENSIONS@** • **@ERROR_MESSAGE@** • **@FIDO_INFOMAP_PARAM@** • **@CANCEL_ACTION@**	Displays a form that allows a user to perform a FIDO authentication.

Table 34. Default template files in the authsvc/authenticator/fido directory (continued)

Page name	File name and macros	Description
Attestation Page	authsvc/authenticator/fido/attestation.html Macros • **@FIDO_RP_ID@** • **@FIDO_RP_NAME@** • **@FIDO_USER_ID@** • **@FIDO_USER_NAME@** • **@FIDO_DISPLAY_NAME@** • **@FIDO_TIMEOUT@** • **@FIDO_CHALLENGE@** • **@FIDO_REQUIRE_RESIDENT_KEY@** • **@FIDO_RESIDENT_KEY@** • **@FIDO_USER_VERIFICATION@** • **@FIDO_AUTHENTICATOR_ATTACHMENT@** • **@FIDO_ATTESTATION@** • **@FIDO_STATUS@** • **@FIDO_ERROR_MESSAGE@** • **@ACTION@** • **@FIDO_ALLOW_CREDENTIALS@** • **@FIDO_EXTENSIONS@** • **@FIDO_PUBKEY_CRED_PARAMS@** • **@ERROR_MESSAGE@** • **@FIDO_INFOMAP_PARAM@** • **@STATE@** • **@CANCEL_ACTION@**	Displays a form that allows a user to register a FIDO device for authentication.
Error Page	authsvc/authenticator/fido/error.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@**	Displays errors during the FIDO authentication.

Table 35. Default template files in the `authsvc/authenticator/fido2pair` directory		
Page name	**File name and macros**	**Description**
FIDO2 PAIR Authentication Decision Page	`authsvc/authenticator/fido2pair/fido2pair_authn_decision.html` Macros • **@FIDO_RP_ID@** • **@FIDO_TIMEOUT@** • **@FIDO_CHALLENGE@** • **@FIDO_USER_VERIFICATION@** • **@FIDO_USER_ID@** • **@FIDO_STATUS@** • **@FIDO_ERROR_MESSAGE@** • **@STATE@** • **@ACTION@** • **@PERSISTENT_USERNAME@** • **@FIDO_ALLOW_CREDENTIALS@** • **@FIDO_EXTENSIONS@** • **@JUNCTION@**	Displays a page that allows a user to either login by using a username and password or by using an already registered FIDO device.
FIDO2 PAIR Login Success Page	`authsvc/authenticator/fido2pair/fido2pair_login_success.html`	Displays a page that indicates that the login was successful. The page is imported into the reverse proxy management root when FIDO2 PAIR is configured and the administrator chooses to overwrite the default login success page. It saves the persistent token from the reverse proxy into the browser for subsequent FIDO2 authentication.
FIDO2 PAIR Device Registration Complete Page	`authsvc/authenticator/fido2pair/fido2pair_reg_complete.html` Macros • **@JUNCTION@** • **@ACTION@**	Displays a page that indicates that a FIDO2 device was registered successfully and can now be used for subsequent authentications.

Table 35. Default template files in the authsvc/authenticator/fido2pair directory (continued)

Page name	File name and macros	Description
FIDO2 PAIR Device Registration Decision Page	authsvc/authenticator/fido2pair/fido2pair_reg_decision.html Macros • **@USERNAME@** • **@JUNCTION@** • **@ACTION@**	Displays a page that allows a user to decide whether they would like to register a FIDO2 device for authentication after the initial username and password login.
FIDO2 PAIR Device Registration Page	authsvc/authenticator/fido2pair/fido2pair_reg_mechanism.html Macros • **@FIDO_ERROR_MESSAGE@** • **@STATE@** • **@FIDO_USER_NAME@** • **@ACTION@** • **@ERROR_MESSAGE@** • **@FIDO_INFOMAP_PARAM@** • **@CANCEL_ACTION@**	Displays a page that allows a user to register a FIDO2 device for authentication.

Table 36. Default template files in the authsvc/authenticator/infomap directory

Page name	File name and macros	Description
Error Page	authsvc/authenticator/infomap/error.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays a page that shows the details of an error that was encountered.

Table 36. Default template files in the `authsvc/authenticator/infomap` directory (continued)		
Page name	**File name and macros**	**Description**
FIDO Assertion Page	`authsvc/authenticator/infomap/fido_assertion.html` Macros • **@FIDO_RP_ID@** • **@FIDO_TIMEOUT@** • **@FIDO_CHALLENGE@** • **@FIDO_USER_VERIFICATION@** • **@FIDO_USER_ID@** • **@FIDO_STATUS@** • **@FIDO_ERROR_MESSAGE@** • **@ACTION@** • **@FIDO_ALLOW_CREDENTIALS@** • **@FIDO_EXTENSIONS@** • **@ERROR_MESSAGE@** • **@FIDO_INFOMAP_PARAM@** • **@STATE@** • **@CANCEL_ACTION@**	Displays a form that allows a user to perform a FIDO authentication.

Table 36. Default template files in the `authsvc/authenticator/infomap` directory (continued)		
Page name	**File name and macros**	**Description**
FIDO Attestation Page	`authsvc/authenticator/infomap/fido_attestation.html` Macros • **@FIDO_RP_ID@** • **@FIDO_RP_NAME@** • **@FIDO_TIMEOUT@** • **@FIDO_CHALLENGE@** • **@FIDO_USER_ID@** • **@FIDO_USER_NAME@** • **@FIDO_USER_DISPLAY_NAME@** • **@FIDO_STATUS@** • **@FIDO_ERROR_MESSAGE@** • **@ACTION@** • **@FIDO_EXCLUDED_CREDENTIALS@** • **@FIDO_PUBKEY_CRED_PARAMS@** • **@FIDO_AUTHENTICATOR_SELECTION@** • **@FIDO_EXTENSIONS@** • **@ERROR_MESSAGE@** • **@FIDO_INFOMAP_PARAM@** • **@STATE@** • **@CANCEL_ACTION@** • **@FIDO_ATTESTATION@**	Displays a form that allows a user to register a FIDO device for authentication.
Username Login Page	`authsvc/authenticator/infomap/login.html` Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@**	Displays the form where the user can enter their username to log in.

Table 37. Default template files in the `authsvc/authenticator/mmfa` directory		
Page name	**File name and macros**	**Description**
Mobile Multi-Factor Authentication Device Selection Page	`authsvc/authenticator/mfa/device_selection.html` Macros • **@JUNCTION@** • **@ACTION@** • **@MMFA_DEVICE_CHECKED@** • **@MMFA_DEVICE_ID@** • **@MMFA_DEVICE_LABEL@**	Displays a form that allows a user to select which registered device to send a mobile multi factor authentication notification.
Mobile Multi-Factor Authentication Error Page	`authsvc/authenticator/mmfa/error.html` Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@**	Displays a page that shows the details of an error that was encountered.
Mobile Multi-Factor Authentication Login Wait Page	`authsvc/authenticator/mmfa/login_wait.html` • **@ACTION@** • **@MMFA_TRANSACTION_STATUS@** • **@ERROR_MESSAGE@** • **@MMFA_TRANSACTION_ID@** • **@MMFA_CONTEXT_MESSAGE@** • **@RETURN_ENABLED@** • **@TOTP_ENROLLED@** • **@MMFA_DEVICE_NAME@** • **@JUNCTION@**	Displays a page that shows that a notification was sent to the selected device and waits for a response.

Table 38. Default template files in the authsvc/authenticator/mobileuserapproval directory

Page name	File name and macros	Description
Mobile User Approval Challenge Page	`authsvc/authenticator/mobileuserapproval/challenge.html` Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@** • **@SERVER_CHALLENGE@** • **@HANDLE@**	Displays a form that allows a user to sign the challenge data with the key that is associated with a given key handle.
Mobile User Approval Error Page	`authsvc/authenticator/mobileuserapproval/error.html` Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays a page that shows the details of an error that was encountered.

Table 39. Default template files in the authsvc/authenticator/qrlogin directory

Page name	File name and macros	Description
QR Login Error Page	`authsvc/authenticator/qrlogin/error.html` Macros • **@JUNCTION@** • **@ERROR@**	Displays errors during the QR code authentication.
QR Login Page	`authsvc/authenticator/qrlogin/qrlogin.html` Macros • **@DSI@** • **@IN_BRANCH@** • **@ACTION@** • **@LSI@** • **@JUNCTION@**	Displays a page that allows a user to authenticate by scanning a QR code with a registered device.

Table 39. Default template files in the authsvc/authenticator/qrlogin directory (continued)		
Page name	**File name and macros**	**Description**
QR Login Response Page	authsvc/authenticator/qrlogin/qrresponse.html Macros • **@USERNAME@** • **@ACTION@**	Sends a response to the device to indicate that the QR code authentication was successful.

Table 40. Default template files in the authsvc/authenticator/recaptcha directory		
Page name	**File name and macros**	**Description**
ReCAPTCHA Challenge Page	authsvc/authenticator/recaptcha/standalone.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@ACTION@** • **@SITE_KEY@**	Displays a form that prompts a user to fulfill a specific re-CAPTCHA challenge.

Table 41. Default template files in the authsvc/authenticator/rsa_securid directory		
Page name	**File name and macros**	**Description**
RSA SecurID One-Time Password Error	authsvc/authenticator/rsa_securid/error.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during the RSA SecurID one-time password authentication.
RSA SecurID One-Time Password Login	authsvc/authenticator/rsa_securid/code.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@ACTION@**	Displays a form where the user can enter the RSA SecurID one-time password to log in.
RSA SecurID One-Time Password Login (New PIN)	authsvc/authenticator/rsa_securid/new_pin.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@ACTION@**	Enables a user to enter a new RSA SecurID pin.

Table 41. Default template files in the authsvc/authenticator/rsa_securid directory (continued)		
Page name	**File name and macros**	**Description**
RSA SecurID One-Time Password Login (Next OTP)	`authsvc/authenticator/rsa_securid/next_code.html` Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@ACTION@**	Enables a user to enter the next RSA SecurID one-time password.

Table 42. Default template files in the authsvc/authenticator/u2f directory		
Page name	**File name and macros**	**Description**
U2F Token Error Page	`authsvc/authenticator/u2f/error.html` Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@**	Displays errors during the U2F token authentication.
U2F Token Registration Page	`authsvc/authenticator/u2f/register.html` Macros • **@U2F_APP_ID@** • **@U2F_CHALLENGE@** • **@U2F_VERSION@** • **@ACTION@** • **@CANCEL_ACTION@** • **@U2F_TOKENS@** • **@JUNCTION@** • **@UNREGISTER_ACTION** • **@UPDATE_ACTION@**	Displays a form to allow a user to register a U2F token for authentication.

Table 43. Default template files in the authsvc/authenticator/verify_gateway directory		
Page name	**File name and macros**	**Description**
IBM Verify Gateway Response Page	`authsvc/authenticator/verify_gateway/response.html`	This file is not currently used.

Table 44. Default template files in the authsvc/authenticator/password/ directory

Page name	File name and macros	Description
Change Password	authsvc/authenticator/password/change_password.html Macros • **@USERNAME@** • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@**	Enables the users to change their registry password.
Username and Password Error	authsvc/authenticator/password/error.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during the username and password authentication or when the users modify their password.
Username and Password Login	authsvc/authenticator/password/login.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@**	Displays the form where the users can enter their username and password to log in.

Table 45. Default template files in the authsvc/authenticator/http_redirect/ directory

Page name	File name and macros	Description
HTTP Redirect Authentication Error	authsvc/authenticator/http_redirect/allerror.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays general errors during for HTTP redirect authentication mechanism.

Table 45. Default template files in the authsvc/authenticator/http_redirect/ directory (continued)

Page name	File name and macros	Description
HTTP Redirect Authentication Failed	authsvc/authenticator/http_redirect/error_authenticate.html Macros • MAC • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during the HTTP redirect authentication flow.

Table 46. Default template files in the authsvc/authenticator/macotp/ directory

Page name	File name and macros	Description
MAC One-Time Password Delivery Selection	authsvc/authenticator/macotp/delivery_selection.html Macros • **@JUNCTION@** • **@ACTION@** • **@OTP_METHOD_ID@** • **@OTP_METHOD_CHECKED@** • **@OTP_METHOD_LABEL@**	Displays the list of methods for generating, delivering, and verifying the one-time password.
MAC OTP One-Time Password Error	authsvc/authenticator/macotp/error.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during the MAC one-time password authentication.

Table 46. Default template files in the authsvc/authenticator/macotp/ directory (continued)

Page name	File name and macros	Description
MAC One-Time Password Login	authsvc/authenticator/macotp/login.html Macros • **@MAPPING_RULE_DATA@** • **@DISPLAY_RESELECT_BUTTON@** • **@OTP_DELIVERY_ATTR@** • **@ERROR_MESSAGE@** • **@ACTION@** • **@JUNCTION@** • **@OTP_HINT@** • **@OTP_LOGIN_DISABLED@** • **@OTP_REGENERATE_DISABLED@**	Displays the form where the user can enter the MAC one-time password.

Table 47. Default template files in the authsvc/authenticator/rsa/ directory

Page name	File name and macros	Description
RSA One-Time Password Error	authsvc/authenticator/rsa/error.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during the RSA one-time password authentication.
RSA One-Time Password Login	authsvc/authenticator/rsa/code.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@**	Displays the form where the users can enter the RSA one-time password to log in.

Table 47. Default template files in the authsvc/authenticator/rsa/ directory (continued)		
Page name	**File name and macros**	**Description**
RSA One-Time Password Login (New PIN)	authsvc/ authenticator/rsa/ new_pin.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@**	Enables users to enter a new RSA pin.
RSA One-Time Password Login (Next OTP)	authsvc/ authenticator/rsa/ next_code.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@**	Enables users to enter the next RSA one-time password.

Table 48. Default template files in the authsvc/authenticator/totp/ directory		
Page name	**File name and macros**	**Description**
TOTP One-Time Password Error	authsvc/authenticator/ totp/error.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during the TOTP one-time password authentication.
TOTP One-Time Password Login	authsvc/authenticator/ totp/login.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@ACTION@**	Displays the form where the users can enter the TOTP password to log in.

Table 49. Default template files in the authsvc/authenticator/hotp/ directory

Page name	File name and macros	Description
HOTP One-Time Password Error	authsvc/authenticator/hotp/error.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during the HOTP one-time password authentication.
HOTP One-Time Password Login	authsvc/authenticator/hotp/login.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@ACTION@**	Displays the form where the users can enter the HOTP password to log in.

Table 50. Default template files in the authsvc/authenticator/consent_register_device/ directory

Page name	File name and macros	Description
Consent page	authsvc/authenticator/consent_register_device/consent-form.html Macros • **@JUNCTION@** • **@ERROR_MESSAGE@** • **@ACTION@**	Prompts the user to provide consent for registering a device.
Consent to Device Registration Error	authsvc/authenticator/consent_register_device/error.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during the consent to device registration flow.

Table 51. Default template files in the authsvc/authenticator/eula/ directory

Page name	File name and macros	Description
End-User License Agreement license file display	authsvc/authenticator/eula/license.txt	Contains the license agreement to display to the user. The template does not use replacement macros. **Note:** You can add more license files to the template tree. Specify the metadata in the End-User License Agreement for the following purposes: • Auditing • Forensic The End-User License Agreement authentication mechanism removes the metadata before it displays the license agreement to the user. The metadata must be on the first line of the license agreement. For example, `Metadata:  Version: 1.0  Identifier: 135223434343` When the user accepts the license agreement or declines the license agreement, the mechanism audits: • The user action. • The license file name. • The corresponding metadata.
End-User License Agreement license agreement display	authsvc/authenticator/eula/eula.html Macros • **@USERNAME@** • **@LICENSE@** • **@JUNCTION@** • **@ACTION@**	Displays the page where the user views the license and accepts the license agreement.

Table 51. Default template files in the authsvc/authenticator/eula/ directory (continued)		
Page name	**File name and macros**	**Description**
End-User License Agreement license agreement decline	authsvc/authenticator/eula/error_license_declined.html Macros • **@USERNAME@** • **@ERROR_MESSAGE@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@ERROR_MESSAGE@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@** • **@LICENSE_FILE@** • **@LICENSE_METADATA@** • **@JUNCTION@**	Displays the page where the user declines the license agreement.

Table 52. Default template files in the authsvc/authenticator/knowledge_questions/ directory		
Page name	**File name and macros**	**Description**
Knowledge Questions authentication mechanism knowledge login form	authsvc/authenticator/knowledge_questions/login.html Macros • **@ERROR_MESSAGE@** • **@JUNCTION@** • **@ACTION@** • **@QUESTION_INDEX@** • **@QUESTION_TEXT@** • **@QUESTION_UNIQUE_ID@** • **@QUESTION_COUNT@**	Displays the form where the user enters the answers to the required knowledge questions.
Knowledge Questions authentication mechanism knowledge question authentication errors	authsvc/authenticator/knowledge_questions/error.html Macros • **@JUNCTION@** • **@REQ_ADDR@** • **@TIMESTAMP@** • **@ERROR_MESSAGE@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors during knowledge-question authentication.

Table 52. Default template files in the authsvc/authenticator/knowledge_questions/ directory (continued)		
Page name	**File name and macros**	**Description**
Knowledge Questions authentication mechanism missing knowledge questions with grace period	authsvc/authenticator/knowledge_questions/not_enough_questions_found_continue.html Macros • **@JUNCTION@** • **@USERNAME@** • **@NUM_REQUIRED_ANSWERS@** • **@NUM_REGISTERED_QUESTIONS@** • **@GRACE_PERIOD_AUTH_COUNT@** • **@MAX_GRACE_PERIOD_AUTH_COUNT@** • **@ACTION@**	Displayed when the user did not register the required number of knowledge questions and answers that are required for successful authentication. The following conditions must also be true: • The administrator configured the environment to allow grace-period authentication. • The user did not reach the limit of grace-period logins.
Knowledge Questions authentication mechanism missing knowledge questions without grace period	authsvc/authenticator/knowledge_questions/not_enough_questions_found_error.html Macros • **@JUNCTION@** • **@USERNAME@** • **@NUM_REQUIRED_ANSWERS@** • **@NUM_REGISTERED_QUESTIONS@** • **@REQ_ADDR@** • **@TIMESTAMP@**	Displayed when the user did not register the required number of knowledge questions and answers that are required for successful authentication. One of the following conditions must also be true: • The administrator did not configure the environment to allow grace-period authentication. • The user reached the limit of grace-period logins.

Authentication error template files

These files display errors that occur during authentication.

Authentication error template files

These files display errors that occur during authentication.

Table 53. Default files in the proper/ directory		
Page name	**File name and macros**	**Description**
Access Denied	proper/errors/access_denied.html Macros: • **@REQ_ADDR@** • **@TIMESTAMP@**	Displays a message that the user cannot access the requested resource.

Table 53. Default files in the `proper/` directory (continued)

Page name	File name and macros	Description
General Error	`proper/errors/allerror.html` Macros: • **@REQ_ADDR@** • **@TIMESTAMP@** • **@DETAIL@** • **@EXCEPTION_STACK@**	Displays general errors that are not displayed in other template files.
Missing Component Error	`proper/errors/missingcomponent.html` Macros: • **@REQ_ADDR@** • **@TIMESTAMP@** • **@DETAIL@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays an error that the component required to process the request was not correctly configured or was not initialized.
Authentication Required	`proper/errors/need_authentication.html` Macros: • **@REQ_ADDR@** • **@TIMESTAMP@**	Displays an error that authentication is required to access the requested resource.
Protocol Determination Error	`proper/errors/noprotdet.html` Macros: • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays an error that the access request is to an unknown address. The error might occur because no configured endpoint or protocol exists that is mapped to this endpoint.
Protocol Runtime Error	`proper/errors/protocol_error.html` Macros: • **@REQ_ADDR@** • **@TIMESTAMP@** • **@EXCEPTION_MSG@** • **@EXCEPTION_STACK@**	Displays errors that an error occurred fulfilling a request to a specified address, and the error was caused by an unexpected error on the protocol module.

OAuth template files

These files support OAuth.

OAuth template files

These files support OAuth. For more information, see OAuth 2.0 and OIDC Support.

Table 54. Default files in the oauth20/ directory

Page name	File name and macros	Description
OAuth 2.0 Trusted Clients Manager	oauth20/clients_manager.html Macros: • **@USERNAME@** • **@OAUTH_CLIENT_COMPANY_NAME@** • **@PERMITTED_SCOPES@** • **@OAUTH_CUSTOM_MACRO@**	Used by resource owners to show and manage trusted clients information.
OAuth 2.0 - Consent to Authorize	oauth20/user_consent.html Macros: • **@USERNAME@** • **@OAUTH_CLIENT_COMPANY_NAME@** • **@PERMITTED_SCOPES@** • **@OAUTH_CUSTOM_MACRO@**	Used by the authorization server to determine and store user consent information about which OAuth clients are authorized to access the protected resource. The page also lists of scopes that the OAuth client requests. These lists are shown in the consent page and can be of indeterminate length. The template supports multiple copies of stanzas that are repeated once for each scope in the lists.
OAuth 2.0 - Error	oauth20/user_error.html Macros: • **@OAUTH_CLIENT_COMPANY_NAME@** • **@CLIENT_TYPE@** • **@CLIENT_ID@** • **@REDIRECT_URI@** • **@STATE@** • **@RESPONSE_TYPE@** • **@USERNAME@** • **@OAUTH_TOKEN_SCOPE_REPEAT@** • **@OAUTH_OTHER_PARAM_REPEAT@** • **@OAUTH_OTHER_PARAM_VALUE_REPEAT@**	Shows detailed text information when an error occurs in an OAuth 2.0 flow.

Table 54. Default files in the oauth20/ directory (continued)		
Page name	**File name and macros**	**Description**
OAuth - Response	`oauth20/user_response.html` Macros: • **@OAUTH_CODE@**	Displays the authorization code of an OAuth client that did not specify a client redirection URI upon registration. When the OAuth client does not specify a client redirection URI or cannot receive redirects, the authorization server does not know where to send the resource owner after authorization. As a result, the OAuth client does not receive the authorization code that is required to exchange for an access token or refresh token. The page includes several codes: • The authorization code that the resource owner can provide to the trusted OAuth client. • The authorization code as machine-readable Quick Response (QR) code. **Note:** The encoder that creates the QR code follows the ISO/IEC 18004:2006 specification. Scanners that support this specification can read the generated QR code.

Customizing SAML 2.0 pages

Verify Access generates files that are displayed in response to events that occur during single sign-on requests. The response that is displayed might be a form, such as when login information is required, or an error or information statement about a condition that occurred while the request was processed.

You can customize the event pages by modifying their appearance or content.

Before you continue with the customization, you need to have a thorough understanding of how event pages are generated and displayed.

Generation of event pages

Event pages are displayed in response to events that occur during single sign-on requests. They usually contain a form (such as a prompt for user name and password information) or text (such as an informational or error message).

Event pages are dynamic pages that are generated by Security Verify Access by using the following information:

Template files
: XML or HTML files that are provided with the appliance and contain elements, such as fields, text, or graphics, and sometimes macros that are replaced with information that is specific to the request or to provide a response to the request.

Page identifiers
Event information that corresponds to one or more template files. Each page identifier corresponds to a specific event condition, such as a specific error or a condition in which a message or a form must be displayed.

Message catalogs
Text that is used to replace macros in the template files.

When a request is received, the appropriate response page is generated as follows:

1. Processing of the request occurs and a response to an event is required.
2. Template files and page identifiers are read from the file system.
3. Macros in the template files are replaced with values that are appropriate for the response that is needed.
4. An appropriate event page is generated.
5. The generated event page is displayed.

SAML 2.0 page identifiers

The SAML 2.0 runtime can display HTML pages in response to events that occur during single sign-on requests. You can select which pages to display and also modify the pages.

Use HTML pages for the following purposes:

- Displaying success and error messages to users
- Asking users for confirmation
- Sending SAML messages

You can customize these HTML pages so that they display what you want. These pages contain *macros* and are similar to other HTML pages in Security Verify Access. A macro is text in an HTML page that is replaced with context-specific information. For example, the macro `@ERROR_MESSSAGE@` is replaced by text that describes the error that occurred.

You can find the SAML 2.0 pages in the local management interface using these steps:

1. Click **Federation** > **Global Settings** > **Template Files**.
2. Expand the locale folder to locate a template file.

For example, the English version of the SAML `consent_to_federate.html` template is in `C/saml20`.

All of the available SAML 2.0 HTML pages are listed in the following table.

Table 55. SAML 2.0 HTML page identifiers and macros

Page identifier	Description	Macros and descriptions
`saml20/consent_to_federate.html`	Displays during the SAML single sign-on flow whenever the service provider wants to federate the account at the identity provider with the account at the service provider.	**`@TOKEN:form_action@`** The URL to which the SAML message is sent. **`@TOKEN:SPProviderID@`** The ID of the Service Provider. **`@TOKEN:SPDisplayName@`** The name of the Service Provider. **`@TOKEN:IPProviderID@`** The name of the Identity Provider.

Table 55. SAML 2.0 HTML page identifiers and macros (continued)

Page identifier	Description	Macros and descriptions
saml20/ logout_partial_success.html	Displays whenever the SAML single log out flow completes with partial success.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@TOKEN:UserName@** The user name that performs the operation.
saml20/ logout_success.html	Displays whenever the SAML single log out flow completes successfully.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@TOKEN:UserName@** The user name that performs the operation.
saml20/ nimgmt_terminate_success.html	Displays whenever the SAML name identifier management terminate flow completes successfully.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@TOKEN:UserName@** The user name that performs the operation. **@TOKEN:PartnerID@** The ID of the partner.
saml20/ nimgmt_update_success.html	Displays whenever the SAML name identifier management update flow completes successfully.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@TOKEN:UserName@** The user name that performs the operation. **@TOKEN:PartnerID@** The ID of the partner.
saml20/ saml_post_artifact.html	Sends the SAML artifact to the partner for HTTP POST binding.	**@TOKEN:form_action@** The URL to which the SAML message is sent. **@TOKEN:RelayState@** The RelayState. **@TOKEN:SamlMessage@** The SAML message.

Table 55. SAML 2.0 HTML page identifiers and macros (continued)

Page identifier	Description	Macros and descriptions
`saml20/saml_post_request.html`	Sends the SAML request message to partner for HTTP POST binding.	**@TOKEN:form_action@** The URL to which the SAML message is sent. **@TOKEN:RelayState@** The RelayState. **@TOKEN:SamlMessage@** The SAML message.
`saml20/saml_post_response.html`	Sends the SAML response message to the partner for HTTP POST binding.	**@TOKEN:form_action@** The URL to which the SAML message is sent. **@TOKEN:RelayState@** The RelayState. **@TOKEN:SamlMessage@** The SAML message.
`saml20/art_exchange_failed.html`	Displays whenever there is a failure during the SAML artifact resolution flow.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/authn_failed.html`	Displays whenever there is a failure during the SAML single sign-on flow.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.

Table 55. SAML 2.0 HTML page identifiers and macros (continued)

Page identifier	Description	Macros and descriptions
`saml20/error_building_msg.html`	Displays whenever an outgoing SAML message is not constructed.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/error_decrypting_msg.html`	Displays whenever an incoming SAML message is decrypted.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/error_missing_config_param.html`	Displays whenever a SAML flow is run on a SAML federation with invalid configuration.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/error_parsing_art.html`	Displays whenever an incoming SAML artifact is parsed.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.

Table 55. SAML 2.0 HTML page identifiers and macros (continued)

Page identifier	Description	Macros and descriptions
`saml20/error_parsing_msg.html`	Displays whenever an incoming SAML message is parsed.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/error_sending_msg.html`	Displays whenever an outgoing SAML message is sent.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/error_validating_art.html`	Displays whenever an incoming SAML artifact is validated.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/error_validating_init_msg.html`	Displays whenever a SAML flow is initiated.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.

Table 55. SAML 2.0 HTML page identifiers and macros (continued)

Page identifier	Description	Macros and descriptions
`saml20/error_validating_msg.html`	Displays whenever an incoming SAML message is validated.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/error_validating_msg_signature.html`	Displays whenever an incoming SAML message is signature validated.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/invalid_art.html`	Displays whenever an incoming SAML artifact is validated.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/invalid_init_msg.html`	Displays whenever a SAML flow is initiated.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.

Table 55. SAML 2.0 HTML page identifiers and macros (continued)

Page identifier	Description	Macros and descriptions
`saml20/invalid_msg.html`	Displays whenever an incoming SAML message is validated.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/logout_failed.html`	Displays whenever there is a failure during SAML single logout flow.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/nimgmt_terminate_failed.html`	Displays whenever there is a failure during the SAML name identifier terminate management flow.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.
`saml20/nimgmt_update_failed.html`	Displays whenever there is a failure during the SAML name identifier update management flow.	**@REQ_ADDR@** The URL of the request. **@TIMESTAMP@** The time stamp of the request. **@ERROR_MESSAGE@** The error message. **@EXCEPTION_STACK@** The stack trace of the error. Do not use this macro in a production environment.

Template page for the WAYF page

The Where Are You From (WAYF) page is used at the service provider. The WAYF page enables users to select their identity provider if there is more than one configured in the federation.

When a user arrives at a service provider, a WAYF identifier can be delivered through a cookie or query-string parameter with the request. The entity ID of the identity provider is stored as the value of the cookie or query-string parameter. If the WAYF identifier cookie or query-string parameter is not present, the WAYF page opens.

An example URL that includes the query string parameter for WAYF:

```
https://sp.host.com/isam/sps/samlfed/saml20/
logininitial?RequestBinding=HTTPRedirect&ResponseBinding
=HTTPPost&ITFIM_WAYF_IDP=https://idp.host.com/isam/sps/samlfed/saml20
```

This example is for a SAML 2.0 single sign-on URL. The query string parameter name is `ITFIM_WAYF_IDP`. The value of the identity provider ID is `https://idp.host.com/isam/sps/samlfed/saml20`.

The WAYF page requires the user to indicate where they came from. If the user is not logged on to their identity provider, they are asked to log on. Depending on the attributes passed, the service provider can grant or deny access to the service.

You can find the template pages for WAYF in the local management interface using these steps:

1. Click **Federation** > **Global Settings** > **Template Files**.
2. Expand the locale folder and navigate to `/pages/itfim/wayf`.

Administrators can use the WAYF page without modifications, but in some cases might want to modify the HTML style to match the specific deployment environment.

This template file provides several replacement macros:

@WAYF_FORM_ACTION@
: This macro is replaced with the endpoint of the original request. This macro does not belong within a repeatable section.

@WAYF_FORM_METHOD@
: This macro is replaced with the HTTP method of the original request. This macro does not belong within a repeatable section.

@WAYF_FORM_PARAM_ID@
: This macro is replaced with ID used by the action for the identity provider. This macro is repeated once for each identity provider.

@WAYF_IP_ID@
: This macro is replaced with the unique ID of the identity provider. This macro is repeated once for each identity provider.

@WAYF_IP_DISPLAY_NAME@
: This macro is replaced with the configured display name of the identity provider. This macro is repeated once for each identity provider.

@WAYF_HIDDEN_NAME@
: This macro is replaced with the name of the hidden parameter. This macro is repeated once for each original request parameter and is hidden.

@WAYF_HIDDEN_VALUE@
: This macro is replaced with the value of the hidden parameter. This macro is repeated once for each original request parameter and is hidden.

Customizing the Consent to Federate Page

A *consent to federate page* is an HTML form which prompts a user to give consent to joining a federation. You can customize the *consent to federate page* to specify what information it requests from a user.

Before you begin

Determine what values you want to use for the consent to federate page.

About this task

When a user accesses a federation, they agree to join the federation. The HTML form `saml20/consent_to_federate.html` prompts for this consent. You can customize what the form requests by adding consent values. These values indicate how a user agrees to join a federation and if service providers are notified of the consent. Identity providers receive the consent values in the SAML 2.0 response.

The following values determine how a user joins a federation:

1
A user agrees to join a federation without notifying the service provider.

0
A user refuses to join a federation.

A URI value
A URI can indicate whether the user agrees to join a federation and if you want to notify the service provider about the user consent. The following table lists and describes the supported URI values.

Table 56. Supported consent values for SAML 2.0 response

Consent value	URI	Description
Unspecified	`urn:oasis:names:tc:SAML:2.0:consent:unspecified`	The consent of the user is not specified.
Obtained	`urn:oasis:names:tc:SAML:2.0:consent: obtained`	Specifies that user consent is acquired by the issuer of the message.
Prior	`urn:oasis:names:tc:SAML:2.0:consent: prior`	Specifies that user consent is acquired by the issuer of the message before the action which initiated the message.
Implicit	`urn:oasis:names:tc:SAML:2.0:consent: current-implicit`	Specifies that user consent is implicitly acquired by the issuer of the message when the message was initiated.
Explicit	`urn:oasis:names:tc:SAML:2.0:consent: current-explicit`	Specifies that the user consent is explicitly acquired by the issuer of the message at the instance that the message was sent.
Unavailable	`urn:oasis:names:tc:SAML:2.0:consent:unavailable`	Specifies that the issuer of the message was not able to get consent from the user.
Inapplicable	`urn:oasis:names:tc:SAML:2.0:consent:inapplicable`	Specifies that the issuer of the message does not need to get or report the user consent.

Follow the steps in this procedure to customize the consent to federate page.

Procedure

1. Log in to the local management interface.
2. Click **Federation** > **Global Settings** > **Template Files**.
3. Expand a locale and select `saml20/consent_to_federate.html`.
4. Click **Edit** and add the appropriate consent values for your federation.
5. Click **Save**.
6. Deploy the changes.

Example

The following example shows an added URI with a consent value `Obtained`:

```
<input type="radio" checked name="Consent"
value="urn:urn:oasis:names:tc:SAML:2.0:consent:obtained"/>
Consent Obtained.<br/>
```

In this example, the user consent is acquired by the issuer of the message.

Template file macros

Most template pages contain one or more macros. The macros are replaced by values that are specific to the action that is requested on the page.

Macro	Value that replaces the macro
@CLIENT_ID@	The `client_id` parameter that is specified in the authorization request.
@CONSENT_FORM_VERIFIER@	A unique identifier for the consent_form_verifier parameter value. The value is automatically generated by the authorization server. Do not modify the parameter name or value.
@DETAIL@	The error message.
@ERROR_CODE@	Characters that uniquely identify the error.
@ERROR_DESCRIPTION@	The native language support (NLS) text of the error message that is associated with the error.
@ERROR_MESSAGE@	An error message that is specific to the action in the page. For example, on the One-time password template page for login, the error message indicates that the password submitted contains errors, such as the password is not valid or has expired.
@EXCEPTION_MSG@	The exception message.
@EXCEPTION_STACK@	The stack trace of the error.
@GRACE_PERIOD_AUTH_COUNT@	The amount of grace-period authentication.
@KICKOFF_METHOD@	The value that is set for the advanced configuration entry `sps.authService.policyKickoffMethod`. Available only through the use of an Infomap authenticator.
@LICENSE@	The contents of the license file.
@LICENSE_FILE@	The name of the license file.

Macro	Value that replaces the macro
@LICENSE_METADATA@	The metadata that is either: • Defined in the license file. • `Not Available` if it is not defined.
@MAPPING_RULE_DATA@	If the submitted one-time password contains an error, this value is the STS Universal User context attribute with the name `@MAPPING_RULE_DATA@` and is type `otp.sts.macro.type`. This context attribute can be set in the OTPVerify mapping rule.
@MAX_GRACE_PERIOD_AUTH_COUNT@	The maximum count of grace-period authentication that is allotted to a policy.
@MAX_STORED_QUESTIONS@	The maximum number of answers that can be stored per user.
@NUM_REQUIRED_ANSWERS@	The number of valid answers that is required for successful authentication.
@NUM_REGISTERED_QUESTIONS@	The number of questions that the user registered.
@OAUTH_AUTHORIZE_URI@	The URI for the authorization endpoint.
@OAUTH_CLIENT_COMPANY_NAME@	A multi-valued macro that belongs inside an `[RPT trustedClients]` repeatable replacement list. The values are replaced with the name of the company that requests access to the protected resource.
@OAUTH_CLIENTMANAGERURL@	A multi-valued macro that belongs inside an `[RPT trustedClients]` repeatable replacement list. The values are replaced with the endpoint of the trusted clients manager.
@OAUTH_CLIENT_NAME@	A macro that represents the name of the client that requests access to the protected resource.
@OAUTH_CODE@	The `oauth_code` parameter that is specified in the authorization response.
@OAUTH_CUSTOM_MACRO@	A multi-valued macro that belongs inside an `[RPT trustedClients]` repeatable replacement list. The values are replaced with trusted client information that contains additional information about an authorized OAuth client.
@OAUTH_OTHER_PARAM_REPEAT@	A multi-valued macro that belongs inside an `[RPT oauthOtherParamsRepeatable]` repeatable replacement list. The values show the list of extra parameter names.
@OAUTH_OTHER_PARAM_VALUE_REPEAT@	A multi-valued macro that belongs inside an `[RPT oauthOtherParamsRepeatable]` repeatable replacement list. The values show the list of extra parameter values.
@OAUTH_TOKEN_SCOPE_REPEAT@	A multi-valued macro that belongs inside an `[RPT oauthTokenScopePreapprovedRepeatable]` or `[RPT oauthTokenScopeNewApprovalRepeatable]`repeatable replacement lists. The values inside the `[RPT oauthTokenScopePreapprovedRepeatable]` show the list of token scopes that have been previously approved by the resource owner. Alternatively, the values inside the `[RPT oauthTokenScopeNewApprovalRepeatable]` show the list of token scopes that have not yet been approved by the resource owner.

Macro	Value that replaces the macro
@OTP_HINT@	The one-time password hint. The hint is a sequence of characters that is associated with the one-time password.
@OTP_METHOD_CHECKED@	For the first method, this macro is replaced with an HTML radio button attribute that causes that radio button to be selected. For the remaining methods that generate, deliver, and verify one-time passwords, this macro is replaced with an empty string.
@OTP_METHOD_ID@	The ID of the method for generating, delivering, and verifying the one-time password. This ID is generated by the `OTPGetMethods` mapping rule.
@OTP_METHOD_LABEL@	The label of the method for generating, delivering, and verifying the one-time password. This label is generated by the `OTPGetMethods` mapping rule.
@OTP_METHOD_TYPE@	The type of the currently selected method for generating, delivering, and verifying the one-time password. This type is generated by the `OTPGetMethods` mapping rule and was selected by the user.
@OTP_STRING@	The one-time password that is generated by the one-time password provider.
@PERMITTED_SCOPES@	A multi-valued macro that belongs inside an `[RPT trustedClients]` repeatable list. The values are replaced with the token scopes to which the OAuth client has access.
@QUESTION_COUNT@	The number of questions that are presented on the login page.
@QUESTION_TEXT@	The question text. This macro is only populated when the question is a user-provided question.
@QUESTION_INDEX@	The question index. This index corresponds to the array of questions that are presented on the page when questions are presented as a group.
@QUESTION_UNIQUE_ID@	The question unique identifier.
@REDIRECT_URI@	The redirect URI that the authorization server uses to send the authorization code to. The value depends on the following items: • Redirect URI that is entered during partner registration. • `oauth_redirect` parameter that is specified in the authorization request
@REGENERATE_ACTION@	The URl where the Generate button posts the form to regenerate and deliver the new one-time password value.
@RESPONSE_TYPE@	The `response_type` parameter specified in the authorization request.
@REQ_ADDR@	The URL into which the request from the user is sent.
@RESELECT_ACTION@	The URl where the Reselect button posts the form to reselect the method for generating, delivering, and verifying the one-time password value.
@STATE@	The `state` parameter that is specified in the authorization request.

Macro	Value that replaces the macro

@STS_USER_MESSAGE_EXCEPTION@	This macro is populated with the customized user exception that is set in a JavaScript mapping rule by using the following utility:
	`IDMappingExtUtils.throwSTSUserMessageException(String message);`
	A template page can then use this macro to display a customized exception.
	For example:
	`<h1 class="pageTitle error">An error has occurred</h1>`
	`<div class="instructions">@STS_USER_MESSAGE_EXCEPTION@</div>`

@TIMESTAMP@	The time stamp when the error occurred.
@UNIQUE_ID@	A multi-valued macro that belongs inside an `[RPT trustedClients]` repeatable replacement list. The values are replaced with a unique identifier that identifies the trusted client information for each entry in the list.
@USERNAME@	The Security Verify Access user name.

Template File Locales

Use the local management interface to manage allowed locales for both messages and template files.

Template Files can be associated with a specific language and/or region. The directory structure of the template pages that is combined with specific Advanced configuration properties allows an administrator to configure which locale version of pages is returned to a user in differing situations.

Users can configure which locales are supported on the appliance and which locale is the fallback default in circumstances where a requested locale is not supported.

The following advanced configuration properties controls the default locales and the allowed locales:

Property	Description
`sps.page.allowedLocales`	This is a comma separated list of allowed locales with or without region. For example, `pt_BR`, `it`. This example demonstrates that the Portuguese language from Brazil region and any Italian language are allowed by the appliance. The default for this item is a special identifier "`all`", which denotes that all locale and region combinations are allowed by the appliance.
`sps.page.defaultLocale`	This is a single entry, that identifies the fallback locale when the request does not include any locale from the **`allowedLocales`** list. For example, if the default for this item is `en`, this means if the request does not contain a locale from the **`allowedLocales`** list, the response is using the English language templates, and messages. In template files, the English version is provided by the top level directory `/C`.

Property	Description
sps.page.strictLocaleMatching	A flag which controls whether the locale matching algorithm should be strict for matching the requested locale to the available template files, as well as the allowed locales list. When set to true, both the base language code (for example, en, pt) and the region code (for example, US, BR) must exactly match. When set to false, an exact match of base language and region code will be preferred, but if no exact match is found, an approximate match of only the base language code will be accepted. The default value is false.

Messages can only be translated to languages which are pre-defined out of the box and cannot be extended beyond what is available on the appliance by default. In the case that the configured default is not an out of the box supported locale for messages, the English messages are returned.

For more information on advanced configuration properties, see Advanced configuration properties.

Template Files and Content Security Policy

The Advanced Access Control (AAC) template files have been developed for compliance with content security policy (CSP) directives.

Content Security Policy is not enabled for AAC responses by default but can be enabled by configuring the reverse proxy to add the CSP header to all outgoing responses. In the reverse proxy configuration file set the following response header:

```
[rsp-header-names]
    content-security-policy = default-src ‘self’; frame-ancestors 'self'; form-action 'self';
```

Note: The header can be set on a junction only by setting the same entry in the junction specific stanza [rsp-header-names:/junction_name].

The example content security policy header that is shown above is the level of CSP as is enabled by default for Reverse Proxy responses (other than the junction specific configuration).

Reverse Proxy Configuration for CSP Compliant Advanced Access Control (AAC) Templates

There are some reverse proxy and junction configuration entries that need to be considered for the content security policy compliant AAC templates to work as designed.

Inline Images

In AAC, there are some scenarios that require images to be made available to the HTML file as inline data. For example, QR codes. The image is not available as a static image but it is generated dynamically. The resulting HTML includes the base64 encoded image.

For example,

```
<img src=“ <base64 encoded image text>” />
```

These types of inline image will require that the content security policy is relaxed slightly to allow the inline data:

```
content-security-policy = default-src ‘self’; frame-ancestors 'self'; form-action 'self'; img-
src ‘self’ data:
```

This can be set explicitly on each response with the `rsp-header-names` entry in the reverse proxy configuration file or an HTTP transformation rule can be used to swap the content security policy header for the effected policy URI only.

For example:

1. Create the HTTP Transformation Rule (LUA).

```
HTTPResponse.removeHeader("content-security-policy")
HTTPResponse.setHeader("content-security-policy", "default-src 'self'; frame-ancestors
'self'; form-action 'self'; img-src 'self' data:;")
```

2. Apply the transformation rule to the GET on the effected policy ID.

```
request-match = response:GET /mga/sps/authsvc?
PolicyId=urn:ibm:security:authentication:asf:qrcode HTTP/*
```

Identity Cookie

The reverse proxy junction can pass identity information in a variety of ways including the injection of JavaScript code into the HEAD of all HTML responses. This method is not compliant with the content security policy directives stated above. As such the method used for the identity cookie should be set as HTTP Header rather than inline.

reCAPTCHA

The reCAPTCHA authentication policy requires multiple requests to a non-origin server. As such, the content security policy must enable these requests.

To enable this, include the following directives:

script-src

'self'

https://www.recaptcha.net

https://recaptcha.net

https://www.gstatic.com/recaptcha/

https://www.gstatic.cn/recaptcha/

https://www.google.com/recaptcha/;

frame-src

'self'

*.recaptcha.net

recaptcha.net

https://www.google.com/recaptcha/

https://recaptcha.google.com;

img-src

'self'

www.gstatic.com/recaptcha;

worker-src

'self'

www.recaptcha.net;

For example,

```
Content-Security-Policy = default-src 'self'; frame-ancestors 'self'; form-action 'self';
script-src 'self' https://www.recaptcha.net
https://www.google.com/recaptcha/ https://recaptcha.net https://www.gstatic.com/recaptcha/
https://www.gstatic.cn/recaptcha/;
frame-src 'self' *.recaptcha.net recaptcha.net https://www.google.com/recaptcha/ https://
recaptcha.google.com; img-src 'self'
www.gstatic.com/recaptcha; worker-src 'self' www.recaptcha.net;
```

Template Files Format

Each individual template file is split into the following three files:

The HTML template file
This file contains the actual HTML and any potential dynamic Macro replacements. The Macro replaced data is passed to a secondary JavaScript file using either the HTML script element dataset or the script text content as JSON.

An optional JavaScript file
This file contains any required scripting including handlers for HTML elements such as buttons, links, and more. There is no Macro replacement performed in JavaScript files for authentication mechanism templates. For example, the templates in `C/authsvc/authenticator`. However, Macro replacement does work in user self care JavaScript files, such as those in `C/mga` or `C/mmfa`. JavaScript files must be included by the HTML template.

An optional css file
This contains any required styling for the HTML elements. Stylesheet files must be included by the HTML template.

Directory Structure

There are different layouts for the various AAC template files:

1. Authentication Mechanism templates
   - The HTML template files exist in the location: `<LANG>/authsvc/authenticator/<mech_name>`
   - The JavaScript template files exist in the location: `C/static/javascript/<mech_name>`
   - The css template files exist in the location: `C/static/css/<mech_name>`

   Note: Some files only exist in the `C/static directory` and not other language directories, as they do not contain any translated strings.
2. MMFA User Self Care templates
   - The HTML, JavaScript, and css template files exist in the location: `<LANG>/mmfa/user/mgmt/mmfa`

   The exception to this is that the manage.html app templates are split into:
   - The HTML template files exist in the location: `<LANG>/mmfa/user/mgmt/mmfa/usc`
   - The JavaScript template files exist in the location: `<LANG>/mmfa/user/mgmt/mmfa/usc/static/js`
   - The css template files exist in the location: `<LANG>/mmfa/user/mgmt/mmfa/usc/static/css`
3. Other User Self Care templates
   - The HTML, JavaScript, and css template files exist in or under the location: `<LANG>/mga/user/mgmt/`

Mapping rules

Mapping rules are JavaScript code that runs during the authentication flow for Advanced Access Control and Federation.

Mapping rules can be used for multiple purposes. For Advanced Access Control, you can modify rules for the Authentication Service, OTP, and OAuth 2.0. For Federation, you can modify mapping rules to manage

identities for OIDC and SAML 2.0. Use the task topic below that applies to the type of mapping rule you want to manage.

Note: Support for the importing of a mapping rule into another mapping rule applies to all mapping rules.

Managing JavaScript mapping rules

Create or edit JavaScript mapping rules.

About this task

When you activate the Advanced Access Control offering, the following mapping rule types are available:

AuthSvc
Authorization service mapping rule.

OAUTH
OAuth mapping rule.

OTP
One-time password mapping rule.

OIDC
OpenID Connect mapping rule.

SAML2_0
SAML 2.0 mapping rule.

Procedure

1. Click **AAC**.
2. Under **Global Settings**, click **Mapping Rules**.
   All existing mapping rules are displayed.
3. You can create and manage a mapping rule with the following methods:

   Create a mapping rule

   a. Click **Add**.
   b. In the **Content** field, enter the JavaScript mapping rule content.
   c. In the **Name** field, enter a name for the rule.
   d. In the **Category** field, select the type of the mapping rule from the list.

      Note: Only the mapping rule types that apply to your current activated offering are displayed in the list.

   e. Click **Save**.

   Modify a mapping rule

   a. Select the mapping rule to modify.
   b. Click **Edit**.
   c. Modify the mapping rule in the **Content** field as needed.

      Note: The **Name** and **Category** fields are not editable.

   d. Click **Save**.

   Delete a mapping rule

   a. Select the mapping rule to delete.
   b. Click **Delete**.
   c. Click **Delete** to confirm.

Replace a mapping rule

a. Select the mapping rule to replace.

b. Click **Replace**.

c. Click the **Browse** button and select the local file that contains the new contents.

d. Click **OK**.

Import a mapping rule

a. Click **Import**.

b. In the **Name** field, enter a name for the rule.

c. In the **Category** field, select the type of the mapping rule from the list.

Note: Only the mapping rule types that apply to your current activated offering are displayed in the list.

d. Click the **Browse** button and select the local file that contains the new contents.

e. Click **OK**.

Export a mapping rule

a. Select the mapping rule to export.

b. Click **Export**.

Import multiple mapping rules

a. Click **Manage** and select **Import Zip** from the drop-down menu.

b. Click the **Browse** button and select the local zip file that contains the mapping rules to import.

The mapping rules must exist in the root directory of the zip file alongside a `manifest.json` file that describes each new mapping rule.

The `manifest.json` file is an array of entries where each entry must contain each of:

name
The name of the mapping rule.

category
The category of the mapping rule.

fileName
The name of the file in the zip that contains the mapping rule contents.

For example:

```
[
    {“name”:”ruleA”, “category”:”InfoMap”, “fileName”:”ruleA.js”},
    {“name”:”ruleB”, “category”:”AuthSvc”, “fileName”:”ruleB.js”}
]
```

An error will be returned if:

- A file exists without a manifest entry.
- A manifest entry exists for a non existent file.
- A manifest entry does not contain name, category, and fileName.

c. Click **OK**.

Exporting multiple mapping rules

a. Click **Manage** and select **Export Zip** from the drop-down menu.

Managing mapping rules

The mapping rules are JavaScript code that run during the authentication flow. Use the rules to customize the authentication service and the one-time password generation, delivery, and verification.

Before you begin

Attention: Use extreme care when you replace mapping rules. Any change that you make to a mapping rule can affect the entire runtime environment. Always export a copy of the original rule you plan to replace so that you have a backup copy.

About this task

You can customize several components through JavaScript code. For example, you can customize the Authentication Service to modify the content of user credential by modifying the AuthSvcCredential mapping rule.

The JavaScript code is run by the Rhino JavaScript engine. Your JavaScript code must conform to JavaScript 1.7. Your JavaScript code is not run under a browser environment. Therefore, you cannot use objects and functions that are available only in a browser environment. You can, however, use standard JavaScript objects (such as `Math`) and functions (such as `parseInt`). In addition, your JavaScript code can use allowed Java classes, which you might need so that you can use operations that are not supported by standard JavaScript functions. You can find the list of these Java classes at "JavaScript Allowlist" on page 339. To find out more about using Java classes in JavaScript, see the Rhino documentation https://developer.mozilla.org/en/docs/Rhino.

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Policy**, click **Authentication**.
4. Click **Advanced**.
5. Take one of the following actions:

   View a mapping rule:

   a. Select a mapping rule.

   b. Click . The **View Mapping Rule** panel opens. The content of the mapping rule is displayed.

   c. Click **OK** to close the panel.

   Export a mapping rule:

   a. Select a mapping rule.

   b. Click .

   c. Choose a location and save the file.

   Replace a mapping rule:

   Use an existing mapping rule as the basis for the updated mapping rule.

   Attention: When you replace this file, an error in the JavaScript source might be found immediately after it is replaced or it might not be found until the file is run.

   a. Select a mapping rule that you want to replace.

   b. Click . The **Replace Mapping Rule** panel opens.

   c. Click the field or the **Browse** button and select a file.

   Attention: The name of the mapping rule cannot be replaced. The name of the uploaded file is ignored.

d. Click **OK** to upload the mapping rule.

What to do next

When you replace a mapping rule, the appliance displays a message that there are undeployed changes. Deploy the changes when you are done. For more information, see Chapter 15, “Deploying pending changes,” on page 221.

Authentication Service Credential mapping rule

The Authentication Service Credential mapping rule is JavaScript code that you can use to customize the information that is contained in the user credential.

During authentication, the Authentication Service gathers information about the authenticated user, including attributes associated with the user ID. After successful authentication, the Authentication Service provides this information to the Authentication Service Credential mapping rule. The main task of the mapping rule is to modify or add attributes to the user information before it is used to generate a credential.

Customizing the mapping rule is an advanced way to customize the credential. To specify basic credential attributes, use an authentication policy and the **Credentials** panel in the local management interface instead of creating a custom mapping rule. See Creating an authentication policy.

If you write your own mapping rule and use it to replace the existing rule, be aware of the following considerations:

- Credential attributes are string values. For example, user names and lists of groups are string arrays.
- Do not use spaces, commas, or colons in credential attribute names. Use alphanumeric characters.

The sample mapping rule provides more descriptions about considerations for writing your own mapping rule.

A default `AuthSvcCredential` mapping rule is provided. To review the rule:

1. Log in to the local management interface.
2. Click **AAC**
3. Under **Policy**, click **Authentication**.
4. Click **Advanced**.
5. Select `AuthSvcCredential`.
6. Click .
7. Choose a location and save the file.

To review an example of a customized credential mapping rule:

1. Log in to the local management interface.
2. Click **System**.
3. Click **File Downloads**.
4. Click **access_control** > **examples** > **mapping_rules**.
5. Select `authsvc_credential.js`.
6. Click **Export** to download the file.

If you create your own rule, use it to replace the existing rule. See the replacement instructions in “Managing mapping rules” on page 73.

OTPGetMethods mapping rule

`OTPGetMethods` specifies the methods for delivering the one-time password to the user.

This sample mapping rule sets password delivery conditions for the following delivery methods:

- By email
- By SMS
- No delivery

Each delivery method includes the following attributes and their corresponding value:

id
Specifies a unique delivery method ID. This value replaces the `@OTP_METHOD_ID@` macro in the **OTP Method Selection** page. Use a unique value across different methods. For example, `sms`.

deliveryType
Specifies the delivery plug-in that delivers the one-time password. The value must match one of the types in the `DeliveryTypesToOTPDeliveryModuleIds` parameter of the OTP response file. For example, `sms_delivery`.

deliveryAttribute
Specifies an attribute that is associated with the delivery type. The value depends on the one-time password provider plug-in for the delivery type. For example:

- For SMS delivery, the value is the mobile number of the user. For example, `mobileNumber`.
- For email delivery, the value is the email address of the user. For example, `emailAddress`.
- For no delivery, the value is an empty string.

label
Specifies the unique delivery method to the user. For time-based and counter-based one-time password, use this attribute to specify the secret key of the user. If `label` is not specified, the time-based and counter-based one-time password code retrieves the key by invoking the user information provider plug-in. This parameter replaces the `@OTP_METHOD_LABEL@` macro in the **OTP Method Selection** page.

otpType
Specifies the one-time password provider plug-in that generates and verifies the password. The value must match one of the types in the `OTPTypesToOTPProviderModuleIds` parameter of the OTP response file. For example, `mac_otp`.

userInfoType
Specifies which user information provider plug-in to use to retrieve user information that is required to calculate the one-time password. This parameter is only required if user information is used for calculation of the one-time password.

To customize one-time password delivery, you can do one of the following actions:

- Create your own mapping rules that are based on the sample `OTPGetMethods` mapping rule.
- Modify the sample `OTPGetMethods` mapping rule.

You can also customize the mapping rule to use access control context data. For details see, "Customizing one-time password mapping rules to use access control context data" on page 78.

OTPGenerate mapping rule

`OTPGenerate` mapping rule specifies the generation of the one-time password for the user.

You can use the `OTPGenerate` mapping rule in the following configuration:

Modify the one-time password type of the selected method to generate the one-time password
Indicates the one-time password type to determine the one-time password Provider plug-in that generates the one-time password for the user.

Note: See the comments in the mapping rule for more details.

You can also customize the mapping rule to use access control context data. For details see, "Customizing one-time password mapping rules to use access control context data" on page 78.

OTPDeliver mapping rule

The `OTPDeliver` mapping rule specifies the delivery method of the one-time password to the user.

Use the following `OTPDeliver` mapping rules:

Generate the one-time password hint
The one-time password hint is a sequence of characters that is associated with the one-time password. The one-time password hint is displayed in the **One-Time Password Login** page. It is also sent to the user together with the one-time password.

You can customize the way the one-time password hint is generated by modifying the following section in the default `OTPDeliver` mapping rule:

```
var otpHint = Math.floor(1000 + (Math.random() * 9000));
```

Note: See the comments in the mapping rule for more details.

Generate the formatted one-time password
The formatted one-time password is the formatted version of the one-time password. The formatted one-time password, instead of the actual one-time password, is sent to the user. For example, for one-time password hint `abcd`, and one-time password 12345678, you can set the formatted one-time password as `abcd-12345678`. For one-time password hint `efgh`, and one-time password87654321, you can set the one-time password as `efgh#8765#4321`.

You can customize the way that the one-time password is generated by modifying the following section in the sample OTPDeliver mapping rule:

```
var otpFormatted = otpHint + "-" + otp;
```

Note: See the comments in the mapping rule for more details.

Modify the delivery type of the selected method for delivering the one-time password
The delivery type specifies the one-time password Delivery plug-in that delivers the one-time password to the user.

Modify the delivery attribute of the selected method to deliver
The delivery attribute is an attribute that is associated with delivery type. The meaning of the delivery attribute depends on the one-time password provider plug-in for the delivery type. For example, for SMS delivery type, the delivery attribute is the mobile number of the user. For email delivery type, the delivery attribute is the email address of the user.

Note: See the comments in the mapping rule for more details.

You can also customize the mapping rule to use access control context data. For details see, “Customizing one-time password mapping rules to use access control context data” on page 78.

OTPVerify mapping rule

`OTPVerify` specifies the verification of the one-time password that is submitted by the user.

You can customize the sample `OTPVerify` mapping rule to modify the following verification rules:

Modify the one-time password type of the user
Indicates the one-time password type to determine the one-time Provider plug-in that verifies the one-time password submitted by the user.

Set the authentication level of the user
After one-time password authentication completes, a credential is issued that contains the authentication level of the user. You can customize the authentication level by modifying the following section in the mapping rule:

```
var authenticationLevel = contextAttributesAttributeContainer.getAttributeValueByNameAndType
       ("otp.otp-callback.authentication-level", "otp.otp-callback.type");
var attributeAuthenticationLevel = new Attribute("AUTHENTICATION_LEVEL",
```

```
       "urn:ibm:names:ITFIM:5.1:accessmanager", authenticationLevel);
attributeContainer.setAttribute(attributeAuthenticationLevel);
```

Enforce the number of times the user can submit the one-time password in the one-time password login page

If a user exceeds the permitted number of times to submit a one-time password, an error message displays. You can customize the number of times that the user can submit the one-time password in the one-time password login page by modifying the following section in the mapping rule:

```
var retryLimit = 5;
```

By default, this option is set to `false`.

Note: This setting applies only to MAC OTP.

Identify the secret key of a user

When a user registers with a time-based one-time password application, they are assigned a secret key. Store the secret key in this mapping rule for verification of the user by modifying the following code:

```
var secretStr = new java.lang.String(SECRET_KEY_GOES_HERE);
```

By default, this option is set to `false`.

Override the one-time password target URL

By default, a user is redirected to a target URL upon completion of an one-time password flow. That target URL was either the initial cached request at the WebSEAL or reverse proxy instance or was specified as part of the one-time password invocation using the **`Target`** query string parameter.

You can use the 0TP`Verify` mapping rule to override this target URL by adding an attribute called **`itfim_override_targeturl_attr`**. This attribute ensures that at the completion of a successful one-time password flow, the user is redirected to the override target instead of the initial target. Example code:

```
var targetUrl = new java.lang.String("http://www.example.com/url");
var targetUrlAttr = new Attribute("itfim_override_targeturl_attr",
"urn:ibm:names:ITFIM:5.1:accessmanager", targetUrl);
attributeContainer.setAttribute(targetUrlAttr);
```

To customize one-time password verification, you can do one of the following actions:

- Create your own verification rules that are based on the sample 0TP`Verify` mapping rule.
- Modify the sample 0TP`Verify` mapping rule.

You can also customize the mapping rule to use access control context data. For details see, “Customizing one-time password mapping rules to use access control context data” on page 78.

Customizing one-time password mapping rules to use access control context data

Some authentication scenarios require that context data used in making an access control decision be available during authentication. You can configure Security Verify Access to capture the content data and make it available to the one-time password mapping rules.

About this task

You can configure Security Verify Access to perform access control policy evaluation when a resource is accessed. The access control policy evaluation can result on a permit with authentication. The required authentication is determined by the access control policy. Some scenarios require that the context data used to perform the access control decision be available during the authentication. In order to provide access to the access control context data, you can persist the context information for the predefined authentication obligations that perform one-time password authentication.

Note: The context data available is limited to the attributes referenced by the access control policy and the request attributes provided by the policy enforcement point. If the policy relies on the risk score to perform access control, the context data available also includes the risk-profile attributes.

Procedure

1. Log in to the local management interface.
2. Click **AAC** > **Global Settings** > **Advanced Configuration**.
3. Select **attributeCollection.authenticationContextAttributes**.
4. Click for the property.
5. In the text field, enter a list of comma separated attribute names to be collected during the authorization policy evaluation.
   For example, if your scenario requires the authentication level and host of the request the configuration property, enter `authenticationLevel, http:host`.

   The access control context data is provided to the one-time password mapping rules as context attributes values. The following format is used:

   ```
   <stsuuser:Attribute name="AttributeName-AttributeURI"
     type=""authn.service.context.attribute.type.AttributeDatatype">
   <stsuuser:Value>AttributeValue</stsuuser:Value>
   </stsuuser:Attribute>
   ```

   Where:

   - `name` is the attribute name and attribute identifier separated by a dash (-).
   - `type` is the attribute data type prefixed by `authn.service.context.attribute.type`.

   For example the `authenticationLevel` attribute value is added as:

   ```
   <stsuuser:Attribute name="authenticationlevel-urn-ibm:
      security:subject:authenticationlevel"
      type="authn.service.context.attribute.type.Integer">
   <stsuuser:Value>1</stsuuser:Value>
   </stsuuser:Attribute>
   ```

6. Click **OK**.
7. When you edit a property, a message indicates that there are undeployed changes. If you have finished making changes, deploy them.

   For more information, see Chapter 15, “Deploying pending changes,” on page 221.
8. Configure the mapping rule to use the information collected by this property as the context attribute.
   a) Click **AAC**.
   b) Under **Policy**, click **Authentication**.
   c) Click **Advanced**.
   d) Select and export the mapping rule.
   e) Use a text editor and modify the rule to access the attributes collected during the access control policy evaluation in the following format:

   ```
   var accessControlAttribute =
   contextAttributesAttributeContainer.getAttributeValueByNameAndType
   ("AttributeName-AttributeURI",
   "authn.service.context.attribute.type.AttributeDatatype");
   ```

   Where:

   - `name` is the attribute name and attribute identifier separated by a dash (-).
   - `type` is the attribute data type prefixed by `authn.service.context.attribute.type`.

For example, the `authenticationLevel` attribute can be obtained using the following information:

```
var accessControlAuthenticationLevel =
contextAttributesAttributeContainer.getAttributeValueByNameAndType
("authenticationlevel-urn-ibm:security:subject:authenticationlevel",
"authn.service.context.attribute.type.Integer");
```

f) Save the mapping rule and take note of its location.

g) In the local management interface, click **AAC**.

h) Under **Policy**, click **Authentication**.

i) Click **Advanced**.

j) Select the mapping rule you want to replace.

k) Click **Replace**. The Replace Mapping Rule panel opens.

l) Click the field or the **Browse** button and select the file for your saved mapping rule.

Attention: The name of the mapping rule cannot be replaced. The name of the uploaded file is ignored.

m) Click **OK** to upload the mapping rule.

Managing OAuth 2.0 mapping rules

Use the mapping rules to customize the methods for the OAuth 2.0 or OIDC flow.

About this task

The OAuth 2.0 and OIDC mapping rules are JavaScript code that run during the OAuth 2.0 or OIDC flow. You can view, export, and replace OAuth or OIDC mapping rules.

View the mapping rule if you want to see the content and structure of the mapping rule. Export the mapping rule if you want to save a copy of the mapping rule. You can also edit this copy. Replace a mapping rule if you want to use a new mapping rule.

Procedure

1. Log in to the local management interface.
2. Click **AAC** > **Policy** > **OpenID Connect and API Protection** or **Federation** > **Manage** > **OpenID Connect and API Protection**.
3. Click **Mapping Rules**.
4. Perform one or more of the following actions:

View a mapping rule

a. Select a mapping rule.

b. Click . The **View Mapping Rule** panel opens. The content of the mapping rule is displayed.

c. Click **OK** to close the panel.

Export a mapping rule

a. Select a mapping rule.

b. Click .

c. Choose a location and save the file.

Replace a mapping rule:

Note: Use an existing mapping rule as the basis for the updated mapping rule.

a. Select a mapping rule that you want to replace.

b. Click . The **Replace Mapping Rule** panel opens.

c. Click the field or **Browse** and select a file.

d. Click **OK** to upload the mapping rule.

5. When you replace a mapping rule, the appliance displays a message that there are undeployed changes. If you are finished with the changes, deploy them.

   For more information, see Chapter 15, "Deploying pending changes," on page 221.

Related reference

"OAuth 2.0 and OIDC mapping rule methods" on page 157

You can use Java methods to customize the `PreTokenGeneration` and `PostTokenGeneration` mapping rules.

OAuth 2.0 mapping rule methods

You can use Java methods to customize the `PreTokenGeneration` and `PostTokenGeneration` mapping rules.

The sample mapping rules are `oauth_20_pre_mapping.js` and `oauth_20_post_mapping.js`.

You can access the sample mapping rules from the LMI. Navigate to **System** > **Secure Settings** > **File Downloads**. Continue to either of the following locations:

- **access_control** > **examples** > **mapping rules**
- **federation** > **examples** > **mapping rules**

The following limitations affect the attribute keys and values that are associated with the `state_id` by using the `OAuthMappingExtUtils` class:

- Keys cannot be null or empty.
- Values cannot be null but can be empty.
- Associated key-value pairs are read and write-allowed and not-sensitive.
- Some keys are reserved for system use and cannot be modified by this utility. For example, the keys and values for the API PIN protection.

For more information, see the Javadoc. In the LMI, navigate to **System** > **Secure Settings** > **File Downloads**. Continue to either **access_control** > **doc** or **federation** > **doc**.

See also "JavaScript Allowlist" on page 339.

Actions to be performed in mapping rules

For certain grant types, you must perform these actions in the pre-token mapping rule.

Resource owner password credentials (ROPC) grant type flow

For the ROPC flow, the pre-token mapping rule is responsible for performing validation of the user name and password. This validation can be performed in various ways. The pre-defined rule that is included with the appliance provides the following examples:

- The java class **`PluginUtils`** can be used to validate a user name and password against a configured LDAP.

  To configure the LDAP to be used, see "Configuring username and password authentication" on page 48.
- Validate the user name and password through an HTTP callout. The mapping rule sends the user name and password to a web service. As the format of the messages is not fixed, various services (for example, REST, SOAP, SCIM) can be used for this purpose. Javadoc on the HTTP client and all other exposed Java classes available in mapping rules can be downloaded from the appliance **File Downloads** page under the path **access_control** > **doc** > **ISAM-javadoc.zip**.

JWT and SAML bearer grant type flow

For the JWT or SAML assertion bearer grant type flows, the pre-token mapping rule must perform the following actions:

- Validate the assertion, including but not limited to:
  - Validate the signature (if signed).
  - Decrypt the assertion (if encrypted).
  - Check the expiry and "not before" value of the assertion.
  - Ensure that the issuer is a trusted party.
- Extract the subject from the assertion and set the **USERNAME** field of the STSUU.

  The **USERNAME** field of the STSUU can be set via a call, for example:

```
// username is a variable containing the subject of the assertion

stsuu.addContextAttribute(new com.tivoli.am.fim.trustserver.sts.uuser.Attribute
("username","urn:ibm:names:ITFIM:oauth:rule:decision", username));
```

  The validation of the assertion can be performed in various ways:

  - HTTP callout to a web service. Use the HTTP client to perform this.
  - WS-Trust request to the Secure Token Service (STS).
    - A chain must be configured to consume the assertion and return the required information.
    - The **STSClientHelper** will be called to invoke the STS via HTTP. For more information about this class, see the Javadoc that is embedded in the appliance.

  Any attributes of the assertion can be extracted and associated to the OAuth grant to be used later. For more information about associating attributes, see “OAuth 2.0 and OIDC mapping rule methods” on page 157.
- The type of the username attribute added must be `"urn:ibm:names:ITFIM:oauth:rule:decision"` to ensure that only a value populated from the rule is used.

MMFA mapping rule methods

Customize the OAuth **PreTokenGeneration** and **PostTokenGeneration** mapping rules by using these methods.

Sample mapping rules are available from **System** > **Secure Settings** > **File Downloads** under the **access_control** > **examples** > **mapping rules** directory.

The following limitations affect the attribute keys and values that are associated with the **state_id** by using the **MMFAMappingExtUtils** class:

- Keys cannot be null or empty.
- Values can only be null or empty when specified.
- Associated key-value pairs are read-only and not case sensitive.
- The push token is read-only and case sensitive.

registerAuthenticator

```
public static String registerAuthenticator(
      String stateId
      )
```

This method performs the final steps of registering an authenticator. Use the following parameters:

stateId

The state ID of the authorization grant. This parameter cannot be null or empty.

These responses come from the runtime after registration.

- The new authenticator's ID if successful.
- Null if not successful.

savePushToken

```
public static boolean savePushToken(
      String stateId,
      String pushToken,
      String applicationID
      )
```

This method saves the push token and application ID with the authorization grant state ID. Use the following parameters:

stateId

The state ID of the authorization grant. This parameter cannot be null or empty.

pushToken

The push token the authenticator application has received from its push notification service provider. This parameter cannot be null or empty.

applicationID

The application ID of the authenticator application. This parameter can be null or empty.

These responses come from the runtime.

- True if successful.
- False if not successful.

savePushToken

```
public static boolean savePushToken(
      String stateId,
      String pushToken
      )
```

This method saves the push token and application ID with the authorization grant state ID. Use the following parameters:

stateId

The state ID of the authorization grant. This parameter cannot be null or empty.

pushToken

The push token the authenticator application has received from its push notification service provider. This parameter cannot be null or empty.

These responses come from the runtime.

- True if successful.
- False if not successful.

saveDeviceAttributes

```
public static boolean saveDeviceAttributes(
      String stateId,
      String deviceName,
      String deviceType,
      String osVersion,
```

```
      String fingerprintSupport,
      String frontCameraSupport,
      String tenantId
      )
```

This method saves various device attributes with the authorization grant state ID. Use the following parameters:

stateId

The state ID of the authorization grant. This parameter cannot be null or empty.

deviceName

The name of the device the authenticator is installed on. This parameter can be null or empty. If empty, the value is cleared.

deviceType

The type of the device the authenticator is installed on. This parameter can be null or empty. If empty, the value is cleared.

osVersion

The OS version of the device the authenticator is installed on. This parameter can be null or empty. If empty, the value is cleared.

fingerprintSupport

The type of fingerprint sensor that is supported by the device. This parameter can be null or empty. If empty, the value is cleared.

frontCameraSupport

flag that indicates if the device has a front facing camera. This parameter can be null or empty. If empty, the value is cleared.

tenantId

The tenant ID for this registration, if the authenticator application is multi-tenant. This parameter can be null or empty. If empty, the value is cleared.

These responses come from the runtime.

- True if successful.
- False if not successful.

XML Mapping Rules Method

Customize mapping rules by using these methods from the XMLExtUtils class.

Sample mapping rules are available from **System** > **Secure Settings** > **File Downloads**, under the **access_control** > **examples** > **mapping rules directory**.

getNode

```
public static Node getNode(String xpath, Element elem)

public static Node getNode(String xpath, Document doc)
```

The following methods evaluate an XPath on an XML document or element to retrieve a Node. Use the following parameters:

xpath
The XPath to evaluate. This parameter cannot be null or empty.

elem
The XML element on which to evaluate the specified XPath.

doc
The XML document on which to evaluate the specified XPath.

The following responses are expected:

- A node, if successful
- Null, if not successful

getNodes

```
public static NodeList getNodes(String xpath, Element elem)

public static NodeList getNodes(String xpath, Document doc)
```

The following methods evaluate an XPath on an XML document or element to retrieve a Node. Use the following parameters:

xpath
The XPath to evaluate. This parameter cannot be null or empty.

elem
The XML element on which to evaluate the specified XPath.

doc
The XML document on which to evaluate the specified XPath.

The following responses are expected:

- A NodeList, if successful
- Null, if not successful

See JavaScript whitelist.

JavaScript Allowlist

Advanced Access Control JavaScript mapping rules and Federation mapping rules call Java code from JavaScript. The set of classes that can be called is restricted.

Exercise reasonable caution when you call Java code from JavaScript rules to ensure that accidental damage to appliance resources is avoided.

Common classes allowed in one-time password, OAuth or API protection, dynamic attributes, and JavaScript PIP, federation mapping rules, and access policies.

```
java.lang.Boolean
java.lang.Byte
java.lang.Character
java.lang.Class
java.lang.Double
java.lang.Float
java.lang.Integer
java.lang.Long
java.lang.reflect.Array
java.lang.Short
java.lang.String
java.lang.System
```

```
java.io.ByteArrayInputStream
java.io.ObjectInputStream
java.io.PrintStream
```

```
java.math.BigDecimal
```

```
java.util.ArrayList **
java.util.Base64
java.util.Base64$Decoder
java.util.Base64$Encoder
java.util.Date
java.util.HashSet **
java.util.HashMap **
java.util.Iterator
java.util.List
java.util.logging.Level
java.util.Map
java.util.Set
java.util.UUID
```

```
com.ibm.security.access.httpclient.HttpClient
com.ibm.security.access.httpclient.HttpResponse
com.ibm.security.access.httpclient.Headers
com.ibm.security.access.httpclient.Parameters
com.ibm.security.access.httpclient.HttpClientV2
com.ibm.security.access.httpclient.RequestParameters
com.ibm.security.access.scimclient.ScimClient
com.ibm.security.access.scimcleint.ScimConfig
com.ibm.security.access.ciclient.CiClient
com.ibm.security.access.ciclient.CiClientV2
com.tivoli.am.rba.attributes.AttributeIdentifier
com.tivoli.am.rba.extensions.RBAExtensions
com.tivoli.am.rba.fingerprinting.ValueContainerIdentifierAdapter
com.tivoli.am.rba.extensions.Attribute$Category
com.tivoli.am.rba.extensions.Attribute$DataType
com.tivoli.am.rba.extensions.Attribute
com.tivoli.am.rba.extensions.PluginUtils
com.tivoli.am.fim.trustserver.sts.utilities.XMLExtUtils
```

** Inner classes for these classes are not supported. Methods that involve an inner class implementation of an interface are not available. For example, do not use the following methods in `java.util.HashMap`:

- `Collection<V> values()`
- `Set<K> keySet()`
- `Set<Map.Entry<K,V>> entrySet()`

For more information about dynamic attributes, see Dynamic attributes.

For information about federation mapping rules, see Mapping rules.

Additional classes allowed in one-time password, OAuth or API protection mapping rules, federation mapping rules, and access policies

```
com.tivoli.am.fim.base64.BASE64Utility
com.tivoli.am.fim.fedmgr2.trust.util.LocalSTSClient
com.tivoli.am.fim.fedmgr2.trust.util.LocalSTSClient$LocalSTSClientResult
com.tivoli.am.fim.saml20.protocol.extension.js.JSMessageExtensionContext
com.tivoli.am.fim.trustserver.sts.modules.http.stsclient.STSClientHelper
com.tivoli.am.fim.trustserver.sts.oauth20.Client
com.tivoli.am.fim.trustserver.sts.oauth20.Grant
com.tivoli.am.fim.trustserver.sts.oauth20.Token
com.tivoli.am.fim.trustserver.sts.oauth20.Definition
com.tivoli.am.fim.trustserver.sts.oauth20.OidcDefinition
com.tivoli.am.fim.trustserver.sts.STSModuleException
com.tivoli.am.fim.trustserver.sts.STSUniversalUser *
com.tivoli.am.fim.trustserver.sts.utilities.HttpResponse
com.tivoli.am.fim.trustserver.sts.utilities.IDMappingExtUtils
com.tivoli.am.fim.trustserver.sts.utilities.IDMappingExtCacheDMAPImpl
com.tivoli.am.fim.trustserver.sts.utilities.InfoCardClaim
com.tivoli.am.fim.trustserver.sts.utilities.KubernetesUtils
com.tivoli.am.fim.trustserver.sts.utilities.MMFAMappingExtUtils
com.tivoli.am.fim.trustserver.sts.utilities.OAuthMappingExtUtils
com.tivoli.am.fim.trustserver.sts.utilities.QueryServiceAttribute
com.tivoli.am.fim.trustserver.sts.utilities.USCContextAttributesHelper
com.tivoli.am.fim.trustserver.sts.uuser.Attribute *
com.tivoli.am.fim.trustserver.sts.uuser.AttributeList *
com.tivoli.am.fim.trustserver.sts.uuser.AttributeStatement *
com.tivoli.am.fim.trustserver.sts.uuser.ContextAttributes *
com.tivoli.am.fim.trustserver.sts.uuser.Group *
com.tivoli.am.fim.trustserver.sts.uuser.Principal *
com.tivoli.am.fim.trustserver.sts.uuser.RequestSecurityToken *
com.tivoli.am.fim.trustserver.sts.uuser.Subject *
com.tivoli.am.fim.utils.IteratorWrapper
com.tivoli.am.rba.pip.JavaScriptPIP
com.tivoli.am.rba.pip.JavaScriptPIP$Context
java.mail.internet.InternetAddress
com.tivoli.am.fim.saml.misc.Saml20ObjectFactory
com.tivoli.am.fim.saml.protocol.Saml20IDPList
com.tivoli.am.fim.saml.protocol.Saml20IDPListImpl
com.tivoli.am.fim.saml.protocol.Saml20Scoping
com.tivoli.am.fim.saml.protocol.Saml20IDPEntry
com.tivoli.am.fim.saml.protocol.Saml20IDPEntryImpl
com.tivoli.am.fim.saml.protocol.Saml20AuthnRequest
com.tivoli.am.fim.saml.protocol.Saml20ScopingImpl
```

* The allow list does not contain any implementation of the interfaces that are defined in the `org.w3c.dom` package. For example, you cannot use the method `org.w3c.dom.Document toXML()` in `com.tivoli.am.fim.trustserver.sts.STSUniversalUser`.

Additional classes allowed in JavaScript PIP

```
com.tivoli.am.fim.base64.BASE64Utility
com.tivoli.am.rba.pip.JavaScriptPIP
com.tivoli.am.rba.pip.JavaScriptPIP$Context
com.tivoli.am.rba.rtss.AttributeLocatorImpl
```

For more information about policy information points, see Managing policy information points.

Additional classes allowed in mapping rules

```
packages.com.ibm.security.access.user.UserLookupHelper
packages.com.ibm.security.access.user.User
com.ibm.security.access.ldap.utils.AttributeUtil
com.ibm.security.access.ldap.utils.AttributeUtil$AttributeGetResult
com.ibm.security.access.ldap.LdapAttributeGetResult
com.ibm.security.access.ldap.LdapModifyResult
com.ibm.security.access.ldap.LdapSearchResult
com.ibm.security.access.ldap.LdapContextCreateResult
com.sun.jndi.ldap.LdapSearchEnumeration
javax.naming.NamingEnumeration
javax.naming.directory.BasicAttributes
javax.naming.directory.BasicAttribute
javax.naming.directory.SearchResult
com.ibm.security.access.recaptcha.RecaptchaClient
com.ibm.security.access.signing.SigningHelper
javax.crypto.SecretKey
javax.crypto.SecretKeyFactory
javax.crypto.spec.PBEKeySpec
com.ibm.crypto.provider.PBEKey
com.ibm.crypto.provider.PBKDF2KeyImpl
com.ibm.ws.logging.internal.impl.BaseTraceService$TeePrintStream
com.tivoli.am.fim.email.Email
com.tivoli.am.fim.email.EmailDeliveryException
com.tivoli.am.fim.email.EmailSender
com.tivoli.am.fim.email.EmailSender$SendStatus
```

For information on mapping rules, see:

- “Managing OAuth 2.0 and OIDC mapping rules” on page 156
- “Managing mapping rules” on page 73

Additional classes to manage server connections

```
com.ibm.security.access.server_connections.LdapServerConnection
com.ibm.security.access.server_connections.LdapServerConnection$LdapHost
com.ibm.security.access.server_connections.ServerConnection
com.ibm.security.access.server_connections.ServerConnectionFactory
com.ibm.security.access.server_connections.SmtpServerConnection
com.ibm.security.access.server_connections.WebServerConnection
com.ibm.security.access.server_connections.CiServerConnection
```

For more information, see “Managing server connections” on page 361.

Classes to use with InfoMap

```
com.tivoli.am.fim.authsvc.action.authenticator.infomap.InfoMapResult
com.tivoli.am.fim.authsvc.action.authenticator.infomap.InfoMapString
com.tivoli.am.fim.authsvc.local.client.AuthSvcClient
```

For more information, see “Configuring an Info Map authentication mechanism” on page 58.

Classes to use in Access Policies

```
com.ibm.security.access.policy.Context
com.ibm.security.access.policy.Cookie
com.ibm.security.access.policy.decision.ChallengeDecisionHandler
com.ibm.security.access.policy.decision.DecisionHandler
com.ibm.security.access.policy.decision.DenyDecisionHandler
com.ibm.security.access.policy.decision.Decision
com.ibm.security.access.policy.decision.DecisionType
com.ibm.security.access.policy.decision.HtmlPageChallengeDecisionHandler
com.ibm.security.access.policy.decision.HtmlPageDecisionHandler
com.ibm.security.access.policy.decision.HtmlPageDenyDecisionHandler
com.ibm.security.access.policy.decision.RedirectChallengeDecisionHandler
com.ibm.security.access.policy.decision.RedirectDecisionHandler
com.ibm.security.access.policy.decision.RedirectDenyDecisionHandler
com.ibm.security.access.policy.oauth20.AuthenticationContext
com.ibm.security.access.policy.oauth20.AuthenticationRequest
com.ibm.security.access.policy.oauth20.Claim
com.ibm.security.access.policy.oauth20.ProtocolContext
com.ibm.security.access.policy.ProtocolContext
com.ibm.security.access.policy.Request
com.ibm.security.access.policy.saml20.AuthnRequest
com.ibm.security.access.policy.saml20.ProtocolContext
com.ibm.security.access.policy.saml20.RequestedAuthnContext
com.ibm.security.access.policy.Session
com.ibm.security.access.policy.user.Attribute
com.ibm.security.access.policy.user.Group
com.ibm.security.access.policy.user.User
```

For more information, see Access policies.

Additional classes to customize FIDO2 flows

```
com.tivoli.am.fim.fido.mediation.FIDO2Registration
com.tivoli.am.fim.fido.mediation.FIDO2RegistrationHelper
com.tivoli.am.fim.fido.server.FIDOClientManager
com.tivoli.am.fim.fido.server.LocalFIDOClient
```

For more information, see FIDO2 Mediation and FIDO Client Manager

Additional classes to manage 2FA registrations

```
com.tivoli.am.fim.registrations.Mechanism
com.tivoli.am.fim.registrations.MechanismList
com.tivoli.am.fim.registrations.MechanismRegistrationHelper
com.tivoli.am.fim.registrations.cloud.CloudMechanism
com.tivoli.am.fim.registrations.local.FIDORegistration
com.tivoli.am.fim.registrations.local.MMFARegistration
com.tivoli.am.fim.registrations.local.HOTPRegistration
com.tivoli.am.fim.registrations.local.TOTPRegistration
com.tivoli.am.fim.registrations.local.KnowledgeQuestionRegistration
com.tivoli.am.fim.registrations.local.EULAStatus
com.tivoli.am.fim.registrations.local.MMFATransactionData
```

Managing JavaScript mapping rules

Create, edit, or delete JavaScript mapping rules.

About this task

When you activate the Federation offering, the following mapping rule types are available:

OAUTH
OAuth mapping rule.

OIDC
OpenID Connect mapping rule.

SAML2_0
SAML 2.0 mapping rule.

SAML2_0_AUTHN_REQ
SAML 2.0 Authentication Request mapping rule

Procedure

1. Click **Federation**.
2. Under **Global Settings**, click **Mapping Rules**.
   All existing mapping rules are displayed.
3. You can create, edit, or delete a mapping rule.

   Create a mapping rule

   a. Click **Add**.
   b. In the **Content** field, enter the JavaScript mapping rule content.
   c. In the **Name** field, enter a name for the rule.
   d. In the **Category** field, select the type of the mapping rule from the list.

      Note: Only the mapping rule types that apply to your current activated offering are displayed in the list.

   e. Click **Save**.

   Modify a mapping rule

   a. Select the mapping rule to modify.
   b. Click **Edit**.
   c. Modify the mapping rule in the **Content** field as needed.

      Note: The **Name** and **Category** fields are not editable.

   d. Click **Save**.

   Delete a mapping rule

   a. Select the mapping rule to delete.
   b. Click **Delete**.
   c. Click **Delete** to confirm.

   Replace a mapping rule

   a. Select the mapping rule to replace.
   b. Click **Replace**.
   c. Click the **Browse** button and select the local file that contains the new contents.
   d. Click **OK**.

   Import a mapping rule

   a. Click **Import**.
   b. In the **Name** field, enter a name for the rule.
   c. In the **Category** field, select the type of the mapping rule from the list.

      Note: Only the mapping rule types that apply to your current activated offering are displayed in the list.

   d. Click the **Browse** button and select the local file that contains the new contents.
   e. Click **OK**.

   Export a mapping rule

   a. Select the mapping rule to export.

b. Click **Export**.

Import multiple mapping rules

a. Click **Manage** and select **Import Zip** from the drop-down menu.

b. Click the **Browse** button and select the local zip file that contains the mapping rules to import.

The mapping rules must exist in the root directory of the zip file alongside a `manifest.json` file that describes each new mapping rule.

The `manifest.json` file is an array of entries where each entry must contain each of:

name
The name of the mapping rule.

category
The category of the mapping rule.

fileName
The name of the file in the zip that contains the mapping rule contents.

For example:

```
[
    {“name”:”ruleA”, “category”:”InfoMap”, “fileName”:”ruleA.js”},
    {“name”:”ruleB”, “category”:”AuthSvc”, “fileName”:”ruleB.js”}
]
```

An error will be returned if:

- A file exists without a manifest entry.
- A manifest entry exists for a non existent file.
- A manifest entry does not contain name, category, and fileName.

c. Click **OK**.

Exporting multiple mapping rules

a. Click **Manage** and select **Export Zip** from the drop-down menu.

Customizing SAML 2.0 identity mapping

Use mapping rules to map local identities to SAML tokens and to map SAML tokens to local identities.

You can use an attribute source, such as LDAP, for the identity mapping. See Managing attribute sources.

You can use an HTTP external user mapping to map a local identity to a SAML token and to map SAML token to a local identity.

See Managing JavaScript mapping rules for information about how to create or modify mapping rules.

Mapping a local identity to a SAML 2.0 token

You can map a local identity to a SAML 2.0 token for an identity provider.

The Security Verify Access server places the local user identity information into an XML document that conforms to the security token service universal user (STSUUSER) schema. The identity provider issues a SAML 2.0 token to the service provider. It generates the SAML 2.0 token based on the local identity of the user. You can customize how the local identity is converted into a SAML 2.0 token by using a mapping rule.

Security Verify Access first converts the local identity to an STS Universal User. It then converts this STS Universal User into another STS Universal User by using a mapping rule that you provide. After that, it converts the latter STS Universal User to a SAML 2.0 token.

Your mapping rule does not operate directly on local identity or SAML 2.0 token. Instead, it operates on the STS Universal User. Any modification that you make to an STS Universal User has an impact on the output SAML 2.0 token.

The mapping rule is responsible for the following tasks:

1. Mapping Principal Attr Name to a Principal Name entry. When the token module generates the token, this Principal name is not directly used. Instead, the value in the **Name** field is sent as input to the alias service. The alias service obtains the alias name, name identifier, for the principal, and places the returned alias in the generated token module.

   The type must be valid for SAML. For example:

   ```
   urn:oasis:names:tc:SAML:2.0:assertion
   ```

2. Setting the authentication method to the `password` mechanism. This action is required by the SAML standard.
3. Setting the audience of the audience restriction condition to the value of the STSUU element `AudienceRestriction`. If this STSUU element is not present, the audience is set to the Provider ID of the federation partner.
4. Populating the attribute statement of the assertion with the attributes in the AttributeList in the In-STSUU. This information becomes custom information in the token.

   Custom attributes might exist that are required by applications that use information that is to be transmitted between federation partners.
5. Specifying whether the assertion conditions should contain the `<saml:OneTimeUse></saml:OneTimeUse>` element. If so, insert a special context attribute into the STSUU as shown:

```
var oneTimeUseAttr = new Attribute("AssertionIncludeOneTimeUse","urn:oasis:names:tc:SAML:2.0:assertion",
"true");
stsuu.addContextAttribute(oneTimeUseAttr);
```

6. Setting the `NameID` attribute in the assertion with Transient NameId format. This action is useful when you want to specify a `name` value to use instead of the default UUID that is generated by the runtime for Transient NameID format.

   To replace the UUID, create a principal `name` attribute of type `urn:oasis:names:tc:SAML:2.0:nameid-format:transient`, with its value provided by user.

   The examples below show the user-provided value *`UserGeneratedTransientId`* but it could be any other value. The value of the specified STSUU principal `name` will be set as the `NameID` in the SAML assertion.

   Example mapping rule

   ```
   importPackage(Packages.com.tivoli.am.fim.trustserver.sts.uuser);
   var transientNameId = "UserGeneratedTransientId";
   stsuu.addPrincipalAttribute(new Attribute("name",
      "urn:oasis:names:tc:SAML:2.0:nameid-format:transient", transientNameId));
   ```

   Example STSUU values after mapping rule applied

   ```
    <stsuuser:Attribute name="name" type="urn:oasis:names:tc:SAML:2.0:nameid-format:transient">
              <stsuuser:Value>UserGeneratedTransientId</stsuuser:Value>
          </stsuuser:Attribute>
   ```

   Example SAML assertion `NameID` with Transient NameId formats

   ```
   <saml:NameID Format="urn:oasis:names:tc:SAML:2.0:nameid-format:transient"
                           NameQualifier="https://ip-wga/isam/sps/saml20ip/saml20"
                           SPNameQualifier="https://sp-wga/isam/sps/saml20sp/saml20"
                           >UserGeneratedTransientId</saml:NameID>
   ```

7. Determine if the partner requires a specific `SPNameQualifier` within `NameID` of assertion for transient identifiers. To change `SPNameQualifer` within `NameID` of assertion, insert a special context attribute into the STSUU with a value agreed with partner as shown in the following example:

   ```
   var SPNameQualifierAttr = new
   Attribute("AssertionChangeSPNameQualifier","urn:oasis:names:tc:SAML:2.0:assertion","http://sp
   ```

```
/target/app");
stsuu.addContextAttribute(SPNameQualifierAttr);
```

Mapping a SAML 2.0 token to a local identity

You can map a SAML 2.0 token to a local identity for a service provider.

A service provider consumes a SAML 2.0 token that is issued by an identity provider. It generates the local identity of the user based on a SAML 2.0 token. You can customize how a SAML 2.0 token is converted into the local identity of the user by using a mapping rule.

Security Verify Access first converts a SAML 2.0 token to an STS Universal User. It then converts this STS Universal User into another STS Universal User by using a mapping rule that you provide. After that, it converts the latter STS Universal User to a local identity of the user.

Your mapping rule does not operate directly on the local identity or SAML 2.0 token. Instead, it operates on the STS Universal User. Any modifications that you make on the STS Universal User impacts the output local identity of the user.

STSRequest and STSResponse access using a JavaScript mapping rule

By using the Default Mapping STS Module and a JavaScript mapping rule, you can perform identity mapping. The mapping rule can access STSRequest and STSResponse objects.

The following two implicit objects and the classes required by these two objects can be exposed (for example, Java DOM, XML classes, and so on):

- STSRequest which represents the WS-Trust request
- STSResponse, which represents the WS-Trust response

Use JavaScript code `stsrequest.getRequestSecurityToken().getBase()` to get the input security token from the WS-Trust request. This returns the input security token as an instance of the Java class org.w3c.dom.Element.

Use JavaScript code `stsresponse.getRequestSecurityTokenResponse().setRequestedSecurityToken` (outputSecurityToken) to set the output security token in the WS-Trust response. The outputSecurityToken is the output security token represented as an instance of Java class org.w3c.dom.Element. By default, WS-Trust response contains only one output security token. To return additional output security tokens, you can use the following JavaScript code:

```
stsresponse.addRequestSecurityTokenResponse().setRequestedSecurityToken(outputSecurityToken)
```

The examples in the following topics show the mapping to and from a base64 encoded JSON string. They use the Default Mapping module with a JavaScript mapping rule. The JavaScript mapping rule accesses the STSRequest and STSResponse objects and performs the identity mapping.

Mapping a JSON Web Token to a SAML2 token example

You can map a base64 encoded JSON string to a SAML 2 token by using a JavaScript mapping rule.

About this task

The steps show an end-to-end JSON to SAML2 mapping. STSRequest and STSResponse access using a JavaScript mapping rule provides a description of this support.

Procedure

1. Create a JavaScript mapping rule by using the local management interface.
   a) Select **Federation** > **Global Settings** > **Mapping Rules**.
   b) Click **Add**.

c) In the **Content** field, copy and paste the following code:

```
    importClass(com.tivoli.am.fim.base64.BASE64Utility);
    importClass(com.tivoli.am.fim.trustserver.sts.uuser.Attribute);

    var jwtElement = stsrequest.getRequestSecurityToken().getBase();
    var jwtText    = jwtElement.getTextContent();
    var jwtString  = new java.lang.String(BASE64Utility.decode(jwtText), "UTF-8");
    var jwt        = JSON.parse(jwtString);

    for (var name in jwt) {
      if (jwt.hasOwnProperty(name)) {
        if ("sub".equals(name)) {
          stsuu.addPrincipalAttribute(new Attribute("name",
 "urn:oasis:names:tc:SAML:1.1:nameid-format:emailAddress", jwt[name]));
        } else {
          stsuu.addAttribute(new Attribute(name,
"urn:oasis:names:tc:SAML:2.0:attrname-format:basic", jwt[name]));
        }
      }
    }
```

d) In the **Name** field, enter `jwt_saml`.

e) In the **Category** field, select **SAML2_0**.

f) Click **Save** and deploy the changes.

2. Assemble the Security Token Service (STS) template.

a) Select **Federation** > **Manage** > **Security Token Service**.

b) Click **Templates**.

c) Click **Add** and name the template `JSON to SAML2`. Click **OK**.

d) Select the `JSON to SAML2` template and add the Default Map Module in Map mode and a Default SAML 2.0 token in Issue mode.

e) Save and deploy the changes.

3. Create an STS chain that references the mapping rule and template you created in the previous steps.

a) Within the **Security Token Service** panel, select **Module Chains**.

b) Click **Add** to create the module chain, with the following values:

Table 57. JSON to SAML2 module chain values

Tab: Field	**Value**
Overview: Name	JSON to SAML2
Overview: Description	base64 encoded JSON string to SAML2 conversion STS chain
Overview: Template	JSON to SAML2
Lookup: Request Type	Validate
Lookup: Applies to Address	`jwtappliesto`
Lookup: Issuer Address	`jwtissuer`
Properties: Default Map Module (JavaScript file containing the identity mapping rule	`jwt_saml`
Properties: Default SAML 2.0 Token (Name of the organization issuing the assertions)	isam
Properties: Default SAML 2.0 Token (Amount of time before the issue date that an assertion is considered valid)	60

Table 57. JSON to SAML2 module chain values (continued)	
Tab: Field	**Value**
Properties: Default SAML 2.0 Token (Amount of time that the assertion is valid after being issued)	60
Properties: Default SAML 2.0 Token (List of attribute types to include)	*

Use the defaults for all of the fields that are not specified in the table.

c) Save and deploy the changes.

4. Use **curl** to test the chain.

a) Send the following WS-Trust 1.2 message:

```
<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance">
  <SOAP-ENV:Header/>
  <SOAP-ENV:Body>
    <ns1:RequestSecurityToken xmlns:ns1="http://docs.oasis-open.org/ws-sx/ws-trust/
200512">
      <wst:RequestType xmlns:wst="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
      http://schemas.xmlsoap.org/ws/2005/02/trust/Validate</wst:RequestType>
      <wst:Issuer xmlns:wst="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
        <wsa:Address xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/
addressing">jwtissuer</wsa:Address>
      </wst:Issuer>
      <wsp:AppliesTo xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy">
        <wsa:EndpointReference xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/
addressing">
          <wsa:Address>jwtappliesto</wsa:Address>
        </wsa:EndpointReference>
      </wsp:AppliesTo>
      <wst:Base xmlns:wst="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
<JWT>ewogICJlbWFpbCI6ICJqb2huLmRvZUBleGFtcGxlLmNvbSIsIAogICJmYW1pbHlfbmFtZSI6ICJkb2UiLCAK
ICAiZ2l2ZW5fbmFtZSI6ICJqb2huIiwgCiAgImlzcyI6ICJpc2FtIiwgCiAgInN1YiI6ICIwMTIzNDU2Nzg5Igp9</
JWT>
      </wst:Base>
    </ns1:RequestSecurityToken>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The bold embedded element, **<JWT> </JWT>**, is the input to the chain. This is a Base64 encoded JSON string that contains the following data::

```
{
 "email": "john.doe@example.com",
  "family_name": "doe",
  "given_name": "john",
  "iss": "isam",
  "sub": "0123456789"
}
```

b) Save this file as `jwt.xml`.

c) Run the following **curl** command, where `jwt.xml` is the WS-Trust 1.2 message:

```
curl -k -v -u "easuser:passw0rd" -H "Content-Type: text/xml" --data-binary
@jwt.xml https://ip-rte/TrustServer/SecurityTokenService
```

The following results are returned:

```
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
    <SOAP-ENV:Header xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"></SOAP-
ENV:Header>
    <soap:Body>
        <wst:RequestSecurityTokenResponseCollection xmlns:wst="http://docs.oasis-open.org/
ws-sx/ws-trust/200512">
```

```
            <wst:RequestSecurityTokenResponse xmlns:wsu="http://docs.oasis-open.org/wss/
2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
            wsu:Id="uuidc1288a62-0153-1f8b-bf2a-b4c46f51cd03">
                <wsp:AppliesTo xmlns:wsa="http://www.w3.org/2005/08/addressing"
xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy">
                    <wsa:EndpointReference>
                        <wsa:Address>jwtappliesto</wsa:Address>
                    </wsa:EndpointReference>
                </wsp:AppliesTo>
                <wst:Lifetime xmlns:wst="http://docs.oasis-open.org/ws-sx/ws-trust/
200512">
                    <wsu:Created>2016-03-29T06:56:13Z</wsu:Created>
                    <wsu:Expires>2016-03-29T06:57:13Z</wsu:Expires>
                </wst:Lifetime>
               <wst:RequestedSecurityToken>
                    <saml:Assertion xmlns:saml="urn:oasis:names:tc:SAML:2.0:assertion"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
                    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" ID="Assertion-
uuidc1288ae8-0153-10bd-b7ef-b4c46f51cd03"
                    IssueInstant="2016-03-29T06:56:13Z" Version="2.0">
                        <saml:Issuer Format="urn:oasis:names:tc:SAML:2.0:nameid-
format:entity">isam</saml:Issuer>
                        <saml:Subject>
                            <saml:NameID Format="urn:oasis:names:tc:SAML:1.1:nameid-
format:emailAddress">
                            0123456789</saml:NameID>
                            <saml:SubjectConfirmation
Method="urn:oasis:names:tc:SAML:2.0:cm:bearer">
                                <saml:SubjectConfirmationData
NotOnOrAfter="2016-03-29T06:57:13Z"></saml:SubjectConfirmationData>
                            </saml:SubjectConfirmation>
                        </saml:Subject>
                        <saml:Conditions NotBefore="2016-03-29T06:55:13Z"
NotOnOrAfter="2016-03-29T06:57:13Z">
                            <saml:AudienceRestriction>
                                <saml:Audience>jwtappliesto</saml:Audience>
                            </saml:AudienceRestriction>
                        </saml:Conditions>
                        <saml:AuthnStatement AuthnInstant="2016-03-29T06:56:13Z">
                            <saml:AuthnContext>

<saml:AuthnContextClassRef>urn:oasis:names:tc:SAML:2.0:ac:classes:Password
                            </saml:AuthnContextClassRef>
                            </saml:AuthnContext>
                        </saml:AuthnStatement>
                        <saml:AttributeStatement>
                            <saml:Attribute Name="given_name"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:basic">
                                <saml:AttributeValue xsi:type="xs:string">john</
saml:AttributeValue>
                            </saml:Attribute>
                            <saml:Attribute Name="email"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:basic">
                                <saml:AttributeValue
xsi:type="xs:string">john.doe@example.com</saml:AttributeValue>
                            </saml:Attribute>
                            <saml:Attribute Name="iss"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:basic">
                                <saml:AttributeValue xsi:type="xs:string">isam</
saml:AttributeValue>
                            </saml:Attribute>
                            <saml:Attribute Name="family_name"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:basic">
                                <saml:AttributeValue xsi:type="xs:string">doe</
saml:AttributeValue>
                            </saml:Attribute>
                        </saml:AttributeStatement>
                    </saml:Assertion>
                </wst:RequestedSecurityToken>
```

The JSON string is mapped into the SAML assertion, as shown by the previous bold text. The attributes in the SAML2 assertion are mapped from JSON attributes.

```
<wst:RequestedAttachedReference xmlns:wss="http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-wssecurity-secext-1.0.xsd">
                    <wss:SecurityTokenReference xmlns:wss11="http://docs.oasis-
open.org/wss/oasis-wss-wssecurity-secext-1.1.xsd"
                    wss11:TokenType="http://docs.oasis-open.org/wss/oasis-wss-saml-token-
profile-1.1#SAMLV2.0">
                        <wss:KeyIdentifier
```

```
xmlns:saml="urn:oasis:names:tc:SAML:2.0:assertion"
                        xmlns:wss="http://docs.oasis-open.org/wss/2004/01/oasis-200401-
wss-wssecurity-secext-1.0.xsd"
                        ValueType="http://docs.oasis-open.org/wss/oasis-wss-saml-token-
profile-1.1#SAMLID">
                        Assertion-uuidc1288ae8-0153-10bd-b7ef-b4c46f51cd03</
wss:KeyIdentifier>
                    </wss:SecurityTokenReference>
                </wst:RequestedAttachedReference>
                <wst:RequestType>http://schemas.xmlsoap.org/ws/2005/02/trust/Validate</
wst:RequestType>
                <wst:Status>
                    <wst:Code>http://docs.oasis-open.org/ws-sx/ws-trust/200512/status/
valid</wst:Code>
                </wst:Status>
            </wst:RequestSecurityTokenResponse>
        </wst:RequestSecurityTokenResponseCollection>
    </soap:Body>
</soap:Envelope>
```

Related tasks

Mapping a SAML2 token to a base64 encoded JSON string example

Mapping a SAML2 token to a JSON Web Token example

You can map a SAML 2 token to a base64 encoded JSON string by using a JavaScript mapping rule.

About this task

The steps show an end-to-end SAML to JSON mapping. STSRequest and STSResponse access using a JavaScript mapping rule provides a description of this support.

Procedure

1. Create a JavaScript mapping rule using the local management interface.
   a) Select **Federation** > **Global Settings** > **Mapping Rules**.
   b) Click **Add**.
   c) In the **Content** field, copy and paste the following code:

```
    importClass(com.tivoli.am.fim.base64.BASE64Utility);
    importClass(com.tivoli.am.fim.trustserver.sts.utilities.IDMappingExtUtils)

    var jwt = {};

    var it = stsuu.getPrincipalAttributes();
    var jt = stsuu.getAttributes();

    while (it.hasNext()) {
      var attribute = it.next();
      var name      = new String(attribute.getName());
      var value     = new String(attribute.getValues()[0]);

      if ("name".equals(name)) {
        jwt["sub"] = value;
      } else {
        jwt[name] = value;
      }
    }

    while (jt.hasNext()) {
      var attribute = jt.next();
      var name      = new String(attribute.getName());
      var value     = new String(attribute.getValues()[0]);

      jwt[name] = value;
    }

    var document   = IDMappingExtUtils.newXMLDocument();
    var jwtString  = JSON.stringify(jwt);
    var jwtText    = document.createTextNode(BASE64Utility.encode((new
java.lang.String(jwtString)).getBytes("UTF-8")));
    var jwtElement = document.createElement("JWT");
```

```
    jwtElement.appendChild(jwtText);

    stsresponse.getRequestSecurityTokenResponse().setRequestedSecurityToken(jwtElement);
```

d) In the **Name** field, enter `saml_jwt`.

e) In the **Category** field, select SAML2_0.

f) Click **Save** and deploy the changes.

2. Assemble the Security Token Service (STS) template.

a) Select **Federation** > **Manage** > **Security Token Service**.

b) Click **Templates**.

c) Click **Add** and name the template `SAML2 to JSON`. Click **OK**.

d) Select the `SAML2 to JSON` template and add the Default SAML 2.0 Token in Validate mode and a Default Map Module in Map mode.

e) Save and deploy the changes.

3. Create an STS chain that references the mapping rule and template you created in the previous steps.

a) Within the **Security Token Service** panel, select **Module Chains**.

b) Click **Add** to create a module chain, with the following values:

Table 58. SAML2 to JSON module chain values

Tab: Field	**Value**
Overview: Name	SAML2 to JSON
Overview: Description	SAML2 to base64 encoded JSON string conversion STS chain
Overview: Template	SAML2 to JSON
Lookup: Request Type	Validate
Lookup: Applies to Address	SAML2_AppliesTo
Lookup: Issuer Address	SAML2_Issuer
Properties: Default Map Module (JavaScript file containing the identity mapping rule	`saml_jwt`

Use the defaults for all of the fields not in the table.

c) Save and deploy the changes.

4. Use **`curl`** to test the chain.

a) Send the following WS-Trust 1.2 message:

```
<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <SOAP-ENV:Header/>
  <SOAP-ENV:Body>
    <ns1:RequestSecurityToken xmlns:ns1="http://docs.oasis-open.org/ws-sx/ws-trust/
200512">
      <wst:RequestType xmlns:wst="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
      http://schemas.xmlsoap.org/ws/2005/02/trust/Validate</wst:RequestType>
      <wst:Issuer xmlns:wst="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
        <wsa:Address xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/
addressing">SAML2_Issuer</wsa:Address>
      </wst:Issuer>
      <wsp:AppliesTo xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy">
        <wsa:EndpointReference xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/
addressing">
          <wsa:Address>SAML2_AppliesTo</wsa:Address>
        </wsa:EndpointReference>
      </wsp:AppliesTo>
```

```
<wst:Base xmlns:wst="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
        <saml:Assertion xmlns:saml="urn:oasis:names:tc:SAML:2.0:assertion"
        xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/
XMLSchema-instance"
        ID="Assertion-uuidbcb46a39-0153-1337-8efa-fec506fb7461"
IssueInstant="2016-03-28T10:10:53Z" Version="2.0">
          <saml:Issuer Format="urn:oasis:names:tc:SAML:2.0:nameid-format:entity">isam</
saml:Issuer>
          <saml:Subject>
            <saml:NameID Format="urn:oasis:names:tc:SAML:1.1:nameid-
format:emailAddress">0123456789</saml:NameID>
            <saml:SubjectConfirmation Method="urn:oasis:names:tc:SAML:2.0:cm:bearer">
              <saml:SubjectConfirmationData NotOnOrAfter="2016-03-28T10:11:53Z"/>
            </saml:SubjectConfirmation>
          </saml:Subject>
          <saml:Conditions NotBefore="2016-03-28T10:09:53Z"
NotOnOrAfter="2016-03-29T10:11:53Z">
            <saml:AudienceRestriction>
              <saml:Audience>jwt_saml</saml:Audience>
            </saml:AudienceRestriction>
          </saml:Conditions>
          <saml:AuthnStatement AuthnInstant="2016-03-28T10:10:53Z">
            <saml:AuthnContext>
              <saml:AuthnContextClassRef>urn:oasis:names:tc:SAML:2.0:ac:classes:Password</
saml:AuthnContextClassRef>
            </saml:AuthnContext>
          </saml:AuthnStatement>
          <saml:AttributeStatement>
            <saml:Attribute Name="given_name"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:basic">
              <saml:AttributeValue xsi:type="xs:string">john</saml:AttributeValue>
            </saml:Attribute>
            <saml:Attribute Name="email" NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-
format:basic">
              <saml:AttributeValue xsi:type="xs:string">john.doe@example.com</
saml:AttributeValue>
            </saml:Attribute>
            <saml:Attribute Name="iss" NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-
format:basic">
              <saml:AttributeValue xsi:type="xs:string">isam</saml:AttributeValue>
            </saml:Attribute>
            <saml:Attribute Name="family_name"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:basic">
              <saml:AttributeValue xsi:type="xs:string">doe</saml:AttributeValue>
            </saml:Attribute>
          </saml:AttributeStatement>
        </saml:Assertion>
      </wst:Base>
    </ns1:RequestSecurityToken>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The bold element in the SAML2 assertion is mapped to the JSON attributes in the result.

b) Save this file as `saml2.xml`.

c) Run the following **curl** command, where `saml2.xml` is the WS-Trust 1.2 message:

```
curl -k -v -u "easuser:passw0rd" -H "Content-Type: text/xml" --data-binary
@saml2.xml https://ip-rte/TrustServer/SecurityTokenService
```

The following results are returned:

```
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
    <SOAP-ENV:Header xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"></SOAP-
ENV:Header>
    <soap:Body>
        <wst:RequestSecurityTokenResponseCollection xmlns:wst="http://docs.oasis-open.org/
ws-sx/ws-trust/200512">
            <wst:RequestSecurityTokenResponse
            xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-
utility-1.0.xsd"
            wsu:Id="uuidc1676e30-0153-16a8-86b5-c34fd1aca7a8">
                <wsp:AppliesTo xmlns:wsa="http://www.w3.org/2005/08/addressing"
                xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy">
                    <wsa:EndpointReference>
                        <wsa:Address>SAML2_AppliesTo</wsa:Address>
                    </wsa:EndpointReference>
                </wsp:AppliesTo>
```

```
                <wst:RequestedSecurityToken>

<JWT>eyJzdWIiOiIwMTIzNDU2Nzg5IiwiZ2l2ZW5fbmFtZSI6ImpvaG4iLCJOb3RPbk9yQWZ0ZXIiOiIyMDE2LTAz

LTI5VDEwOjExOjUzWiIsIkF1dGhlbnRpY2F0aW9uTWV0aG9kIjoidXJuOm9hc2lzOm5hbWVzOnRjOlNBTUw6MS4w

OmFtOnBhc3N3b3JkIiwiZW1haWwiOiJqb2huLmRvZUBleGFtcGxlLmNvbSIsIkF1ZGllbmNlUmVzdHJpY3Rpb25

Db25kaXRpb24uQXVkaWVuY2UiOiJqd3Rfc2FtbCIsImlzcyI6ImlzYW0iLCJJc3N1ZUluc3RhbnQiOiIyMDE2LT

AzLTI4VDEwOjEwOjUzWiIsImZhbWlseV9uYW1lIjoiZG9lIiwiTm90QmVmb3JlIjoiMjAxNi0wMy0yOFQxMDowO

To1M1oiLCJBdXRoZW50aWNhdGlvbkluc3RhbnQiOiIyMDE2LTAzLTI4VDEwOjEwOjUzWiIsImlzc3VlciI6Iml
                zYW0ifQ==</JWT>
                </wst:RequestedSecurityToken>
                <wst:RequestType>http://schemas.xmlsoap.org/ws/2005/02/trust/Validate</
wst:RequestType>
                <wst:Status>
                    <wst:Code>http://docs.oasis-open.org/ws-sx/ws-trust/200512/status/
valid</wst:Code>
                </wst:Status>
            </wst:RequestSecurityTokenResponse>
        </wst:RequestSecurityTokenResponseCollection>
    </soap:Body>
</soap:Envelope>
```

The bold embedded element, **<JWT> </JWT>)** , is the result in a Base64 encoded JSON Web Token:

```
{
  "sub": "0123456789",
  "given_name": "john",
  "NotOnOrAfter": "2016-03-29T10:11:53Z",
  "AuthenticationMethod": "urn:oasis:names:tc:SAML:1.0:am:password",
  "email": "john.doe@example.com",
  "AudienceRestrictionCondition.Audience": "jwt_saml",
  "iss": "isam",
  "IssueInstant": "2016-03-28T10:10:53Z",
  "family_name": "doe",
  "NotBefore": "2016-03-28T10:09:53Z",
  "AuthenticationInstant": "2016-03-28T10:10:53Z",
  "issuer": "isam“
}
```

Related tasks

Mapping a base64 encoded JSON string to a SAML2 token example

OpenID Connect mapping rules

Mapping rules allow users to customize the information that is propagated from an OpenID Connect Provider or what is consumed by a Relying Party.

These mapping rules can either be JavaScript, which is invoked internally via the STS, or the mapping can be performed externally via a HTTP request.

OpenID Connect Provider mapping rules

When you write mapping rules for a provider, the primary goal is to augment the claims that are included in the ID token.

After mapping rule execution, all attributes in the STSUU will be added to the id_token as a claim, where the attribute key is the key in the id_token, and the value is the value of the attribute. If there are several attributes with the same key, then an array containing each attribute will be added to the claim. Some context information is made available to the user when writing mapping rules; the context attributes of the passed in STSUU will contain attributes with the type “urn:ibm:ITFIM:oidc:provider:context”, which can be used to make decisions on what claims are added, or if any other actions are performed.

These context attributes include:

- The client ID of the client making the request.
- The federation name of the provider servicing the request.

- The redirect URI sent in the request.
- The response type of the request.
- The state parameter of the request.
- The user-consented scopes for the request.

OpenID Connect Relying Party mapping rules

When you write mapping rules for a Relying Party, the resulting STSUU is turned into a PAC that is used to authenticate the user to a Reverse Proxy via EAI.

The attributes that are included in that PAC will be the attributes of the STSUU, and the principal will be the first principal which was in the STSUU. When writing mapping rules for a Relying Party, the values of the `id_token` will be made available as Attributes in the STSUU. Some additional context is made available to the user via the STSUU's context attributes. These attributes will have the types “urn:ibm:ITFIM:oidc:client:idtoken:param” and “urn:ibm:ITFIM:oidc:client:token:param”.

These context attributes include:

- All of the claims inside the `id_token`.
- The raw JWT.
- Any issued access or refresh tokens.
- All of the properties of the issued bearer token if an authorization code flow is used.
- All of the parameters issued in the response if an implicit flow is used.

Attribute sources

Both OpenID Connect Providers and Relying Parties can be configured to use an attribute source.

For an OpenID Connect Provider, this can be used instead of a mapping rule. However for an OpenID Connect Relying Party a mapping rule must still be present, this mapping rule is required to construct the principal used in the `iv-cred`.

For more information about attribute sources, see Managing attribute sources.

Import a mapping rule from another mapping rule

You can reuse mapping rules by importing a mapping rule from another mapping rule.

When you want to create a new mapping rule, or customize an existing mapping rule, you can reuse JavaScript code from a previously defined mapping rule. With this feature, you can define a mapping rule once and then reuse it in other mapping rules.

Use the function `importMappingRule()` to specify a mapping rule to import. For example, you can define a mapping rule that is called `Utility.js` that contains functions for obtaining an HTTP header and an HTTP cookie.

```
function getHeader(name) {
          // function for getting HTTP header
}

function getCookie(name) {
         // function for getting HTTP cookie
}
```

If you have another mapping rule that is called `Credential.js`, which also needs to obtain HTTP headers, use the following code to include the functions from the `Utility.js` mapping rule:

```
importMappingRule("Utility");
var host = getHeader("Host");
// do something with the host header
```

```
var sessionID = getHeader("PD-SESSION-ID");
// do something with the session ID
```

The function `importMappingRule()` accepts a list of mapping rule names and imports each of the mapping rules. For example:

```
importMappingRule("Utility","Credential","UserIdentity");
```

Alternatively, you can also make multiple calls to `importMappingRule()` within one script. For example:

```
importMappingRule("Utility");
importMappingRule("Credential");
importMappingRule("UserIdentity");
```

The JavaScript engine throws an error if you do not specify a mapping rule name, or if you specify the name of a mapping rule that does not exist.

Use the Local Management Interface (LMI) to view existing mapping rules that are defined on your system. Select **Federation > Global Settings > Mapping Rules**, or **AAC > Global Settings > Mapping Rules**.

Note:

On the LMI menu, the icon **Import** is for importing mapping rules into IBM Security Verify Access, not for importing a mapping rule into an existing mapping rule. Use the **Edit** icon to add the `importMappingRule()` function to an existing mapping rule.

Auditing from Mapping Rules

Data that is used in JavaScript Mapping rules can be audited with **`IDMappingExtUtils`**.

Data that is used in making an access control decision is audited in JavaScript Mapping Rules. You can use the **`IDMappingExtUtils.logAuditEvent()`** function to capture data and make it available in audit logs.

Scenario 1: User completed password reset (`USC_PasswordReset_Success`)

```
IDMappingExtUtils.logAuditEvent(username, "Successfully completed password reset", true);
```

produces the following audit log entry:

```
<CommonBaseEvent creationTime="2018-09-04T00:23:05.239Z" extensionName="IBM_SECURITY_AUTHN"
globalInstanceId="FIMa1f61b1801651c11a034fb3858d13" sequenceNumber="0" version="1.1">
    <contextDataElements name="Security Event Factory" type="eventTrailId">
        <contextId>FIM_a1f61b17016516b19127fb3858d13aff+667021443</contextId>
    </contextDataElements>
    <extendedDataElements name="EventName" type="string">
        <values>JavaScriptEvent</values>
    </extendedDataElements>
    <extendedDataElements name="Username" type="string">
        <values>testuser</values>
    </extendedDataElements>
    <extendedDataElements name="Outcome" type="string">
        <values>SUCCESSFUL</values>
    </extendedDataElements>
    <extendedDataElements name="Message" type="string">
        <values>Successfully completed password reset</values>
    </extendedDataElements>
    <extendedDataElements name="progName" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="authnProvider" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="partner" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="trustRelationship" type="string">
```

```
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="userInfoList" type="noValue">
        <children name="userInfo" type="noValue">
            <children name="registryUserName" type="string">
                <values>Not Available</values>
            </children>
            <children name="appUserName" type="string">
                <values>testuser</values>
            </children>
        </children>
    </extendedDataElements>
    <extendedDataElements name="authnType" type="string">
        <values>authenticationService</values>
    </extendedDataElements>
    <extendedDataElements name="action" type="string">
        <values>validate</values>
    </extendedDataElements>
    <extendedDataElements name="tokenType" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="authnScope" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="outcome" type="noValue">
        <children name="result" type="string">
            <values>SUCCESSFUL</values>
        </children>
        <children name="majorStatus" type="int">
            <values>0</values>
        </children>
    </extendedDataElements>
    <sourceComponentId application="IBM Security Verify Access"
component="Authentication and Federated Identity" componentIdType="ProductName"
executionEnvironment="Linux[amd64]#3.10.0-693.21.1.el7_1.iss8_1.4.x86_64"
location="localhost" locationType="FQHostname"
subComponent="com.tivoli.am.fim.trustserver.sts.utilities.IDMappingExtUtils"
threadId="Default Executor-thread-44" componentType="http://www.ibm.com/namespaces/autonomic/
Tivoli_componentTypes"/>
    <situation categoryName="ReportSituation">
        <situationType
            xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="ReportSituation"
reasoningScope="INTERNAL" reportCategory="SECURITY"/>
        </situation>
    </CommonBaseEvent>
```

Scenario 2: OAuth flow is used to enroll Mobile Multi-Factor Authentication (*PostTokenGeneration)

```
var auditData = {"status":"registering MMFA", "deviceName":device_name,
"deviceType":device_type, "osVersion":os_version};
IDMappingExtUtils.logAuditEvent(displayName, JSON.stringify(auditData), true);
```

produces the following audit log entry:

```
<CommonBaseEvent creationTime="2018-09-04T00:23:05.241Z" extensionName="IBM_SECURITY_AUTHN"
globalInstanceId="FIMa1f61b1901651d24b0adfb3858d13" sequenceNumber="1" version="1.1">
    <contextDataElements name="Security Event Factory" type="eventTrailId">
        <contextId>FIM_a1f61b17016516b19127fb3858d13aff+667021443</contextId>
    </contextDataElements>
    <extendedDataElements name="EventName" type="string">
        <values>JavaScriptEvent</values>
    </extendedDataElements>
    <extendedDataElements name="Username" type="string">
        <values>displayName</values>
    </extendedDataElements>
    <extendedDataElements name="Outcome" type="string">
        <values>SUCCESSFUL</values>
    </extendedDataElements>
    <extendedDataElements name="Message" type="string">
        <values>{"status":"registering MMFA","deviceName":"Jasmine's
iPhone","deviceType":"iPhone","osVersion":"11"}</values>
    </extendedDataElements>
    <extendedDataElements name="progName" type="string">
        <values>Not Available</values>
```

```
    </extendedDataElements>
    <extendedDataElements name="authnProvider" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="partner" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="trustRelationship" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="userInfoList" type="noValue">
        <children name="userInfo" type="noValue">
            <children name="registryUserName" type="string">
                <values>Not Available</values>
            </children>
            <children name="appUserName" type="string">
                <values>displayName</values>
            </children>
        </children>
    </extendedDataElements>
    <extendedDataElements name="authnType" type="string">
        <values>authenticationService</values>
    </extendedDataElements>
    <extendedDataElements name="action" type="string">
        <values>validate</values>
    </extendedDataElements>
    <extendedDataElements name="tokenType" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="authnScope" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="outcome" type="noValue">
        <children name="result" type="string">
            <values>SUCCESSFUL</values>
        </children>
        <children name="majorStatus" type="int">
            <values>0</values>
        </children>
    </extendedDataElements>
    <sourceComponentId application="IBM Security Verify Access"
component="Authentication and Federated Identity" componentIdType="ProductName"
executionEnvironment="Linux[amd64]#3.10.0-693.21.1.el7_1.iss8_1.4.x86_64"
location="localhost" locationType="FQHostname"
subComponent="com.tivoli.am.fim.trustserver.sts.utilities.IDMappingExtUtils"
threadId="Default Executor-thread-44" componentType="http://www.ibm.com/namespaces/autonomic/
Tivoli_componentTypes"/>
    <situation categoryName="ReportSituation">
        <situationType
            xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="ReportSituation"
reasoningScope="INTERNAL" reportCategory="SECURITY"/>
        </situation>
    </CommonBaseEvent>
```

Scenario 3: OTP retry limit is reached (OTPVerify)

```
IDMappingExtUtils.logAuditEvent("", "Retry limit exceeded.", false);
```

produces the following audit log entry:

```
<CommonBaseEvent creationTime="2018-09-04T00:50:24.603Z" extensionName="IBM_SECURITY_AUTHN"
globalInstanceId="FIMa20f1edb01651a4c8c61fb3858d13" sequenceNumber="2" version="1.1">
    <contextDataElements name="Security Event Factory" type="eventTrailId">
        <contextId>FIM_a20f1ed2016510a09325fb3858d13aff+1389200945</contextId>
    </contextDataElements>
    <extendedDataElements name="EventName" type="string">
        <values>JavaScriptEvent</values>
    </extendedDataElements>
    <extendedDataElements name="Username" type="string">
        <values></values>
    </extendedDataElements>
    <extendedDataElements name="Outcome" type="string">
        <values>UNSUCCESSFUL</values>
    </extendedDataElements>
    <extendedDataElements name="Message" type="string">
        <values>Retry limit exceeded.</values>
    </extendedDataElements>
```

```
    <extendedDataElements name="progName" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="authnProvider" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="partner" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="trustRelationship" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="userInfoList" type="noValue">
        <children name="userInfo" type="noValue">
            <children name="registryUserName" type="string">
                <values>Not Available</values>
            </children>
            <children name="appUserName" type="string">
                <values></values>
            </children>
        </children>
    </extendedDataElements>
    <extendedDataElements name="authnType" type="string">
        <values>authenticationService</values>
    </extendedDataElements>
    <extendedDataElements name="action" type="string">
        <values>validate</values>
    </extendedDataElements>
    <extendedDataElements name="tokenType" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="authnScope" type="string">
        <values>Not Available</values>
    </extendedDataElements>
    <extendedDataElements name="outcome" type="noValue">
        <children name="result" type="string">
            <values>UNSUCCESSFUL</values>
        </children>
        <children name="failureReason" type="string">
            <values>Retry limit exceeded.</values>
        </children>
        <children name="majorStatus" type="int">
            <values>1</values>
        </children>
    </extendedDataElements>
    <sourceComponentId application="IBM Security Verify Access"
component="Authentication and Federated Identity" componentIdType="ProductName"
executionEnvironment="Linux[amd64]#3.10.0-693.21.1.el7_1.iss8_1.4.x86_64"
location="localhost" locationType="FQHostname"
subComponent="com.tivoli.am.fim.trustserver.sts.utilities.IDMappingExtUtils"
threadId="Default Executor-thread-692" componentType="http://www.ibm.com/namespaces/autonomic/
Tivoli_componentTypes"/>
    <situation categoryName="ReportSituation">
        <situationType
            xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="ReportSituation"
reasoningScope="INTERNAL" reportCategory="SECURITY"/>
        </situation>
    </CommonBaseEvent>
```

HTTP Claims

HTTP claims can be accessed by OIDC, OAuth, SAML, Authsvc credential, InfoMap, and FIDO mapping rules.

HTTP Claims in OIDC, OAuth and SAML JavaScript Mapping Rules

HTTP Request claims can be accessed by OIDC, OAuth, and SAML mapping rules from the Security Token Service Universal User (stsuu) variable that is available by default.

If `sps.httpRequestClaims.enabled` (see SPS HTTP Request Claims) is `true`, then the header, cookie and parameter values are added to the claims attribute in the request security token.

The following example is an example for retrieving and logging HTTP headers from the request claims:

```
var claims = stsuu.getRequestSecurityToken().getAttributeByName("Claims").getNodeValues();
for (var i = 0; i < claims.length; i++) {
```

```
    var dialect = claims[i].getAttribute("Dialect");
    if ("urn:ibm:names:ITFIM:httprequest".equalsIgnoreCase(dialect)) {
        var headers = claims[i].getElementsByTagName("Header");
        for (var j = 0; j < headers.getLength(); j++) {
            var header = headers.item(j);
            var name   = header.getAttribute("Name");
            var values = header.getElementsByTagName("Value");
            for (var k = 0; k < values.getLength(); k++) {
                var value = values.item(k).getTextContent();
                IDMappingExtUtils.traceString("Header with name [" + name + "] and value [" +
value + "]");
            }
        }
    }
}
```

A similar code can be used to access cookies and query string parameters, providing values match the regex filter defined in the `sps.httpRequestClaims.filterSpec` (see SPS HTTP Request Claims)) advanced configuration parameter.

HTTP Claims in Authsvc and InfoMap JavaScript Mapping Rules

HTTP Request claims can be accessed by the Authsvc credential and InfoMap mapping rules by using the `context` variable that is defined by default in the Authsvc mapping rules.

If `sps.httpRequestClaims.enabled` (see SPS HTTP Request Claims) is `true`, then the header, cookie, and parameter values are available in the `urn:ibm:security:request` namespace of the request context.

The following example is an example for retrieving and logging HTTP headers from the request claims:

```
var headers = context.get(Scope.REQUEST, "urn:ibm:security:asf:request", "headers").toArray();
for (var i = 0; i < headers.length; i++) {
    var name = headers[i];
    var value = context.get(Scope.REQUEST, "urn:ibm:security:asf:request:header", name);
    IDMappingExtUtils.traceString("Header with name [" + name + "] and value [" + value + "]");
}
```

A similar code can be used to access cookies and query string parameters, providing values match the regex filter defined in the `sps.httpRequestClaims.filterSpec` (see SPS HTTP Request Claims)) advanced configuration parameter.

HTTP Claims in FIDO2 Mediator JavaScript Mapping Rules

HTTP Request claims can be accessed by a FIDO Mediator mapping rule from the `context.requestData` variable that is defined by default in FIDO mapping rules.

If `sps.httpRequestClaims.enabled` (see SPS HTTP Request Claims) is `true`, then header, cookie and parameter values are added to the requestData field of the context parameter.

The following example is an example for retrieving and logging HTTP headers from the request claims:

```
var headers = context.requestData.headers
for (var name in headers) {
    var value = context.requestData.headers[name];
    IDMappingExtUtils.traceString("Header with name [" + name + "] and value [" + value + "]");
}
```

A similar code can be used to access cookies and query string parameters, providing values match the regex filter defined in the `sps.httpRequestClaims.filterSpec` (see SPS HTTP Request Claims)) advanced configuration parameter.

Managing Distributed Session Cache

In a clustered appliance environment, session information is stored in the Distributed Session Cache. To work with these sessions, use the Distributed Session Cache management page.

About this task

The Distributed Session Cache feature replaces the Session Management Server. The Session Management Server (SMS) is not supported on IBM Security Verify Access for Web Version 8 and later.

Procedure

1. From the top menu, select the menu for your activation level.
   - **Web** > **Manage** > **Distributed Session Cache**
   - **AAC** > **Global Settings** > **Distributed Session Cache**
   - **Federation** > **Global Settings** > **Distributed Session Cache**

   All replica set names and the number of sessions in each replica set are displayed.
2. You can then view the replica set server list and manage sessions in a particular replica set.
   a) To view a list of the servers that are registered with a replica set, select the replica set and then click **Servers**.
   b) To manage the sessions in a replica set, select the replica set and then click **Sessions**.

   Tip: Typically, the list of sessions contains many entries. You can locate a session or a user faster by using the filter in the upper left corner.

   Delete a specific session

   i) Select the session to delete.
   ii) Click **Delete**.
   iii) In the confirmation window, click **Delete Session**.

   Delete all sessions for a user

   i) Select any session for that user.
   ii) Click **Delete**.
   iii) In the confirmation window, click **Delete User**.

Managing server connections

To use data from outside your appliance in your policies, you must define the server connection to access the data.

Before you begin

Obtain the connection information for the existing database server you want to define for your policy information point.

About this task

You can create server connections to data sources, such as Oracle, DB2, PostgreSQL, LDAP, SMTP, Web Service, Cloud Identity, and Verify Access Runtime. You can have multiple servers for an LDAP connection.

Note:

LDAP anonymous bind credentials:

username : anonymous password: anonymous

Procedure

1. Log in to the local management interface.
2. Click **AAC**.
3. Under **Global Settings**, click **Server Connections**.
4. Take one of the following actions:

   Filter server connections:

   a. In the Quick Filter field, type one or more characters. For example, enter g to search for all server connection names that contain g or G.

   b. Press Enter.

   Add a server connection:

   a. Click the drop-down button.

   b. Select **Oracle**, **DB2**, **PostgreSQL**, **LDAP**, **SMTP**, **Web Service**, **Cloud Identity** or **Verify Access Runtime**.

   c. Complete the properties for the new server connection.

   Modify an existing server connection:

   a. Select a server connection.

   b. Click .

   c. Complete the properties for the server connection.

   Delete a server connection:

   Note: Do not delete a server connection if it returns attributes that are used in a policy or risk score.

   a. Select a server connection.

   b. Click .

5. For LDAP connections, take one of the following actions in the **Servers** tab.

   Add a server connection:

   a. Click the drop-down button.

   b. Complete the properties for the new server connection.

   Modify an existing server connection:

   a. Click .

   b. Complete the properties for the server connection.

   Delete a server connection:

   a. Select a server connection.

   b. Click .

   Move a server connection:

   a. Select a server connection.

   b. Click or .

What to do next

- For information on server properties, see “Server connection properties” on page 363.

- After you define a server connection to a data source, you can create a policy information point to access this data and use it in policies. See Managing policy information points.

Server connection properties

To access a data source outside of the appliance, define the properties of the server.

The Server Connection properties table describes the properties on the **Server Connections** panel for the Advanced Access Control and Federation module activation levels.

- **Advanced Access Control**: Configure LDAP, database, web service, or Cloud Identity server connections so that you can set up policy information points. You can configure any of the server connection types.
- **Federation**: Configure an LDAP server as an attribute source for attribute mapping. Federation does not configure any of the other database server connection types.

Table 59. Server Connection properties

Property	Description
Name	Specifies the name for the server connection. Ensure that the name is unique. Select this name when you define the policy information point. **Note:** The server connection name must begin with an alphabetic character. Do not use control characters, leading and trailing blanks, and the following special characters ~ ! @ # $ % ^ & * ( ) + | ` = \ ; " ' < > ? , [ ] { } / anywhere in the name.
Description	Describes the server connection. This property is optional.
Type	Shows the server connection type. (Read only)
JNDI ID (Oracle, DB2, PostgreSQL only)	Specifies the JNDI ID that the server uses. Ensure that the ID is unique. Use only alphanumeric characters: a-b, A-B, 0-9
Set the connection by using the full URL (Oracle only)	Indicates that the connection to the database is set as the full JDBC URL.
Set the connection by using the server name and port (Oracle only)	Indicates that the connection to the database is set by specifying the server name and port.
Server name (Oracle, DB2, PostgreSQL, SMTP only)	Specifies the name or IP address for the server.
Port (Oracle, DB2, PostgreSQL, LDAP, SMTP, Redis only)	Specifies the port number where the connection to the server can be made.
URL (Oracle only)	Specifies the JDBC URL where the connection to the database can be made.
URL (Web Service only)	Specifies the URL where the connection to the server can be made.
Master Name (Redis-Sentinel only)	
User name (Oracle, DB2, PostgreSQL, SMTP, and Web Service only)	Specifies the user name that has the correct permissions to access the resources.
Password (Oracle, DB2, PostgreSQL, SMTP, and Web Service only)	Specifies the password to access the server.

Table 59. Server Connection properties (continued)	
Property	**Description**
SSL	Specifies whether SSL is used for connecting to the server. Select **True** or **False**. The default value is **True**.
Driver type (Oracle only)	Specifies the driver type. Select **Thin** or **OCI**. The default value is **Thin**.
Service name (Oracle only)	Specifies the name of the service.
Database name (DB2, PostgreSQL only)	Specifies the name of the database.
Host name (LDAP and Redis only)	Specifies the host name or IP address of the LDAP and Redis server. For Redis-Sentinel, select the **Servers** tab to add specify the servers.
Bind DN (LDAP only)	Specifies the LDAP distinguished name (DN) that is used when binding, or signing on, to the LDAP server. **Note:** If this value is set to `"anonymous"`, the appliance uses an anonymous bind to the LDAP directory server. Typically the **`bind-dn`** has significant privileges so that it can be used to modify LDAP registry entries, such as creating users and resetting passwords via pdadmin or the Registry Direct Java API. Using an anonymous connection to LDAP typically comes with very limited access, perhaps at most search and view of entries, at the least no access at all. If anonymous access has sufficient privileges, then it might be usable for the WebSEAL level of access on users and groups. This access includes the permission for a user to change password if `"bind-auth-and-pwdchg = yes"` is set (`"ldap.bind-auth-and-pwdchg = true"` for Registry Direct Java API).
Bind Password (LDAP only)	Specifies the password for the LDAP bind DN. **Note:** If bind DN (`bind-dn`) is set to `anonymous`, you can use any non-empty string as the value of bind password (`bind-pwd`).
Administration hostname (Cloud Identity only)	Specifies the administration hostname of the Cloud Identity subscription.
Client ID (Cloud Identity only)	Specifies the client ID of an API Client on Cloud Identity.
Client Secret (Cloud Identity only)	Specifies the client secret of an API Client on Cloud Identity.
SSL Truststore (LDAP, Web Service, Cloud Identity, and Redis only)	Specifies the truststore that verifies the credentials.
SSL Mutual Authentication Key (LDAP, Web Service, Cloud Identity, Redis only)	Label of the client certificate to be presented when connecting to the LDAP. This property is sourced from SSL Truststore. **Note:** This field is required only if mutual SSL authentication is required by the server.

Note: For information on SSL configuration, see Configuring SSL connections.

The properties in the following table are connection manager properties. The defaults that are listed are the current known defaults. All tuning properties are optional.

Table 60. Tuning properties	
Property	**Description**
Aged timeout (seconds) (Oracle, DB2, PostgreSQL only)	Specifies the amount of time, in seconds, before a physical connection is discarded by pool maintenance. Specify `-1` to disable this timeout. The default is `-1`.
Connection timeout (seconds)	Specifies the amount of time, in seconds, after which a connection times out. For Oracle, DB2, PostgreSQL, and SMTP, specify `-1` to disable this timeout. The default is `30` seconds. For LDAP, specify only integers, `1` or greater. The default is `120` seconds. For Redis, the default is `10` seconds
Min Idle Size (Redis only)	Specifies the minimum number of established connections that must be kept in the pool.
Max Idle Size (Redis only)	Specifies the maximum number of established connections that must be kept in the pool.
Max Idle Time (seconds)	Specifies the maximum amount of time, in seconds, after which an unused or idle connection is discarded during pool maintenance. Specify `-1` to disable this timeout. The default is `1800` seconds.
Max Idle Time (seconds) (LDAP only)	Specifies the amount of time, in seconds, after which an established connection is discarded as idle. Set this to a value lower than the connection idle timeout on the LDAP server. **Note:** This is only applicable for performing Attribute Mapping from an LDAP server.
Reap time (seconds) (Oracle, DB2, PostgreSQL only)	Specifies the amount of time, in seconds, between runs of the pool maintenance thread. Specify `-1` to disable pool maintenance. The default is `180` seconds.
Max pool size (Oracle, DB2, PostgreSQL only)	Specifies the maximum number of physical connections for a pool. Specify `0` for unlimited. The default is `50`.
Max pool size (LDAP and Redis only)	Specifies the maximum number of connections that are pooled. **Note:** This is only applicable for performing Attribute Mapping from an LDAP server.
Min pool size (Oracle, DB2, PostgreSQL only)	Specifies the minimum number of physical connections to maintain in a pool. The aged timeout can override the minimum.

Table 60. Tuning properties (continued)	
Property	**Description**
Purge policy (Oracle, DB2, PostgreSQL only)	Specifies which connections to delete when a stale connection is detected in the pool. Select from the following options: **Entire pool** When a stale connection is detected, all connections in the pool are marked stale, and when no longer in use, are closed. This is the default option. **Failing connection only** When a stale connection is detected, only the connection that was found to be bad is closed. **Validate all connections** When a stale connection is detected, connections are tested and the ones that are found to be bad are closed.
Max connections per thread (Oracle, DB2, PostgreSQL only)	Specifies the limit of open connections on each thread.
Cache connections per thread (Oracle, DB2, PostgreSQL only)	Specifies the number of cache connections for each thread.
Idle Timeout (seconds) (Redis only	Specifies the amount of time, in seconds, after which an established connection is discarded as idle. The default is 1800 seconds.
IO Timeout (seconds) (Redis only)	Specifies the amount of time, in seconds, that the client waits for a response from the server, after an established connection, before it is discarded as idle.

Point of contact profiles

Use the local management interface to work with your point of contact profiles.

You can perform the following point of contact profile tasks:

- “Creating a point of contact profile” on page 366
- “Updating or viewing a point of contact profile” on page 367
- “Deleting a point of contact profile” on page 368
- “Setting a current point of contact profile” on page 368

Creating a point of contact profile

Create a point of contact server profile to capture the information needed for the runtime to communicate with the point of contact server.

About this task

You can create point of contact profiles with the Federation module or the Advanced Access Control module.

Three point of contact profiles provided by Security Verify Access are ready for use.

When you want to create your own profile that is similar to an existing one, use **Create Like** to save time. If you do not want to reuse any of the existing specifications, create a brand new one with **Create**. The details are in the following procedure.

Procedure

1. From the local management interface, select **Federation** or **AAC**. Then, **Global Settings** > **Point of Contact**.

   A list of point of contact server profiles displays. The list includes three preconfigured profiles and any other custom profiles that you created.
2. Take one of the following actions:
   - Click **Create** to create a custom point of contact profile.
   - Select a profile from the list and click **Create Like** to start with values similar to an existing profile.
3. On the Profile Name page, enter the name of the profile. The first character of the profile name must be alphanumeric. The maximum number of characters is 200.
4. Optional: Enter a description.
5. Specify the parameter information:
   - Enter the information on each tabbed page, and click **Next**.
   - In the Callback Parameters section on each page, click **Create** to open a window to add a set of parameter name and value pairs. Click **Save** when complete.
   - Add as many parameters as you need. The **Value** field might be empty for some parameters.
   - To delete a parameter name from the list, select the parameter and click **Delete**.
6. At the Summary page, if everything is correct, click **Finish**.
7. Deploy the pending changes.

What to do next

- See "Callback parameters and values" on page 368 for descriptions.
- You might want to change the current point of contact profile. See "Setting a current point of contact profile" on page 368.

Updating or viewing a point of contact profile

Update or view a point of contact server profile.

About this task

You cannot update the preconfigured point of contact profiles.

Procedure

1. From the local management interface, select **Federation** or **AAC**. Then, **Global Settings** > **Point of Contact**.

   A list of point of contact server profiles displays.
2. Perform one of the following actions:
   - Update
     a. Select a profile from the list that is not a preconfigured profile and click **Update** to change the configuration details.
     b. Click **Next** to see each page and make updates if necessary.
     c. On the Summary page, click **Finish** to save your changes.
     d. Deploy the changes
   - View
     a. Select a profile from the list and click **Properties** to look at the configuration details without making updates.
     b. Click on each tab to see the information.

c. Click **OK** when finished.

What to do next

See "Callback parameters and values" on page 368 for more information about the properties.

Deleting a point of contact profile

Use the local management interface to remove a point of contact profile.

About this task

You cannot delete the following profiles:

- A preconfigured point of contact profile.
- A profile that is set as the current profile. Select another profile as the current one, if necessary.

See "Setting a current point of contact profile" on page 368.

Procedure

1. From the local management interface, select **Federation** > **Global Settings** > **Point of Contact** or **AAC** > **Global Settings** > **Point of Contact**.

   A list of point of contact server profiles displays.
2. Select a profile from the list, that is not a preconfigured profile, and click **Delete**.

   The details of the selected profile display.
3. Review the profile to ensure that it is the one you want to delete.
4. Click **Finish**.
5. Click **OK** to confirm.
6. Deploy the change.

Setting a current point of contact profile

Set a point of contact profile as the current one so that the federation runtime communicates with the point of contact server using the correct set of specifications.

Procedure

1. From the local management interface, select **Federation** > **Global Settings** > **Point of Contact** or select **AAC** > **Global Settings** > **Point of Contact**.

   A list of point of contact server profiles displays. The list includes three preconfigured profiles and any other custom profiles that you created. The green dot indicates the current profile.
2. To change the current profile, select the profile you want to use as the current one and click **Set As Current**.

   The current profile indicator displays next to the profile you selected.
3. Deploy the changes.

Callback parameters and values

Specify the callback parameters and values when you define a point of contact profile.

Sign In callbacks

fim.user.request.header.name

The name of the header that contains the user name of the user.

Data type: String

Example: `iv-user`

fim.attributes.response.header.name
The name of the header that contains the attributes of the user.

Data type: String

Example: `am-fim-eai-xattrs`

fim.groups.response.header.name
The name of the header that contains the groups of the user.

Data type: String

Example: `fim.groups`

fim.server.response.header.name
The name of the header that contains the hostname that authenticates the user.

Data type: String

Example: `fim.server`

fim.target.response.header.name
The name of the header that contains the redirect URL.

Data type: String

Example: `am-fim-eai-redir-url`

fim.user.response.header.name
The name of the header that contains the user name of the user.

Data type: String

Example: `am-fim-eai-user-id`

fim.user.session.id.response.header.name
The name of the header that contains the reverse proxy session ID of the user.

Data type: String

Example: `user_session_id`

fim.cred.response.header.name
The name of the header that contains the IVCred of the user.

Data type: String

Example: `am-fim-eai-pac`

url.encoding.enabled
Indicates whether the EAI header names and values are URL encoded. The default setting for this property is `false`. The EAI header names and values are not URL encoded.

Data type: Boolean

Example: `false`

Sign Out callbacks

fim.user.session.id.request.header.name
The name of the header that contains the reverse proxy session ID of the user.

Data type: String

Example: `user_session_id`

fim.user.request.header.name
The name of the header that contains the user name.

Data type: String

Example: `iv-user`

Local ID

fim.attributes.request.header.name
The name of the header that contains the attributes of the user.

Data type: String

Example: `fim.attributes`

fim.cred.request.header.name
The header that contains the IVCred of the user.

Data type: String

Example: `iv-creds`

fim.groups.request.header.name
The name of the header that contains the groups of the user.

Data type: String

Example: `iv-groups`

fim.user.request.header.name
The name of the header that contains the user name.

Data type: String

Example: `iv-user`

Authenticate

fim.user.request.header.name
The name of the header that contains the user name.

Data type: String

Example: `iv-user`

authentication.macros
A list of macros that defines contextual information to pass to the web reverse proxy login page. The macros you specify can customize an authentication login page for a specific service provider. For more information, see Customizing the SAML 2.0 login form.

Data type: String

Example: If an identity provider wants to display the provider ID and target URL of a partner, specify the following macros:

`%PARTNERID%,%TARGET%`

Runtime monitoring using Prometheus

Runtime can be configured to provide a `/metrics` REST interface from which you can access all metrics that are emitted by the Runtime. The default format for responses to requests to `/metrics` is a text format that is compatible with Prometheus.

This is controlled by the advance tuning parameter `runtime_profile.enable.monitor`.
To enable, set the parameter to `true` and deploy pending changes. To disable, set the `runtime_profile.enable.monitor` to `false`

The monitoring endpoint is unprotected. If the service needs to be protected, it needs to be done with a WebSEAL junction.

Use `/metrics` to access the monitoring data.

Chapter 19. Choose a synchronization mode

You can choose synchronization mode types for the IBM Security Verify Access Advanced Access Control component.

Feature	Recommended Replication Mode	Comment
Context/Risk-based access	NEARSYNC	Context/risk-based access usage data, device fingerprint, and obligation data are used in authentication decision making and requires to be replicated in a failover scenario.
Mobile Multi Factor Authentication (MMFA)		MMFA authenticators required to be presents at standby node during failover.
User Self Care (USC)		

Overall recommendation: NEARSYNC within datacenter. In case of cross data center replication where network latency is significant , it is advised use Superasync as HADR mode to get optimal performance.

For more information on synchronization mode types for the IBM Security Verify Access Federation component, see Choose a synchronization mode for the Federation component.

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