Administrator Tasks

This chapter is written for administrators who must manage and maintain Autonomous Identity.

ForgeRock® Autonomous Identity is an entitlements and roles analytics system that lets you fully manage your company's access to your data.

An entitlement refers to the rights or privileges assigned to a user or thing for access to specific resources. A company can have millions of entitlements without a clear picture of what they are, what they do, and who they are assigned to. Autonomous Identity solves this problem by using advanced artificial intelligence (AI) and automation technology to determine the full entitlements landscape for your company. The system also detects potential risks arising from incorrect or over-provisioned entitlements that lead to policy violations. Autonomous Identity eliminates the manual re-certification of entitlements and provides a centralized, transparent, and contextual view of all access points within your company.

Self Service

Run self-service tasks.

Manage Identities

Add, edit, or remove user identities.

Prepare Data

Prepare your data for ingestion.

Deployment Tasks

Run deployment-related tasks.

Set Entity Definitions

Set your attribute entity definitions.

Set Data Sources

Set your data sources.

Set Attribute Mappings

Set attribute mappings.

Set Analytics Settings

Set analytic settings.

Run Analytics

Run the analytics pipeline.

Admin Tasks

Run admin tasks.

Server Maintenance

Run server maintenance-related tasks.

Roles Management

Manage your roles.

For installation instructions, see the Autonomous Identity Installation Guide.

For a description of the Autonomous Identity UI console, see the Autonomous Identity Users Guide.

Self Service

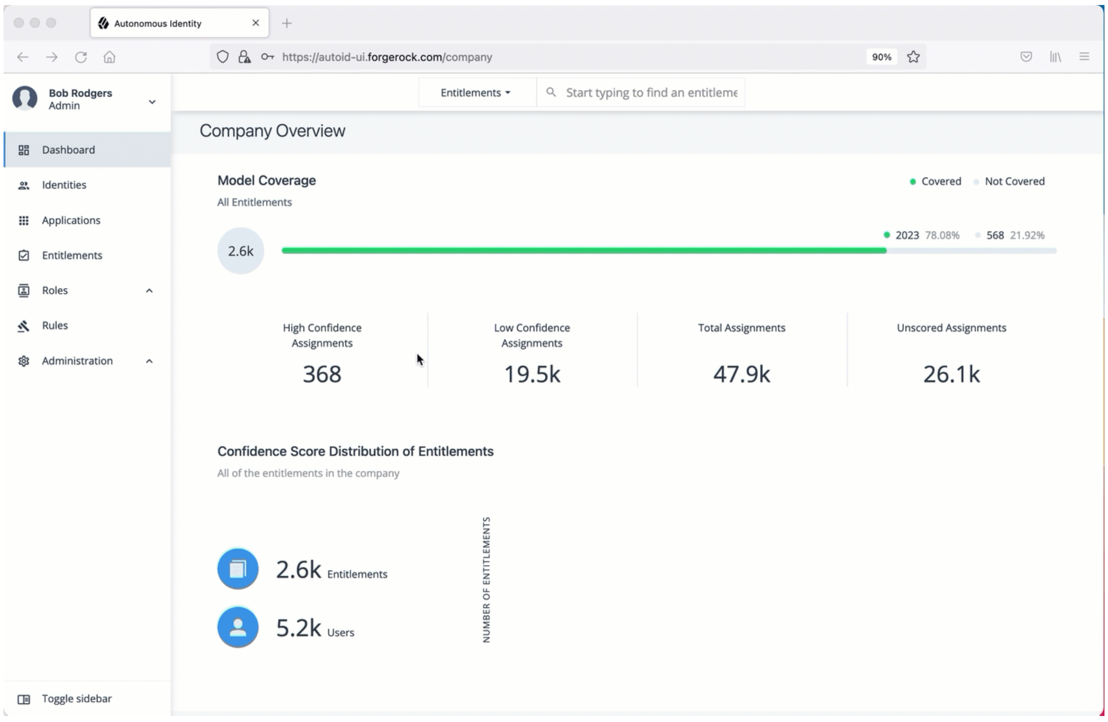
Autonomous Identity provides a self service UI page for administrators to change their profile and password information.

The page also lets administrators create time-based API keys for users to access the Autonomous Identity system. For more information, see Generate an API Key.

Reset Your Password

1. On the Autonomous Identity UI, click the admin drop-down on the top-left of the page.
2. Click **Self Service**.
3. On the Profile page, enter and re-enter a new password, and then click **Save**.

▼ *See it in action*



Update Your Profile

1. On the Autonomous Identity UI, click the admin drop-down on the top-left of the page.
2. Click **Self Service**.
3. On the Profile page, click **Edit personal info** to update your profile details:

   NOTE

   You cannot change your email address or group ID as these are used to identify each user.

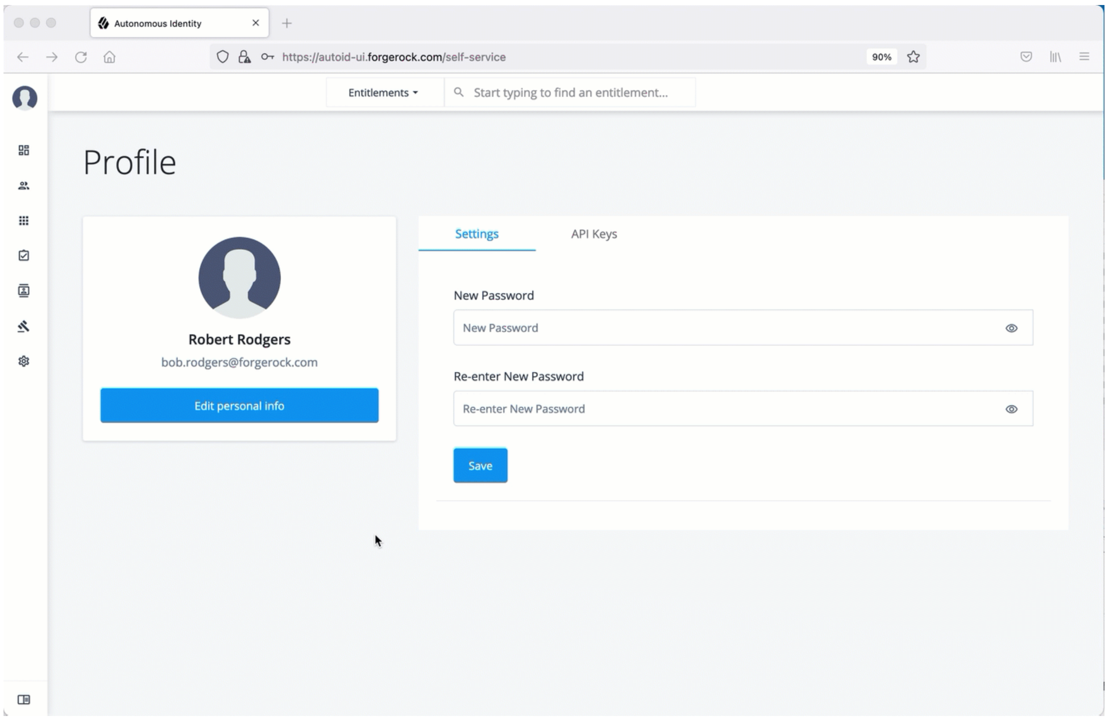
   a. Update the display name.

b. Update your distinguished name (DN).

c. Update your uid.

4. Click **Save** to apply your changes.

▼ *See it in action*



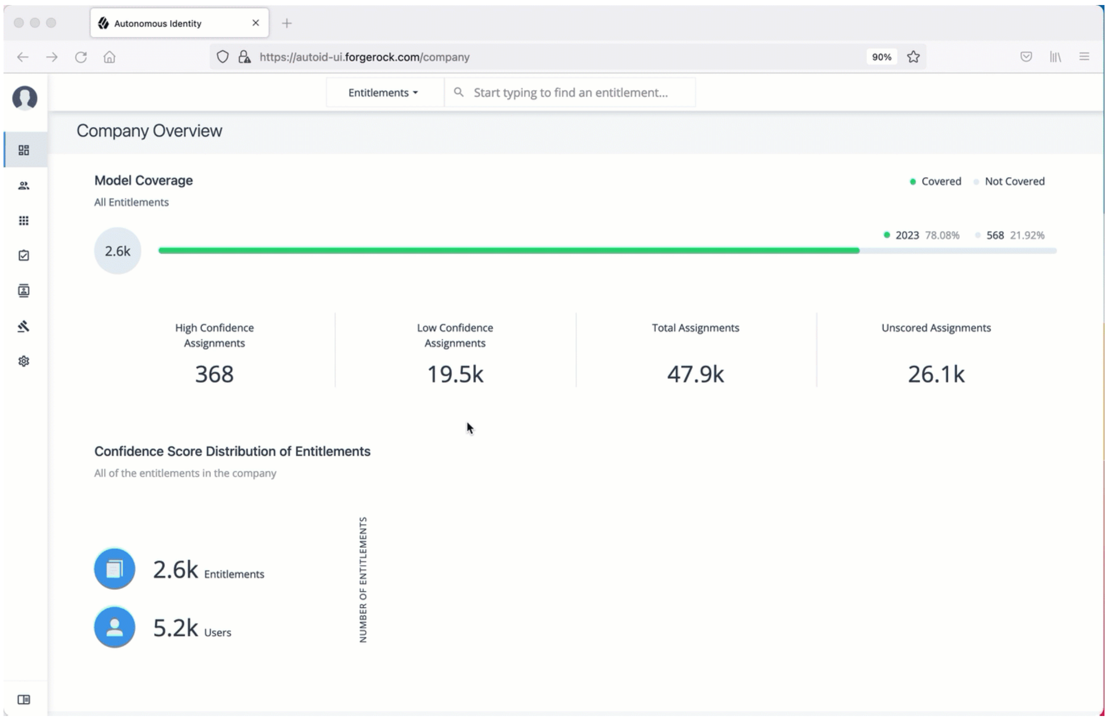
Manage Identities

The Manage Identities page lets administrators add or edit, assign roles, and deactivate users to Autonomous Identity.

View the Default Roles

1. On the Autonomous Identity UI, click the administration icon on the navigation menu, and then click Manage.
2. On the Manage Identities page, click **Roles**.
3. Select a specific role, and then click **Edit** to view its details.
4. Click through the Details and Permissions to view its details. You cannot change the permissions in these roles.
5. Click **Role Members** to see the members associated with this role. If you want to add a user to this Role group, click **New Role Member** and enter the user's name. You can enter multiple users. When finished, click **Save**.

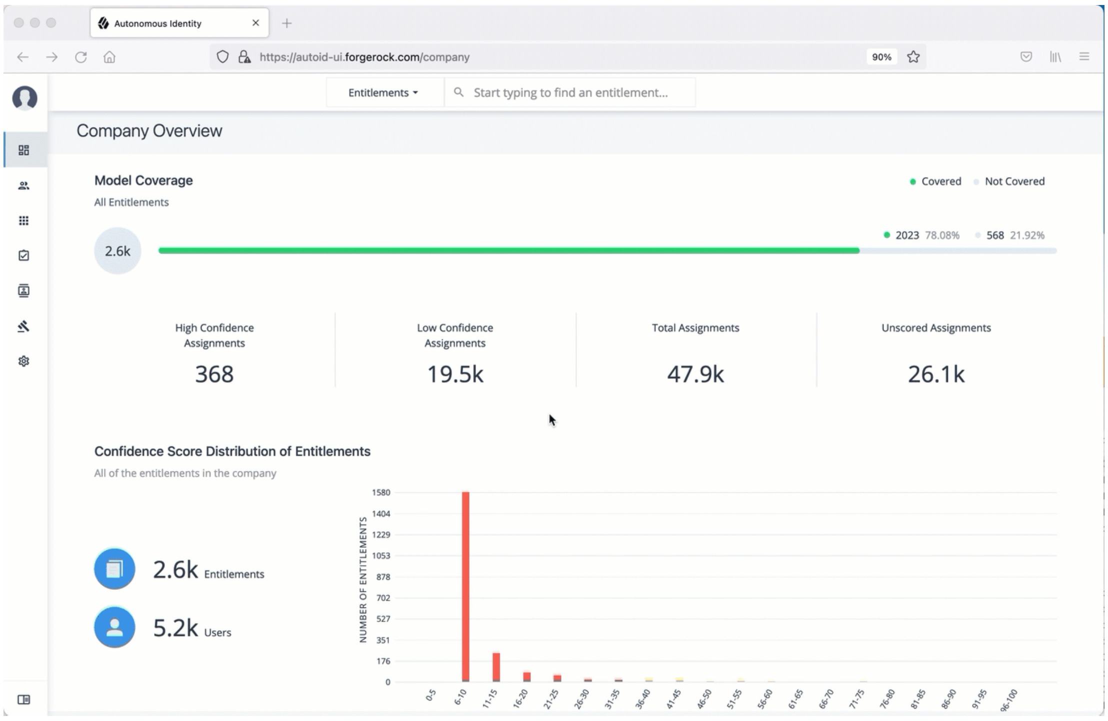
▼ *See it in action*



Create a New User

1. On the Autonomous Identity UI, click the administration icon on the navigation menu, and then click **Manage**.
2. On the Manage Identities page, click **New User**.
3. Enter the Display Name, Email Address, DN, Gid Number, Uid, and Password for the user.
4. Click **Save**.
5. Click **Authorization Roles**, and then click **New Authorization Roles**. This step is important to assign the proper role to the user.
6. Select a role to assign the user, and then click **Save**.

▼ *See it in action*



Autonomous Identity
https://autoid-ui.forgerock.com/company
90%
Entitlements
Start typing to find an entitlement...

Company Overview

Model Coverage
All Entitlements

● Covered ● Not Covered

2.6k

● 2023 78.08% ● 568 21.92%

High Confidence Assignments	Low Confidence Assignments	Total Assignments	Unscored Assignments
368	19.5k	47.9k	26.1k

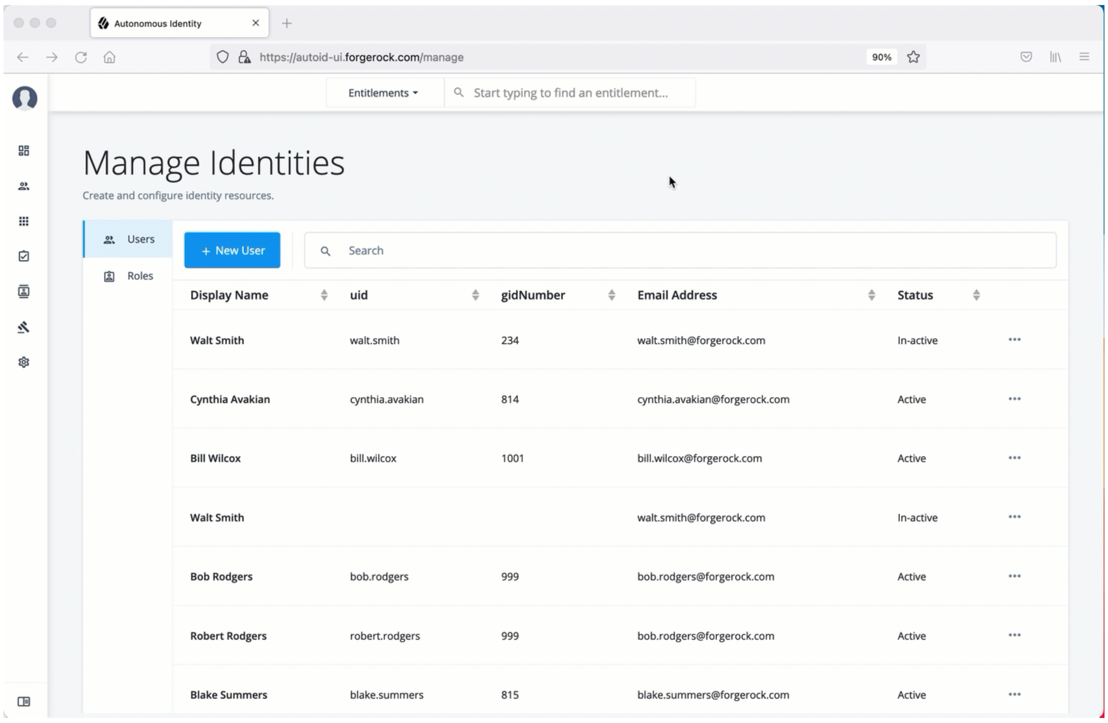
Confidence Score Distribution of Entitlements
All of the entitlements in the company

2.6k Entitlements
5.2k Users

Reset a User's Password

1. On the Autonomous Identity UI, click the administration icon on the navigation menu, and then click **Manage**.
2. On the Manage Identities page, search for a user.
3. For a specific user, click **Edit**.
4. Click **Reset Password**, enter a temporary password, and then click **Save**.

   ▼ *See it in action*



Autonomous Identity
https://autoid-ui.forgerock.com/manage
90%
Entitlements
Start typing to find an entitlement...

Manage Identities
Create and configure identity resources.

Users
Roles
+ New User
Search

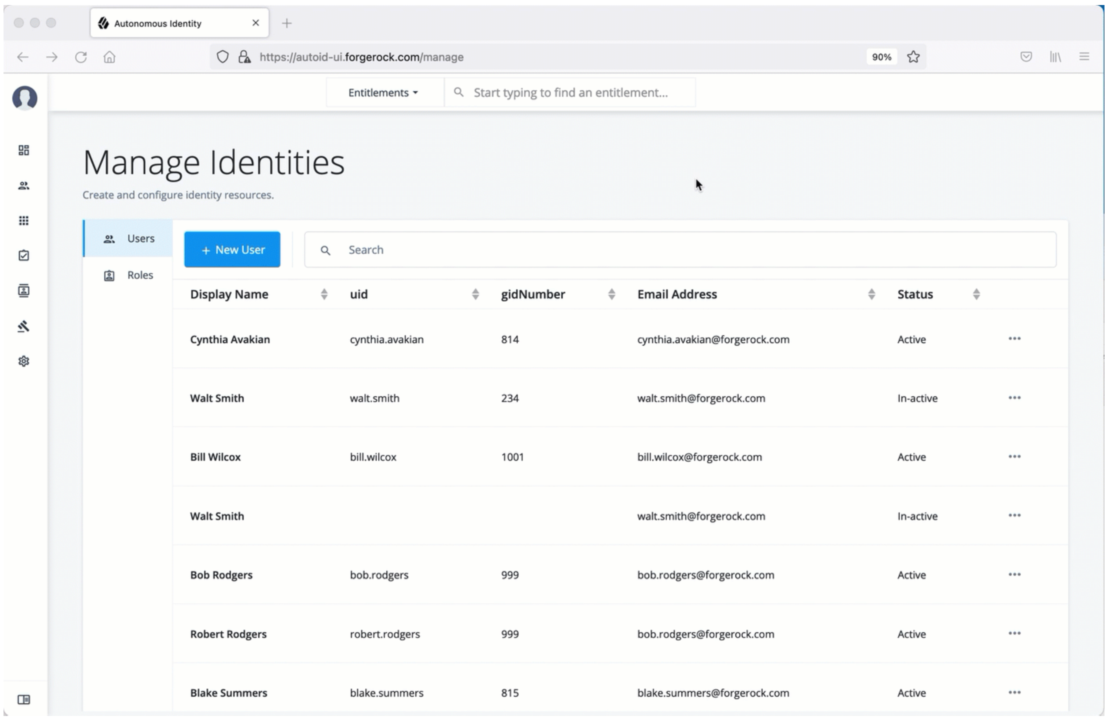
Display Name	uid	gidNumber	Email Address	Status	
Walt Smith	walt.smith	234	walt.smith@forgerock.com	In-active	•••
Cynthia Avakian	cynthia.avakian	814	cynthia.avakian@forgerock.com	Active	•••
Bill Wilcox	bill.wilcox	1001	bill.wilcox@forgerock.com	Active	•••
Walt Smith			walt.smith@forgerock.com	In-active	•••
Bob Rodgers	bob.rodgers	999	bob.rodgers@forgerock.com	Active	•••
Robert Rodgers	robert.rodgers	999	bob.rodgers@forgerock.com	Active	•••
Blake Summers	blake.summers	815	blake.summers@forgerock.com	Active	•••

Add a Role to an Existing User

Often administrators need to assign roles to existing members. There are two ways to do this: from the user's detail page (see below) and through the role's Role Members page (see View the Default Roles).

1. On the Autonomous Identity UI, click the administration icon on the navigation menu, and then click **Manage**.
2. On the Manage Identities page, search for a user.
3. For a specific user, click **Edit**.
4. Click **Authorization Roles**, and then click **New Authorization Roles**.
5. Select one or more roles to add, and then click **Save**.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/manage
90%
Entitlements
Start typing to find an entitlement...
Users
Roles
+ New User
Search

Manage Identities

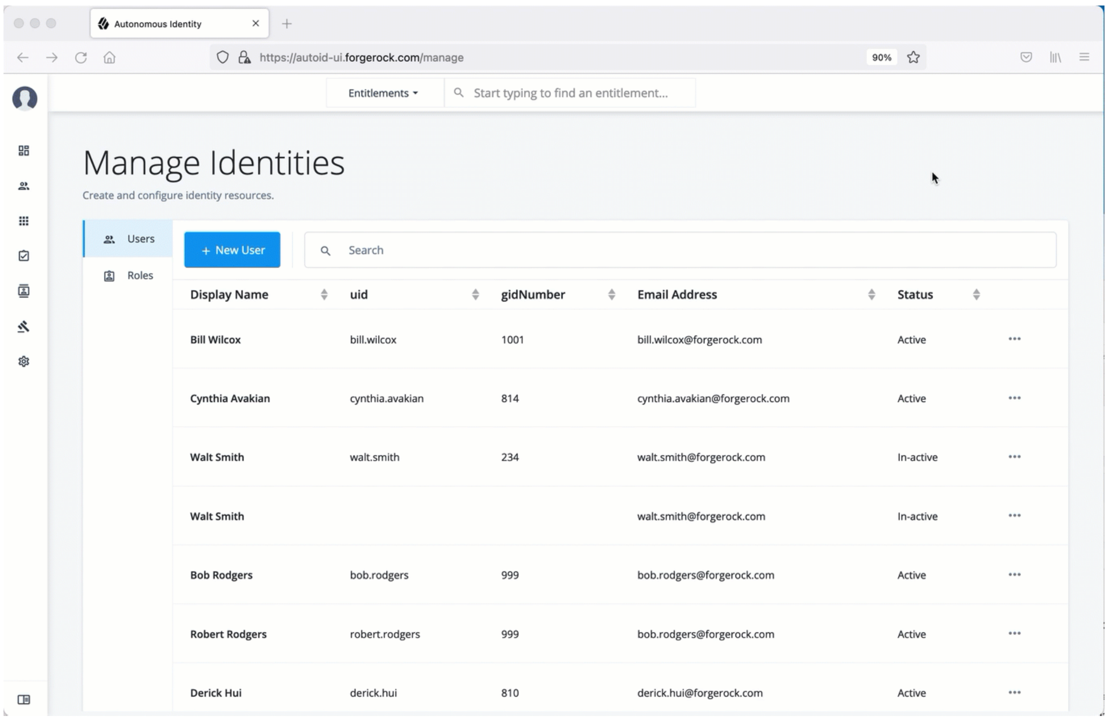
Create and configure identity resources.

Display Name	uid	gidNumber	Email Address	Status
Cynthia Avakian	cynthia.avakian	814	cynthia.avakian@forgerock.com	Active
Walt Smith	walt.smith	234	walt.smith@forgerock.com	In-active
Bill Wilcox	bill.wilcox	1001	bill.wilcox@forgerock.com	Active
Walt Smith			walt.smith@forgerock.com	In-active
Bob Rodgers	bob.rodgers	999	bob.rodgers@forgerock.com	Active
Robert Rodgers	robert.rodgers	999	bob.rodgers@forgerock.com	Active
Blake Summers	blake.summers	815	blake.summers@forgerock.com	Active

Deactivate an Existing User

1. On the Autonomous Identity UI, click the administration icon on the navigation menu, and then click **Manage**.
2. On the Manage Identities page, search for a user.
3. For a specific user, click **Deactivate**. The user's status changes to "In-active".

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/manage
90%
Entitlements
Start typing to find an entitlement...
Users
Roles
+ New User
Search

Manage Identities

Create and configure identity resources.

Display Name	uid	gidNumber	Email Address	Status
Bill Wilcox	bill.wilcox	1001	bill.wilcox@forgerock.com	Active
Cynthia Avakian	cynthia.avakian	814	cynthia.avakian@forgerock.com	Active
Walt Smith	walt.smith	234	walt.smith@forgerock.com	In-active
Walt Smith			walt.smith@forgerock.com	In-active
Bob Rodgers	bob.rodgers	999	bob.rodgers@forgerock.com	Active
Robert Rodgers	robert.rodgers	999	bob.rodgers@forgerock.com	Active
Derick Hui	derick.hui	810	derick.hui@forgerock.com	Active

Prepare Data

Autonomous Identity administrators and deployers must set up additional tasks prior to your installment.

The following are some deployments tasks that may occur:

Data Preparation

Once you have deployed Autonomous Identity, you can prepare your dataset into a format that meets the schema.

The initial step is to obtain the data as agreed upon between ForgeRock and your company. The files contain a subset of user attributes from the HR database and entitlement metadata required for the analysis. Only the attributes necessary for analysis are used.

There are a number of steps that must be carried out before your production entitlement data is input into Autonomous Identity. The summary of these steps are outlined below:

Data Collection

Typically, the raw client data is not in a form that meets the Autonomous Identity schema. For example, a unique user identifier can have multiple names, such as `user_id`, `account_id`, `user_key`, or `key`. Similarly, entitlement columns can have several names, such as `access_point`, `privilege_name`, or `entitlement`.

To get the correct format, here are some general rules:

- Submit the raw client data in `.csv` file format. The data can be in a single file or multiple files. Data includes application attributes, entitlement assignments, entitlements decriptions, and identities data.
- Duplicate values should be removed.
- Add optional columns for additional training attributes, for example, `MANAGERS_MANAGER` and `MANAGER_FLAG`. You can add these additional attributes to the schema using the Autonomous Identity UI. For more information, see Set Entity Definitions.
- Make a note of those attributes that differ from the Autonomous Identity schema, which is presented below. This is crucial for setting up your attribute mappings. For more information, see Set Attribute Mappings.

CSV Files and Schema

The required attributes for the schema are as follows:

CSV Files Schema

Files	**Schema**
applications.csv	This file depends on the attributes that the client wants to include. Here are some required columns: • **app_id**. Specifies the applications's unique ID. • **app_name**. Specifies the applications's name. • **app_owner_id**. Specifies the ID of the application's owner.
assignments.csv	• **user_id**. Specifies the unique user ID to which the entitlement is assigned. • **ent_id**. Specifies the entitlements's unique ID.
entitlements.csv	• **ent_id**. Specifies the entitlements's unique ID. • **ent_name**. Specifies the entitlement name. • **ent_owner_id**. Specifies the entitlement's owner. • **app_id**. Specifies the applications's unique ID.

Files	Schema
identities.csv	• **usr_id**. Specifies the user's unique ID. • **user_name**. Specifies a human readable username. For example, `John Smith`. • **usr_manager_id**. Specifies the user's manager ID.

Deployment Tasks

Autonomous Identity administrators and deployers must set up additional tasks during installment.

The following are some deployments tasks that may occur:

Customize the Domain and Namespace

By default, the Autonomous Identity URL and domain for the UI console is set to `autoid-ui.forgerock.com`, and the URL and domain for the self-service feature is `autoid-selfservice.forgerock.com`.

Customize domain and namespace:

1. Customize the domain name and target environment by editing the `/autoid-config/vars.xml` file. By default, the domain name is set to `forgerock.com` and the target environment is set to `autoid`. The default Autonomous Identity URL will be: `https://autoid-ui.forgerock.com`. For example, we set the domain name to `abc.com` and the target environment to `myid`:

```
domain_name: forgerock.com
target_environment: autoid
```

2. If you set up your domain name and target environment in the previous step, you need to change the certificates to reflect the changes. Autonomous Identity generates self-signed certificates for its default configuration. You must generate new certificates as follows:

   a. Generate the private key (that is, `privatekey.pem`).

   ```
   $ openssl genrsa 2048 > privatekey.pem
   ```

   b. Generate the certificate signing request.

```
$ openssl req -new -key privatekey.pem -out csr.pem
```

c. Generate the Diffie-Hellman (DH) parameters file (dhparam4096.pem).

```
$ openssl dhparam -out dhparam4096.pem 4096
```

d. Create a self-signing certificate.

```
$ openssl x509 -req -days 365 -in csr.pem -signkey
privatekey.pem -out server.crt
```

e. Use your Certificate Authority (CA) to sign the certificate. The certificate must be `server.crt`.

f. Copy the files to the `/autoid-config/certs` directory.

g. Make the domain changes on your DNS server or update your `/etc/hosts` (Linux/Unix) file or `C:\Windows\System32\drivers\etc\hosts` (Windows) locally on your machine.

Configuring Your Filters

The filters on the Applications pages let you focus your searches based on entitlement and user attributes. In most cases, the default filters should suffice for most environments. However, if you need to customize the filters, you can do so by accessing the configuration service API endpoint as show below.

The default filters for an entitlement are the following:

- Risk Level
- Criticality

The default filters for an user attributes are the following:

- User Department Name
- Line of Business Subgroup
- City
- Jobcode Name
- User Employee Type
- Chief Yes No
- Manager Name
- Line of Business
- Cost Center

Configure the Filters:

1. From the deployer node, SSH to the target node.
2. Run the **curl** command to retrieve the current filters configuration.

```
$ curl -i -k -u configadmin:<configadmin-password> --
header "Content-Type: application/json" --request GET
  https://autoid-configuration-
service.forgerock.com/api/configuration/AllowedAttributesF
orFiltering

{
  "entitlement": [
    "risk_level",
    "criticality",
    "owner"
  ],
  "user": [
    "usr_department_name",
    "line_of_business_subgroup",
    "city",
    "jobcode_name",
    "usr_emp_type",
    "chief_yes_no",
    "manager_name",
    "line_of_business",
    "cost_center"
  ]
}
```

3. Update the filters configuration. The syntax is as follows:

```
$ curl -i -k -u configadmin:<configadmin-password> \
      --request PUT \
      --header "Content-Type: application/json" \
      --data '{<UPDATED_FILTERING_JSON_DATA>}' \
    https://autoid-configuration-
service.forgerock.com/api/configuration/AllowedAttributesF
orFiltering
```

For example, update the filters list with fewer attributes:

```
$ curl -i -k -u configadmin:<configadmin-password> \
      --request PUT \
      --header "Content-Type: application/json"
      --data '{ "entitlement":
["risk_level","criticality","owner"], \
        "user":
["usr_department_name","line_of_business_subgroup","city",
"jobcode_name"]}' \
    https://autoid-configuration-
service.forgerock.com/api/configuration/AllowedAttributesF
orFiltering

configuration item updated
```

Change the Vault Passwords

Autonomous Identity uses the ansible vault to store passwords in encrypted files, rather than in plaintext. Autonomous Identity stores the vault file at `/autoid-config/vault.yml` saves the encrypted passwords to `/config/.autoid_vault_password` . The `/config/` mount is internal to the deployer container. The default encryption algorithm used is AES256.

By default, the `/autoid-config/vault.yml` file uses the following parameters:

```
configuration_service_vault:
  basic_auth_password: Welcome123

openldap_vault:
  openldap_password: Welcome123

cassandra_vault:
  cassandra_password: Welcome123
  cassandra_admin_password: Welcome123

mongo_vault:
  mongo_admin_password: Welcome123
  mongo_root_password: Welcome123

elastic_vault:
  elastic_admin_password: Welcome123
  elasticsearch_password: Welcome123
```

Assume that the vault file is encrypted during the installation. To edit the file:

Edit the Vault file:

1. Change to the `/autoid-config/` directory.

   ```
   $ cd ~/autoid-config/
   ```

2. First, decrypt the vault file.

   ```
   $ ./deployer.sh decrypt-vault
   ```

3. Open a text editor and edit the `vault.yml` file.
4. Encrypt the file again.

   ```
   $ ./deployer.sh encrypt-vault
   ```

Set Up Single Sign-On (SSO)

Autonomous Identity supports single sign-on (SSO) using OpenID Connect (OIDC) JWT tokens. SSO lets you log in once and access multiple applications without the need to re-authenticate yourself. You can use any third-party identity provider (IdP) to connect to Autonomous Identity.

There are two scenarios for SSO configuration:

- **Set up SSO for initial deployments**. In this example, we use ForgeRock Access Management (AM) as an OpenID Connect (OIDC) IdP for Autonomous Identity during the original installation of Autonomous Identity. See Set up SSO in initial deployments.
- **Set up SSO for existing deployments**. For procedures to set up SSO in an existing Autonomous Identity deployment, see Set up SSO in existing deployments.

NOTE

If you set up SSO-only, be aware that the following services are not deployed with this setting:

- Self Service
- Manage Identities

If you want to use these services and SSO, set up the authentication as `"LocalAndSSO"` in the `vars.yml` file. Otherwise, for SSO-only, you must use the user services provided by your SSO provider.

Set up SSO in initial deployments

The following procedure requires a running instance of ForgeRock AM. For more information, see ForgeRock Access Management Authentication and Single Sign-On Guide.

Set up SSO (initial deployment):

1. First, set up your hostnames locally in `/etc/hosts` (Linux/Unix) file or `C:\Windows\System32\drivers\etc\hosts` (Windows):

   ```
   35.189.75.99  autoid-ui.forgerock.com autoid-
   selfservice.forgerock.com
   35.246.65.234 openam.example.com
   ```

2. Open a browser and point to `http://openam.example.com:8080/openam`. Log in with username: `amadmin`, password: `cangetinam`.
3. In AM, select Realm > Identities > Groups tab, and add the following groups:
   - AutoIdAdmin
   - AutoIdEntitlementOwner
   - AutoIdExecutive
   - AutoIdSupervisor
   - AutoIdUser
   - AudtIdAppOwner
   - AutoIdRoleOwner
   - AutoIdRoleEngineer

   NOTE

   The group names above are arbitrary and are defined in the `/autoid-config/vars.yml` file. Ensure that the groups you create in AM match the values in the `vars.yml` file.

4. Add the `demo` user to each group.
5. Go back to the main AM Admin UI page. Click **Configure OAuth Provider**.
6. Click **Configure OpenID Connect**, and then **Create**.
7. Select desired Realm > Go to Applications > OAuth 2.0, and then click **Add Client**. Enter the following properties, specific to your deployment:

   ```
   Client ID:         <autoid>
   Client secret:     <password>
   Redirection URIs:  https://<autoid-ui>.
   ```

```
<domain>/api/sso/finish
Scope(s):           openid profile
```

For example:

```
Client ID:          autoid
Client secret:      Welcome123
Redirection URIs:   https://autoid-
ui.forgerock.com/api/sso/finish
Scope(s):           openid profile
```

8. On the New Client page, go to to the Advanced tab, and enable **`Implied Consent`**. Next, change the `Token Endpoint Authentication Method` to `client_secret_post`.
9. Edit the OIDC claims script to return `roles (groups)`, so that AM can match the Autonomous Identity groups. Additionally, add the groups as a claim in the script:

```
"groups": { claim, identity -> [ "groups" :
identity.getMemberships(IdType.GROUP).collect { group ->
group.name }]}
```

In the `utils.setScopeClaimsMap` block, add:

```
groups: ['groups']
```

NOTE

For more information about the OIDC claims script, see the ForgeRock Knowledge Base.

The `id_token` returns the content that includes the group names.

```
{
  "at_hash": "QJRGiQgr1c1sOE4Q8BNyyg",
  "sub": "demo",
  "auditTrackingId": "59b6524d-8971-46da-9102-
704694cae9bc-48738",
  "iss": "http://openam.example.com:8080/openam/oauth2",
  "tokenName": "id_token",
  "groups": [
    "AutoIdAdmin",
    "AutoIdSupervisor",
    "AutoIdUser",
    "AutoIdExecutive",
    "AutoIdEntitlementOwner",
    "AutoIdAppOwner",
    "AutoIdRoleOwner",
    "AutoIdRoleEngineer"
  ],
  "given_name": "demo",
  "aud": "autoid",
  "c_hash": "SoLsfc3zjGq9xF5mJG_C9w",
  "acr": "0",
  "org.forgerock.openidconnect.ops":
"B15A_wXm581fO8INtYHHcwSQtJI",
  "s_hash": "bOhtX8F73IMjSPeVAqxyTQ",
  "azp": "autoid",
  "auth_time": 1592390726,
  "name": "demo",
  "realm": "/",
  "exp": 1592394729,
  "tokenType": "JWTToken",
  "family_name": "demo",
  "iat": 1592391129,
  "email": "demo@example.com"
}
```

NOTE

For more information on how to retrieve the `id_token` for observation, see OpenID Connect 1.0 Endpoints.

You have successfully configured AM as an OIDC provider.

10. Next, we set up Autonomous Identity. Change to the Autonomous Identity install directory on the deployer machine.

```
cd ~/autoid-config/
```

11. Open a text editor, and set the SSO parameters in the `/autoid-config/vars.yml` file. Make sure to change `LDAP` to `SSO`.

```
authentication_option: "SSO"

oidc_issuer:
"http://openam.example.com:8080/openam/oauth2"
oidc_auth_url:
"http://openam.example.com:8080/openam/oauth2/authorize"
oidc_token_url:
```

```
"http://openam.example.com:8080/openam/oauth2/access_token
"
oidc_user_info_url:
"http://openam.example.com:8080/openam/oauth2/userinfo"
oidc_jwks_url:
"http://openam.example.com:8080/openam/oauth2/connect/jwk_
uri"
oidc_callback_url: "https://autoid-
ui.forgerock.com/api/sso/finish"
oidc_client_scope: 'openid profile'
oidc_groups_attribute: groups
oidc_uid_attribute: sub
oidc_client_id: autoid
oidc_client_secret: Welcome1
admin_object_id: AutoIdAdmin
entitlement_owner_object_id: AutoIdEntitlementOwner
executive_object_id: AutoIdExecutive
supervisor_object_id: AutoIdSupervisor
user_object_id: AutoIdUser
application_owner_object_id: AutoIdAppOwner
role_owner_object_id: AutoIdRoleOwner
role_engineer_object_id: AutoIdRoleEngineer
oidc_end_session_endpoint:
"http://openam.example.com:8080/openam/oauth2/logout"
oidc_logout_redirect_url:
"http://openam.example.com:8088/openam/logout"
```

12. On the target machine, edit the `/etc/hosts` file or your DNS server, and add an entry for `openam.example.com`.

```
35.134.60.234  openam.example.com
```

13. On the deployer machine, run **`deployer.sh`** to push the new configuration.

```
$ deployer.sh run
```

14. Test the connection now. Access `https://autoid-ui/forgerock.com`. The redirect should occur with the following:

```
http://openam.example.com:8080/openam/XUI/?
realm=%2F&goto=http%3A%2F%2Fopenam.example.com%3A8080%2Fop
enam%2Foauth2%2Fauthorize%3Fresponse_type%3Dcode%26client_
id%3Dautoid
```

Set up SSO in existing deployments

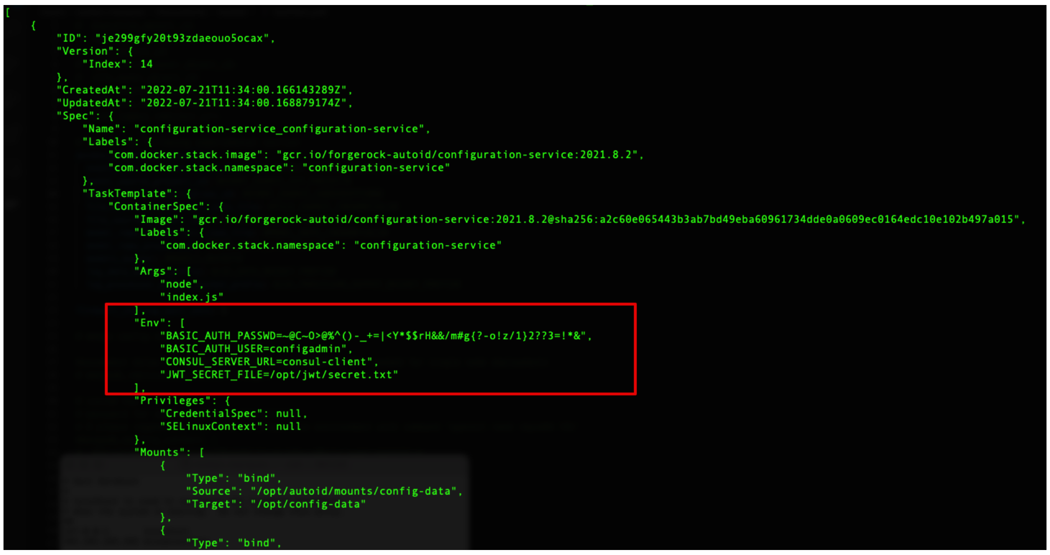
Set up SSO (existing deployment):

1. First, retrieve and update your `configuration-service` permissions:

   a. On the instance where the `configuration-service` Docker container is running, run the following command to obtain the `configuration-service` basic authentication credentials:

   ```
   docker inspect configuration-service_configuration-
   service
   ```

   You can find these properties in the output under `Spec > TaskTemplate > Env` object as `BASIC_AUTH_PASSWD` and `BASIC_AUTH_USER`:

   ```
   [
       {
           "ID": "je299gfy20t93zdaeouo5ocax",
           "Version": {
               "Index": 14
           },
           "CreatedAt": "2022-07-21T11:34:00.166143289Z",
           "UpdatedAt": "2022-07-21T11:34:00.168879174Z",
           "Spec": {
               "Name": "configuration-service_configuration-service",
               "Labels": {
                   "com.docker.stack.image": "gcr.io/forgerock-autoid/configuration-service:2021.8.2",
                   "com.docker.stack.namespace": "configuration-service"
               },
               "TaskTemplate": {
                   "ContainerSpec": {
                       "Image": "gcr.io/forgerock-autoid/configuration-service:2021.8.2@sha256:a2c60e065443b3ab7bd49eba60961734dde0a0609ec0164edc10e102b497a015",
                       "Labels": {
                           "com.docker.stack.namespace": "configuration-service"
                       },
                       "Args": [
                           "node",
                           "index.js"
                       ],
                       "Env": [
                           "BASIC_AUTH_PASSWD=~@C~O>@%^()-_+=|<Y*$$rH&&/m#g{?-o!z/1}2??3=!*&",
                           "BASIC_AUTH_USER=configadmin",
                           "CONSUL_SERVER_URL=consul-client",
                           "JWT_SECRET_FILE=/opt/jwt/secret.txt"
                       ],
                       "Privileges": {
                           "CredentialSpec": null,
                           "SELinuxContext": null
                       },
                       "Mounts": [
                           {
                               "Type": "bind",
                               "Source": "/opt/autoid/mounts/config-data",
                               "Target": "/opt/config-data"
                           },
                           {
                               "Type": "bind",
   ```

   NOTE

   You can also get the password using `basic_auth_password` and opening the `~/autoid-config/vault.yml` file.

   b. Depending on how you want to configure SSO, use one of the following templates:

   ▼ *localAndSSO template (`LocalAndSSO.json`)*

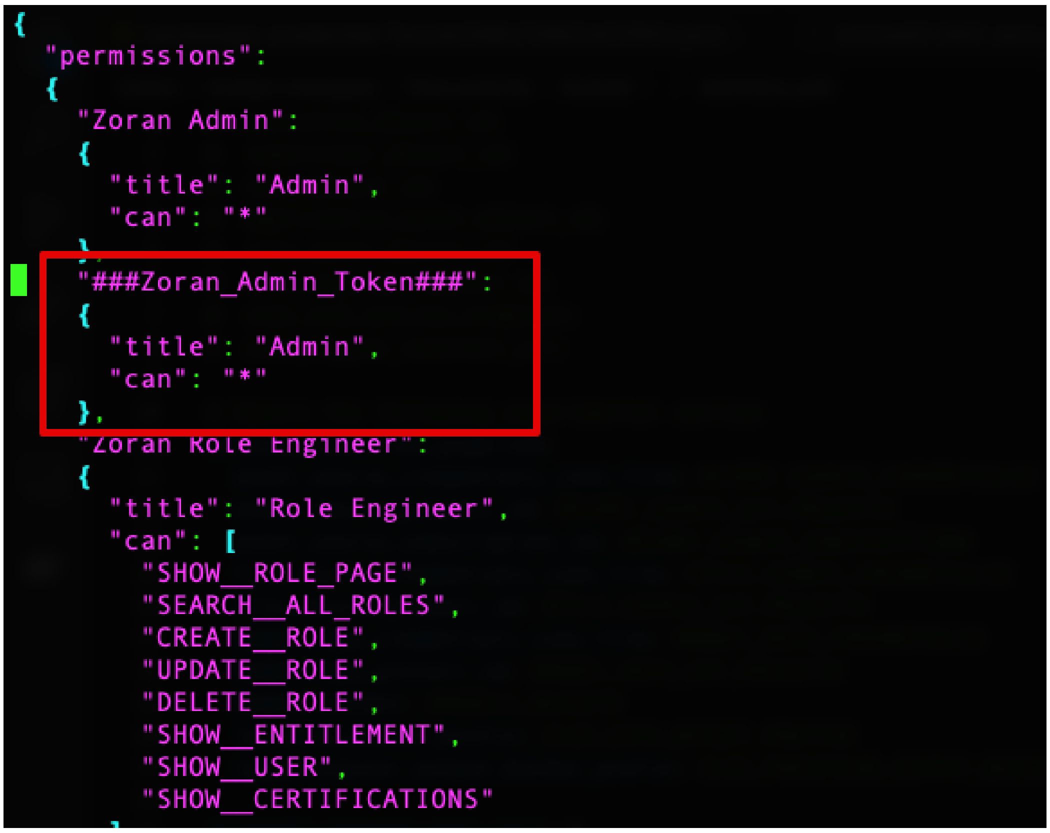
   ```
   {
       "permissions":
       {
           "Zoran Admin":
           {
               "title": "Admin",
               "can": "*"
   ```

```
        },
        "###Zoran_Admin_Token###":
        {
            "title": "Admin",
            "can": "*"
        },
        "Zoran Role Engineer":
        {
            "title": "Role Engineer",
            "can": [
                "SHOW__ROLE_PAGE",
                "SEARCH__ALL_ROLES",
                "CREATE__ROLE",
                "UPDATE__ROLE",
                "DELETE__ROLE",
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "###Zoran_Role_Engineer_Token###":
        {
            "title": "Role Engineer",
            "can": [
                "SHOW__ROLE_PAGE",
                "SEARCH__ALL_ROLES",
                "CREATE__ROLE",
                "UPDATE__ROLE",
                "DELETE__ROLE",
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "Zoran Role Owner":
        {
            "title": "Role Owner",
            "can": [
                "SHOW__ROLE_PAGE",
                "SEARCH__ROLES",
                "CREATE__ROLE",
                "UPDATE__ROLE",
                "DELETE__ROLE",
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "###Zoran_Role_Owner_Token###":
        {
            "title": "Role Owner",
            "can": [
                "SHOW__ROLE_PAGE",
                "SEARCH__ROLES",
                "CREATE__ROLE",
                "UPDATE__ROLE",
                "DELETE__ROLE",
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "Zoran Application Owner":
        {
            "title": "Application Owner",
            "can": [
                "SHOW__APPLICATION_PAGE",
                "SEARCH__USER",
                "SEARCH__ENTITLEMENTS_BY_APP_OWNER",
                "SHOW_OVERVIEW_PAGE",
                "SHOW__ENTITLEMENT",
                "SHOW__ENTITLEMENT_USERS",
                "SHOW__APP_OWNER_FILTER_OPTIONS",

"SHOW__ENTT_OWNER_UNSCORED_ENTITLEMENTS",
                "SHOW__ENTT_OWNER_PAGE",
                "SHOW__ENTT_OWNER_USER_PAGE",
                "SHOW__ENTT_OWNER_ENT_PAGE",
                "SHOW__USER_ENTITLEMENTS",
                "SHOW__RULES_BY_APP_OWNER",
                "REVOKE__CERTIFY_ACCESS",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "###Zoran_Application_Owner_Token###":
        {
            "title": "Application Owner",
            "can": [
                "SHOW__APPLICATION_PAGE",
                "SEARCH__USER",
                "SEARCH__ENTITLEMENTS_BY_APP_OWNER",
                "SHOW_OVERVIEW_PAGE",
                "SHOW__ENTITLEMENT",
                "SHOW__ENTITLEMENT_USERS",
                "SHOW__APP_OWNER_FILTER_OPTIONS",

"SHOW__ENTT_OWNER_UNSCORED_ENTITLEMENTS",
                "SHOW__ENTT_OWNER_PAGE",
                "SHOW__ENTT_OWNER_USER_PAGE",
                "SHOW__ENTT_OWNER_ENT_PAGE",
                "SHOW__USER_ENTITLEMENTS",
                "SHOW__RULES_BY_APP_OWNER",
                "REVOKE__CERTIFY_ACCESS",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "Zoran Entitlement Owner":
        {
            "title": "Entitlement Owner",
            "can": [
                "SEARCH__ENTITLEMENTS_BY_ENTT_OWNER",
                "SHOW_OVERVIEW_PAGE",
                "SHOW__ENTITLEMENT",
                "SHOW__ENTITLEMENT_USERS",
                "SHOW__ENTT_OWNER_FILTER_OPTIONS",

"SHOW__ENTT_OWNER_UNSCORED_ENTITLEMENTS",
                "SHOW__ENTT_OWNER_PAGE",
                "SHOW__ENTT_OWNER_USER_PAGE",
                "SHOW__ENTT_OWNER_ENT_PAGE",
                "SHOW__USER_ENTITLEMENTS",
                "SHOW__RULES_BY_ENTT_OWNER",
                "REVOKE__CERTIFY_ACCESS",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "###Zoran_Entitlement_Owner_Token###":
        {
            "title": "Entitlement Owner",
            "can": [
                "SEARCH__ENTITLEMENTS_BY_ENTT_OWNER",
                "SHOW_OVERVIEW_PAGE",
                "SHOW__ENTITLEMENT",
                "SHOW__ENTITLEMENT_USERS",
                "SHOW__ENTT_OWNER_FILTER_OPTIONS",

"SHOW__ENTT_OWNER_UNSCORED_ENTITLEMENTS",
                "SHOW__ENTT_OWNER_PAGE",
                "SHOW__ENTT_OWNER_USER_PAGE",
                "SHOW__ENTT_OWNER_ENT_PAGE",
                "SHOW__USER_ENTITLEMENTS",
                "SHOW__RULES_BY_ENTT_OWNER",
                "REVOKE__CERTIFY_ACCESS",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "Zoran Executive":
        {
            "title": "Executive",
            "can": [
                "SEARCH__USER",
                "SHOW__ASSIGNMENTS_STATS",
                "SHOW__COMPANY_PAGE",
                "SHOW__COMPANY_ENTITLEMENTS_DATA",
                "SHOW__CRITICAL_ENTITLEMENTS",
                "SHOW__ENTITLEMENT_AVG_GROUPS",
                "SHOW__USER_ENTITLEMENTS"
            ]
        },
        "###Zoran_Executive_Token###":
        {
            "title": "Executive",
            "can": [
                "SEARCH__USER",
                "SHOW__ASSIGNMENTS_STATS",
                "SHOW__COMPANY_PAGE",
                "SHOW__COMPANY_ENTITLEMENTS_DATA",
                "SHOW__CRITICAL_ENTITLEMENTS",
                "SHOW__ENTITLEMENT_AVG_GROUPS",
                "SHOW__USER_ENTITLEMENTS"
            ]
        },
        "Zoran Supervisor":
        {
            "title": "Supervisor",
            "can": [
                "SEARCH__USER",
                "SHOW_OVERVIEW_PAGE",
                "SHOW__SUPERVISOR_FILTER_OPTIONS",
                "SHOW__SUPERVISOR_PAGE",
                "SHOW__SUPERVISOR_ENTITLEMENT_USERS",
                "SHOW__SUPERVISOR_USER_ENTITLEMENTS",

"SHOW__SUPERVISOR_UNSCORED_ENTITLEMENTS",

"SEARCH__SUPERVISOR_USER_ENTITLEMENTS",
                "REVOKE__CERTIFY_ACCESS",
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "###Zoran_Supervisor_Token###":
        {
            "title": "Supervisor",
            "can": [
                "SEARCH__USER",
                "SHOW_OVERVIEW_PAGE",
                "SHOW__SUPERVISOR_FILTER_OPTIONS",
                "SHOW__SUPERVISOR_PAGE",
                "SHOW__SUPERVISOR_ENTITLEMENT_USERS",
                "SHOW__SUPERVISOR_USER_ENTITLEMENTS",

"SHOW__SUPERVISOR_UNSCORED_ENTITLEMENTS",

"SEARCH__SUPERVISOR_USER_ENTITLEMENTS",
                "REVOKE__CERTIFY_ACCESS",
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "Zoran User":
        {
            "title": "User",
            "can": [
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "###Zoran_User_Token###":
        {
            "title": "User",
            "can": [
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS"
            ]
        },
        "Zoran Service Connector":
        {
            "title": "Service Connector",
            "can": [
                "SERVICE_CONNECTOR",
                "SHOW__API_KEY_MGMT_PAGE",
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS",
                "SHOW__RULES"
            ]
        },
        "###Zoran_Service_Connector###":
        {
            "title": "Service Connector",
            "can": [
                "SERVICE_CONNECTOR",
                "SHOW__API_KEY_MGMT_PAGE",
                "SHOW__ENTITLEMENT",
                "SHOW__USER",
                "SHOW__CERTIFICATIONS",
                "SHOW__RULES"
            ]
        }
    }
}
```

▼ *SSO template (`SSO.json`)*

```
{
  "permissions":
  {
    "###Zoran_Admin_Token###":
    {
      "title": "Admin",
      "can": "*"
    },
    "###Zoran_Role_Engineer_Token###":
    {
      "title": "Role Engineer",
      "can": [
        "SHOW__ROLE_PAGE",
        "SEARCH__ALL_ROLES",
        "CREATE__ROLE",
        "UPDATE__ROLE",
        "DELETE__ROLE",
        "SHOW__ENTITLEMENT",
        "SHOW__USER",
        "SHOW__CERTIFICATIONS"
      ]
    },
    "###Zoran_Role_Owner_Token###":
    {
      "title": "Role Owner",
      "can": [
        "SHOW__ROLE_PAGE",
        "SEARCH__ROLES",
        "CREATE__ROLE",
        "UPDATE__ROLE",
        "DELETE__ROLE",
        "SHOW__ENTITLEMENT",
        "SHOW__USER",
        "SHOW__CERTIFICATIONS"
      ]
    },
    "###Zoran_Application_Owner_Token###":
    {
      "title": "Application Owner",
      "can": [
        "SHOW__APPLICATION_PAGE",
        "SEARCH__USER",
        "SEARCH__ENTITLEMENTS_BY_APP_OWNER",
        "SHOW_OVERVIEW_PAGE",
        "SHOW__ENTITLEMENT",
        "SHOW__ENTITLEMENT_USERS",
        "SHOW__APP_OWNER_FILTER_OPTIONS",
        "SHOW__ENTT_OWNER_UNSCORED_ENTITLEMENTS",
        "SHOW__ENTT_OWNER_PAGE",
        "SHOW__ENTT_OWNER_USER_PAGE",
        "SHOW__ENTT_OWNER_ENT_PAGE",
        "SHOW__USER_ENTITLEMENTS",
        "SHOW__RULES_BY_APP_OWNER",
        "REVOKE__CERTIFY_ACCESS",
        "SHOW__USER",
        "SHOW__CERTIFICATIONS"
      ]
    },
    "###Zoran_Entitlement_Owner_Token###":
    {
      "title": "Entitlement Owner",
      "can": [
        "SEARCH__ENTITLEMENTS_BY_ENTT_OWNER",
        "SHOW_OVERVIEW_PAGE",
        "SHOW__ENTITLEMENT",
        "SHOW__ENTITLEMENT_USERS",
        "SHOW__ENTT_OWNER_FILTER_OPTIONS",
        "SHOW__ENTT_OWNER_UNSCORED_ENTITLEMENTS",
        "SHOW__ENTT_OWNER_PAGE",
        "SHOW__ENTT_OWNER_USER_PAGE",
        "SHOW__ENTT_OWNER_ENT_PAGE",
        "SHOW__USER_ENTITLEMENTS",
        "SHOW__RULES_BY_ENTT_OWNER",
        "REVOKE__CERTIFY_ACCESS",
        "SHOW__USER",
        "SHOW__CERTIFICATIONS"
      ]
    },
    "###Zoran_Executive_Token###":
    {
      "title": "Executive",
      "can": [
        "SEARCH__USER",
        "SHOW__ASSIGNMENTS_STATS",
        "SHOW__COMPANY_PAGE",
        "SHOW__COMPANY_ENTITLEMENTS_DATA",
        "SHOW__CRITICAL_ENTITLEMENTS",
        "SHOW__ENTITLEMENT_AVG_GROUPS",
        "SHOW__USER_ENTITLEMENTS"
      ]
    },
    "###Zoran_Supervisor_Token###":
    {
      "title": "Supervisor",
      "can": [
        "SEARCH__USER",
        "SHOW_OVERVIEW_PAGE",
        "SHOW__SUPERVISOR_FILTER_OPTIONS",
        "SHOW__SUPERVISOR_PAGE",
        "SHOW__SUPERVISOR_ENTITLEMENT_USERS",
        "SHOW__SUPERVISOR_USER_ENTITLEMENTS",
        "SHOW__SUPERVISOR_UNSCORED_ENTITLEMENTS",
        "SEARCH__SUPERVISOR_USER_ENTITLEMENTS",
        "REVOKE__CERTIFY_ACCESS",
        "SHOW__ENTITLEMENT",
        "SHOW__USER",
        "SHOW__CERTIFICATIONS"
      ]
    },
    "###Zoran_User_Token###":
    {
      "title": "User",
      "can": [
        "SHOW__ENTITLEMENT",
        "SHOW__USER",
        "SHOW__CERTIFICATIONS"
      ]
    },
    "###Zoran_Service_Connector###":
    {
      "title": "Service Connector",
      "can": [
        "SERVICE_CONNECTOR",
        "SHOW__API_KEY_MGMT_PAGE",
        "SHOW__ENTITLEMENT",
        "SHOW__USER",
        "SHOW__CERTIFICATIONS",
        "SHOW__RULES"
      ]
    }
  }
}
```

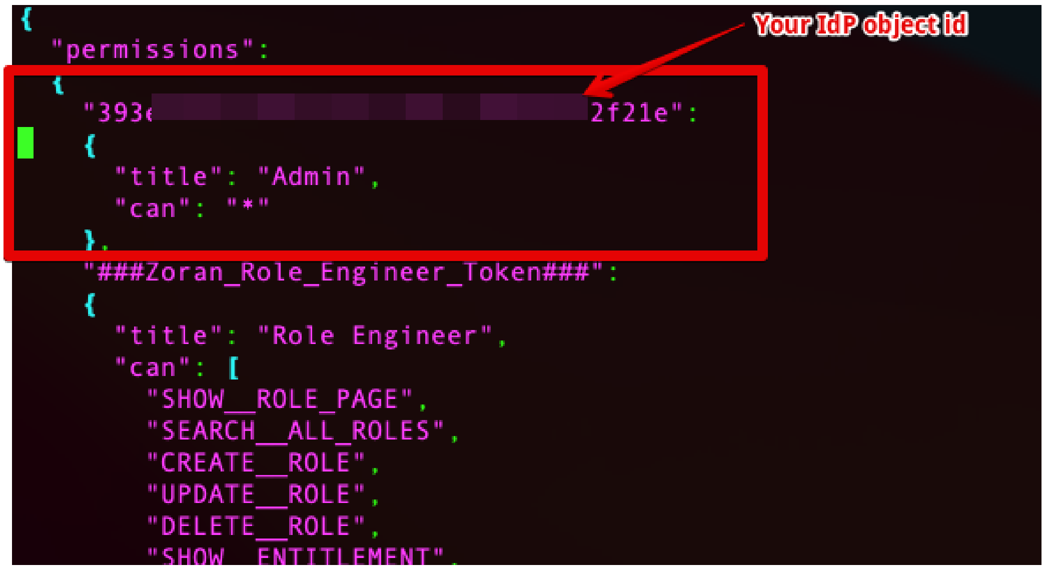
c. Edit the Permissions object in the templates by replacing the `Zoran_…_Token` fields with the actual SSO group IDs (object_ids):



```
{
  "permissions":
  {
    "Zoran Admin":
    {
      "title": "Admin",
      "can": "*"
    },
    "###Zoran_Admin_Token###":
    {
      "title": "Admin",
      "can": "*"
    },
    "Zoran Role Engineer":
    {
      "title": "Role Engineer",
      "can": [
        "SHOW__ROLE_PAGE",
        "SEARCH__ALL_ROLES",
        "CREATE__ROLE",
        "UPDATE__ROLE",
        "DELETE__ROLE",
        "SHOW__ENTITLEMENT",
        "SHOW__USER",
        "SHOW__CERTIFICATIONS"
```

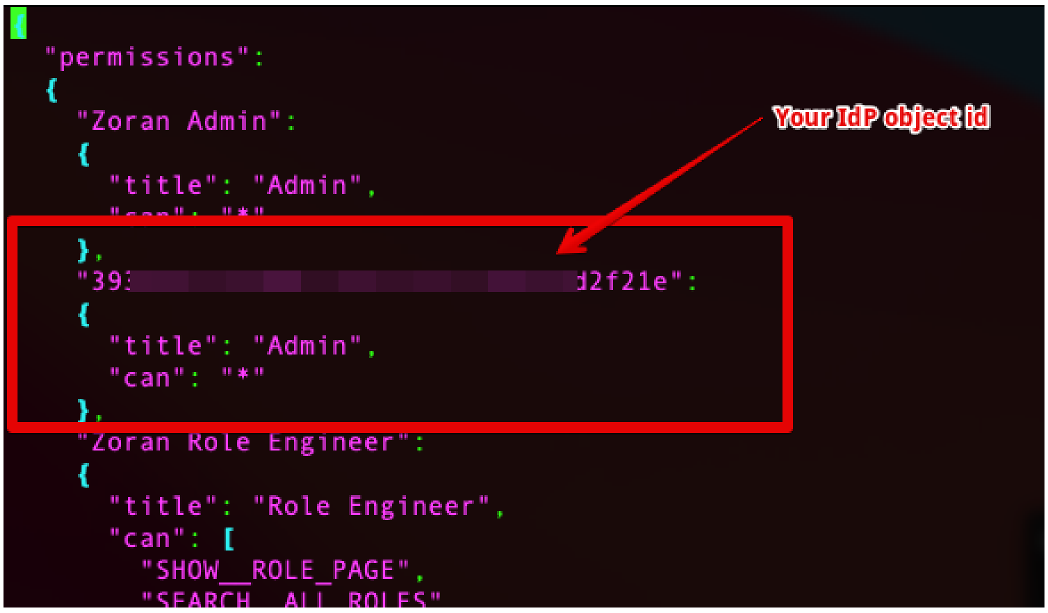
Next, we set up Autonomous Identity.

For SSO only:



```
{
  "permissions":
  {
    "393[redacted]2f21e":
    {
      "title": "Admin",
      "can": "*"
    },
    "###Zoran_Role_Engineer_Token###":
    {
      "title": "Role Engineer",
      "can": [
        "SHOW__ROLE_PAGE",
        "SEARCH__ALL_ROLES",
        "CREATE__ROLE",
        "UPDATE__ROLE",
        "DELETE__ROLE",
        "SHOW__ENTITLEMENT",
```

For LocalAndSSO:



```
{
  "permissions":
  {
    "Zoran Admin":
    {
      "title": "Admin",
      "can": "*"
    },
    "39[redacted]d2f21e":
    {
      "title": "Admin",
      "can": "*"
    },
    "Zoran Role Engineer":
    {
      "title": "Role Engineer",
      "can": [
        "SHOW__ROLE_PAGE",
        "SEARCH__ALL_ROLES"
```

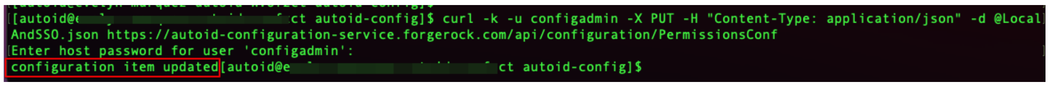
d. Add an entry to your local system's `/etc/hosts` file or DNS entry for the `configuration-service` domain:

```
127.0.0.1    autoid-configuration-service.forgerock.com
autoid-ui.forgerock.com
```

e. Use `curl` to update the current permissions configuration object. For example, replace the "<>" placeholders with actual values using the json file and password:

```
curl -k -u configadmin -X PUT -H "Content-Type:
application/json" \
-d @LocalAndSSO.json https://autoid-configuration-
service.forgerock.com/api/configuration/PermissionsConf
```

If everything is okay, you should see the following:



```
[autoid@[redacted]ct autoid-config]$ curl -k -u configadmin -X PUT -H "Content-Type: application/json" -d @Local
AndSSO.json https://autoid-configuration-service.forgerock.com/api/configuration/PermissionsConf
Enter host password for user 'configadmin':
configuration item updated[autoid@e[redacted]ct autoid-config]$
```

f. Use curl to verify the new permissions. You should see a response that includes the configuration changes you made in json:

```
curl -k -u configadmin -X GET -H "Content-Type:
application/json" \
-d @LocalAndSSO.json https://autoid-configuration-
service.forgerock.com/api/configuration/PermissionsConf
```

2. Next, update the JAS container environment variables:

   a. On the instance where Docker is running, create a backup of the `/opt/autoid/res/jas/docker-compose.yml` file, and edit the variables in the environment section. For example, change the following variables:

From:

```
- OIDC_ENABLED=False
- GROUPS_ATTRIBUTE=_groups
- OIDC_JWKS_URL=na
```

To:

```
- OIDC_ENABLED=True
- GROUPS_ATTRIBUTE=groups
- OIDC_JWKS_URL= <Same value as in the zoran-api. See
step 3 below>
```

NOTE

The `GROUPS_ATTRIBUTE` variable must match the `OIDC_GROUPS_ATTRIBUTE` variable used in the `docker-compose.yml` file.

b. Remove the running JAS container and re-deploy:

```
docker stack rm jas

docker stack deploy --with-registry-auth --compose-file
/opt/autoid/res/jas/docker-compose.yml jas
```

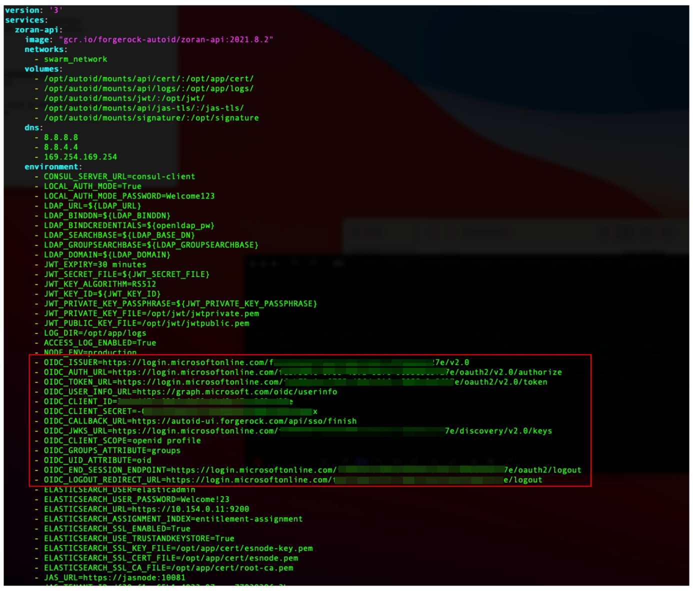
3. Next, update the `zoran-api` container environment variables:

   a. On the instance where Docker is running, create a backup of the `/opt/autoid/res/api/docker-compose.yml` file, and edit the following variables in the file replacing the `\$\{…\}` placeholders:

```
- OIDC_ISSUER=${OIDC_ISSUER}
- OIDC_AUTH_URL=${OIDC_AUTH_URL}
- OIDC_TOKEN_URL=${OIDC_TOKEN_URL}
- OIDC_USER_INFO_URL=${OIDC_USER_INFO_URL}
- OIDC_CLIENT_ID=${OIDC_CLIENT_ID}
- OIDC_CLIENT_SECRET=${OIDC_CLIENT_SECRET}
- OIDC_CALLBACK_URL=${OIDC_CALLBACK_URL}
- OIDC_JWKS_URL=${OIDC_JWKS_URL}
- OIDC_CLIENT_SCOPE=${OIDC_CLIENT_SCOPE}
- OIDC_GROUPS_ATTRIBUTE=${OIDC_GROUPS_ATTRIBUTE}
- OIDC_UID_ATTRIBUTE=${OIDC_UID_ATTRIBUTE}
```

```
-
OIDC_END_SESSION_ENDPOINT=${OIDC_END_SESSION_ENDPOINT}
- OIDC_LOGOUT_REDIRECT_URL=${OIDC_LOGOUT_REDIRECT_URL}
```

For example, you should see something similar below (the example uses Asure links and object IDs):



```
version: '3'
services:
  zoran-api:
    image: "gcr.io/forgerock-autoid/zoran-api:2021.8.2"
    networks:
      - swarm_network
    volumes:
      - /opt/autoid/mounts/api/cert/:/opt/app/cert/
      - /opt/autoid/mounts/api/logs/:/opt/app/logs/
      - /opt/autoid/mounts/jwt/:/opt/jwt/
      - /opt/autoid/mounts/api/jas-tls/:/jas-tls/
      - /opt/autoid/mounts/signature/:/opt/signature
    dns:
      - 8.8.8.8
      - 8.8.4.4
      - 169.254.169.254
    environment:
      - CONSUL_SERVER_URL=consul-client
      - LOCAL_AUTH_MODE=True
      - LOCAL_AUTH_MODE_PASSWORD=Welcome123
      - LDAP_URL=${LDAP_URL}
      - LDAP_BINDDN=${LDAP_BINDDN}
      - LDAP_BINDCREDENTIALS=${openldap_pw}
      - LDAP_SEARCHBASE=${LDAP_BASE_DN}
      - LDAP_GROUPSEARCHBASE=${LDAP_GROUPSEARCHBASE}
      - LDAP_DOMAIN=${LDAP_DOMAIN}
      - JWT_EXPIRY=30 minutes
      - JWT_SECRET_FILE=${JWT_SECRET_FILE}
      - JWT_KEY_ALGORITHM=RS512
      - JWT_KEY_ID=${JWT_KEY_ID}
      - JWT_PRIVATE_KEY_PASSPHRASE=${JWT_PRIVATE_KEY_PASSPHRASE}
      - JWT_PRIVATE_KEY_FILE=/opt/jwt/jwtprivate.pem
      - JWT_PUBLIC_KEY_FILE=/opt/jwt/jwtpublic.pem
      - LOG_DIR=/opt/app/logs
      - ACCESS_LOG_ENABLED=True
      - NODE_ENV=production
      - OIDC_ISSUER=https://login.microsoftonline.com/f[redacted]7e/v2.0
      - OIDC_AUTH_URL=https://login.microsoftonline.com/[redacted]7e/oauth2/v2.0/authorize
      - OIDC_TOKEN_URL=https://login.microsoftonline.com/[redacted]e/oauth2/v2.0/token
      - OIDC_USER_INFO_URL=https://graph.microsoft.com/oidc/userinfo
      - OIDC_CLIENT_ID=[redacted]e
      - OIDC_CLIENT_SECRET=-([redacted]x
      - OIDC_CALLBACK_URL=https://autoid-ui.forgerock.com/api/sso/finish
      - OIDC_JWKS_URL=https://login.microsoftonline.com/[redacted]7e/discovery/v2.0/keys
      - OIDC_CLIENT_SCOPE=openid profile
      - OIDC_GROUPS_ATTRIBUTE=groups
      - OIDC_UID_ATTRIBUTE=oid
      - OIDC_END_SESSION_ENDPOINT=https://login.microsoftonline.com/[redacted]7e/oauth2/logout
      - OIDC_LOGOUT_REDIRECT_URL=https://login.microsoftonline.com/[redacted]e/logout
      - ELASTICSEARCH_USER=elasticadmin
      - ELASTICSEARCH_USER_PASSWORD=Welcome!23
      - ELASTICSEARCH_URL=https://10.154.0.11:9200
      - ELASTICSEARCH_ASSIGNMENT_INDEX=entitlement-assignment
      - ELASTICSEARCH_SSL_ENABLED=True
      - ELASTICSEARCH_USE_TRUSTANDKEYSTORE=True
      - ELASTICSEARCH_SSL_KEY_FILE=/opt/app/cert/esnode-key.pem
      - ELASTICSEARCH_SSL_CERT_FILE=/opt/app/cert/esnode.pem
      - ELASTICSEARCH_SSL_CA_FILE=/opt/app/cert/root-ca.pem
      - JAS_URL=https://jasnode:10081
```

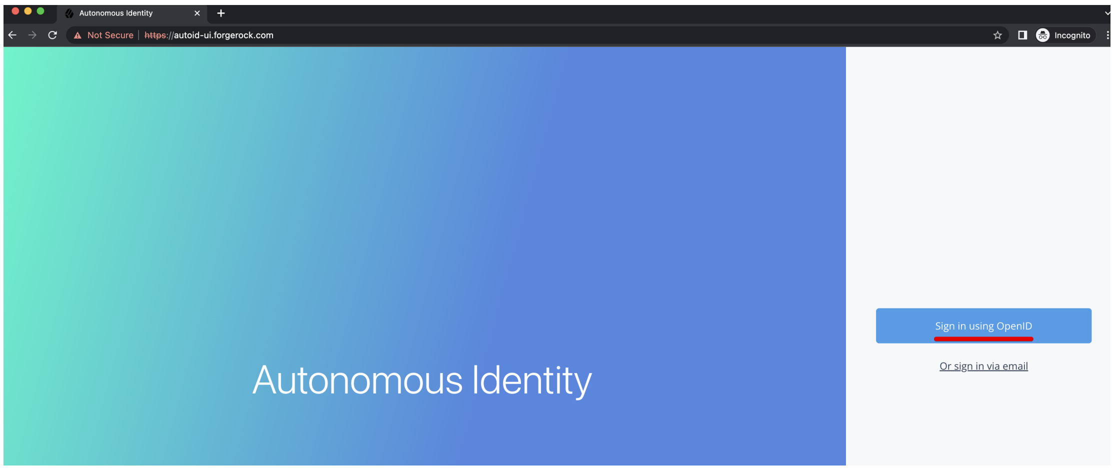
b. Remove the running zoran-api Docker container and re-deploy:

```
docker stack rm api

docker stack deploy --with-registry-auth --compose-file
/opt/autoid/res/api/docker-compose.yml api
```

c. Restart the UI and Nginx Docker containers:

```
docker service update --force ui_zoran-ui

docker service update --force nginx_nginx
```

3. Open the Autonomous Identity UI to verify the SSO login.



Setting the Session Duration

By default, the session duration is set to 30 minutes. You can change this value at installation by setting the `JWT_EXPIRY` property in the `/autoid-config/vars.yml` file.

If you did not set the value at installation, you can make the change after installation by setting the `JWT_EXPIRY` property using the API service.

Set the session duration:

1. Log in to the Docker manager node.
2. Verify the `JWT_EXPIRY` property.

   ```
   $ docker inspect api_zoran-api
   ```

3. Go to the API folder.

   ```
   $ cd /opt/autoid/res/api
   ```

4. Edit the `docker-compose.yml` file and update the `JWT_EXPIRY` property. The `JWT_EXPIRY` property is set to minutes.
5. Redeploy the Docker stack API.

   ```
   $ docker stack deploy --with-registry-auth --compose-file
   docker-compose.yml api
   ```

   If the command returns any errors, such as "image could not be accessed by the registry," then try the following command:

   ```
   $ docker stack deploy --with-registry-auth --resolve-image
   changed \
   ```

```
    --compose-file /opt/autoid/res/api/docker-compose.yml
api
```

6. Verify the new `JWT_EXPIRY` property.

   ```
   $ docker inspect api_zoran-api
   ```

7. Log in to the Docker worker node.
8. Stop the worker node.

   ```
   $ docker stop [container ID]
   ```

   The Docker manager node re-initiates the worker node. Repeat this step on any other worker node.

Custom certificates

By default, Autonomous Identity uses self-signed certificates in its services. You can replace these self-signed certificates with a certificate issued by a Certificate Authority (CA). This section provides instructions on how to replace your self-signed certificates and also update your existing certificates when expired.

- Update certificates on Cassandra
- Update certificates on MongoDB
- Update certificates on JAS
- Update the certificates on NGINX
- Update certificates on Elasticsearch

Pre-requisites

The following items were used to test the custom certificate procedures:

- **Private key file**. The procedure uses a private key file **privkey.pem**.
- **Full trust chain**. The procedure also uses a full trust certificate chain, **fullchain.pem**.
- **Keystore password**. The procedure was tested using the keystore password is **Acc#1234**.
- **NGINX certificate**. The NGINX certificate must support subject alternative name (SAN) for the following domains:
  - **autoid-ui.<domain-name>**
  - **autoid-jas.<domain-name>**

  - autoid-configuration-service.<domain-name>
  - autoid-kibana.<domain-name>
  - autoid-api.<domain-name>
- **Domain name**. The domain name used in the procedure below is `certupdate.autoid.me.` Change the value in various places to the domain name applicable to your deployment.
- **Autonomous Identity version**. The procedures were tested on Autonomous Identity versions 2021.8.5 and 2021.8.6.

Update certificates on Cassandra

The following section shows how to replace the certificates in Cassandra.

1. Create the Java keystore and truststore files for the server using `keytool.` The commands generate two JKS files: `cassandra-keystore.jks` and `cassandra-truststore.jks.` You need these files for configuring Cassandra and the Java API Service (JAS).

   ```
   openssl pkcs12 -export -in fullchain.pem -inkey
   privkey.pem -out server.p12 -name cassandranode

   keytool -importkeystore -deststorepass Acc#1234 -
   destkeypass Acc#1234 -destkeystore cassandra-keystore.jks
   -srckeystore server.p12 -srcstoretype PKCS12 -srcstorepass
   Acc#1234 -alias cassandranode

   keytool -importcert -keystore cassandra-truststore.jks -
   alias rootCa -file fullchain.pem -noprompt -keypass
   Acc#1234 -storepass Acc#1234
   ```

2. Create the client certificate. The client certificate is used by external clients, such as JAS and `cqlsh` to authenticate to Cassandra. In the following example, use the same client certificate for the Cassandra nodes to authenticate with each other.

   NOTE

   You can create a different certificate, if desired, using similar steps.

   ```
   # Create client.conf with following contents
   [ req ]
   distinguished_name = CA_DN
   prompt             = no
   ```

```
default_bits       = 2048

[ CA_DN ]
C  = cc
O  = eng
OU = cass
CN = CA_CN

# Create client key and CSR
openssl req -newkey rsa:2048 -nodes -keyout client.key -
out signing_request.csr -config client.conf

# Create client certificate
openssl x509 -req -CA fullchain.pem -CAkey privkey.pem -in
signing_request.csr -out client.crt -days 3650 -
CAcreateserial

# Import client cert into a Java keystore for JAS
openssl pkcs12 -export -in client.crt -inkey client.key -
out client.p12 -name jas

keytool -importkeystore -deststorepass Acc#1234 -
destkeypass Acc#1234 -destkeystore client-keystore.jks -
srckeystore client.p12 -srcstoretype PKCS12 -srcstorepass
Acc#1234 -alias jas
```

3. View the files that are needed in later steps:

```
$ ls -1 .

cassandra-keystore.jks
cassandra-truststore.jks
client.conf
client.crt
client.key
client-keystore.jks
client.p12
fullchain.pem
fullchain.srl
privkey.pem
server.p12
signing_request.csr
```

4. Copy the following files to the `/opt/autoid/apache-cassandra-3.11.2/conf/certs` directory on each Cassandra node:

   - **cassandra-keystore.jks**
   - **cassandra-truststore.jks**
   - **client-keystore.jks**
5. Copy the following files to the `<autoid-user-home-dir>/.cassandra` directory on each Cassandra node:
   - **client.key**
   - **client.crt**
   - **fullchain.pem**
6. Make the following edits in the `/opt/autoid/apache-cassandra-3.11.2/conf/cassandra.yaml` file on each Cassandra node:
   a. Change the keystore and truststore paths in the `server_encryption_options` and `client_encryption_options` sections:

      ```
      keystore: /opt/autoid/apache-cassandra-
      3.11.2/conf/certs/client-keystore.jks
      truststore: /opt/autoid/apache-cassandra-
      3.11.2/conf/certs/cassandra-truststore.jks
      ```
7. Update the `<autoid-user-home-dir>/.cassandra/cqlshrc` file with the following edits:

   ```
   [authentication]
   username = zoranuser
   password = <password>
   [connection]
   hostname = <ip address>
   factory = cqlshlib.ssl.ssl_transport_factory

   [ssl]
   certfile = <autoid-user-home-dir>/.cassandra/fullchain.pem
   validate = false
   version = SSLv23
   # Next 2 lines must be provided when require_client_auth =
   true in the cassandra.yaml file
   userkey = <autoid-user-home-dir>/.cassandra/client_key.key
   usercert = <autoid-user-home-dir>/.cassandra/client.crt
   ```
8. Restart Cassandra.

   ```
   ps auxf | grep cassandra
   kill <pid>
   cd /opt/autoid/apache-cassandra-3.11.2/bin
   ```

```
nohup ./cassandra >/opt/autoid/apache-cassandra-
3.11.2/cassandra.out 2>&1 &
```

9. Make sure that Cassandra is running normally using `cqlsh`. Use your server's IP. :

```
$ cqlsh --ssl
Connected to Zoran Cluster at <server-ip>:9042.
[cqlsh 5.0.1 | Cassandra 3.11.2 | CQL spec 3.4.4 | Native
protocol v4]
Use HELP for help.
zoranuser@cqlsh> describe keyspaces;

autonomous_iam  system_auth  system_distributed
autoid_analytics
autoid          system       system_traces
autoid_base
system_schema   autoid_meta  autoid_staging

zoranuser@cqlsh>
```

Update certificates on MongoDB

1. Create the keystore and truststore using `keytool`.

```
openssl pkcs12 -export -in fullchain.pem -inkey
privkey.pem -out server.p12 -name mongonode

keytool -importkeystore -deststorepass Acc#1234 -
destkeypass Acc#1234 -destkeystore mongo-client-
keystore.jks -srckeystore server.p12 -srcstoretype PKCS12
-srcstorepass Acc#1234 -alias mongonode

keytool -importcert -keystore mongo-server-truststore.jks
-alias rootCa -file fullchain.pem -noprompt -keypass
Acc#1234 -storepass Acc#1234
```

2. Create a new mongodb.pem file.

```
cat fullchain.pem privkey.pem > mongodb.pem
```

3. Download the `isg root x1` root certificate from Lets Encrypt at https://letsencrypt.org/certs/isgrootx1.pem, and save it as `rootCA.pem`.
4. Back up the MongoDB certificates.

```
cd /opt/autoid/mongo/certs/
mkdir backup
mv mongodb.pem backup/
mv rootCA.pem backup/
mv mongo-*.jks backup
```

5. Copy the new certificates to the mongodb installation.

```
cp mongodb.pem /opt/autoid/mongo/certs/
cp rootCA.pem /opt/autoid/mongo/certs/
```

6. Restart Mongo DB.

```
sudo systemctl stop mongo-autoid
sudo systemctl start mongo-autoid
```

7. Check for logs for errors in `/opt/autoid/mongo/mongo-autoid.log`. The log may show connection errors until JAS has been updated and restarted.
8. Add the hostname to the hosts file. For example, we are using: `autoid-mongo.certupdate.autoid.me`.
9. Check the MongoDB connection from the command line.

```
mongo --tls --host autoid-mongo.certupdate.autoid.me --
tlsCAFile /opt/autoid/mongo/certs/rootCA.pem --
tlsCertificateKeyFile /opt/autoid/mongo/certs/mongodb.pem
--username mongoadmin
```

10. Back up and copy the new keystore and truststore to JAS.

```
cd /opt/autoid/mounts/jas
mkdir backup
mv mongo-*.jks backup

cp mongo-server-truststore.jks /opt/autoid/mounts/jas
cp mongo-client-keystore.jks /opt/autoid/mounts/jas
```

11. Update the JAS configuration. On each Docker manager and worker node, copy the following files to the `/opt/autoid/mount/jas` directory.
    - mongo-client-keystore.jks

- mongo-server-truststore.jks

> NOTE
>
> The certificates must exist on all Docker nodes (all managers and worker nodes).

12. On each Docker *manager* node, update `/opt/autoid/res/jas/docker-compose.yml` file and set the Mongo keystore, truststore, and host, and add the `extra_hosts` line as follows:

```
MONGO_KEYSTORE_PATH=/db-certs/mongo-client-keystore.jks
MONGO_TRUSTSTORE_PATH=/db-certs/mongo-server-
truststore.jks
MONGO_HOST=autoid-mongo.certupdate.autoid.me

extra_hosts:
  - "autoid-mongo.certupdate.autoid.me:<ip of mongodb
host>"
```

13. Restart JAS.

```
docker stack rm jas nginx
docker stack deploy -c /opt/autoid/res/jas/docker-
compose.yml jas
docker stack deploy -c /opt/autoid/res/nginx/docker-
compose.yml nginx
```

14. Check JAS logs for errors.

```
docker service logs -f jas_jasnode
```

Update certificates on JAS

1. On each Docker manager and worker node, copy the following keystore and truststore files to `/opt/autoid/mounts/jas` directory:
   - client-keystore.jks
   - cassandra-truststore.jks
2. On each Docker *manager* node, update `/opt/autoid/res/jas/docker-compose.yml` with the correct keystore and truststore paths:

```
CASSANDRA_KEYSTORE_PATH=/db-certs/client-keystore.jks
CASSANDRA_TRUSTSTORE_PATH=/db-certs/cassandra-
truststore.jks
```

3. Redeploy the JAS server.

```
docker stack rm jas
docker stack deploy jas -c /opt/autoid/res/jas/docker-
compose.yml
```

4. Make sure JAS has no errors.

```
docker service logs -f jas_jasnode
```

Update the certificates on NGINX

1. Copy the following files to `/opt/autoid/mounts/nginx/cert/`:
   - privkey.pem
   - fullchain.pem
2. In the `/opt/autoid/mounts/nginx/nginx.conf` file, update the `ssl_certificate` and `ssl_certificate_key` properties as follows:

```
#SSL Settings
ssl_certificate          /etc/nginx/cert/fullchain.pem;
ssl_certificate_key      /etc/nginx/cert/privkey.pem;
```

3. Make sure that the domain names in the configuration files (`/opt/autoid/mounts/nginx/conf.d`) matches the domain names used for certificate generation.
4. Restart the Docker container.

```
docker stack rm nginx
docker stack deploy -c /opt/autoid/res/nginx/docker-
compose.yml nginx
```

Update certificates on Elasticsearch

1. Create a keystore and truststore using `keystore`.

   ```
   openssl pkcs12 -export -in fullchain.pem -inkey
   privkey.pem -out server.p12 -name esnodekey

   keytool -importkeystore -deststorepass Acc#1234 -
   destkeypass Acc#1234 -destkeystore elastic-client-
   keystore.jks -srckeystore server.p12 -srcstoretype PKCS12
   -srcstorepass Acc#1234 -alias esnodekey

   keytool -importcert -keystore elastic-server-
   truststore.jks -alias rootCa -file fullchain.pem -noprompt
   -keypass Acc#1234 -storepass Acc#1234
   ```

2. Create backups.

   ```
   cd /opt/autoid/certs/elastic
   mkdir backup
   mv *.jks backup
   ```

3. Copy the new jks files, `fullchain.pem`, `privkey.pem`, and `chain.pem` to `/opt/autoid/certs/elastic`.

4. Also, copy the `fullchain.pem`, `privkey.pem`, and `chain.pem` certificates to `/opt/autoid/elastic/opendistroforelasticsearch-1.9.0/config/`.

5. Update the following attributes in the `/opt/autoid/elastic/opendistroforelasticsearch-1.9.0/config/elasticsearch.yml` file:

   ```
   opendistro_security.ssl.transport.pemcert_filepath:
   fullchain.pem
   opendistro_security.ssl.transport.pemkey_filepath:
   privkey.pem
   opendistro_security.ssl.transport.pemtrustedcas_filepath:
   chain.pem

   opendistro_security.ssl.http.pemcert_filepath:
   fullchain.pem
   opendistro_security.ssl.http.pemkey_filepath: privkey.pem
   opendistro_security.ssl.http.pemtrustedcas_filepath:
   chain.pem


   opendistro_security.nodes_dn:
   ```

```
  - CN=elastic.certupdate.autoid.me
```

6. Restart Elasticsearch on all Elasticsearch nodes:

   ```
   sudo systemctl restart elastic
   ```

7. Check `/opt/autoid/elastic/logs/elasticcluster.log` for errors. The file shows any certificate error until all nodes have been restarted.
8. In the `/opt/autoid/res/jas/docker-compose.yml` file, add the following:

   ```
   extra_hosts:
   - "elastic.certupdate.autoid.me:<ip of ES host>"

   update ES_HOST env var:
   ES_HOST=elastic.certupdate.autoid.me
   ```

9. Restart the JAS container:

   ```
   docker stack rm jas
   docker stack rm nginx
   docker stack deploy -c /opt/autoid/res/jas/docker-
   compose.yml jas
   docker stack deploy -c /opt/autoid/res/nginx/docker-
   compose.yml nginx
   ```

10. Test the connection from the JAS container to Elasticsearch:

    ```
    docker container exec -it <jas container id> sh
    apk add curl
    curl -v --cacert /elastic-certs/fullchain.pem -u
    elasticadmin https://elastic.certupdate.autoid.me:9200
    ```

11. Update the configuration in the JAS service using curl:

    a. First log in using `curl`.

    ```
    curl -X POST https://autoid-
    ui.certupdate.autoid.me:443/api/authentication/login -k
    -H 'Content-Type: application/json' -H 'X-TENANT_ID:
    <tenant_id >' -d '{
    "username": "bob.rodgers@forgerock.com",
    "password": "Welcome123"
    }'
    ```

b. Pull in the current configuration using `curl`.

```
curl -k -H "Content-Type: application/json" -H 'X-
TENANT-ID: <tenant_id>' -H 'Authorization: Bearer
<bearer_token>' --request GET
https://jasnode:10081/config/analytics_env_config
```

c. Modify value for `elasticsearch" to "host"`: elastic.certupdate.autoid.me``.

d. Push the updated configuration:

```
curl -k  -H "Content-Type: application/json" -H 'X-
TENANT-ID: <tenant_id>'  -H 'Authorization: Bearer
<bearer_token>' --request PUT
https://jasnode:10081/config/analytics_env_config -d
'<updated json config>'
```

12. Update the environment variable in your `.bashrc` on all Elasticsearch nodes and Spark nodes:

```
ES_HOST=elastic.certupdate.autoid.me
```

Set Entity Definitions

Before you run analytics, you can add new attributes to the schema using the Autonomous Identity UI. Only administrators have access to this functionality.

1. Open a browser. If you set up your own url, use it for your login.

```
$ https://autoid-ui.forgerock.com/
```

2. Log in as an admin user, specific to your system. For example:

```
test user: bob.rodgers@forgerock.com
password: Welcome123
```

3. Click the Administration icon, indicated by the sprocket. Then, click **Entity Definitions**.
4. On the Entity Definitions page, click **Applications** to add any new attributes to the schema.

a. Click the **Add attribute** button.

b. In the Attribute Name field, enter the name of the new attribute. For example, `app_owner_id`.

c. In the Display Name field, enter a human-readable name of the attribute.

d. Select the attribute type. The options are: `Text`, `Boolean`, `Integer`, `Float`, `Date`, and `Number`.

e. Click **Searchable** if you want the attribute to be indexed.

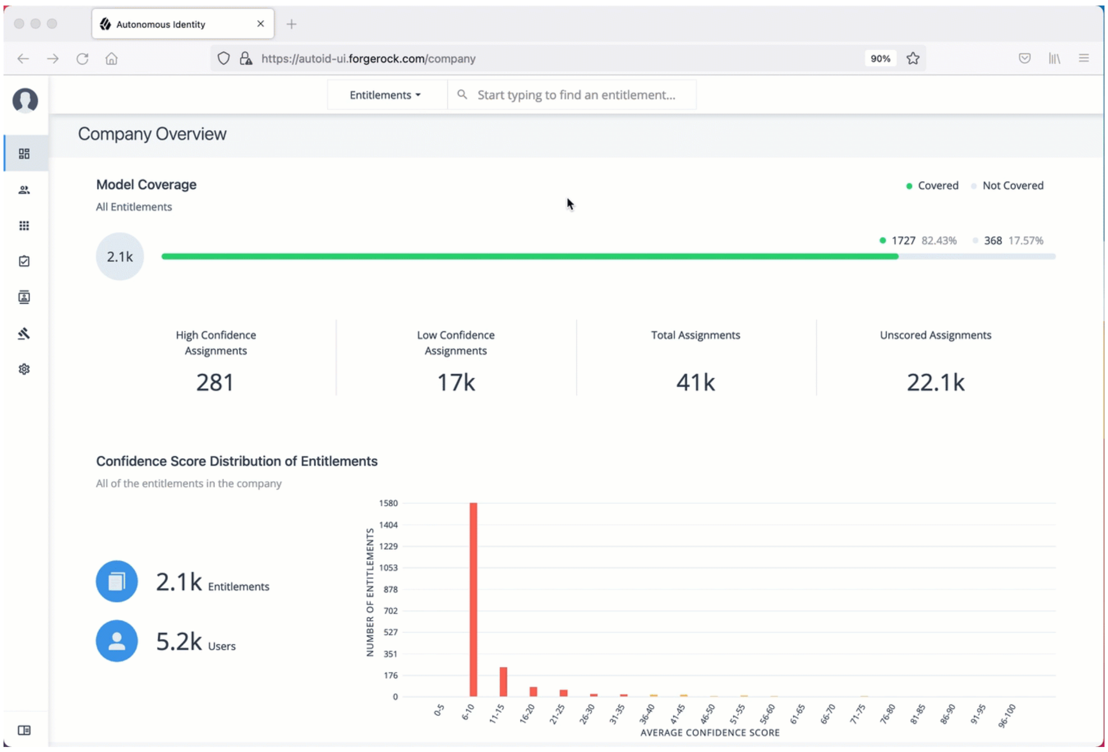
f. Click **Save**.

g. Click **Save** again to apply your attribute.

h. If you need to edit the attribute, click the **Edit** icon. If you need to remove the attribute, click the **Remove** icon. Note that attributes marked as `Required` cannot be removed.

5. Click **Assignments**, and repeat the previous steps.
6. Click **Entitlements**, and repeat the previous steps.
7. Click **Identities**, and repeat the previous steps.

▼ *See it in action*



7. Next, you must set the data sources. See Set Data Sources.

Set Data Sources

After defining any new attributes, you must set your data sources, so that Autonomous Identity can import and ingest your data. Autonomous Identity supports three types of data source files:

- **Comma-separated values (CSV)**. A comma-separated values (CSV) file is a text file that uses a comma delimiter to separate each field value. Each line of text represents a record, consisting of one or more fields of data.
- **Java Database Connectivity (JDBC)**. Java Database Connectivity (JDBC) is a Java API that connects to and executes queries on databases, like Oracle, MySQL, PostgreSQL, and MSSQL.
- **Generic**. Generic data sources are those data types from vendors that have neither CSV nor JDBC-based formats, such as JSON, or others.

Data Source Sync Types

Autonomous Identity supports partial or incremental data ingestion for faster and efficient data uploads. The four types are `full`, `incremental`, `enrichment`, and `delete`, and are summarized below:

Table: Summary of Data Sync Types

Sync Type	Data Source	In AutoID	Result
Full	The records from the entity represents the full set of all records that you intend to ingest. For example: • 0, "amy.user" • 1, "bob.user"	An existing table may have the following: • 2, "walt.user" • 3, "kelly.user"	After the ingest job runs, all existing records are fully replaced: • 0, "amy.user" • 1, "bob.user"

Sync Type	Data Source	In AutoID	Result
Incremental	The records from the entity represents the records that you want to add to AutoID. For example: • 2, "walt.user" • 3, "kelly.user"	An existing table may have the following: • 0, "amy.user" • 1, "bob.user"	After the ingest job runs, the records in the data source are added to the existing records: • 0, "amy.user" • 1, "bob.user" • 2, "walt.user" • 3, "kelly.user"
Enrichment	The records from the entity represents changes to existing data, such as adding a department attribute. No new objects are added, but here you want to edit or "patch" in new attributes to existing records: • 0, "finance" • 1, "finance" • 2, "finance"	An existing table may have the following: • 0, "amy.user" • 1, "bob.user" • 2, "walt.user" • 3, "kelly.user"	After the ingest job runs, the attributes in the data source is added to the existing records. If attributes exist, they get updated. If attributes do not exist, they do not get updated, but you can add also attributes using mappings: • 0, "amy.user", "finance" • 1, "bob.user", "finance" • 2, "walt.user", "finance" • 3, "kelly.user"

Sync Type	Data Source	In AutoID	Result
Delete	The records from the entity represent records to be deleted, identified by the primary key: • 3, "kelly.user"	An existing table may have the following: • 0, "amy.user", "finance" • 1, "bob.user", "finance" • 2, "walt.user", "finance" • 3, "kelly.user"	After the ingest job completes, the records with the primary key are deleted: • 0, "amy.user", "finance" • 1, "bob.user", "finance" • 2, "walt.user", "finance"

CSV Data Sources

The following are general tips for setting up your comma-separated-values (CSV) files:

- Make sure you have access to your CSV files: `applications.csv`, `assignments.csv`, `entitlements.csv`, and `identities.csv`.
- You can review the Data Preparation chapter for more tips on setting up your files.

Set Up a CSV Data Source:

1. Log in to the Autonomous Identity UI as an administrator.
2. On the Autonomous Identity UI, click the **Administration** > **Data Sources** > **Add data source** > **CSV** > **Next**.
3. In the CSV Details dialog box, enter a human-readable name for your CSV file.
4. Select the Sync Type. The options are as follows:
    - **Full**. Runs a full replacement of data if any.
    - **Incremental**. Adds new records to existing data.
    - **Enrichment**. Adds new attributes to existing data records.
    - **Delete**. Delete any existing data objects.
5. Click **Add Object**, and then select the data source file.
    a. Click **Applications**, enter the path to the `application.csv` file. For example, `/data/input/applications.csv`.

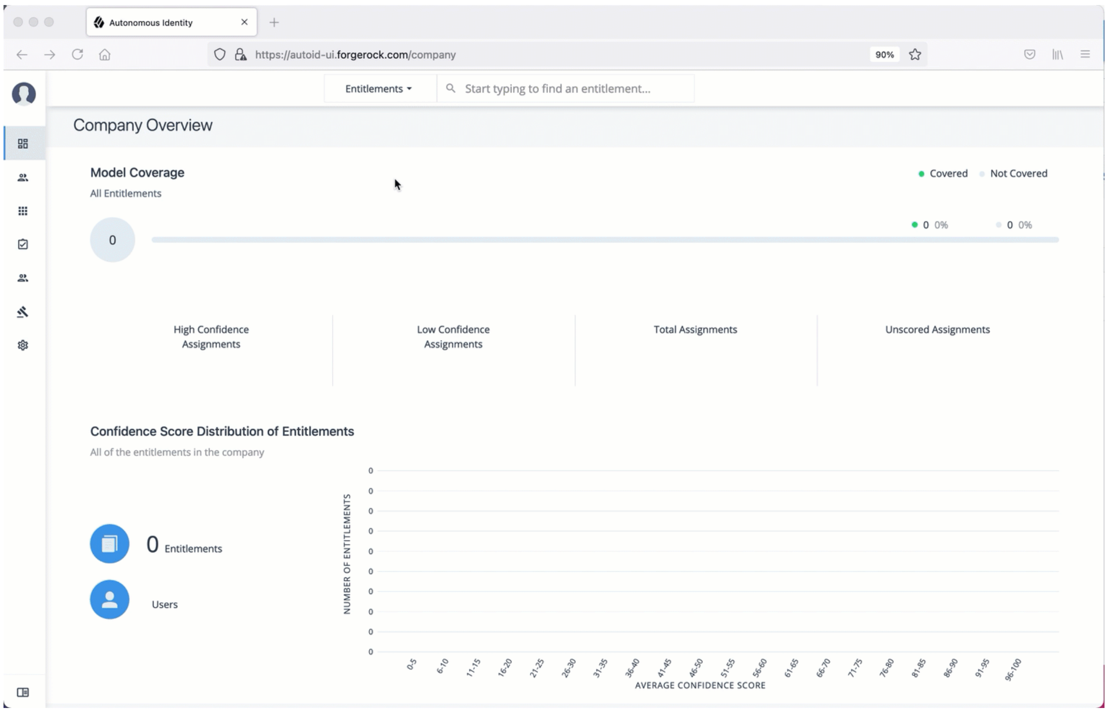
b. Click **Assignments**, enter the path to the `assignments.csv` file. For example, `/data/input/assignments.csv`.

c. Click **Entitlements**, enter the path to the `entitlements.csv` file. For example, `/data/input/entitlements.csv`.

d. Click **Identities**, enter the path to the `identities.csv` file. For example, `/data/input/identities.csv`.

6. Click **Save**.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/company
90%
Entitlements
Start typing to find an entitlement...
Company Overview
Model Coverage
All Entitlements
Covered
Not Covered
0
0 0%
0 0%
High Confidence Assignments
Low Confidence Assignments
Total Assignments
Unscored Assignments
Confidence Score Distribution of Entitlements
All of the entitlements in the company
0 Entitlements
Users
NUMBER OF ENTITLEMENTS
AVERAGE CONFIDENCE SCORE

7. Repeat the previous steps to add more CSV data source files if needed.

8. Next, you must set the attribute mappings. This is a critical step to ensure a successful analytics run. See Set Attribute Mappings.

JDBC Data Sources

The following are general tips for setting up your JDBC data sources (Oracle, MySQL, PostgreSQL, and MSSQL):

- When configuring your JDBC database, make sure you have properly "whitelisted" the IP addresses that can access the server. For example, you should include your local `autoid` instance and other remote systems, such as a local laptop.
- Make sure you have configured your database tables on your system: `applications`, `assignments`, `entitlements`, and `identities`.
- Make sure to make note of the IP address of your database server.

The following procedure assumes that you have set up Autonomous Identity with connectivity to a database:

Set Up a JDBC Data Source:

1. Log in to the Autonomous Identity UI as an administrator.
2. On the Autonomous Identity UI, click the **Administration** icon > **Data Sources** > **Add data source** > **JDBC** > **Next**.
3. In the JDBC Details dialog box, enter a human-readable name for your JDBC files.
4. Select the Sync Type. The options are as follows:
   - **Full**. Runs a full replacement of data if any.
   - **Incremental**. Adds new records to existing data.
   - **Enrichment**. Adds new attributes to existing data records.
   - **Delete**. Delete any existing data objects.
5. For Connection Settings, enter the following:
   a. **Database Username**. Enter a user name for the database user that connects to the data source.
   b. **Database Password**. Enter a password for the database user.
   c. **Database Driver**. Select the database driver. Options are:
      - `Oracle`
      - `Mysql`
      - `Postgresql`
      - `Mssqlserver`

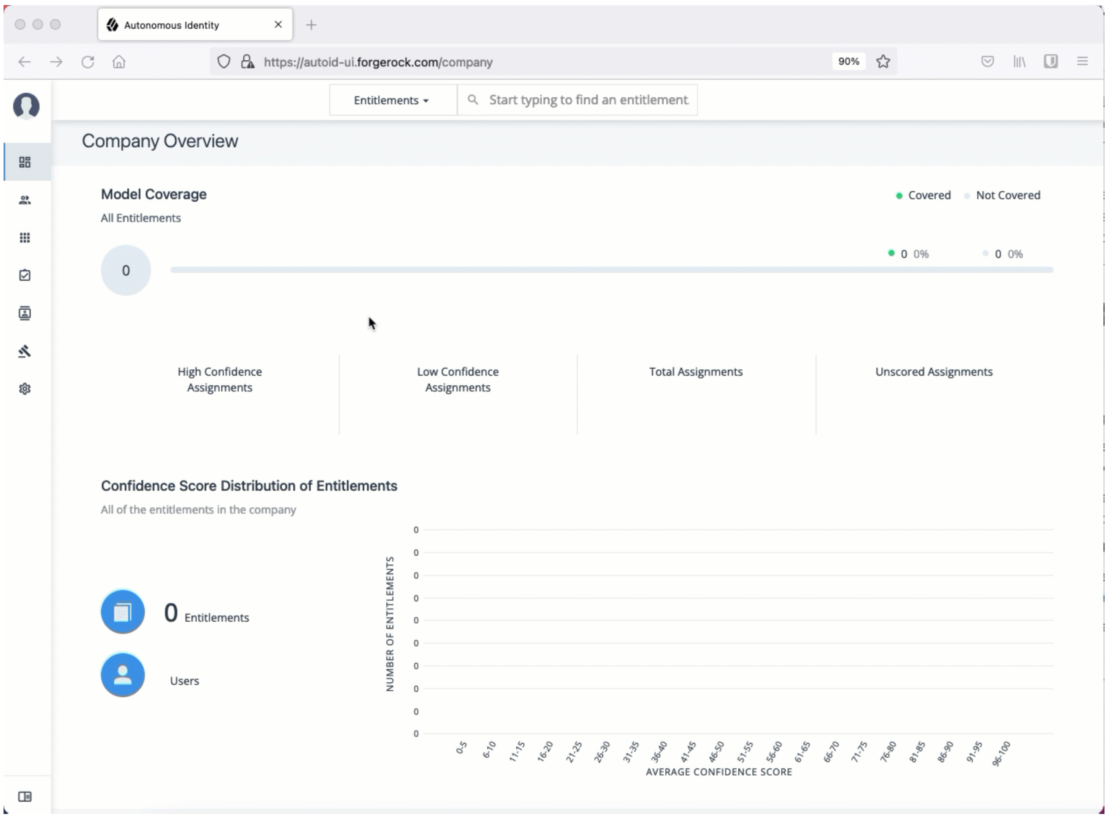
   d. **Database Connect String**. Enter the database connection URI to the data source. For example, `jdbc:<Database Type>://<Database IP Address>/<Database Acct Name>`, where:
      - `jdbc` is the SQL driver type
      - `<Database Type>` is the database management system type. Options are: `oracle`, `mysql`, `postgresql`, or `sqlserver`.
      - `<Database IP Address>` is the database IP address
      - `<Database Acct Name>` is the database account name created in the database instance.

For example: * Oracle: `jdbc:oracle://35.180.130.161/autoid` * MySQL: `jdbc:mysql://35.180.130.161/autoid` * PostgreSQL: `jdbc:postgresql://35.180.130.161/autoid` * MSSQL: `jdbc:sqlserver://35.180.130.161;database=autoid`

+ NOTE: There are other properties that you can use for each JDBC connection URI. See the respective documentation for more information.

1. Click **Add Object**, and then select the data source file:
   a. Click **Applications**, enter the path to the `APPLICATIONS` table. For example, using PostgreSQL, `SELECT * FROM public.applications`, where `public` is the PostgreSQL schema. Make sure to use your company's database schema.
   b. Click **Assignments**, enter the path to the `ASSIGNMENTS` table. For example, `SELECT * FROM public.assignments`.
   c. Click **Entitlements**, enter the path to the `ENTITLEMENTS` table. For example, `SELECT * FROM public.entitlements`.
   d. Click **Identities**, enter the path to the `IDENTITIES` table. For example, `SELECT * FROM public.identities`.
2. Click **Save**.

   ▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/company
90%
Entitlements
Start typing to find an entitlement
Company Overview
Model Coverage
All Entitlements
Covered
Not Covered
0
0 0%
0 0%
High Confidence Assignments
Low Confidence Assignments
Total Assignments
Unscored Assignments
Confidence Score Distribution of Entitlements
All of the entitlements in the company
0 Entitlements
Users
NUMBER OF ENTITLEMENTS
AVERAGE CONFIDENCE SCORE

3. If you are having connection issues, check the Java API Service (JAS) logs to verify the connection failure:

```
$ docker service logs -f jas_jasnode
```

   You may see something like the following entry, which possibly indicates the whitelist was not properly set on the database server:

```
jas_jasnode.1.5gauc33o1nnn@autonomous-base-dev     |
java.lang.RuntiimeException:
org.postgresql.util.PSQLException: The connection attempt
failed.
. . .
  jas_jasnode.1.5gauc33o1nnn@autonomous-base-dev     |
Caused by: org.postgresql.util.PSQLException: The
connection attempt failed.
  . . .
  Caused by: java.net.SocketTimeoutExceptiion: connect
timed out
```

4. Next, you must set the attribute mappings. This is a critical step to ensure a successful analytics run. See Set Attribute Mappings.

Generic Data Sources

The following are general tips for setting up your generic data sources:

- Make sure you have configured data source files: `applications`, `assignments`, `entitlements`, and `identities`.
- Make sure you have the metadata (e.g., URL, prefix) required to access your generic data source files.

Set Up a Generic Data Source:

1. Log in to the Autonomous Identity UI as an administrator.
2. On the Autonomous Identity UI, click the **Administration** icon > **Data Sources** > **Add data source** > **Generic** > **Next**.
3. In the Generic Details dialog box, enter a human-readable name for your generic files.
4. Select the Sync Type. The options are as follows:
   - **Full**. Runs a full replacement of data if any.
   - **Incremental**. Adds new records to existing data.
   - **Enrichment**. Adds new attributes to existing data records.
   - **Delete**. Delete any existing data objects.
5. For Connection Settings, enter the settings to connect to your database server. For example:

```
{
  "username": "admin",
  "password": "Password123",
  "connectURL": "http://identity.generic.com"
}
```

6. Click **Add Object**, and then select the data source file:

   a. Click **Applications**, enter the metadata for applications file. For example:

   ```
   {
     "appMetaUrl": "http://identity.generic.com?
   q=applications&appName=Ac*",
     "prefix": "autoid"
   }
   ```

   b. Click **Assignments**, enter the metadata for the assignments file. For example:

   ```
   {
     "appMetaUrl": "http://identity.generic.com?
   q=assignments&userId=*",
     "prefix": "autoid"
   }
   ```

   c. Click **Entitlements**, enter the metadata for the entitlements file. For example:

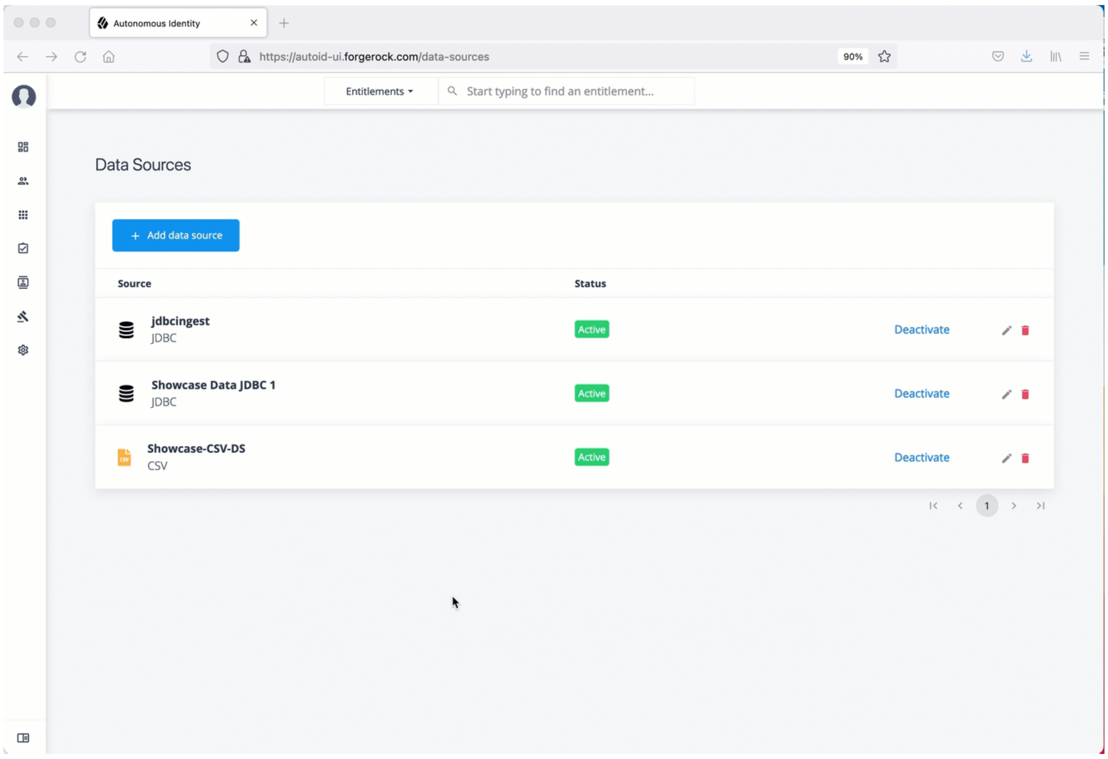
   ```
   {
     "appMetaUrl": "http://identity.generic.com?
   q=entitlements&appId=*",
     "prefix": "autoid"
   }
   ```

   d. Click **Identities**, enter the metadata for the identities file. For example:

   ```
   {
     "appMetaUrl": "http://identity.generic.com?
   q=identities&userId=*",
     "prefix": "autoid"
   }
   ```

7. Click **Save**.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/data-sources
Entitlements
Start typing to find an entitlement...
Add data source
Deactivate

Data Sources

Source	Status
jdbcingest JDBC	Active
Showcase Data JDBC 1 JDBC	Active
Showcase-CSV-DS CSV	Active

8. Repeat the previous steps to add more JDBC data source files if necessary.
9. Next, you must set the attribute mappings. This is a critical step to ensure a successful analytics run. See Set Attribute Mappings.

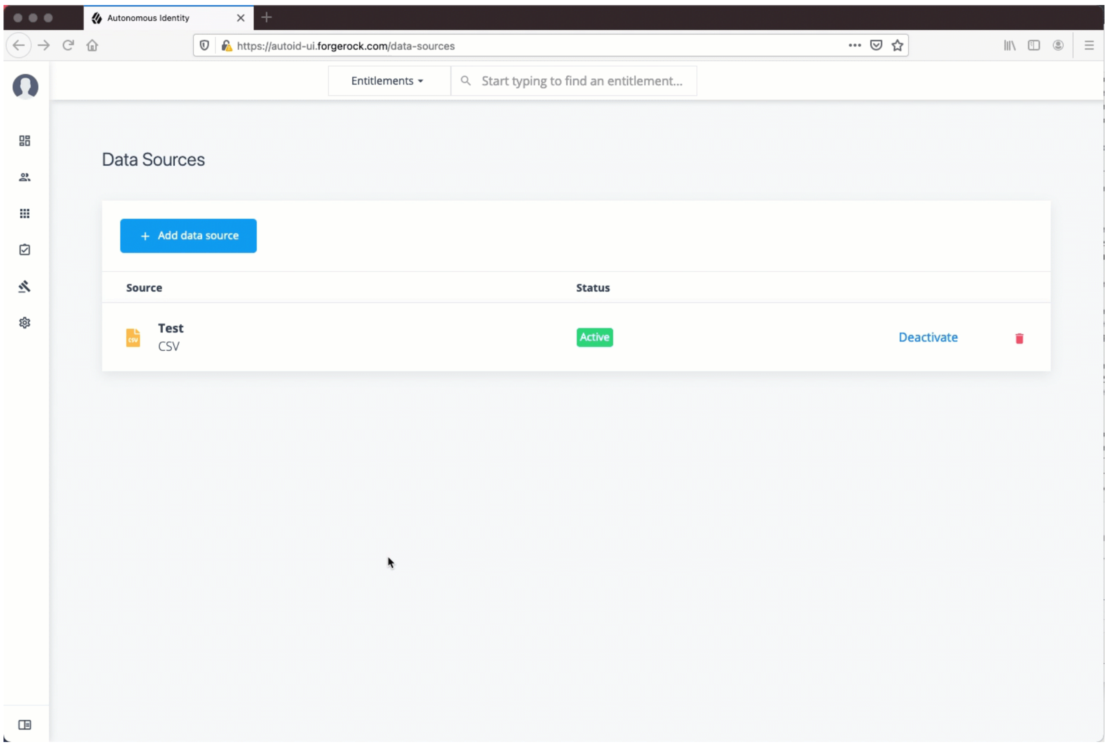
Set Attribute Mappings

After setting your data sources for your CSV files, you must map any attributes specific to each of your data files to the Autonomous Identity schema.

1. On the Autonomous Identity UI, click the **Administration** icon > **Data Sources**.
2. Click the specific data source file to map.
3. Click **Applications** to set up its attribute mappings.
   a. Click **Discover Schema** to view the current attributes in the schema, and then click **Save**.
   b. Click **Edit mapping** to set up attribute mappings. On the Choose an attribute menu, select the corresponding attribute to map to the required attributes. Repeat for each attribute.
   c. Click **Save**.
4. Click **Assignments** and repeat the previous steps.
5. Click **Entitlements** and repeat the previous steps.
6. Click **Identities** and repeat the previous steps.

7. Repeat the procedures for each data source file that you want to map.

▼ *See it in action*



8. Optional. Next, adjust the analytics thresholds. See Set Analytic Thresholds.

Set Analytics Thresholds

The Autonomous Identity UI now supports the configuration of the analytics threshold values to calculate confidence scores, predications, and recommendations.

WARNING

In general, there is little reason to change the default threshold values. If you do edit these values, be aware that incorrect threshold values could ruin your analytics.

There are three types of threshold values that you can edit:

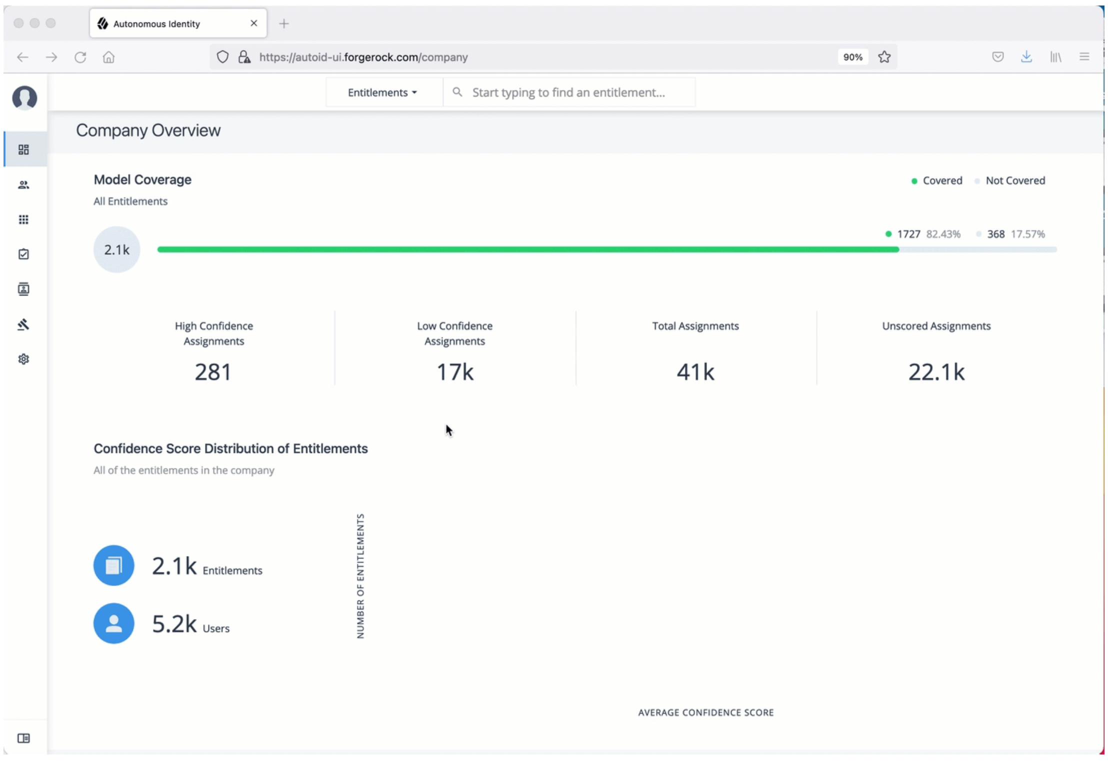
- **Confidence Score Threshold**. These thresholds are used to identify High, Medium, and Low confidence access. Autonomous Identity computes a confidence score for each access assignment based on its machine learning algorithm. An administrator specifies the thresholds in the UI and API to categorize an assignment as having high, medium, or low confidence.
- **Automation Threshold**. Administrators can review access patterns and make a decision on which access pattern to automate for provisioning, approvals, and certifications. The automation threshold controls which access pattern are available for automation.

- **Recommendation Threshold**. Approvers and certifiers look to Autonomous Identity to provide a recommendation on whether access should be approved or certified. This recommendation relies on a confidence score threshold. Confidence scores above the threshold result is a positive recommendation, while those below that threshold result are not recommended.
- **Role Discovery Threshold**. Administrators can set the thresholds for role discovery in the system. Once set, Autonomous Identity discovers and creates *candidates* for potential roles into production.
- **Analytics Spark Job Config**. Administrators can adjust the Apache Spark job configuration if needed.

Configure Analytic Settings:

1. Log in to the Autonomous Identity UI as an administrator.
2. On the Autonomous Identity UI, click **Administration**.
3. Click **Analytics Settings**.
4. Under Confidence Score Thresholds, click **Edit** next to the High threshold value, and then enter a new value. Click **Save**. Repeat for the Medium threshold value.
5. Under Automation Score Threshold, click **Edit** next to the threshold value, and then enter a new value.
6. Under Recommendation Threshold, click **Edit** next to the threshold value, and then enter a new value.
7. Under Role Discovery Setting, click [label]## next to the threshold value, and then enter a new value.
8. Under Analytics Spark Job Config, click **Edit** next to the threshold value, and then enter a new value.

▼ *See it in action*



9. Next, you can run the analytics. See Run Analytics.

Run Analytics

The Analytics pipeline is the heart of Autonomous Identity. The pipeline analyzes, calculates, and determines the association rules, confidence scores, predictions, and recommendations for assigning entitlements and roles to the users.

The analytics pipeline is an intensive processing operation that can take time depending on your dataset and configuration. To ensure an accurate analysis, the data needs to be as complete as possible with little or no null values. Once you have prepared the data, you must run a series of analytics jobs to ensure an accurate rendering of the entitlements and confidence scores.

Pre-Analytics Tasks

Before running the analytics, you must run the following pre-analytics steps to set up your datasets and schema using the Autonomous Identity UI:

- Add attributes to the schema. For more information, see Set Entity Definitions.
- Define your datasources. Autonomous Identity supports different file types for ingestion: CSV, JDBC, and generic. You can enter more than one data source file, specifying the dataset location on your target machine. For more information, see Set Data Sources.

- Define attribute mappings between your data and the schema. For more information, see Set Attribute Mappings.
- Configure your analytics threshold values. For more information, see Set Analytics Thresholds.

About the Analytics Process

Once you have finished the pre-analytics steps, you can start the analytics. The general analytics process is outlined as follows:

- **Ingest**. The ingestion job pulls in data into the system. You can ingest CSV, JDBC, and generic JSON files depending on your system.
- **Training**. The training job creates the association rules for each user-assigned entitlement. This is a somewhat intensive operation as the analytics generates a million or more association rules. Once the association rules have been determined, they are applied to user-assigned entitlements.
- **Role Mining**. The role mining job analyzes all existing entitlements and analyzes candidate configurations for new roles.
- **Predict As-Is**. The predict as-is job determines the current confidence scores for all assigned entitlements.
- **Predict Recommendation**. The predict recommendations job looks at all users who do not have a specific entitlement, but are good candidates to receive the entitlement based on their user attribute data.
- **Publish**. The publish run publishes the data to the backend Cassandra or MongoDB databases.
- **Create Assignment Index**. The create-assignment-index creates the Autonomous Identity index.
- **Refresh Company View**. Run refresh-company-view to refresh the indexes and company view display. Currently, you can only run this procedure on the command line.
- **Run Reports**. You can run the create-assignment-index-report (report on index creation), anomaly (report on anomalous entitlement assignments), insight (summary of the analytics jobs), and audit (report on change of data).

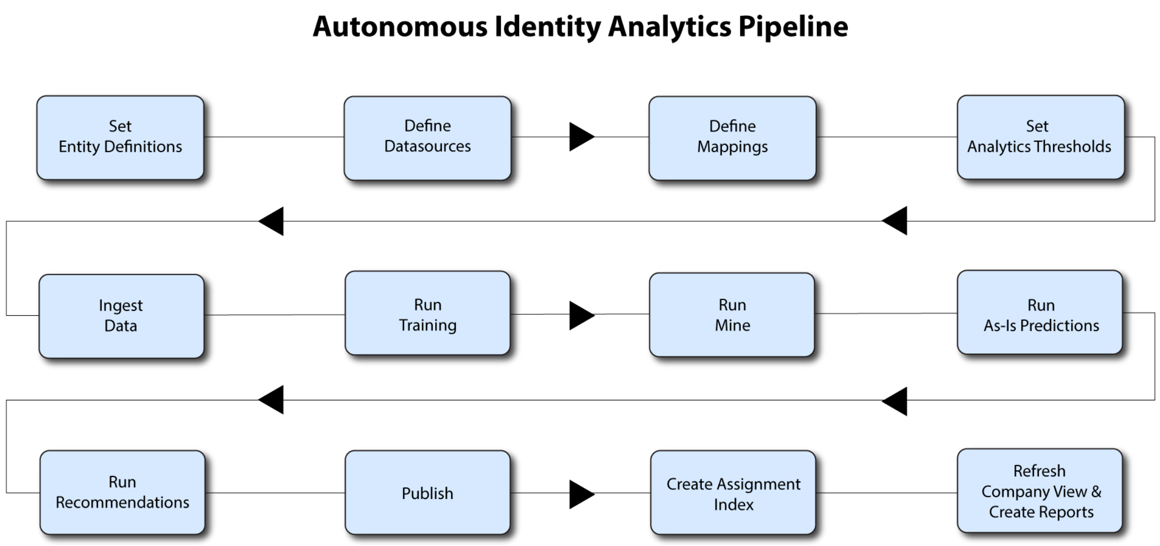


Figure 1. Autonomous Identity Analytics Pipeline Jobs

NOTE

The analytics pipeline requires that DNS properly resolve the hostname before its start. Make sure to set it on your DNS server or locally in your `/etc/hosts` file.

The following sections present the steps to run the analytics pipeline using the Jobs UI.

NOTE

You can continue to use the command-line to run each step of the analytics pipeline. For instructions, see Run Analytics on the Command Line.

Ingest the Data Files

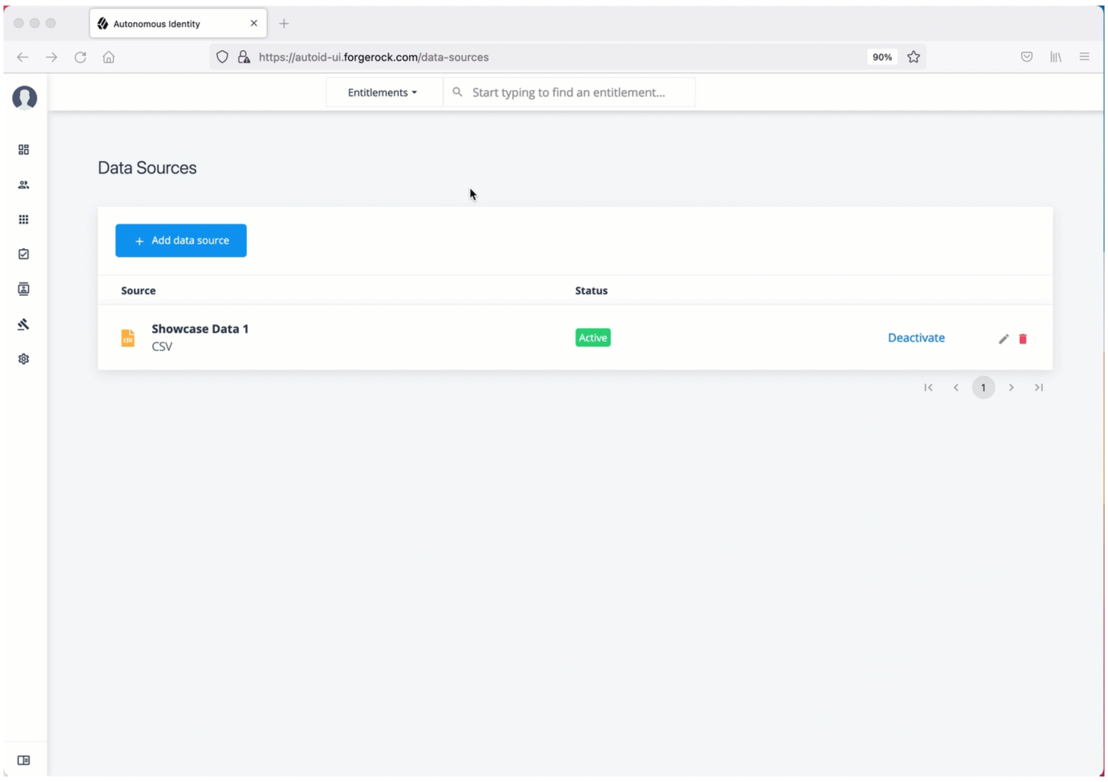
At this point, you should have set your data sources and configured your attribute mappings. You can now run the initial analytics job to import the data into the Cassandra or MongoDB database.

Run ingest using the UI:

1. On the Autonomous Identity UI, click the Administration link, and then click **Jobs**.
2. On the Jobs page, click **New Job**. You will see a job schedule with each job in the analytics pipeline.
3. Click **Ingest**, and then click **Next**.
4. On the New Ingest Job box, enter the name of the job, and then select the data source file.
5. Click **Advanced** and adjust any of the Spark properties, if necessary:
   - Driver Memory (GB)

  - Driver Cores
  - Executor Memory (GB)
  - Executor Cores
6. Click **Save** to continue.
7. Click one of the following commands:
   a. If you need to edit any of the job settings, click **Edit**.
   b. If you want to remove the job from your Jobs page, click **Delete job**.
8. Click **Run Now** to start the ingestion run.
9. Next monitor the state of the job by clicking **Logs**, or click **Refresh** to update the Jobs page.
10. When the job completes, you can see the change in the status.

▼ *See it in action*



Run Training

After you have ingested the data into Autonomous Identity, start the training run.

Training involves two steps:

- Autonomous Identity starts an initial machine learning run where it analyzes the data and produces association rules, which are relationships discovered within your large set of data. In a typical deployment, you can have several million generated rules. The training process can take time depending on the size of your data set.

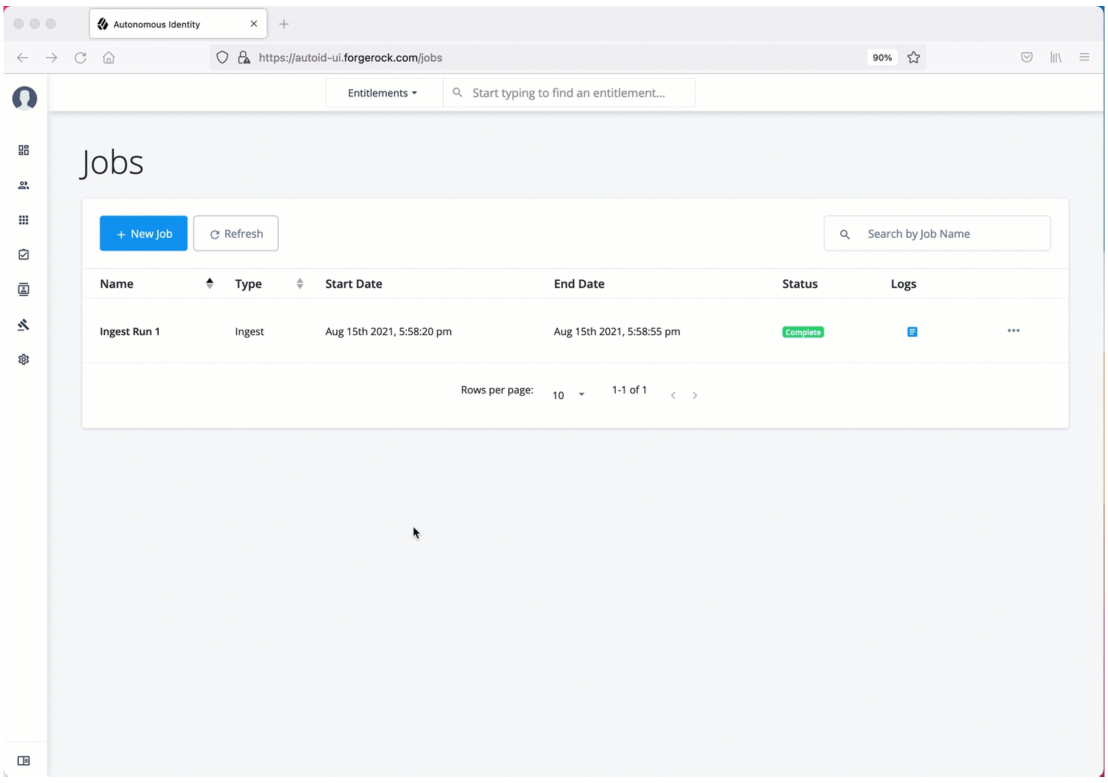
- Each of these rules are mapped from the user attributes to the entitlements and assigned a confidence score.

The initial training run may take time as it goes through the analysis process. Once it completes, it saves the results directly to the database.

Run training using the UI:

1. On the Autonomous Identity UI, click the Administration link, and then click **Jobs**.
2. On the Jobs page, click **New Job**. You will see a job schedule with each job in the analytics pipeline.
3. Click **Training**, and then click **Next**.
4. On the New Training Job box, enter the name of the job.
5. Click **Advanced** and adjust any of the Spark properties, if necessary.
6. Click **Save** to continue.
7. Click **Run Now**.
8. Next monitor the state of the job by clicking **Logs**, or click **Refresh** to update the Jobs page.
9. When the job completes, you can see the change in the status.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/jobs
90%
Entitlements
Start typing to find an entitlement...
Jobs
+ New Job
Refresh
Search by Job Name

Name	Type	Start Date	End Date	Status	Logs
Ingest Run 1	Ingest	Aug 15th 2021, 5:58:20 pm	Aug 15th 2021, 5:58:55 pm	Complete	

Rows per page: 10 1-1 of 1

Run Role Mining

After you have run training, you can now run the role mining job.

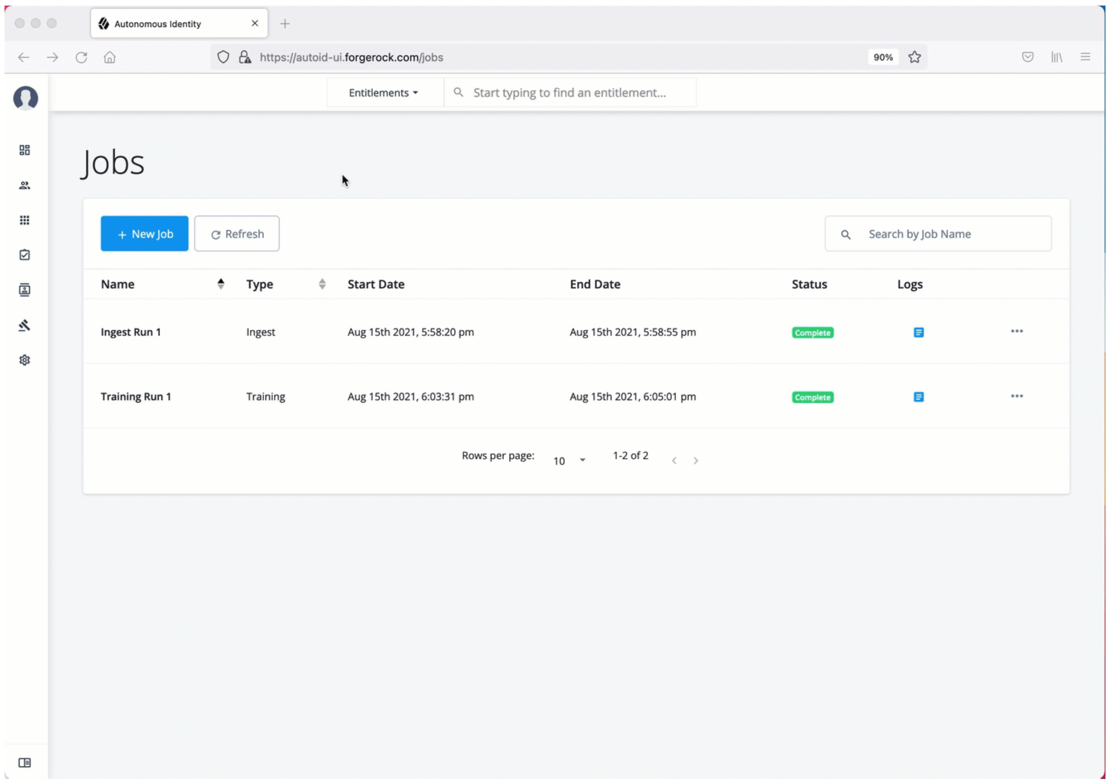
NOTE

If you want to update your role mining data after an initial analytics job, you can minimally run the `ingest`, `train`, and `mine` analytics jobs. However, we recommend re-running the full analytics pipeline, so that other pages can pick up changes to your access landscape.

Run role mining using the UI:

1. On the Autonomous Identity UI, click the Administration link, and then click **Jobs**.
2. On the Jobs page, click **New Job**. You will see a job schedule with each job in the analytics pipeline.
3. Click **Role Mining**, and then click **Next**.
4. On the New Role Mining Job box, enter the name of the job.
5. Click **Advanced** and adjust any of the Spark properties, if necessary.
6. Click **Save** to continue.
7. Click **Run Now**.
8. Next monitor the state of the job by clicking **Logs**, or click **Refresh** to update the Jobs page.
9. When the job completes, you can see the change in the status.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/jobs
90%
Entitlements
Start typing to find an entitlement...
Jobs
+ New Job
Refresh
Search by Job Name

Name	Type	Start Date	End Date	Status	Logs
Ingest Run 1	Ingest	Aug 15th 2021, 5:58:20 pm	Aug 15th 2021, 5:58:55 pm	Complete	
Training Run 1	Training	Aug 15th 2021, 6:03:31 pm	Aug 15th 2021, 6:05:01 pm	Complete	

Rows per page: 10 1-2 of 2

Run As-Is Predictions

After your initial training run, the association rules are saved to disk. The next phase is to use these rules as a basis for the predictions module.

The predictions module is comprised of two different processes:

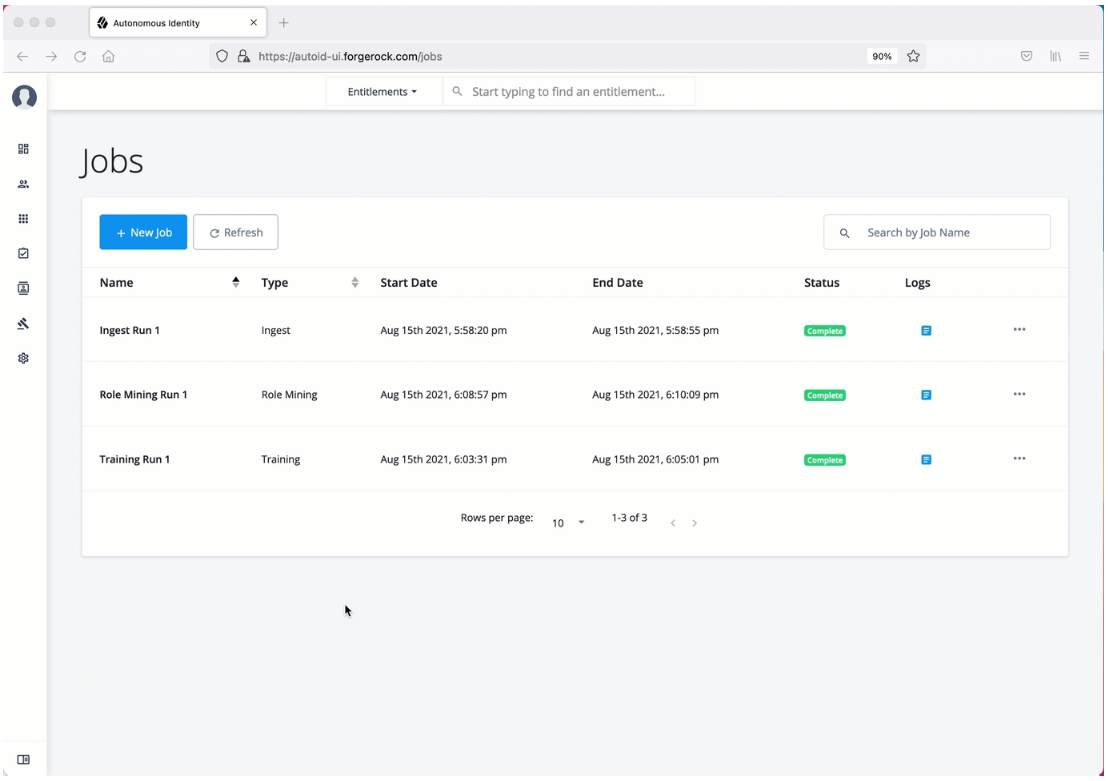
- **as-is**. During the As-Is Prediction process, confidence scores are assigned to the entitlements that users currently have. The as-is process maps the highest confidence score to the highest `freqUnion` rule for each user-entitlement access. These rules will then be displayed in the UI and saved directly to the database.
- **Recommendations**. See Run Recommendations.

Run predict as-is using the UI:

1. On the Autonomous Identity UI, click the Administration link, and then click **Jobs**.
2. On the Jobs page, click **New Job**. You will see a job schedule with each job in the analytics pipeline.
3. Click **Predict-As-Is**, and then click **Next**.
4. On the New Predict-As-Is Job box, enter the name of the job.
5. Click **Advanced** and adjust any of the Spark properties, if necessary.

6. Click **Save** to continue.
7. Click **Run Now**.
8. Next monitor the state of the job by clicking Logs, or click Refresh to update the Jobs page.
9. When the job completes, you can see the change in the status.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/jobs
90%
Entitlements
Start typing to find an entitlement...
+ New Job
Refresh
Search by Job Name

Jobs

Name	Type	Start Date	End Date	Status	Logs
Ingest Run 1	Ingest	Aug 15th 2021, 5:58:20 pm	Aug 15th 2021, 5:58:55 pm	Complete	
Role Mining Run 1	Role Mining	Aug 15th 2021, 6:08:57 pm	Aug 15th 2021, 6:10:09 pm	Complete	
Training Run 1	Training	Aug 15th 2021, 6:03:31 pm	Aug 15th 2021, 6:05:01 pm	Complete	

Rows per page: 10 1-3 of 3

Run Recommendations

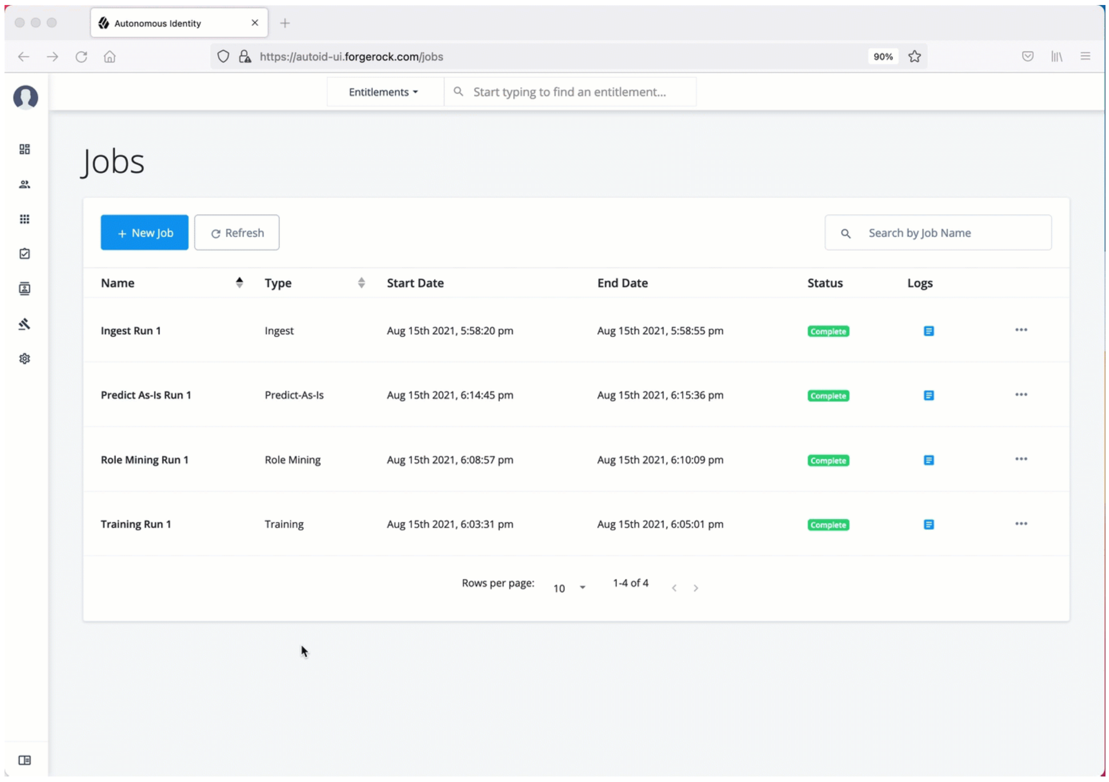
During the second phase of the predictions process, the recommendations process analyzes each employee who may not have a particular entitlement and predicts the access rights that they should have according to their high confidence score justifications. These rules will then be displayed in the UI and saved directly to the database.

Run predict-recommendation using the UI:

1. On the Autonomous Identity UI, click the Administration link, and then click **Jobs**.
2. On the Jobs page, click **New Job**. You will see a job schedule with each job in the analytics pipeline.
3. Click **Predict-Recommendation**, and then click **Next**.
4. On the New Predict-Recommendation Job box, enter the name of the job.
5. Click **Advanced** and adjust any of the Spark properties, if necessary.

6. Click **Save** to continue.
7. Click **Run Now**.
8. Next monitor the state of the job by clicking **Logs**, or click **Refresh** to update the Jobs page.
9. When the job completes, you can see the change in the status.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/jobs
90%
Entitlements
Start typing to find an entitlement...
Jobs
+ New Job
Refresh
Search by Job Name

Name	Type	Start Date	End Date	Status	Logs
Ingest Run 1	Ingest	Aug 15th 2021, 5:58:20 pm	Aug 15th 2021, 5:58:55 pm	Complete	
Predict As-Is Run 1	Predict-As-Is	Aug 15th 2021, 6:14:45 pm	Aug 15th 2021, 6:15:36 pm	Complete	
Role Mining Run 1	Role Mining	Aug 15th 2021, 6:08:57 pm	Aug 15th 2021, 6:10:09 pm	Complete	
Training Run 1	Training	Aug 15th 2021, 6:03:31 pm	Aug 15th 2021, 6:05:01 pm	Complete	

Rows per page: 10 1-4 of 4

Publish the Analytics Data

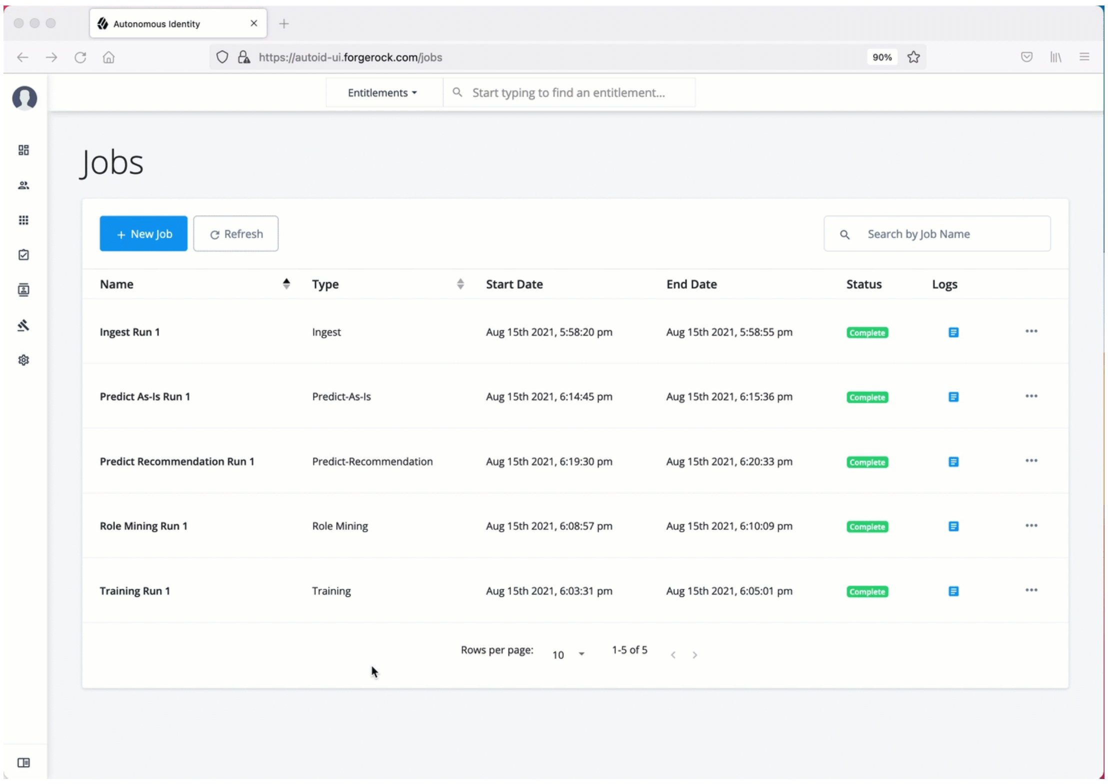
Populate the output of the training, predictions, and recommendation runs to a large table with all assignments and justifications for each assignment. The table data is then pushed to the Cassandra or MongoDB backend.

Run publish using the UI:

1. On the Autonomous Identity UI, click the Administration link, and then click **Jobs**.
2. On the Jobs page, click **New Job**. You will see a job schedule with each job in the analytics pipeline.
3. Click **Publish**, and then click **Next**.
4. On the New Publish Job box, enter the name of the job.
5. Click **Advanced** and adjust any of the Spark properties, if necessary.

6. Click **Save** to continue.
7. Click one of the following commands:
8. Click **Run Now**.
9. Next monitor the state of the job by clicking **Logs**, or click **Refresh** to update the Jobs page.
10. When the job completes, you can see the change in the status.

▼ *See it in action*


Autonomous Identity

https://autoid-ui.forgerock.com/jobs

Entitlements ▾ Start typing to find an entitlement...

Jobs

+ New Job ⟳ Refresh Search by Job Name

Name	Type	Start Date	End Date	Status	Logs
Ingest Run 1	Ingest	Aug 15th 2021, 5:58:20 pm	Aug 15th 2021, 5:58:55 pm	Complete	
Predict As-Is Run 1	Predict-As-Is	Aug 15th 2021, 6:14:45 pm	Aug 15th 2021, 6:15:36 pm	Complete	
Predict Recommendation Run 1	Predict-Recommendation	Aug 15th 2021, 6:19:30 pm	Aug 15th 2021, 6:20:33 pm	Complete	
Role Mining Run 1	Role Mining	Aug 15th 2021, 6:08:57 pm	Aug 15th 2021, 6:10:09 pm	Complete	
Training Run 1	Training	Aug 15th 2021, 6:03:31 pm	Aug 15th 2021, 6:05:01 pm	Complete	

Rows per page: 10 ▾ 1-5 of 5

Create Assignment Index

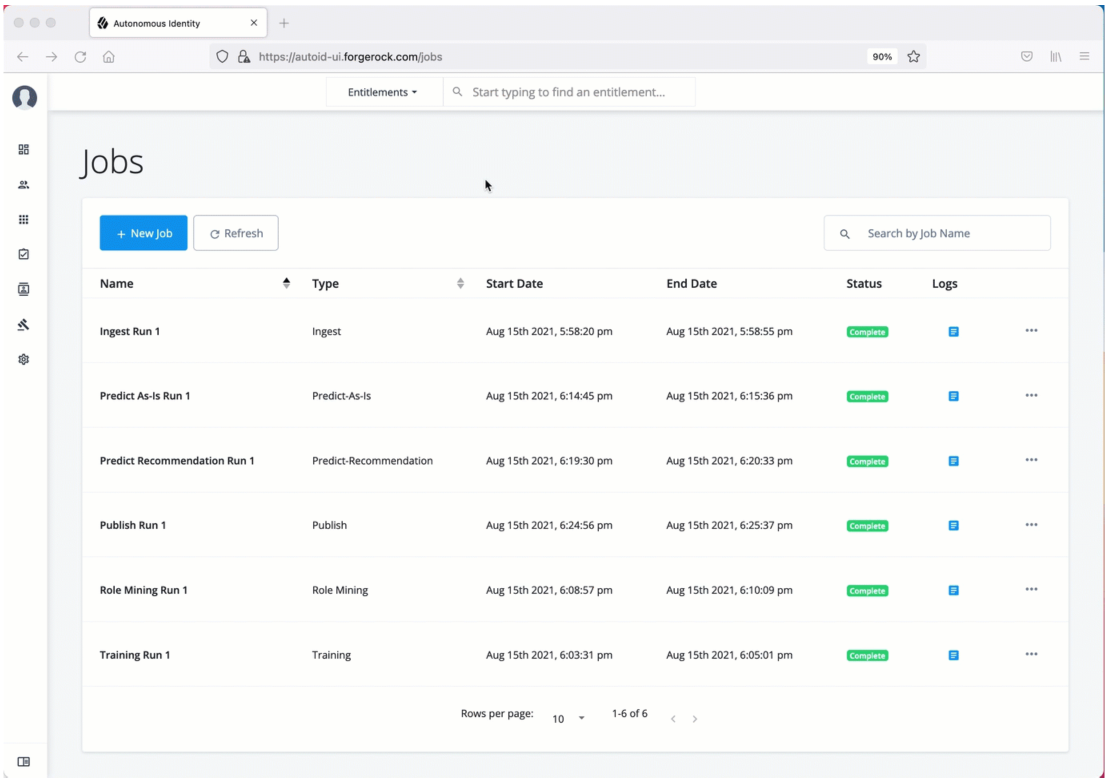
Next, run the `create-assignment-index` job. This command creates a master index by joining together all database tables. The combined index becomes a source index for the APIs.

Run create-assignment-index using the UI:

1. On the Autonomous Identity UI, click the Administration link, and then click **Jobs**.
2. On the Jobs page, click **New Job**. You will see a job schedule with each job in the analytics pipeline.
3. Click **Create Assignment Index**, and then click **Next**.
4. On the New Create Assignment Index Job box, enter the name of the job.

5. Click **Advanced** and adjust any of the Spark properties, if necessary.
6. Click **Save** to continue.
7. Click **Run Now**.
8. Next monitor the state of the job by clicking Logs, or click **Refresh** to update the Jobs page.
9. When the job completes, you can see the change in the status.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/jobs
90%
Entitlements
Start typing to find an entitlement...
+ New Job
Refresh
Search by Job Name

Jobs

Name	Type	Start Date	End Date	Status	Logs
Ingest Run 1	Ingest	Aug 15th 2021, 5:58:20 pm	Aug 15th 2021, 5:58:55 pm	Complete	
Predict As-Is Run 1	Predict-As-Is	Aug 15th 2021, 6:14:45 pm	Aug 15th 2021, 6:15:36 pm	Complete	
Predict Recommendation Run 1	Predict-Recommendation	Aug 15th 2021, 6:19:30 pm	Aug 15th 2021, 6:20:33 pm	Complete	
Publish Run 1	Publish	Aug 15th 2021, 6:24:56 pm	Aug 15th 2021, 6:25:37 pm	Complete	
Role Mining Run 1	Role Mining	Aug 15th 2021, 6:08:57 pm	Aug 15th 2021, 6:10:09 pm	Complete	
Training Run 1	Training	Aug 15th 2021, 6:03:31 pm	Aug 15th 2021, 6:05:01 pm	Complete	

Rows per page: 10 1-6 of 6

NOTE

The `create-assignment-index-report` is an export of the assignment index to a csv file. This allows users to create custom reports from the master table.

Refresh Company View

Next, refresh the indexes and company view display with the updated data. ForgeRock has set up an alias to run the command from the target server.

NOTE

Currently, this procedure can only be run on the command line within a terminal window. In a future release, you will be able to run this command from the Jobs UI.

1. In a terminal window, SSH to the target server.

2. Run the **refresh-company-view** alias.

   ```
   $ refresh-company-view
   ```

   You will see the following output:

   ```
   021-10-08 19:04:30,043 INFO ServiceConfigParser [main]
   Building JAS config
   2021-10-08 19:04:30,121 INFO SSLUtils [main] --→ KeyStore
   path :
   2021-10-08 19:04:30,130 INFO SSLUtils [main] --→
   Truststore path : /opt/autoid/certs/jas/jas-server-
   truststore.jks
   2021-10-08 19:04:30,460 INFO ServiceConfigParser [main]
   Building JAS config
   2021-10-08 19:04:30,624 INFO ServiceConfigParser [main]
   Building elasticsearch config
   2021-10-08 19:04:30,768 INFO SSLUtils [main] --→ KeyStore
   path : /opt/autoid/certs/elastic/elastic-client-
   keystore.jks
   2021-10-08 19:04:30,770 INFO SSLUtils [main] --→
   Truststore path : /opt/autoid/certs/elastic/elastic-
   server-truststore.jks
   2021-10-08 19:04:31,373 INFO RefreshCompanyView [main] →
   Index Deleted
   2021-10-08 19:04:31,373 INFO RefreshCompanyView [main] →
   Refreshing Company View Cache
   2021-10-08 19:04:31,393 INFO ServiceConfigParser [main]
   Building JAS config
   2021-10-08 19:04:33,866 INFO RefreshCompanyView [main] →
   Refreshing Assignment Stats
   2021-10-08 19:04:33,885 INFO ServiceConfigParser [main]
   Building JAS config
   2021-10-08 19:04:38,492 INFO RefreshCompanyView [main] →
   Refreshing Most Critical Assignments
   2021-10-08 19:04:38,510 INFO ServiceConfigParser [main]
   Building JAS config
   2021-10-08 19:04:41,418 INFO RefreshCompanyView [main] →
   Job finished
   ```

Run Anomaly Report

Autonomous Identity provides a report on any anomalous entitlement *assignments* that have a low confidence score but are for entitlements that have a high average confidence score. The report's purpose is to identify true anomalies rather than poorly managed entitlements.

The report generates the following points:

- Identifies potential anomalous assignments.
- Identifies the number of users who fall below a low confidence score threshold. For example, if 100 people all have low confidence score assignments to the same entitlement, then it is likely not an anomaly. The entitlement is either missing data or the assignment is poorly managed.

Run the anomaly report using the UI:

1. On the Autonomous Identity UI, click the Administration link, and then click **Jobs**.
2. On the Jobs page, click **New Job**. You will see a job schedule with each job in the analytics pipeline.
3. Click **Anomaly**, and then click **Next**.
4. On the New Anomaly Job box, enter the name of the job.
5. Click **Advanced** and adjust any of the Spark properties, if necessary.
6. Click **Save** to continue.
7. Click **Run Now** to start the ingestion run.
8. Next monitor the state of the job by clicking **Logs**, or click **Refresh** to update the Jobs page.
9. When the job completes, you can see the change in the status.
10. Access the anomaly report. The report is available at `/data/output/reports/anomaly_report/<report-id>.csv`.

Run Insight Report

Next, run an insight report on the generated rules and predictions that were generated during the training and predictions runs. The analytics command generates `insight_report.txt` and `insight_report.xlsx` and writes them to the `/data/input/spark_runs/reports` directory.

The report provides the following insights:

- Number of assignments received, scored, and unscored.
- Number of entitlements received, scored, and unscored.

- Number of assignments scored >80% and <5%.
- Distribution of assignment confidence scores.
- List of the high volume, high average confidence entitlements.
- List of the high volume, low average confidence entitlements.
- Top 25 users with more than 10 entitlements.
- Top 25 users with more than 10 entitlements and confidence scores greater than 80%.
- Top 25 users with more than 10 entitlements and confidence scores less than 5%.
- Breakdown of all applications and confidence scores of their assignments.
- Supervisors with most employees and confidence scores of their assignments.
- Top 50 role owners by number of assignments.
- List of the "Golden Rules," high confidence justifications that apply to a large volume of people.

Run the insight report using the UI:

1. On the Autonomous Identity UI, click the Administration link, and then click **Jobs**.
2. On the Jobs page, click **New Job**. You will see a job schedule with each job in the analytics pipeline.
3. Click **Insight**, and then click **Next**.
4. On the New Insight Job box, enter the name of the job.
5. Click **Advanced** and adjust any of the Spark properties, if necessary.
6. Click **Save** to continue.
7. Click **Run Now**.
8. Next monitor the state of the job by clicking Logs, or click Refresh to update the Jobs page.
9. When the job completes, you can see the change in the status.
10. Access the insight report. The report is available at `/data/output/reports/insight_report.xlsx`.

Run Analytics on the Command Line

Autonomous Identity supports the ability to run the pipeline from the command-line. Before you run the pipeline commands, you must run the pre-analytic tasks as defined in Pre-Analytics Tasks, and then define the jobs on the Jobs UI.

IMPORTANT

IMPORTANT

The analytics pipeline CLI commands will be deprecated in a future release. We recommend using the Jobs UI to run the analytics jobs.

Run the CLI analytics commands:

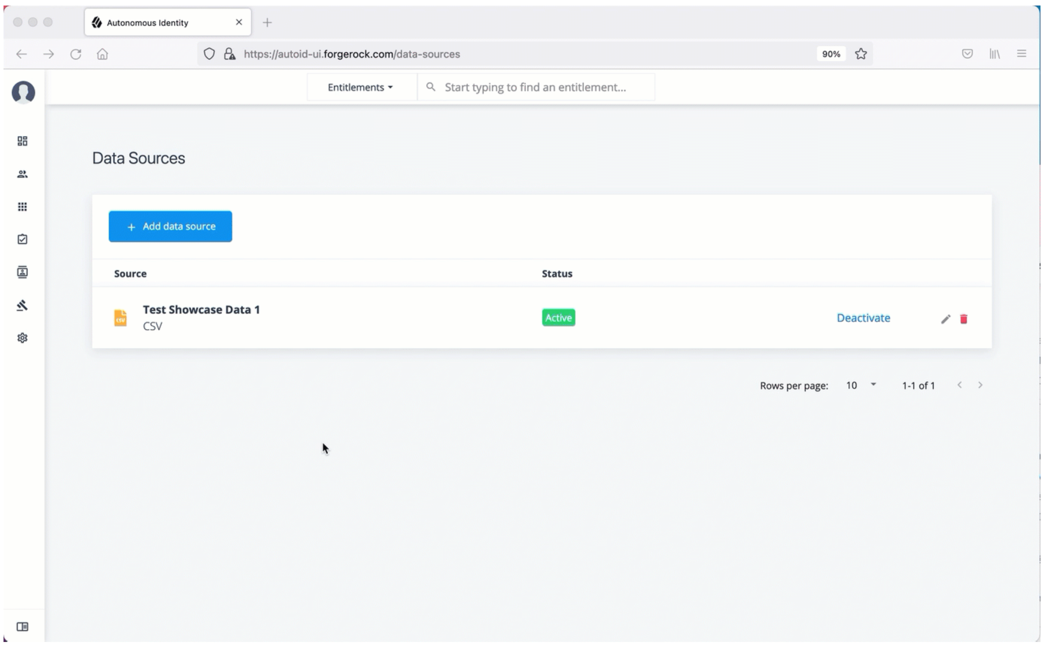
1. Make sure to run the pre-analytics tasks, such as adding attributes to the schema, define your datasources, set up your attribute mappings, and adjusting your analytics threshold values, if necessary:
   - Add attributes to the schema. For more information, see Set Entity Definitions.
   - Define your datasources. Autonomous Identity supports different file types for ingestion: CSV, JDBC, and generic. You can enter more than one data source file, specifying the dataset location on your target machine. For more information, see Set Data Sources.
   - Define attribute mappings between your data and the schema. For more information, see Set Attribute Mappings.
   - Configure your analytics threshold values. For more information, see Set Analytics Thresholds.
2. Define your job definitions on the UI for each of the following:

   IMPORTANT

   You can only define your job definitions on the Autonomous Identity UI. There is no command-line equivalent to define the jobs.

   - Ingest
   - Train
   - Role Mine
   - Predict As-Is
   - Predict Recommendation
   - Publish
   - Create Assignment Index
   - Anomaly Report (Optional)
   - Insight Report (Optional)
   - Audit Report (Optional)

   ▼ ***See it in action***


Autonomous Identity
https://autoid-ui.forgerock.com/data-sources
Entitlements
Start typing to find an entitlement...
+ Add data source
Rows per page: 10
1-1 of 1

Data Sources

Source	Status		
Test Showcase Data 1 CSV	Active	Deactivate	

3. In a terminal window, SSH to the target server.
4. Change to the `analytics` directory.

```
$ cd /opt/autoid/apache-livy/analytics
```

5. Run each of the following jobs to completion, and then submit the next job.
   a. Run the ingest job.

```
$ analytics run <ingest-job-definition-name>

For example:
$ analytics run ingestShowcaseData
```

   b. When the ingest job completes, you can run a status command to confirm its completion:

```
$ analytics status ingestShowcaseData

2021-09-20 23:18:55 INFO  AnalyticsJobsClient:104 - →
checking analytic job status for --→
ingestShowcaseData
2021-09-20 23:18:55 INFO  ServiceConfigParser:54 -
Building JAS config
2021-09-20 23:18:55 INFO  JASHelper:49 - → Building new
SSL context for JAS REST Client using trust store
2021-09-20 23:18:55 INFO  SSLUtils:36 - --→ KeyStore
path :
2021-09-20 23:18:55 INFO  SSLUtils:44 - --→ Truststore
path : /opt/autoid/certs/jas/jas-server-truststore.jks
```

```
2021-09-20 23:18:55 INFO  ServiceConfigParser:54 -
Building JAS config
 Job Status result
********************************
Job Status for ingestShowcaseData -→  COMPLETED
********************************
```

c. Run the training job.

```
$ analytics run <training-job-definition-name>

For example:
$ analytics run trainShowcaseData
```

d. Run the role mining job.

```
$ analytics run <role-mining-job-definition-name>

For example:
$ analytics run roleMining
```

e. Run the predict-as-is job.

```
$ analytics run <predict-asis-job-definition-name>

For example:
$ analytics run predictAsIs
```

f. Run the predict-recommendation job.

```
$ analytics run <predict-recommendation-job-definition-
name>

For example:
$ analytics run predictRecommendation
```

g. Run the publish job.

```
$ analytics run <publish-job-definition-name>

For example:
$ analytics run publishShowcaseData
```

h. Run the create assignment index job.

```
$ analytics run <create-assignment-index-definition-
name>

For example:
$ analytics run createAssignmentIndex
```

i. Run the **refresh-company-view** alias. See Refresh Company View for more information.

j. Optional. Run the anomaly report job.

```
$ analytics run <anomaly-report-definition-name>

For example:
$ analytics run anomalyReport
```

k. Optional. Run the insight report job.

```
$ analytics run <insight-report-definition-name>

For example:
$ analytics run insightReport
```

l. Optional. Run the audit report job.

```
$ analytics run <audit-report-definition-name>

For example:
$ analytics run auditReport
```

6. Click the Autonomous Identity UI Dashboard. The page reloads with your data.

Admin User Tasks

The Admin user functionality is similar to that of a system administration *superuser*. Admin users have the access rights to company-wide entitlement data on the Autonomous Identity console. Admin users can approve or revoke a user's entitlement.

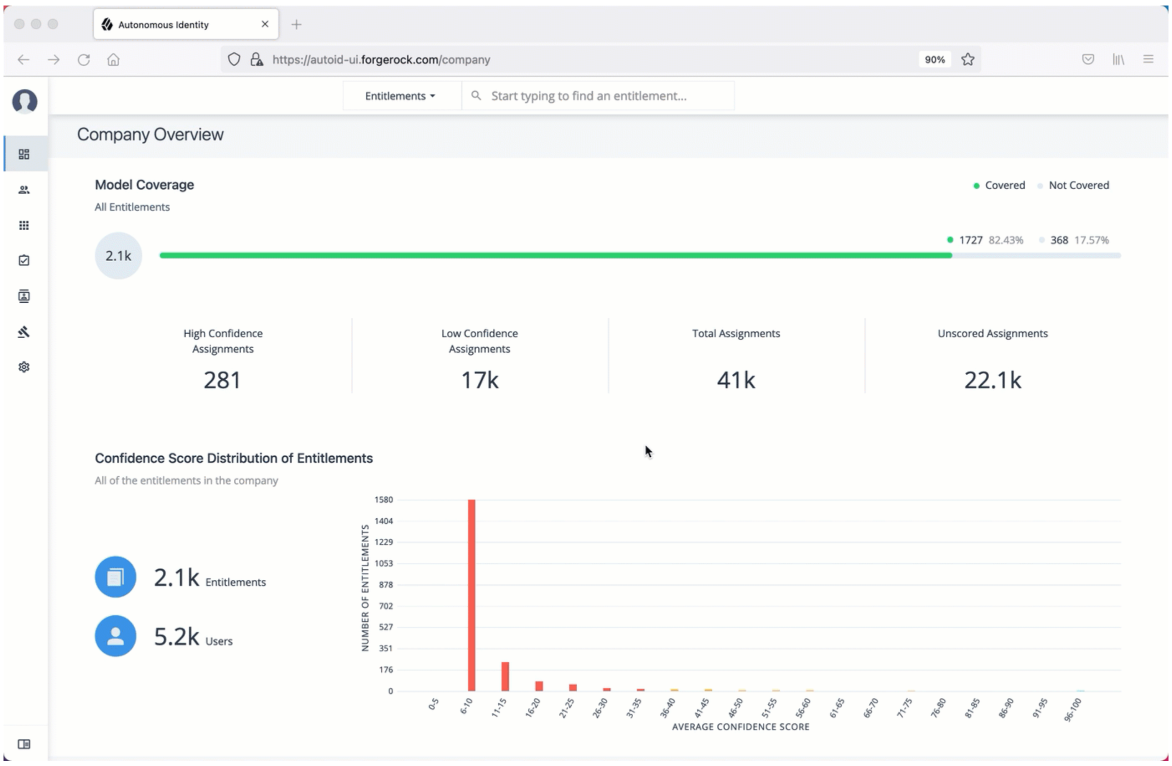
Investigate Most Critical Entitlements

One important task that an administrator must perform is to examine all critical entitlements. Critical entitlements are assigned entitlements that have are highly-assigned but have a low confidence score associated with it. The Autonomous Identity console provides a means to examine these entitlements.

Follow these steps to evaluate the most critical entitlements list:

1. On the Dashboard, scroll down to the Most Critical Entitlements section. This section displays the entitlements that have low confidence scores and a high number of employees who have this entitlement.
2. Click an entitlement to view its details.
3. On the Entitlements detail page, review the key metrics.
4. Click the right arrow in one of the category ranges to view the users, and then click one of the users in the list.
5. On the User's Entitlements page, scroll down to review the Confidence Score Comparison table to see the differences between the user's attribute and the driving factor attributes.
6. Click Employees associated with this entitlement to review other uses who have this entitlement.
7. Click **Actions**, and then click **Approve** or **Revoke** for this entitlement. You can also bulk approve more than one entitlement. You can only revoke one entitlement at a time.

▼ *See it in action*

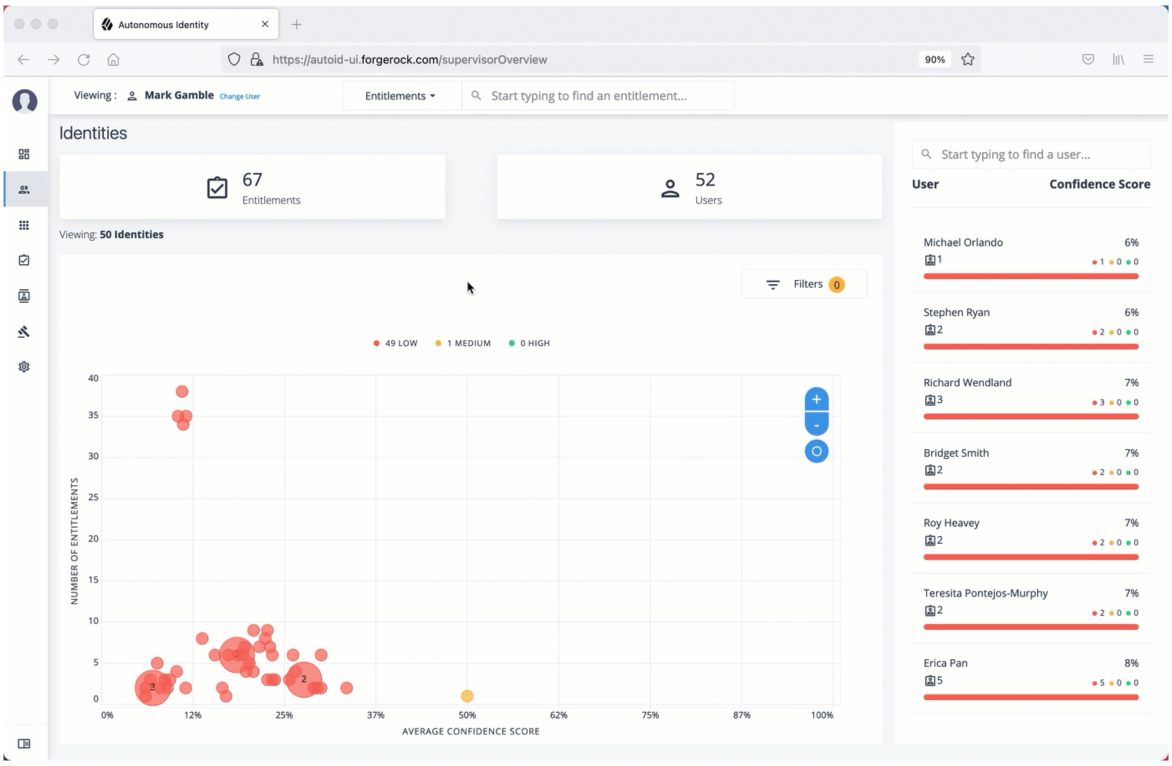


Approve or Revoke Access an Entitlement for a User

Follow these steps to investigate a confidence score and approve or revoke access an entitlement assigned to a specific user:

1. On Autonomous Identity console, click **Identities**, and enter a name of a supervisor. The only way to access a user's entitlements is through the Most Critical Entitlements section or the Identities page.
2. On the Identities page, click a circle, and then click the user in the list on the right.
3. On the User Entitlement page, click a confidence circle on the graph to highlight the entitlement below.
4. For the selected entitlement, click the down arrow on the right to view the Driving Factor Comparison.
5. Click Employees associated with this entitlement to view the justifications for those users with high confidence scores with this entitlement.
6. Click **Actions**, and then click **Approve Access** or **Revoke access**. If you have more than one entitlement that you want to approve, select them all and do a bulk Approval. You can only do one Revoke Access at a time.

▼ *See it in action*



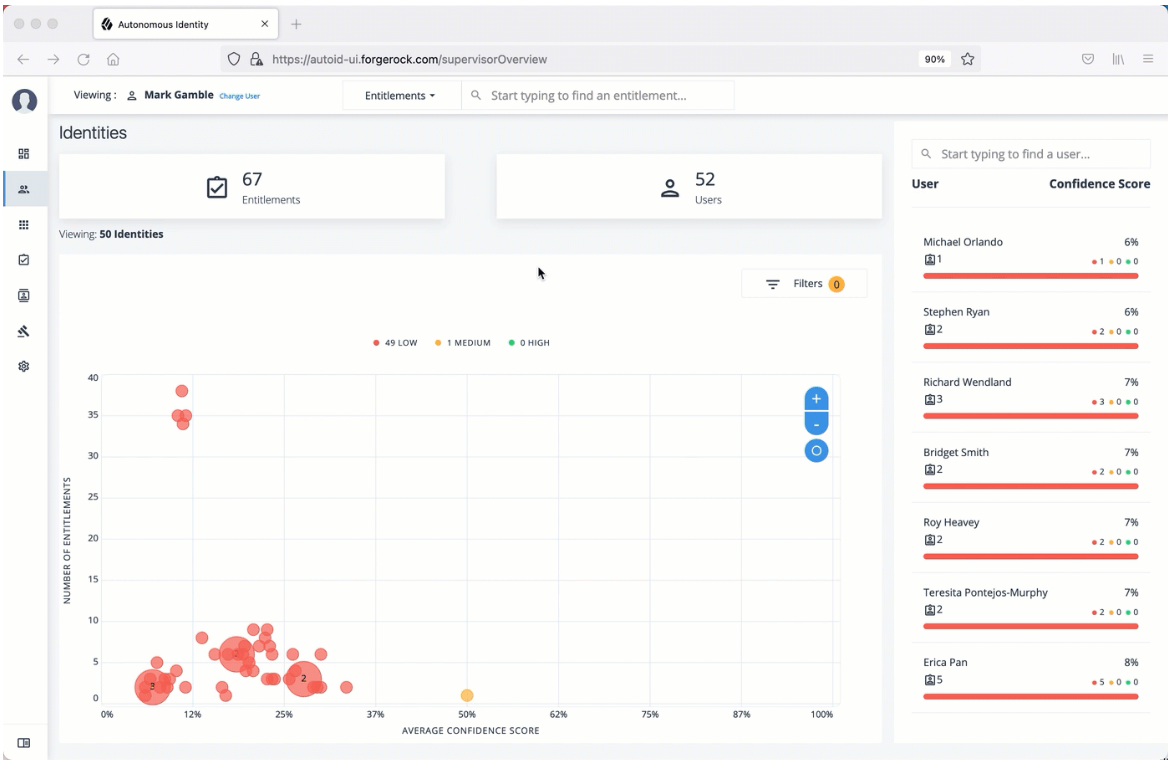
User	Confidence Score
Michael Orlando 1	6% ● 1 ● 0 ● 0
Stephen Ryan 2	6% ● 2 ● 0 ● 0
Richard Wendland 3	7% ● 3 ● 0 ● 0
Bridget Smith 2	7% ● 2 ● 0 ● 0
Roy Heavey 2	7% ● 2 ● 0 ● 0
Teresita Pontejos-Murphy 2	7% ● 2 ● 0 ● 0
Erica Pan 5	8% ● 5 ● 0 ● 0

Check Not-Scored Users

Follow these steps to check Not Scored entitlements. Not-scored indicates that it does not have a justification associated with the entitlement:

1. On Autonomous Identity console, click **Identities**, and enter a name of a supervisor. The only way to access a user's entitlements is through the Most Critical Entitlements section or the Identities page.
2. On the Identities page, click a circle, and then click the user in the list on the right.
3. On the User Entitlement page, click **Not Scored**.
4. On the Not Scored Entitlements page, click the down arrow to view the driving factors comparison.
5. Click Employees associated with this entitlement to view the justifications for those users with high confidence scores with this entitlement.
6. Click **Actions**, and then click **Approve Access** or **Revoke access**. At a later date, you can re-click the **Approve** or **Revoke** button to cancel the operation.

▼ *See it in action*



User	Confidence Score
Michael Orlando 1	6% ● 1 ● 0 ● 0
Stephen Ryan 2	6% ● 2 ● 0 ● 0
Richard Wendland 3	7% ● 3 ● 0 ● 0
Bridget Smith 2	7% ● 2 ● 0 ● 0
Roy Heavey 2	7% ● 2 ● 0 ● 0
Teresita Pontejos-Murphy 2	7% ● 2 ● 0 ● 0
Erica Pan 5	8% ● 5 ● 0 ● 0

Apply Filters

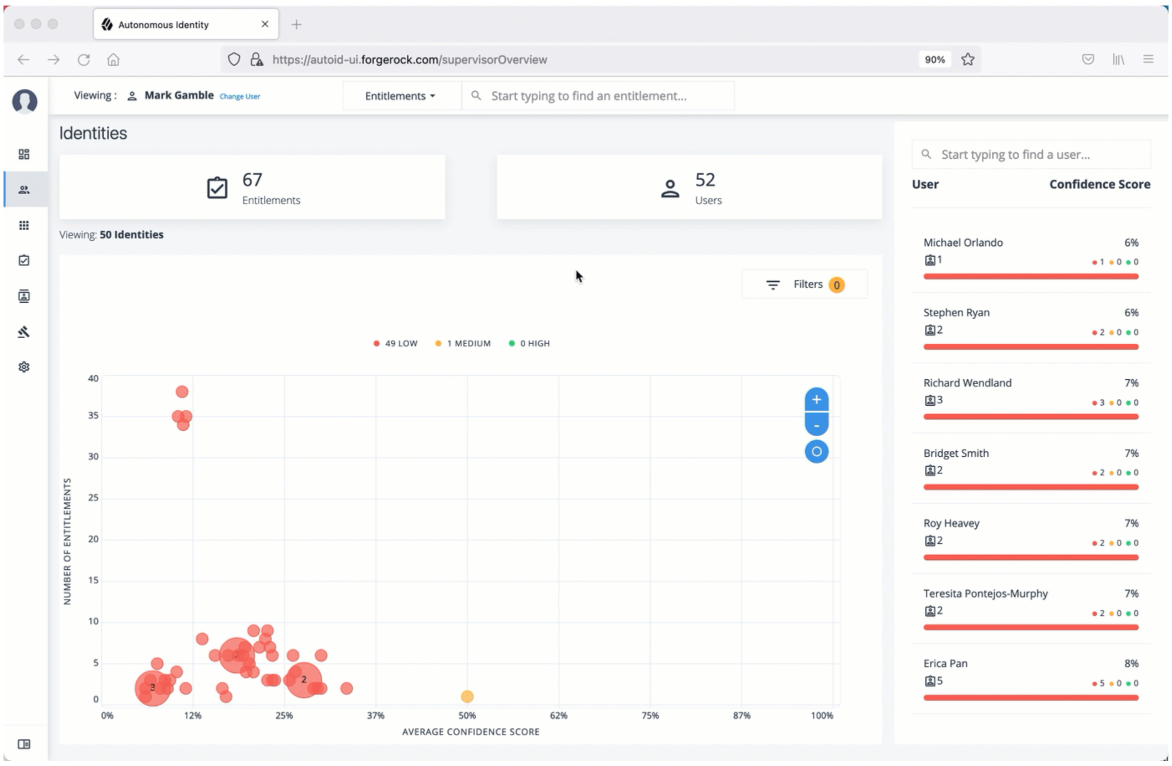
Follow these steps to apply filters to your confidence score graphs on the Identities and Entitlements pages:

NOTE

The Filters for the Identities and Entitlements are similar. The filters for the Applications and Rules pages offer different options to filter your searches.

1. On the Identities or Entitlements page, view the average confidence score graph.
2. On the right, click **Filters**.
3. Under filters, do one or all of the following:
    - Click **Remove High Scores from Average** or enable any filter in the Application Filters section.
    - Under Applications, click one or more applications to see the identities or entitlements asssociated with the selected application.
    - Click **Add Filters** to further see only those identities or entitlements based on a user attribute, such as `city`. When ready, click Apply Filters.
4. Click **Clear Filters** to remove your filters.

▼ ***See it in action***



User	Confidence Score
Michael Orlando 1	6% ● 1 ● 0 ● 0
Stephen Ryan 2	6% ● 2 ● 0 ● 0
Richard Wendland 3	7% ● 3 ● 0 ● 0
Bridget Smith 2	7% ● 2 ● 0 ● 0
Roy Heavey 2	7% ● 2 ● 0 ● 0
Teresita Pontejos-Murphy 2	7% ● 2 ● 0 ● 0
Erica Pan 5	8% ● 5 ● 0 ● 0

Server Maintenance

Autonomous Identity administrators must conduct various tasks to maintain the service for their users.

The following are basic server maintenance tasks that may occur:

Stopping and Starting

The following commands are for Linux distributions:

Stopping Docker

1. Stop docker. This will shutdown all of the containers.

```
$ sudo systemctl stop docker
```

Restarting Docker

1. To restart docker, first set the docker to start on boot using the **`enable`** command:

```
$ sudo systemctl enable docker
```

2. To start docker, run the **`start`** command:

```
$ sudo systemctl start docker
```

3. After restarting Docker, restart the JAS service to ensure the service can write to its logs:

```
$ docker service update --force jas_jasnode
```

Shutting Down Cassandra

1. On the deployer node, SSH to the target node.
2. Check Cassandra status.

```
Datacenter: datacenter1
=======================
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving –  Address
Load       Tokens       Owns (effective)  Host ID
Rack
UN  10.128.0.38  1.17 MiB   256          100.0%
d134e7f6-408e-43e5-bf8a-7adff055637a  rack1
```

3. To stop Cassandra, find the process ID and run the kill command.

```
$ pgrep -u autoid -f cassandra | xargs kill -9
```

4. Check the status again.

```
nodetool: Failed to connect to '127.0.0.1:7199' -
ConnectException: 'Connection refused (Connection
refused)'.
```

Re-Starting Cassandra

1. On the deployer node, SSH to the target node.
2. Restart Cassandra. When you see the `No gossip backlog; proceeding` message, hit **`Enter`** to continue.

```
$ cassandra

…
INFO  [main] 2020-11-10 17:22:49,306 Gossiper.java:1670 -
Waiting for gossip to settle…
INFO  [main] 2020-11-10 17:22:57,307 Gossiper.java:1701 -
No gossip backlog; proceeding
```

3. Check the status of Cassandra. You should see that it is in `UN` status ("Up" and "Normal").

```
$ nodetool status
```

Shutting Down MongoDB

1. Check the status of the MongDB

```
$ ps -ef | grep mongod
```

2. Connect to the Mongo shell.

```
$ mongo --tls --tlsCAFile
/opt/autoid/mongo/certs/rootCA.pem --tlsCertificateKeyFile
/opt/autoid/mongo/certs/mongodb.pem
```

```
    --tlsAllowInvalidHostnames --host <ip-address>

MongoDB shell version v4.2.9
connecting to: mongodb://<ip-address>:27017/?
compressors=disabled&gssapiServiceName=mongodb
2020-10-08T18:46:23.285+0000 W  NETWORK  [js] The server
certificate does not match the host name. Hostname: <ip-
address> does not match CN: mongonode
Implicit session: session { "id" : UUID("22c0123-30e3-
4dc9-9d16-5ec310e1ew7b") }
MongoDB server version: 4.2.9
```

3. Switch the admin table.

```
> use admin

switched to db admin
```

4. Authenticate using the password set in `vault.yml` file.

```
> db.auth("root", "Welcome123")

1
```

5. Start the shutdown process.

```
> db.shutdownServer()

2020-10-08T18:47:06.396+0000 I  NETWORK  [js]
DBClientConnection failed to receive message from <ip-
address>:27017 - SocketException: short read
server should be down…
2020-10-08T18:47:06.399+0000 I  NETWORK  [js] trying
reconnect to <ip-address>:27017 failed
2020-10-08T18:47:06.399+0000 I  NETWORK  [js] reconnect
<ip-address>:27017 failed
```

6. Exit the mongo shell.

```
$ quit()
or <Ctrl-C>
```

7. Check the status of the MongDB

```
$ ps -ef | grep mongod

no instance of mongod found
```

Re-Starting MongoDB

1. Re-start the MongoDB service.

```
$ /usr/bin/mongod --config /opt/autoid/mongo/mongo.conf

about to fork child process, waiting until server is ready
for connections.
forked process: 31227
child process started successfully, parent exiting
```

2. Check the status of the MongDB

```
$ ps -ef | grep mongod

autoid    9245     1  0 18:48 ?        00:00:45
/usr/bin/mongod --config /opt/autoid/mongo/mongo.conf
autoid   22003  6037  0 21:12 pts/1    00:00:00 grep --
color=auto mongod
```

Shutting Down Spark

1. On the deployer node, SSH to the target node.
2. Check Spark status. You should see that it is up-and-running.

```
$ elinks http://localhost:8080
```

3. Stop the Spark Master and workers.

```
$ /opt/autoid/spark/spark-2.4.4-bin-hadoop2.7/sbin/stop-
all.sh

localhost: stopping org.apache.spark.deploy.worker.Worker
stopping org.apache.spark.deploy.master.Master
```

4. Check the Spark status again. You should see: `Unable to retrieve http://localhost:8080: Connection refused.`

Re-Starting Spark

1. On the deployer node, SSH to the target node.
2. Start the Spark Master and workers. Enter the user password on the target node when prompted.

```
$ /opt/autoid/spark/spark-2.4.4-bin-hadoop2.7/sbin/start-
all.sh

starting org.apache.spark.deploy.master.Master, logging to
/opt/autoid/spark/spark-2.4.4-bin-hadoop2.7/logs/spark-a
utoid-org.apache.spark.deploy.master.Master-1.out
autoid-2 password:
localhost: starting org.apache.spark.deploy.worker.Worker,
logging to /opt/autoid/spark/spark-2.4.4-bin-hadoop2.7/l
ogs/spark-autoid-org.apache.spark.deploy.worker.Worker-
1.out
```

3. Check the Spark status again. You should see that it is up-and-running.

Backing Up and Restoring

Autonomous Identity stores its entitlement analytics results, association rules, predictions, and confidence scores in the Apache Cassandra, MongoDB, and Open Distro for Elasticsearch databases. Cassandra is an open-source, NoSQL database system where data is distributed across multiple nodes in a master-less cluster. MongoDB is a popular schema-free database that uses JSON-like documents. Open Distro for Elasticsearch is a distributed search engine based on Apache Lucene.

For single-node deployments, however, you need to back up Cassandra or MongoDB on a regular basis. If the machine goes down for any reason, you need to restore the database as required.

To simplify the backup process, ForgeRock provides backup and restore scripts in the target directory.

Backing Up Cassandra

1. On the ForgeRock Google Cloud Registry (gcr.io), download the `cassandra-backup.sh` script.
2. Move the script to the Cassandra home directory on your deployment.
3. Run the backup.

```
$ ./cassandra-backup.sh \
    -d <Cassandra Database path> \
    -b <Backup folder path> \
    -u <Cassandra Username> \
    -p <Cassandra Password> \
    -s <SSL enable true/false> \
    -k <Keyspace (optional) default value: zoran>
```

Restore Cassandra

1. On the ForgeRock Google Cloud Registry (gcr.io), download the `cassandra-restore.sh` script.
2. Move the script to the Cassandra home directory on your deployment.
3. Run the restore.

```
$ ./cassandra-restore.sh \
    -d <Cassandra Database path> \
    -b <Snapshot Backup tar file> \
    -f <Schema file> \
    -u <Cassandra Username> \
    -p <Cassandra Password> \
    -c <Cassandra commitlog path> \
    -i <Cassandra install path> \
    -s <SSL enable true/false> \
    -k <Keyspace (optional) default value: zoran>
```

Backing Up Assignment Index Data in Elasticsearch

1. From the deployer node, SSH to the target node.
2. Change to the `/opt/autoid/elastic` directory. The directory was configured during the `./deployer.sh run`.

```
$ cd /opt/autoid/elastic
```

3. Run the backup.

```
$ ./assignment-index-backup.sh

Elastic Host: 10.128.0.52
Elastic Server Status : 200
Elastic server is up and running …
assignment index exists status : 200
 registerSnapshotStatus 200
backup snapshot name with time stamp :
assignment_snapshot_2020_10_07__19_31_53
 entitlement-assignment backup status : 200
* entitlement-assignment backup successful *
```

4. Make note of the snapshot name. For example, `assignment_snapshot_2020_10_07__19_31_53`.

Restoring Assignment Index Data in Elasticsearch

1. From the deployer node, SSH to the target node.
2. Change to the `/opt/autoid/elastic` directory.

```
$ cd /opt/autoid/elastic
```

3. Run the restore using the snapshot taken from the previous procedure. When prompted if you want to close the existing index, enter `Y`. When prompted for the snapshot name, enter the name of the snapshot.

```
$ ./assignment-index-restore.sh

[Elastic Host: 10.128.0.55
 Elastic Server Status : 200
 Elastic server is up and running …
 assignment index exists status : 200
 index with alias name -→ entitlement-assignment exists
and is in open state…
 Do you want to close the existing index -→ entitlement-
assignment. (Required for restoring from snapshot ) (Y/N)
?
  y
 Restore snapshot ? true
  registerSnapshotStatus 200
 registering assignment_index_backup successful…
 proceeding with index restore…
 Enter the snapshot name to restore [snapshot_01]:
assignment_snapshot_2020_10_0719_31_53
 snapshot to restore -→
assignment_snapshot_2020_10_0719_31_53
 entitlement-assignment index restore status -→ 200
 * entitlement-assignment restore successful *
```

Accessing Elasticsearch Index Data using Kibana

During the Autonomous Identity deployment, Open Distro for Elasticsearch (ODFE) is installed to facilitate the efficient searching of entitlement data within the system. A typical deployment may have millions of different entitlements and assignments that require fast search processing. ODFE provides that performance.

ODFE comes bundled with its visualization console, Kibana, that lets you monitor and manage your Elasticsearch data. Once you run the **`analytics create-assignment-index`** command that populates the Elasticsearch index, you can configure an SSL tunnel to access Kibana. This is particularly useful when you want to retrieve a list of your backup snapshots.

1. Open a local terminal, and set up an SSL tunnel to your target node. The syntax is as follows:

   ```
   $ ssh -L < local-port >:<private-ip-remote>:<remote-port>
   -i <private-key> <user@public-ip-remote>
   ```

   For example:

   ```
   $ ssh -L 5601:10.128.0.71:5601 -i ~/.ssh/id_rsa
   autoid@34.70.190.144

   Last login: Fri Oct  9 20:10:59 2020
   ```

2. Open a browser and point it to `localhost:5601` Login in as `elasticadmin`. Enter your password that you set in the `~/autoid-config/vault.yml` file on the deployer node during install.
3. On the Elasticsearch page, click **Explore on my own**.

4. On the Elasticsearch Home page, click the menu in the top left corner, and click **Dev Tools**.
5. On the Dev Tools page, get a total count of indices.

   ```
   $ GET /entitlement-assignment/_count
   ```

6. On the Dev Tools page, search the indices.

   ```
   $ GET /entitlement-assignment/_search
   ```

7. On the Dev Tools page, get the list of snapshot backups.

   ```
   $ GET /_cat/snapshots/assignment_index_backup
   ```

Exporting and Importing Data

Export Your Data

If you are migrating data, for example, from a development server to a QA server, then follow this section to export your data from your current deployment. Autonomous Identity provides a python script to export your data to .csv files and stores them to a folder in your home directory.

1. On the target machine, change to the `dbutils` directory.

   ```
   $ cd /opt/autoid/dbutils
   ```

2. Export the database.

   ```
   $ python dbutils.py export ~/backup
   ```

Import the Data into the Autonomous Identity Keyspace

If you are moving your data from another server, import your data to the target environment using the following steps.

1. First, create a `zoran_user.cql` file. This file is used to drop and re-create the Autonomous Identity `user` and `user_history` tables. The file should go to the same directory as the other .csv files. Make sure to create this file from the

source node, for example, the development server, from where we exported the data.

Start cqlsh in the source environment, and use the output of these commands to create the `zoran_user.cql` file:

```
$ describe zoran.user;
```

```
$ describe zoran.user_history;
```

Make sure the **`DROP TABLE`** cql commands precedes the **`CREATE TABLE`** commands as shown in the `zoran_user.cql` example file below:

```
USE zoran ;

DROP TABLE IF EXISTS  zoran.user_history ;

DROP TABLE IF EXISTS zoran.user ;

CREATE TABLE zoran.user (
    user text PRIMARY KEY,
    chiefyesno text,
    city text,
    costcenter text,
    isactive text,
    jobcodename text,
    lineofbusiness text,
    lineofbusinesssubgroup text,
    managername text,
    usrdepartmentname text,
    userdisplayname text,
    usremptype text,
    usrmanagerkey text
) WITH bloom_filter_fp_chance = 0.01
    AND caching = {'keys': 'ALL', 'rows_per_partition':
'NONE'}
    AND comment = ''
    AND compaction = {'class':
'org.apache.cassandra.db.compaction.SizeTieredCompactionSt
rategy', 'max_threshold': '32', 'min_threshold': '4'}
    AND compression = {'chunk_length_in_kb': '64',
'class': 'org.apache.cassandra.io.compress.LZ4Compressor'}
    AND crc_check_chance = 1.0
    AND dclocal_read_repair_chance = 0.1
    AND default_time_to_live = 0
    AND gc_grace_seconds = 864000
    AND max_index_interval = 2048
    AND memtable_flush_period_in_ms = 0
    AND min_index_interval = 128
    AND read_repair_chance = 0.0
    AND speculative_retry = '99PERCENTILE';

CREATE TABLE zoran.user_history (
    user text,
    batch_id int,
    chiefyesno text,
    city text,
    costcenter text,
    isactive text,
    jobcodename text,
    lineofbusiness text,
    lineofbusinesssubgroup text,
    managername text,
    usrdepartmentname text,
    userdisplayname text,
    usremptype text,
    usrmanagerkey text,
    PRIMARY KEY (user, batch_id)
) WITH CLUSTERING ORDER BY (batch_id ASC)
    AND bloom_filter_fp_chance = 0.01
    AND caching = {'keys': 'ALL', 'rows_per_partition':
'NONE'}
    AND comment = ''
    AND compaction = {'class':
'org.apache.cassandra.db.compaction.SizeTieredCompactionSt
rategy', 'max_threshold': '32', 'min_threshold': '4'}
    AND compression = {'chunk_length_in_kb': '64',
'class': 'org.apache.cassandra.io.compress.LZ4Compressor'}
    AND crc_check_chance = 1.0
    AND dclocal_read_repair_chance = 0.1
    AND default_time_to_live = 0
    AND gc_grace_seconds = 864000
    AND max_index_interval = 2048
    AND memtable_flush_period_in_ms = 0
    AND min_index_interval = 128
    AND read_repair_chance = 0.0
    AND speculative_retry = '99PERCENTILE';
```

2. Copy the `ui-config.json` from the source environment where you ran an analytics pipeline, usually under `/data/config`, to the same folder where you have your .csv files.
3. On the target machine, change to the `dbutils` directory.

   ```
   $ cd /opt/autoid/dbutils
   ```

4. Use the **`dbutils.py import`** command to populate the Autonomous Identity keyspace with the .csv files, generated from the **`export`** command from the source environment using the previous steps. Note that before importing the data, the script truncates the existing tables to remove duplicates. Again, make sure the `zoran_user.cql` and the `ui-config.json` are in the `/import-dir` .

   ```
   $ python dbutils.py import /import-dir
   ```

   For example:

   ```
   $ python dbutils.py import ~/import/AutoID-data
   ```

5. Verify that the data is imported in the directory on your server.

Accessing Log Files

Autonomous Identity provides different log files to monitor or troubleshoot your system.

Getting Docker Container Information

1. On the target node, get system wide information about the Docker deployment. The information shows the number of containers running, paused, and stopped containers as well as other information about the deployment.

   ```
   $ docker info
   ```

2. If you want to get debug information, use the `-D` option. The option specifies that all docker commands will output additional debug information.

   ```
   $ docker -D info
   ```

3. Get information on all of your containers on your system.

   ```
   $ docker ps -a
   ```

4. Get information on the docker images on your system.

   ```
   $ docker images
   ```

5. Get docker service information on your system.

   ```
   $ docker service ls
   ```

6. Get docker the logs for a service.

   ```
   $ docker service logs <service-name>
   ```

   For example, to see the nginx service:

   ```
   $ docker service logs nginx_nginx
   ```

   Other useful arguments:

   - `--details`. Show extra details.
   - `--follow, -f`. Follow log output. The command will stream new output from STDOUT and STDERR.
   - `--no-trunc`. Do not truncate output.
   - `--tail {n|all}`. Show the number of lines from the end of log files, where `n` is the number of lines or `all` for all lines.
   - `--timestamps, -t`. Show timestamps.

Getting Cassandra Logs

The Apache Cassandra output log is kicked off at startup. Autonomous Identity pipes the output to a log file in the directory, `/opt/autoid/` .

1. On the target node, get the log file for the Cassandra install.

   ```
   $ cat /opt/autoid/cassandra/installcassandra.log
   ```

2. Get startup information. Cassandra writes to `cassandra.out` at startup.

   ```
   $ cat /opt/autoid/cassandra.out
   ```

3. Get the general Cassandra log file.

   ```
   $ cat /opt/autoid/apache-cassandra-3.11.2/logs/system.log
   ```

By default, the log level is set to `INFO`. You can change the log level by editing the `/opt/autoid/apache-cassandra-3.11.2/conf/logback.xml` file. After any edits, the change will take effect immediately. No restart is necessary. The log levels from most to least verbose are as follows:

- `TRACE`
- `DEBUG`
- `INFO`
- `WARN`
- `ERROR`
- `FATAL`

4. Get the JVM garbage collector logs.

```
$ cat /opt/autoid/apache-cassandra-3.11.2/logs/gc.log.
<number>.current
```

For example:

```
$ cat /opt/autoid/apache-cassandra-
3.11.2/logs/gc.log.0.current
```

The output is configured in the `/opt/autoid/apache-cassandra-3.11.2/conf/cassandra-env.sh` file. Add the following JVM properties to enable them:

- `JVM_OPTS="$JVM_OPTS -XX:+PrintGCDetails"`
- `JVM_OPTS="$JVM_OPTS -XX:+PrintGCDateStamps"`
- `JVM_OPTS="$JVM_OPTS -XX:+PrintHeapAtGC"`
- `JVM_OPTS="$JVM_OPTS -XX:+PrintGCApplicationStoppedTime"`

5. Get the debug log.

```
$ cat /opt/autoid/apache-cassandra-3.11.2/logs/debug.log
```

Other Useful Cassandra Monitoring Tools and Files

Apache Cassandra has other useful monitoring tools that you can use to observe or diagnose and issue. To see the complete list of options, see the Apache Cassandra documentation.

1. View statistics for a cluster, such as IP address, load, number of tokens,

```
$ /opt/autoid/apache-cassandra-3.11.2/bin/nodetool status
```

2. View statistics for a node, such as uptime, load, key cache hit, rate, and other information.

```
$ /opt/autoid/apache-cassandra-3.11.2/bin/nodetool info
```

3. View the Cassandra configuration file to determine how properties are pre-set.

```
$ cat /opt/autoid/apache-cassandra-3.11.2/conf/cassandra.yaml
```

Apache Spark Logs

Apache Spark provides several ways to monitor the server after an analytics run.

1. To get an overall status of the Spark server, point your browser to `http://<spark-master-ip>:8080`.
2. Print the logging message sent to the output file during an analytics run.

```
$ cat /opt/autoid/spark/spark-2.4.4-bin-hadoop2.7/logs/<file-
name>
```

For example:

```
$ cat /opt/autoid/spark/spark-2.4.4-bin-hadoop2.7/logs/spark-
org.apache.spark.deploy.master.Master-1-autonomous-id-test.out
```

3. Print the data logs that were written during an analytics run.

```
$ cat /data/log/files/<filename>
```

For example:

```
$ cat /data/log/files/f6c0870e-5782-441e-b145-b0e662f05f79.log
```

Updating IDP Certificates

When an IDP provider changes their certificates, you can update these certificates in Autonomous Identity.

> 1. SSH to the target machine.

2. View the current certificate settings in the `docker-compose.yml` file, and locate the `NODE_EXTRA_CA_CERTS` property

   ```
   $ vi /opt/autoid/res/api/docker-compose.yml

   NODE_EXTRA_CA_CERTS=/opt/app/cert/<customer ID>-sso.pem
   ```

3. Access your IDP URL, and export the `.cer` file from the browser.
4. Convert the `.cer` file into a `.pem` file using the following command:

   ```
   $ openssl x509 -in certificatename.cer -outform PEM -out
   certificatename.pem
   ```

5. Open the `docker-compose.yml` file and update the `NODE_EXTRA_CA_CERTS` property.

   ```
   $ vi /opt/autoid/res/api/docker-compose.yml

   NODE_EXTRA_CA_CERTS=/opt/app/cert/<new-cert>.pem
   ```

6. Restart the Autonomous Identity services.

   ```
   $ docker stack rm api
   $ docker stack deploy --with-registry-auth --compose-file
   $ /opt/autoid/res/api/docker-compose.yml api
   $ docker service update --force ui_zoran-ui
   $ docker service update --force nginx_nginx
   ```

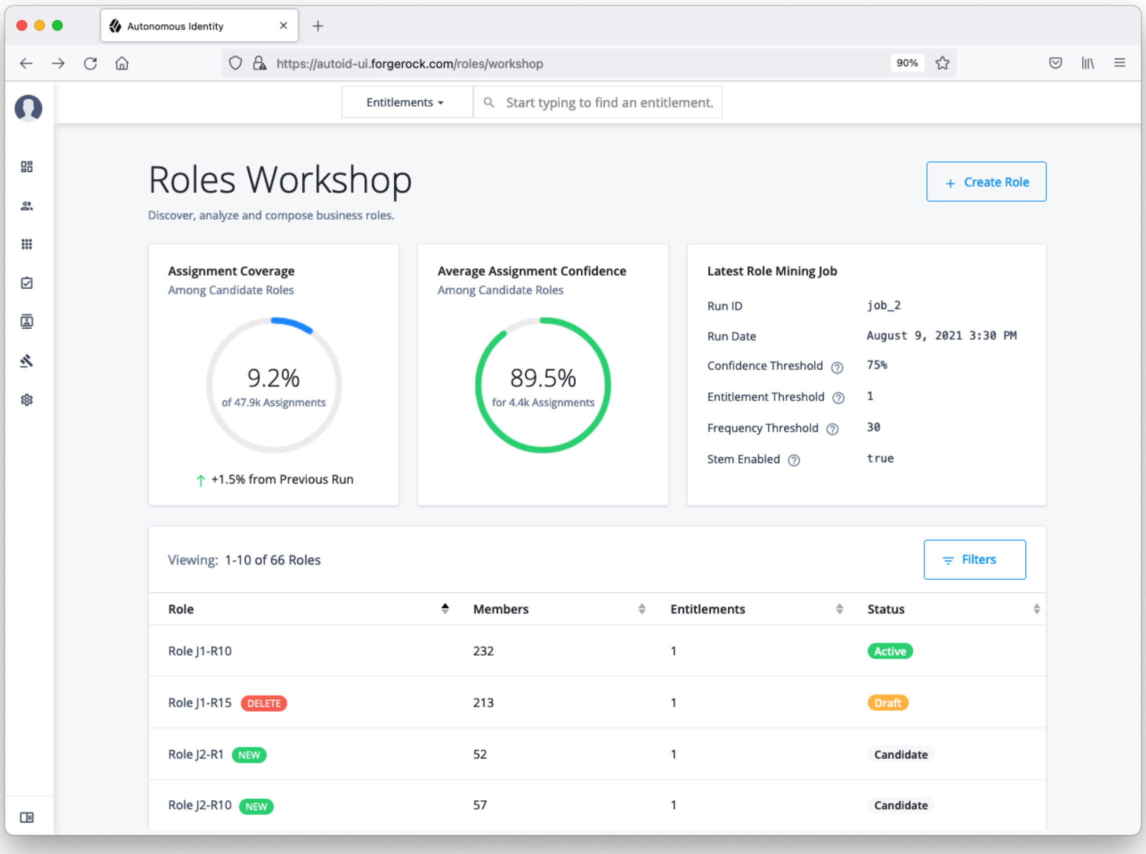
Roles Management Tasks

Autonomous Identity supports a powerful role analysis and management system that examines all roles and their assigned entitlements within your access landscape. The system uses machine learning rules and analytics thresholds to determine the confidence scores and driving factors for each role.

The central hub of the roles management system is the *Roles Workshop*. The Roles Workshop lets authorized users review, edit, and test new or existing roles before publishing them to production.

In a typical scenario, an administrator runs a role mining job as part of the analytics pipeline. During a role mining analytics run, Autonomous Identity discovers *candidates* for any new roles and displays them in the Roles Workshop with confidence scores and driving factors. Authorized users can review these roles, make edits to entitlements, and re-run the role mining analytics until the correct mix of entitlements meets your threshold objectives for given rules.

A month or two later, the administrator can re-run the role mining job to pick up changes in the entitlements landscape. Autonomous Identity re-analyzes each role and recommends updates to existing roles, such as the indication of stale data, or changes in the confidence scores. Based on these recommendations, the authorized user can revoke any active roles, make new configuration changes to a draft, and publish these draft roles to production.



Autonomous Identity
https://autoid-ui.forgerock.com/roles/workshop
90%
Entitlements
Start typing to find an entitlement.
+ Create Role
Filters

Roles Workshop

Discover, analyze and compose business roles.

Assignment Coverage
Among Candidate Roles
9.2%
of 47.9k Assignments
+1.5% from Previous Run

Average Assignment Confidence
Among Candidate Roles
89.5%
for 4.4k Assignments

Latest Role Mining Job

Run ID	job_2
Run Date	August 9, 2021 3:30 PM
Confidence Threshold	75%
Entitlement Threshold	1
Frequency Threshold	30
Stem Enabled	true

Viewing: 1-10 of 66 Roles

Role	Members	Entitlements	Status
Role J1-R10	232	1	Active
Role J1-R15 DELETE	213	1	Draft
Role J2-R1 NEW	52	1	Candidate
Role J2-R10 NEW	57	1	Candidate

Figure 2. Roles Workshop

Roles User Types

Autonomous Identity supports two types of user role types to manage roles with the system. You can assign these roles using the Manage Identities [TBD: Add link] function.

User Type	Description

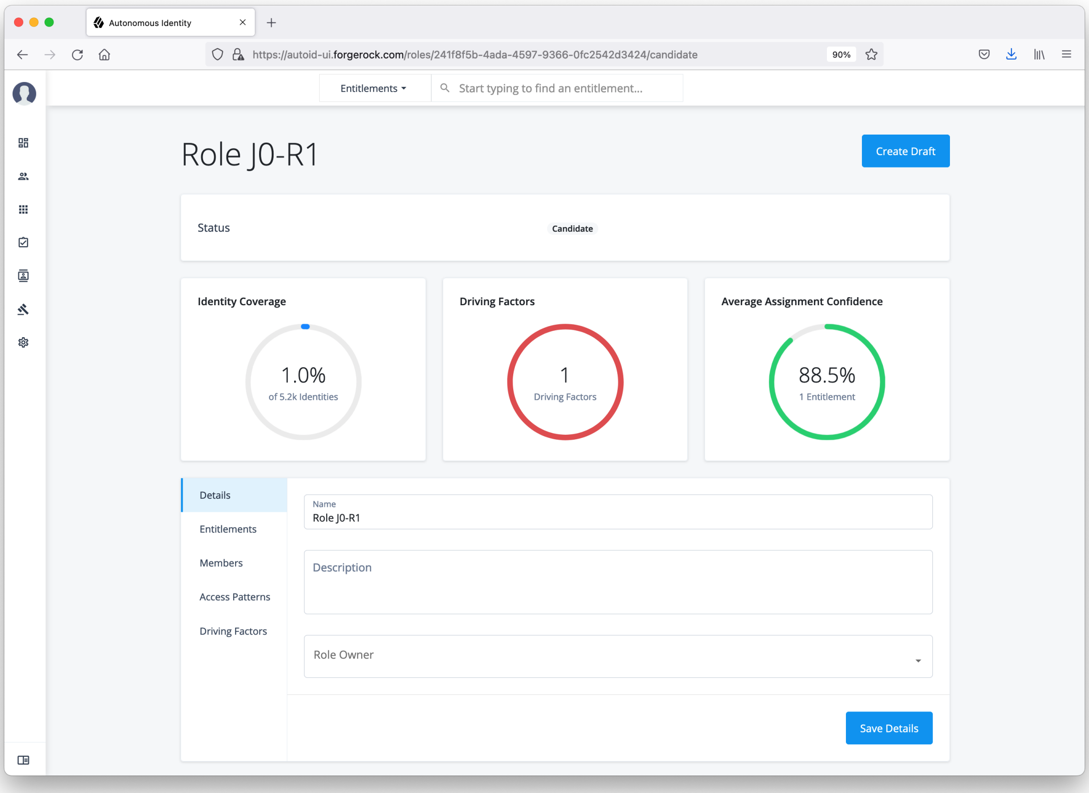
User Type	Description
Role Engineer	A user who has the ability to view, edit, delete, and export all roles. Role engineers can create drafts from mined candidates and assign role owners to the draft. They can also create custom roles for further evaluation and testing. Autonomous Identity administrators automatically are assigned this role.
Role Owner	A user who has the ability to view, edit, delete, and export active and draft roles assigned to them.

Roles Workflow

The Roles Workshop displays roles in three different states: candidate, draft, and active.

- **Candidate**. A *candidate* is a template role that is discovered through the latest role mining analytics job. After each role mining job, all newly *mined* roles are marked as new and as a *candidate*. Role engineers can review a candidate, assign a role owner to it, and approve the role as a *draft*. You cannot edit or remove a candidate role as is, but must create a draft from a candidate to change its details. Candidate roles are retained in the system for later adjustments and for the creation of additional new roles until the next role mining job, where all candidates are deleted and a new candidate pool is rebuilt.

  ▼ See an image.


Autonomous Identity
https://autoid-ui.forgerock.com/roles/241f8f5b-4ada-4597-9366-0fc2542d3424/candidate
90%
Entitlements
Start typing to find an entitlement...
Create Draft
Details
Entitlements
Members
Access Patterns
Driving Factors
Save Details

Role J0-R1

Status Candidate

Identity Coverage: 1.0% of 5.2k Identities

Driving Factors: 1 Driving Factors

Average Assignment Confidence: 88.5% 1 Entitlement

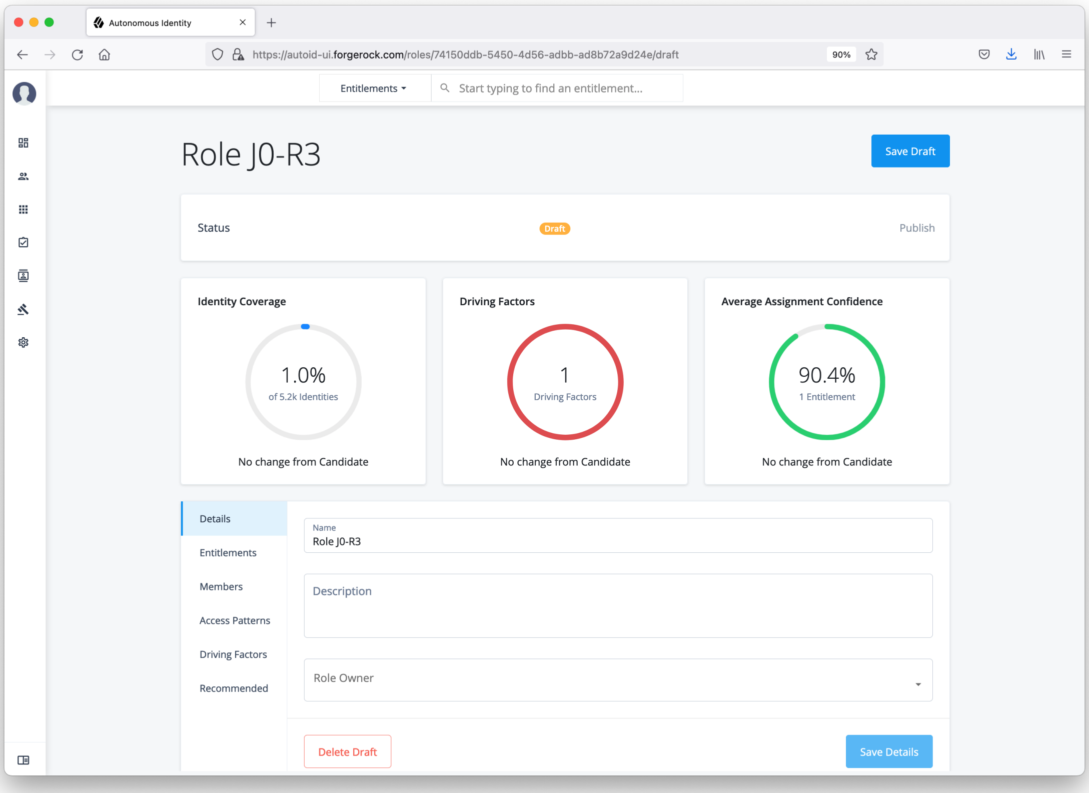
Name: Role J0-R1

Description

Role Owner

- **Draft**. A *draft* is a role that requires review and approval by an authorized approver to become active. Role engineers can re-run a role mining job to pick up the latest changes in the access landscape. The Roles Workshop displays the latest confidence scores, driving factors, and a *Recommended* section that shows a suggested course of action for the role. Also, when you create a custom role, Autonomous Identity saves the role in draft status. You can edit the draft, make another custom role from it, publish the role for production, or delete the draft.

  ▼ See an image.



Role J0-R3

Status: Draft — Publish

Identity Coverage: 1.0% of 5.2k Identities — No change from Candidate

Driving Factors: 1 Driving Factors — No change from Candidate

Average Assignment Confidence: 90.4% 1 Entitlement — No change from Candidate

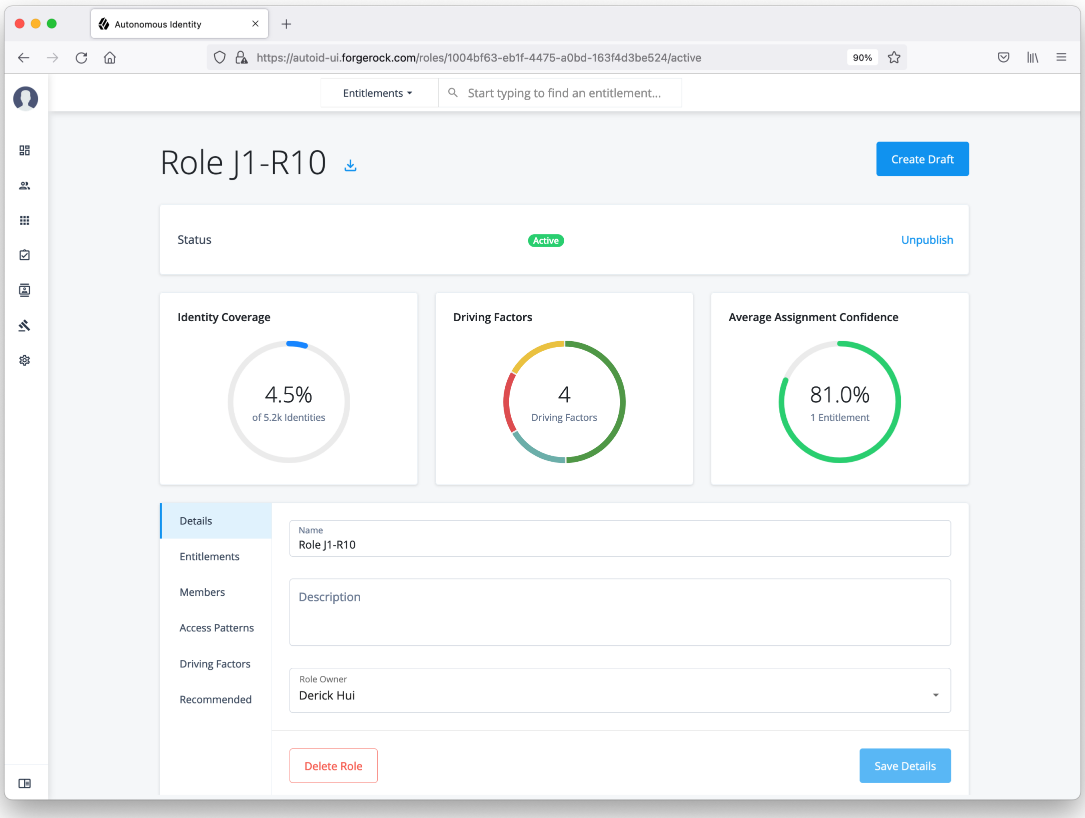
Name: Role J0-R3

Description

Role Owner

- **Active**. Once a draft has been approved, the role is *active* for production use. The role appears with an *Active* status and also appears on the Roles Catalog page. The Recommended section presents suggested updates for each role analyzed in the latest mining job. You can create a draft from this active role or unpublish it back to *draft* status.

  ▼ See an image.



Role J1-R10

Status: Active

Identity Coverage: 4.5% of 5.2k Identities

Driving Factors: 4 Driving Factors

Average Assignment Confidence: 81.0% 1 Entitlement

Name: Role J1-R10

Description

Role Owner: Derick Hui

Role-Mined vs Custom Roles

You can originate roles in two different ways: role-mined and custom.

Role-mined roles are discovered through Autonomous Identity’s machine learning process. The result of the role mining run is a generated list of candidates that a role engineer can edit and review on the Roles Workshop page.

Custom roles are created through different workflows:

- **From Scratch**. You can create a totally new role on the Roles Workshop using the Create Role function.
- **From Existing**. You can create a custom role from an existing draft or active role, which can occur in the following scenarios:
  - When you run a new role-mining job and an existing candidate role is deleted.
  - When you have a draft or an active role that is associated with a deleted candidate, and the recommendation is to delete the draft/active role as role mining determines that it is stale or no longer relevant.

NOTE

Custom roles do not have recommendations. Recommendations are based on the difference between a mined role and its candidate.

Roles Workshop Tasks

The following procedures presents the typical Roles Workshop tasks:

Create a Custom Role

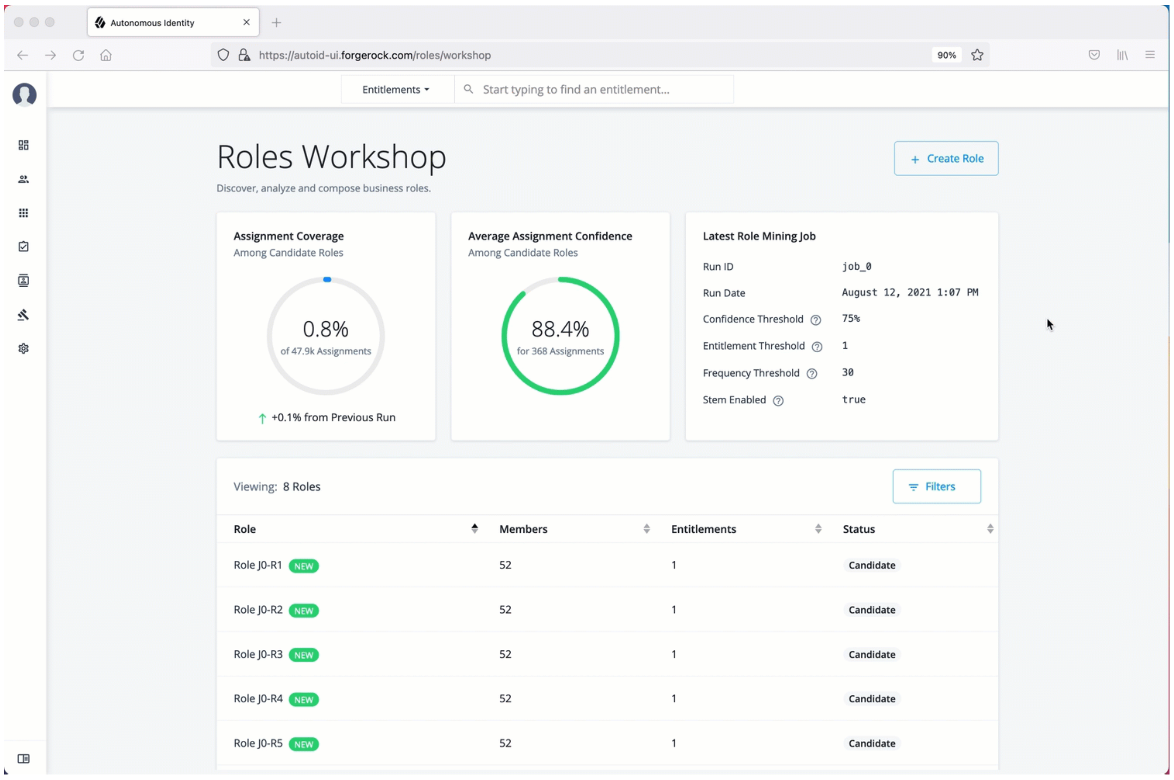
Autonomous Identity lets authorized users create new custom role drafts on the Roles Workshop.

Create a Custom Role:

1. On the Roles Workshop, click **Create Role**. Autonomous Identity creates a random label for the role at the top of the page.
2. Click **Details**. Enter a name, description, and select the Role Owner from the list of authorized users on the drop-down menu.
3. Click **Entitlements**. On the page, click **Add Entitlements**. You can search by entitlement name or application.
4. Click **Access Patterns**. On the page, click **Add Access Pattern**. Select a User Attribute, and enter an associated value.
5. Review your entries. When ready, click **Save Draft**.

   The role will be saved in the Roles Workshop as a draft. An authorized user must review and approve the role to activate it in production.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/roles/workshop
90%
Entitlements
Start typing to find an entitlement...
+ Create Role
Filters

Roles Workshop

Discover, analyze and compose business roles.

Assignment Coverage
Among Candidate Roles
0.8%
of 47.9k Assignments
+0.1% from Previous Run

Average Assignment Confidence
Among Candidate Roles
88.4%
for 368 Assignments

Latest Role Mining Job

Run ID	job_0
Run Date	August 12, 2021 1:07 PM
Confidence Threshold	75%
Entitlement Threshold	1
Frequency Threshold	30
Stem Enabled	true

Viewing: 8 Roles

Role	Members	Entitlements	Status
Role J0-R1 NEW	52	1	Candidate
Role J0-R2 NEW	52	1	Candidate
Role J0-R3 NEW	52	1	Candidate
Role J0-R4 NEW	52	1	Candidate
Role J0-R5 NEW	52	1	Candidate

WARNING

WARNING

Do not create a custom role before running an initial analytics pipeline job. Doing so can result in the role mining job failing.

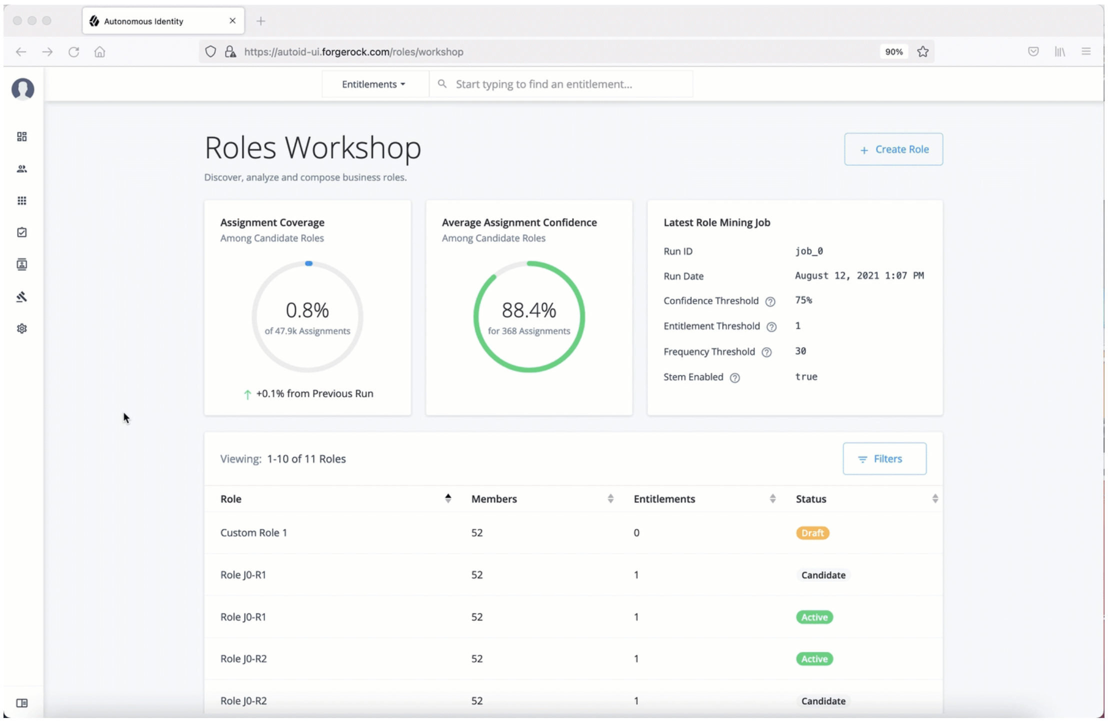
Search Roles Using the Filter

Many companies have a large number of roles within their system. The Roles Workshop provides a useful filter to locate specific roles.

Search Roles using the filter:

1. On the Roles Workshop, click **Filters**.
2. Enter any of the following data:
   a. **Name**. Enter a role name.
   b. **Status**. Select `Active`, `Draft`, or `Candidate`.
   c. **Application**. Enter an application with which the role is associated.
   d. **Role Owner**. Enter a role owner.
   e. **Origin**. Select `Custom` or `Role Mining`.
3. Click **Done**.

▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/roles/workshop
90%
Entitlements
Start typing to find an entitlement...
+ Create Role
Filters

Roles Workshop

Discover, analyze and compose business roles.

Assignment Coverage
Among Candidate Roles
0.8%
of 47.9k Assignments
+0.1% from Previous Run

Average Assignment Confidence
Among Candidate Roles
88.4%
for 368 Assignments

Latest Role Mining Job

Run ID	job_0
Run Date	August 12, 2021 1:07 PM
Confidence Threshold	75%
Entitlement Threshold	1
Frequency Threshold	30
Stem Enabled	true

Viewing: 1-10 of 11 Roles

Role	Members	Entitlements	Status
Custom Role 1	52	0	Draft
Role J0-R1	52	1	Candidate
Role J0-R1	52	1	Active
Role J0-R2	52	1	Active
Role J0-R2	52	1	Candidate

Create a New Draft

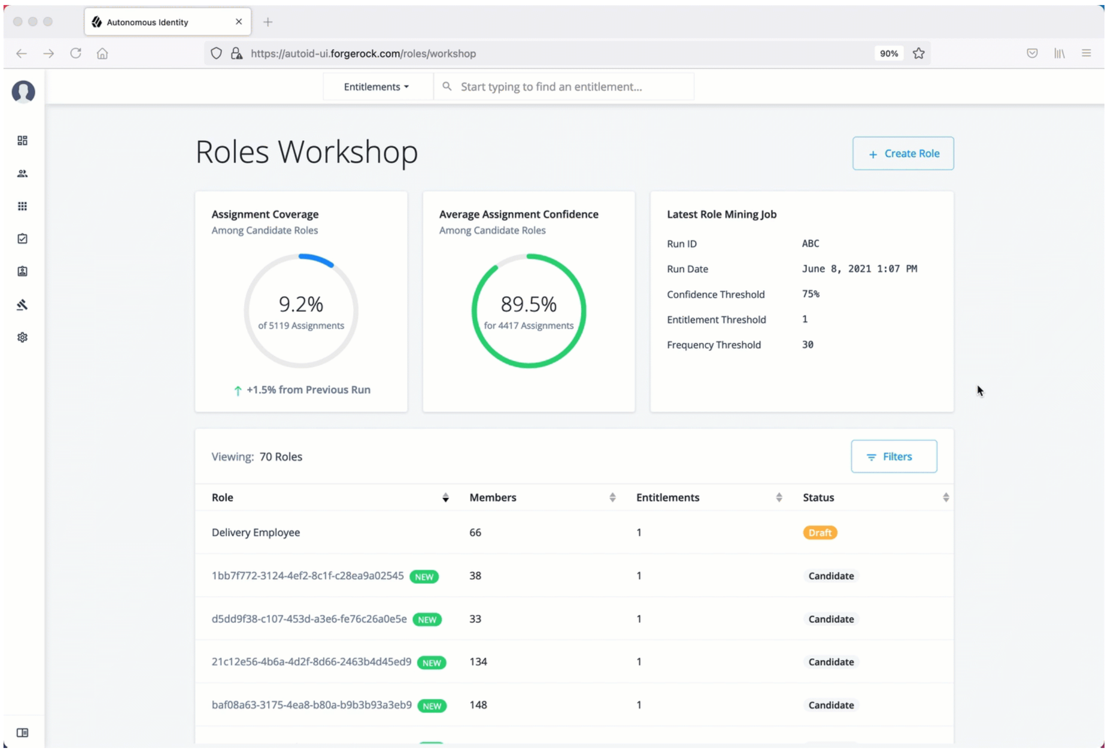
Autonomous Identity lets authorized users review role-mined candidates on the Roles Workshop. If the role engineer and role owner approves the candidate, the role goes to draft state.

Create a New Draft:

1. On the Roles Workshop, review the list of candidates. Click a candidate role.
2. Change the role name, and then add a description.
3. Add an authorized user as a role owner. All drafts or active roles must have a role owner assigned to it.

   Note: The role owner must have the Role Owner role assigned to them. Administrators can add them on the Manage Identities page, or make a request to your adminstrator.
4. Click **Entitlements** to review the entitlement name, application if assigned, and the average confidence score.
5. Click **Members** to review the members or users associated with this role.
6. Click **Access Patterns** to review the access pattern for this role.
7. Click **Driving Factors** to review the list of attributes, driving factors, frequency, and percentage of members with the role.
8. Click **Recommended** to review any suggested action on the role. You must run the role mining job several times to pick up new changes in your access landscape. Initial role mining jobs will not have recommendations other than Create Draft.
9. Click **Create Draft** when all entries are accepted.

   ▼ *See it in action*


Autonomous Identity
https://autoid-ui.forgerock.com/roles/workshop
90%
Entitlements
Start typing to find an entitlement...
+ Create Role
Filters

Roles Workshop

Assignment Coverage
Among Candidate Roles
9.2%
of 5119 Assignments
+1.5% from Previous Run

Average Assignment Confidence
Among Candidate Roles
89.5%
for 4417 Assignments

Latest Role Mining Job

Run ID	ABC
Run Date	June 8, 2021 1:07 PM
Confidence Threshold	75%
Entitlement Threshold	1
Frequency Threshold	30

Viewing: 70 Roles

Role	Members	Entitlements	Status
Delivery Employee	66	1	Draft
1bb7f772-3124-4ef2-8c1f-c28ea9a02545 NEW	38	1	Candidate
d5dd9f38-c107-453d-a3e6-fe76c26a0e5e NEW	33	1	Candidate
21c12e56-4b6a-4d2f-8d66-2463b4d45ed9 NEW	134	1	Candidate
baf08a63-3175-4ea8-b80a-b9b3b93a3eb9 NEW	148	1	Candidate

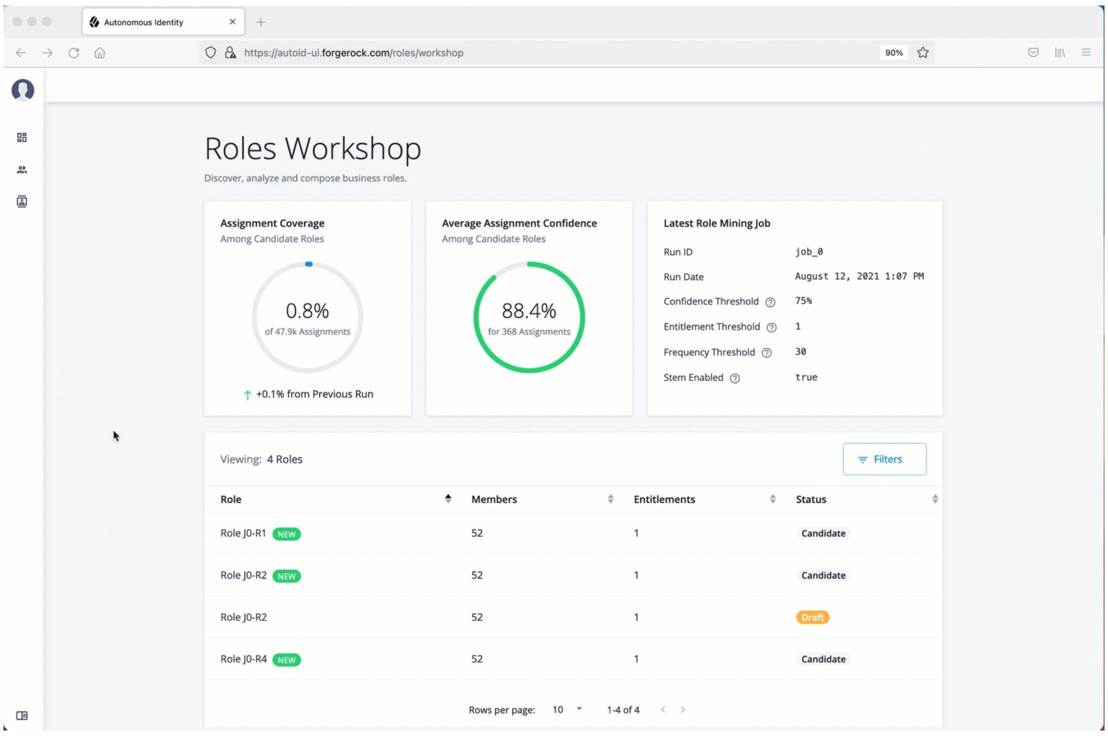
Publish a Role

Autonomous Identity lets role engineers and role owners approves a draft and push it into production. The Roles Workshop displays the role in an *active* state.

Publish a Draft:

1. On the Roles Workshop, review the list of candidates. Click a draft role.
2. Review the role details.
3. Click **Publish**.

▼ *See it in action*



Roles Workshop

Discover, analyze and compose business roles.

Assignment Coverage
Among Candidate Roles
0.8%
of 47.9k Assignments
↑ +0.1% from Previous Run

Average Assignment Confidence
Among Candidate Roles
88.4%
for 368 Assignments

Latest Role Mining Job

Run ID	job_0
Run Date	August 12, 2021 1:07 PM
Confidence Threshold	75%
Entitlement Threshold	1
Frequency Threshold	30
Stem Enabled	true

Viewing: 4 Roles

Filters

Role	Members	Entitlements	Status
Role J0-R1 NEW	52	1	Candidate
Role J0-R2 NEW	52	1	Candidate
Role J0-R2	52	1	Draft
Role J0-R4 NEW	52	1	Candidate

Rows per page: 10 1-4 of 4

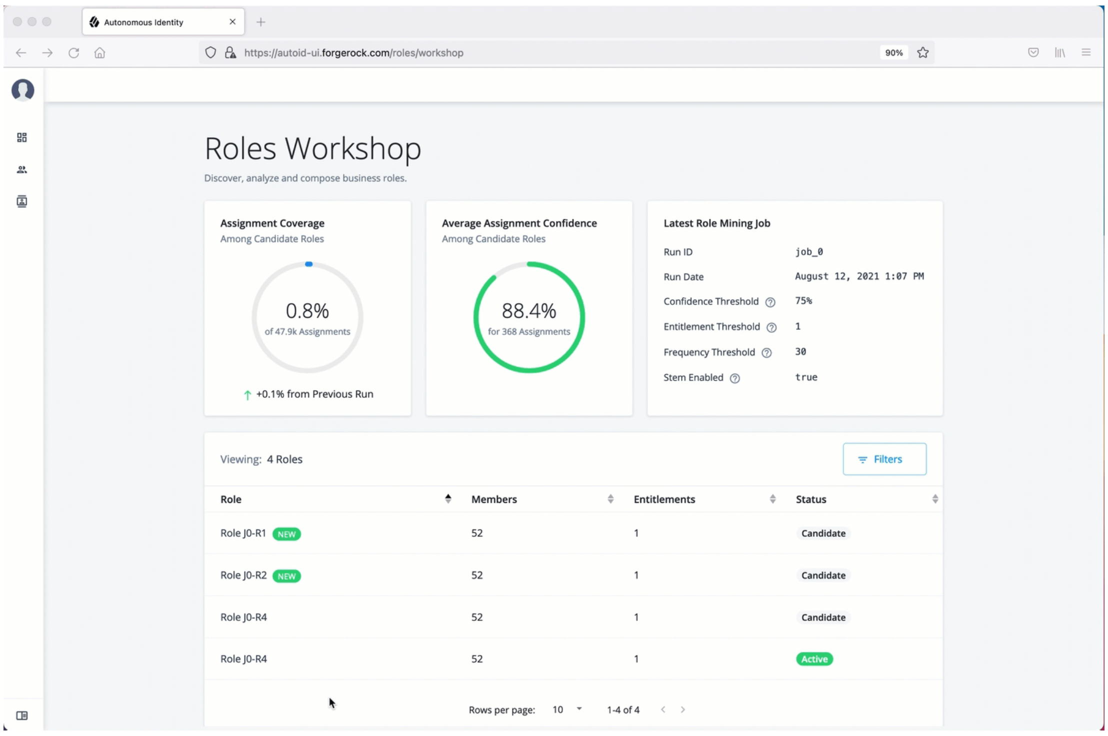
Delete a Role

Autonomous Identity lets role engineers and role owners delete a draft or an active role.

Delete a Role:

1. On the Roles Workshop, review the list of candidates. Click a draft or active role.
2. Review the role details.
3. Click **Delete Draft**.

▼ *See it in action*



Roles Workshop

Discover, analyze and compose business roles.

Assignment Coverage
Among Candidate Roles
0.8%
of 47.9k Assignments
↑ +0.1% from Previous Run

Average Assignment Confidence
Among Candidate Roles
88.4%
for 368 Assignments

Latest Role Mining Job

Run ID	job_0
Run Date	August 12, 2021 1:07 PM
Confidence Threshold	75%
Entitlement Threshold	1
Frequency Threshold	30
Stem Enabled	true

Viewing: 4 Roles — Filters

Role	Members	Entitlements	Status
Role J0-R1 NEW	52	1	Candidate
Role J0-R2 NEW	52	1	Candidate
Role J0-R4	52	1	Candidate
Role J0-R4	52	1	Active

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Roles Catalog Tasks

The Roles Catalog lists all active roles within your system. Role engineers can export any role as a json file, edit, unpublish, and delete the roles if necessary. Role owners can carry out the same tasks on only roles assigned to them.

Export a Role

Export a Role to JSON:

1. On the UI Dashboard, click **Roles**, and then click **Roles Catalog**.
2. Click the role(s) to export.
3. Click **Export** Selected. Autonomous Identity sends a JSON file to your local drive.

Filter Roles in the Catalog

Search the Catalog using the filter:

1. On the UI Dashboard, click **Roles**, and then click **Roles Catalog**.
2. Click **Filters** to view specific roles in your catalog.
3. On the Filters menu, enter and select from the following drop-down lists:
    a. **Name**. Enter a role name.

   b. **Status**. Select `Active`, `Draft`, or `Candidate`.

   c. **Application**. Enter an application with which the role is associated.

   d. **Role Owner**. Enter a role owner.

   e. **Origin**. Select `Custom` or `Role Mining`.

4. Click **Done**.

Was this helpful? 👍 👎