Integrate OpenStack Identity with external user management services

Use Active Directory or Red Hat Identity Management as an external authentication back end
Red Hat OpenStack Platform 17.0-Beta Integrate OpenStack Identity with external user management services

Use Active Directory or Red Hat Identity Management as an external authentication back end

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Abstract

Integrate the OpenStack Identity (keystone) service with Microsoft Active Directory Domain Service (AD DS), Red Hat Identity Management (IdM), and LDAP.
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You can integrate OpenStack Identity (keystone) with Microsoft Active Directory Domain Service (AD DS). Identity Service authenticates certain Active Directory Domain Services (AD DS) users but retains authorization settings and critical service accounts in the Identity Service database. As a result, Identity Service has read-only access to AD DS for user account authentication and continues to manage privileges assigned to authenticated accounts.

By integrating the Identity service with AD DS, you allow AD DS users to authenticate to Red Hat OpenStack Platform (RHOSP) to access resources. RHOSP service accounts, such as the Identity Service and the Image service, and authorization management remain in the Identity Service database. Permissions and roles are assigned to the AD DS accounts using Identity Service management tools.

The process to integrate OpenStack Identity with Active Directory includes the following stages:

1. Configure Active Directory credentials and export the LDAPS certificate
2. Install and configure the LDAPS certificate in OpenStack
3. Configure director to use one or more LDAP backends
4. Configure Controller nodes to access the Active Directory backend
5. Configure Active Directory user or group access to OpenStack projects
6. Verify that the domain and user lists are created correctly
7. Optional: Create credential files for non-admin users.

1.1. CONFIGURING ACTIVE DIRECTORY CREDENTIALS

To configure Active Directory Domain Service (AD DS) to integrate with OpenStack Identity, set up an LDAP account for Identity service to use, create a user group for Red Hat OpenStack users, and export the LDAPS certificate public key to use in the Red Hat OpenStack Platform deployment.

Prerequisites

- Active Directory Domain Services is configured and operational.
- Red Hat OpenStack Platform is configured and operational.
- DNS name resolution is fully functional and all hosts are registered appropriately.
- AD DS authentication traffic is encrypted with LDAPS, using port 636.
- Recommended: Implement AD DS with a high availability or load balancing solution to avoid a single point of failure.

Procedure

Perform these steps on the Active Directory server.

1. Create the LDAP lookup account. This account is used by Identity Service to query the AD DS LDAP service:
PS C:\> New-ADUser -SamAccountName svc-ldap -Name "svc-ldap" -GivenName LDAP -Surname Lookups -UserPrincipalName svc-ldap@lab.local -Enabled $false -PasswordNeverExpires $true -Path 'OU=labUsers,DC=lab,DC=local'

2. Set a password for this account, and then enable it. You will be prompted to specify a password that complies with your AD domain’s complexity requirements:

PS C:\> Set-ADAccountPassword svc-ldap -PassThru | Enable-ADAccount

3. Create a group for RHOSP users, called grp-openstack. Only members of this group can have permissions assigned in OpenStack Identity.

PS C:\> NEW-ADGroup -name "grp-openstack" -groupscope Global -path "OU=labUsers,DC=lab,DC=local"

4. Create the Project groups:

PS C:\> NEW-ADGroup -name "grp-openstack-demo" -groupscope Global -path "OU=labUsers,DC=lab,DC=local"
PS C:\> NEW-ADGroup -name "grp-openstack-admin" -groupscope Global -path "OU=labUsers,DC=lab,DC=local"

5. Add the svc-ldap user to the grp-openstack group:

PS C:\> ADD-ADGroupMember "grp-openstack" -members "svc-ldap"

6. From an AD Domain Controller, use a Certificates MMC to export your LDAPS certificate’s public key (not the private key) as a DER-encoded x509 .cer file. Send this file to the RHOSP administrators.

7. Retrieve the NetBIOS name of your AD DS domain.

PS C:\> Get-ADDomain | select NetBIOSName
NetBIOSName
        
LAB

Send this value to the RHOSP administrators.

1.2. INSTALLING THE ACTIVE DIRECTORY LDAPS CERTIFICATE

OpenStack Identity (keystone) uses LDAPS queries to validate user accounts. To encrypt this traffic, keystone uses the certificate file defined by keystone.conf. To configure the LDAPS certificate, convert the public key received from Active Directory into the .crt format and copy the certificate to a location where keystone will be able to reference it.

NOTE

When using multiple domains for LDAP authentication, you might receive various errors, such as Unable to retrieve authorized projects, or Peer’s Certificate issuer is not recognized. This can arise if keystone uses the incorrect certificate for a certain domain. As a workaround, merge all of the LDAPS public keys into a single .crt bundle, and configure all of your keystone domains to use this file.
Prerequisites

- Active Directory credentials are configured.
- LDAPS certificate is exported from Active Directory.

Procedure

1. Copy the LDAPS public key to the node running OpenStack Identity and convert the `.cer` to `.crt`. This example uses a source certificate file named `addc.lab.local.cer`:

   ```
   # openssl x509 -inform der -in addc.lab.local.cer -out addc.lab.local.crt
   # cp addc.lab.local.crt /etc/pki/ca-trust/source/anchors
   ```

2. Optional: If you need to run diagnostic commands, such as `ldapsearch`, you also need to add the certificate to the RHEL certificate store:

   a. Convert the `.cer` to `.pem`. This example uses a source certificate file named `addc.lab.local.cer`:

      ```
      # openssl x509 -inform der -in addc.lab.local.cer -out addc.lab.local.pem
      ```

   b. Install the `.pem` on the Controller node. For example, in Red Hat Enterprise Linux:

      ```
      # cp addc.lab.local.pem /etc/pki/ca-trust/source/anchors/
      # update-ca-trust
      ```

1.3. CONFIGURING DIRECTOR TO USE DOMAIN-SPECIFIC LDAP BACKENDS

To configure director to use one or more LDAP backends, set the `KeystoneLDAPDomainEnable` flag to `true` in your heat templates, and set up environment files with the information about each LDAP backend. Director then uses a separate LDAP backend for each keystone domain.

**NOTE**

The default directory for domain configuration files is set to `/etc/keystone/domains/`. You can override this by setting the required path with the `keystone::domain_config_directory` hiera key and adding it as an `ExtraConfig` parameter within an environment file.

Procedure

1. In the heat template for your deployment, set the `KeystoneLDAPDomainEnable` flag to `true`. This configures the `domain_specific_drivers_enabled` option in keystone within the `identity` configuration group.

2. Add a specification of the LDAP backend configuration by setting the `KeystoneLDAPBackendConfigs` parameter in `tripleo-heat-templates`, where you can then specify your required LDAP options.

3. Create a copy of the `keystone_domain_specific_ldap_backend.yaml` environment file:
$ cp /usr/share/openstack-tripleo-heat-templates/environments/services/keystone_domain_specific_ldap_backend.yaml /home/stack/templates/

4. Edit the `/home/stack/templates/keystone_domain_specific_ldap_backend.yaml` environment file and set the values to suit your deployment. For example, this parameter create a LDAP configuration for a keystone domain named `testdomain`:

```yaml
parameter_defaults:
  KeystoneLDAPDomainEnable: true
  KeystoneLDAPBackendConfigs:
    testdomain:
      url: ldaps://192.0.2.250
      user: cn=openstack,ou=Users,dc=director,dc=example,dc=com
      password: RedactedComplexPassword
      suffix: dc=director,dc=example,dc=com
      user_tree_dn: ou=Users,dc=director,dc=example,dc=com
      user_filter: "(memberOf=cn=OSuser,ou=Groups,dc=director,dc=example,dc=com)"
      user_objectclass: person
      user_id_attribute: cn
```

**NOTE**

The `keystone_domain_specific_ldap_backend.yaml` environment file contains the following deprecated write parameters:

- `user_allow_create`
- `user_allow_update`
- `user_allow_delete`

The values for these parameters have no effect on the deployment, and can be safely removed.

5. Optional: Add more domains to the environment file. For example:

```yaml
KeystoneLDAPBackendConfigs:
  domain1:
    url: ldaps://domain1.example.com
    user: cn=openstack,ou=Users,dc=director,dc=example,dc=com
    password: RedactedComplexPassword
  ...
  domain2:
    url: ldaps://domain2.example.com
    user: cn=openstack,ou=Users,dc=director,dc=example,dc=com
    password: RedactedComplexPassword
  ...
```

This results in two domains named `domain1` and `domain2`; each will have a different LDAP domain with its own configuration.
1.4. GRANTING THE ADMIN USER ACCESS TO THE OPENSTACK IDENTITY DOMAIN

To allow the admin user to access the OpenStack Identity (keystone) domain and see the Domain tab, get the ID of the domain and the admin user, and then assign the admin role to the user in the domain.

NOTE

This does not grant the OpenStack admin account any permissions on the external service domain. In this case, the term domain refers to OpenStack’s usage of the keystone domain.

Procedure

This procedure uses the LAB domain. Replace the domain name with the actual name of the domain that you are configuring.

1. Get the ID of the LAB domain:

   $ openstack domain show LAB
   +---------+----------------------------------|
   | Field   | Value                            |
   +---------+----------------------------------|
   | enabled | True                             |
   | id      | 6800b0496429431ab1c4efbb3fe810d4 |
   | name    | LAB                              |
   +---------+----------------------------------|

2. Get the ID of the admin user from the default domain:

   $ openstack user list --domain default | grep admin
   | 3d75388d351846c6a880e53b2508172a | admin      |

3. Get the ID of the admin role:

   $ openstack role list

The output depends on the external service you are integrating with:

- Active Directory Domain Service (AD DS):

  +-----------------+-----------------|
  | ID              | Name            |
  +-----------------+-----------------|
  | 01d92614cd224a589bd3b171af5488 | admin           |
  | 034e4620ed3d45969dfe8992af001514 | member          |
  | 0aa377a807df4149b0a8c69b9560b106 | ResellerAdmin   |
  | 9369f2b754443f199c6d6b96479b1fa | heat_stack_user |
  | clea5760d9c948e7b362abc1d06e557f | reader          |
  | d5cb454599e44b47aaa8821df4e11af1 | swiftoperator   |
  | ef3d3f510a474d6c860b4098ad658a29 | service         |
  +-----------------+-----------------|

- Red Hat Identity Manager (IdM):
4. Use the domain and admin IDs to construct the command that adds the admin user to the admin role of the keystone LAB domain:

```
# openstack role add --domain 6800b0496429431ab1c4efbb3fe810d4 --user 3d75388d351846c6a880e53b2508172a 785c70b150ee4c778fe4de088070b4cf
```

## 1.5. GRANTING EXTERNAL GROUPS ACCESS TO RED HAT OPENSTACK PLATFORM PROJECTS

To grant multiple authenticated users access to Red Hat OpenStack Platform (RHOSP) resources, you can authorize certain groups from the external user management service to grant access to RHOSP projects, instead of requiring OpenStack administrators to manually allocate each user to a role in a project. As a result, all members of these groups can access pre-determined projects.

### Prerequisites

- Ensure that the external service administrator completed the following steps:
  - Creating a group named grp-openstack-admin.
  - Creating a group named grp-openstack-demo.
  - Adding your RHOSP users to one of these groups as needed.
  - Adding your users to the grp-openstack group.
- Create the OpenStack Identity domain. This procedure uses the LAB domain.
- Create or choose a RHOSP project. This procedure uses a project called demo that was created with the openstack project create --domain default --description "Demo Project" demo command.

### Procedure

1. Retrieve a list of user groups from the OpenStack Identity domain:

```
# openstack group list --domain LAB
```

The command output depends on the external user management service that you are integrating with:

- Active Directory Domain Service (AD DS):

```
+----------------+-------------------+
| ID             | Name              |
| 544d48aaffde48f1b3c31a52c35f01f9 | SwiftOperator |
| 6d005d783bf0436ee882c55c62457d33d | ResellerAdmin |
| 785c70b150ee4c778fe4de088070b4cf | admin |
| 9fe2ff9ee4384b1894a90878d3e92bab | _member_ |
+----------------+-------------------+
```

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2. Retrieve a list of roles:

```bash
# openstack role list
```

The command output depends on the external user management service that you are integrating with:

- **Active Directory Domain Service (AD DS):**

  ```
  +----------------+-----------------+
  | ID             | Name            |
  +----------------+-----------------+
  | 01d92614cd224a589bdf3b171af35488 | admin           |
  | 034e462043d3d45696dfe8992af001514 | member          |
  | 0aa377a807df4149bf0a869b9560b106 | ResellerAdmin   |
  | 9369f2bf754443f199c6d6b96479b1fa | heat_stack_user |
  | cfead76d9c948e7b362abc1d9d66557f | reader          |
  | d5cb45559e44b47aaa8821df4e11af1 | swiftoperator   |
  | ef3d3f510a474d6c860b4098ad658a29 | service         |
  +----------------+-----------------+
  ```

- **Red Hat Identity Manager (IdM):**

  ```
  +----------------+-----------------+
  | ID             | Name            |
  +----------------+-----------------+
  | 0969957bce5e4f678ca6cef00e1abf8a | ResellerAdmin   |
  | 1fb3cb05b0a4f68e8196aaaecc2b76b7 | admin           |
  | 9fe2ff9ee4384b1894a90878d3e92bab | _member_        |
  | d3570730eb4b4780a7fed97eba197e1b | SwiftOperator   |
  +----------------+-----------------+
  ```
3. Grant the user groups access to RHOSP projects by adding them to one or more of these roles. For example, if you want users in the \texttt{grp-openstack-demo} group to be general users of the \texttt{demo} project, you must add the group to the _member_ or \_member\_ role, depending on the external service that you are integrating with:

- Active Directory Domain Service (AD DS):

  \begin{verbatim}
  # openstack role add --project demo --group
d971bb3bd5e64a454cbd0cc7af4c0773e78d61b5f81321809f8323216938cae8 member
  \end{verbatim}

- Red Hat Identity Manager (IdM):

  $ openstack role add --project demo --group
d971bb3bd5e64a454cbd0cc7af4c0773e78d61b5f81321809f8323216938cae8
  \_member\_

Result

Members of \texttt{grp-openstack-demo} can log in to the dashboard by entering their username and password and entering \texttt{LAB} in the Domain field:

![Dashboard login](image)

\textbf{NOTE}

If users receive the error \texttt{Error: Unable to retrieve container list.}, and expect to be able to manage containers, then they must be added to the \texttt{SwiftOperator} role.

Additional resources

- Section 1.6, “Granting external users access to Red Hat OpenStack Platform projects”

\textbf{1.6. GRANTING EXTERNAL USERS ACCESS TO RED HAT OPENSTACK PLATFORM PROJECTS}

To grant specific authenticated users from the \texttt{grp-openstack} group access to OpenStack resources, you can grant these users direct access to Red Hat OpenStack Platform (RHOSP) projects. Use this process in cases where you want to grant access to individual users instead of granting access to groups.
Prerequisites

- Ensure that the external service administrator completed the following steps:
  - Adding your RHOSP users to the `grp-openstack` group.
  - Creating the OpenStack Identity domain. This procedure uses the `LAB` domain.
- Create or choose a RHOSP project. This procedure uses a project called `demo` that was created with the `openstack project create --domain default --description "Demo Project" demo` command.

Procedure

1. Retrieve a list of users from the OpenStack Identity domain:

   ```bash
   # openstack user list --domain LAB
   +------------------------------------------------------------------+----------------+
   | ID                                                               | Name           |
   +------------------------------------------------------------------+----------------+
   | 1f24ec1f11aeb90520079c29f70afa060d22e2ce92b2eba7784c841ac418091e | user1          |
   | 12c062faddc58b06543449fd6f10ce0eb9259537c93b4112245868693a38bf1 | user2          |
   | afaf48031eb54c3e44e4cb0353f5b612084033ff70f63c22873d181fdae2e73c | user3          |
   | e47fc21dcf0d9716d2663766023e2d8dc15a6d9b01453854a898cabb2396826e | user4          |
   +------------------------------------------------------------------+----------------+
   ```

2. Retrieve a list of roles:

   ```bash
   # openstack role list
   ```

   The command output depends on the external user management service that you are integrating with:

   - Active Directory Domain Service (AD DS):

     ```bash
     +----------------------------------+-----------------+
     | ID                               | Name            |
     +----------------------------------+-----------------+
     | 01d92614cd224a589bdf3b171af5488 | admin           |
     | 034e4620ed3d45969de8992af001514 | member          |
     | 0a377a807d4149b0a8c69b9560b106 | ResellerAdmin   |
     | 9369f2bf754443f199c6d6b96479b11a | heat_stack_user |
     | cfe5760d9c948e7b362abc1d06e557f | reader          |
     | d5db4545ff4e4bb47aaa821df4e11af1 | swiftoperator   |
     | ef3d3f510a474d6c860b4098ad658a29 | service         |
     +----------------------------------+-----------------+
   ```

   - Red Hat Identity Manager (IdM):

     ```bash
     +----------------------------------+-----------------+
     | ID                               | Name            |
     +----------------------------------+-----------------+
     | 0969957bce5e4f678ca6ce00e1ab8a   | ResellerAdmin   |
     | 1fcb3c9b50aa46ee8196aaaecc2b76b7 | admin           |
     +----------------------------------+-----------------+
     ```
3. Grant users access to RHOSP projects by adding them to one or more of these roles. For example, if you want user1 to be a general user of the demo project, you add them to the member or _member_ role, depending on the external service that you are integrating with:

- Active Directory Domain Service (AD DS):
  ```
  # openstack role add --project demo --user 1f24ec1f11aeb90520079c29f70afa060d22e2ce92b2eba7784c841ac418091e member
  ```

- Red Hat Identity Manager (IdM):
  ```
  # openstack role add --project demo --user 1f24ec1f11aeb90520079c29f70afa060d22e2ce92b2eba7784c841ac418091e _member_
  ```

4. If you want user1 to be an administrative user of the demo project, add the user to the admin role:

  ```
  # openstack role add --project demo --user 1f24ec1f11aeb90520079c29f70afa060d22e2ce92b2eba7784c841ac418091e admin
  ```

**Result**

The user1 user is able to log in to the dashboard by entering their external username and password and entering LAB in the Domain field:

![Dashboard Login](image)

**NOTE**

If users receive the error **Error: Unable to retrieve container list**, and expect to be able to manage containers, then they must be added to the SwiftOperator role.

**Additional resources**
1.7. VIEWING THE LIST OF OPENSTACK IDENTITY DOMAINS AND USERS

Use the `openstack domain list` command to list the available entries. Configuring multiple domains in Identity Service enables a new Domain field in the dashboard login page. Users are expected to enter the domain that matches their login credentials.

**IMPORTANT**

After you complete the integration, you need to decide whether to create new projects in the Default domain or in newly created keystone domains. You must consider your workflow and how you administer user accounts. If possible, use the Default domain as an internal domain to manage service accounts and the admin project, and keep your external users in a separate domain.

In this example, external accounts need to specify the LAB domain. The built-in keystone accounts, such as admin, must specify Default as their domain.

**Procedure**

1. Show the list of domains:

   ```
   # openstack domain list
   +----------------------------------+---------+---------+-------------------------------------------------------
   | ID                               | Name    | Enabled | Description                                                          |
   +----------------------------------+---------+---------+-------------------------------------------------------
   | 6800b0496429431ab1c4efbb3fe810d4 | LAB     | True    |                                                     |
   | default                          | Default | True    | Owns users and projects available on Identity API v2. |
   +----------------------------------+---------+---------+-------------------------------------------------------
   
   # openstack user list --domain LAB
   You can also append --domain Default to show the built-in keystone accounts:
   
   # openstack user list --domain Default
   ```

1.8. CREATING A CREDENTIALS FILE FOR A NON-ADMIN USER

After you configure users and domains for OpenStack Identity, you might need to create a credentials file for a non-admin user.

**Procedure**
Create a credentials (RC) file for a non-admin user. This example uses the user1 user in the file.

```bash
$ cat overcloudrc-v3-user1
# Clear any old environment that may conflict.
for key in $( set | awk '{FS="="} /\^OS_/{print $1}' ); do unset $key ; done
export OS_USERNAME=user1
export NOVA_VERSION=1.1
export OS_PROJECT_NAME=demo
export OS_PASSWORD=RedactedComplexPassword
export OS_NO_CACHE=True
export COMPUTE_API_VERSION=1.1
export no_proxy=,10.0.0.5,192.168.2.11
export OS_CLOUDNAME=overcloud
export OS_AUTH_URL=https://10.0.0.5:5000/v3
export OS_AUTH_TYPE=password
export PYTHONWARNINGS="ignore:Certificate has no, ignore:A true
SSLContext object is not available"
export OS_IDENTITY_API_VERSION=3
export OS_PROJECT_DOMAIN_NAME=Default
export OS_USER_DOMAIN_NAME=LAB
```

### 1.9. Testing OpenStack Identity Integration with an External User Management Service

To test that OpenStack Identity (keystone) successfully integrated with Active Directory Domain Service (AD DS), test user access to dashboard features.

**Prerequisites**

- Integration with an external user management service, such as Active Directory (AD) or Red Hat Identity Manager (IdM)

**Procedure**

1. Create a test user in the external user management service, and add the user to the `grp-openstack` group.

2. In Red Hat OpenStack Platform, add the user to the `member` role of the `demo` project.

3. Log in to the dashboard with the credentials of the AD test user.

4. Click on each of the tabs to confirm that they are presented successfully without error messages.

5. Use the dashboard to build a test instance.

**NOTE**

If you experience issues with these steps, log in to the dashboard with the `admin` account and perform the subsequent steps as that user. If the test is successful, it means that OpenStack is still working as expected and that an issue exists somewhere in the integration settings between OpenStack Identity and Active Directory.

**Additional resources**
1.10. TROUBLESHOOTING ACTIVE DIRECTORY INTEGRATION

If you encounter errors when using the Active Directory integration with OpenStack Identity, you might need to test the LDAP connection or test the certificate trust configuration. You might also need to check that the LDAPS port is accessible.

**NOTE**

Depending on the error type and location, perform only the relevant steps in this procedure.

**Procedure**

1. Test the LDAP connection by using the `ldapsearch` command to remotely perform test queries against the Active Directory Domain Controller. A successful result here indicates that network connectivity is working, and the AD DS services are up. In this example, a test query is performed against the server `addc.lab.local` on port **636**:

   ```bash
   # ldapsearch -Z -x -H ldaps://addc.lab.local:636 -D "svc-ldap@lab.local" -W -b "OU=labUsers,DC=lab,DC=local" -s sub "(cn=*)" cn
   ```

   **NOTE**

   - `ldapsearch` is a part of the `openldap-clients` package. You can install this using `# dnf install openldap-clients`.
   - This command expects to find the necessary certificate in your host operating system.

2. If you receive the error **Peer’s Certificate issuer is not recognized.** while testing the `ldapsearch` command, confirm that your `TLS_CACERTDIR` path is correctly set. For example:

   ```bash
   TLS_CACERTDIR /etc/openldap/certs
   ```

3. As a temporary workaround, consider disabling certificate validation.

   **IMPORTANT**

   This setting must not be permanently configured.

   In the `/etc/openldap/ldap.conf`, set the `TLS_REQCERT` parameter to allow:

   ```ini
   TLS_REQCERT allow
   ```

   If the `ldapsearch` query works after setting this value, you might need to review whether your certificate trusts are correctly configured.

4. Use the `nc` command to check that LDAPS port **636** is remotely accessible. In this example, a probe is performed against the server `addc.lab.local`. Press `ctrl-c` to exit the prompt.
# nc -v addc.lab.local 636
^C

Failure to establish a connection might indicate a firewall configuration issue.
CHAPTER 2. INTEGRATING OPENSTACK IDENTITY (KEYSTONE) WITH RED HAT IDENTITY MANAGER (IDM)

When you integrate OpenStack Identity (keystone) with Red Hat Identity Manager (IdM), OpenStack Identity authenticates certain Red Hat Identity Management (IdM) users but retains authorization settings and critical service accounts in the Identity Service database. As a result, Identity Service has read-only access to IdM for user account authentication, while retaining management over the privileges assigned to authenticated accounts. You can also use `novajoin` to enroll your nodes with IdM.

**NOTE**

The configuration files for this integration are managed by Puppet. Therefore, any custom configuration that you add might be overwritten the next time you run the `openstack overcloud deploy` command. You can use director to configure LDAP authentication instead of manually editing the configuration files.

Review the following key terms before you plan and configure the IdM integration:

- **Authentication** - The process of using a password to verify that the user is who they claim to be.
- **Authorization** - Validating that authenticated users have proper permissions to the systems they’re attempting to access.
- **Domain** - Refers to the additional back ends configured in Identity Service. For example, Identity Service can be configured to authenticate users from external IdM environments. The resulting collection of users can be thought of as a **domain**.

The process to integrate OpenStack Identity with IdM includes the following stages:

1. Enroll the undercloud and overcloud in IdM with novajoin
2. Implement TLS-e on the undercloud and overcloud with Ansible
3. Configure IdM server credentials and export the LDAPS certificate
4. Install and configure the LDAPS certificate in OpenStack
5. Configure director to use one or more LDAP backends
6. Configure Controller nodes to access the IdM backend
7. Configure IdM user or group access to OpenStack projects
8. Verify that the domain and user lists are created correctly
9. Optional: Create credential files for non-admin users

2.1. PLANNING THE RED HAT IDENTITY MANAGER (IDM) INTEGRATION

When you plan your OpenStack Identity integration with Red Hat Identity Manager (IdM), ensure that both services are configured and operational and review the impact of the integration on user management and firewall settings. Red Hat Identity Manager IdM depends on SRV records to do load
balancing. You should not put a load balancer in front of IdM.

**Prerequisites**

- Red Hat Identity Management is configured and operational.
- Red Hat OpenStack Platform is configured and operational.
- DNS name resolution is fully functional and all hosts are registered appropriately.

**Permissions and roles**

This integration allows IdM users to authenticate to OpenStack and access resources. OpenStack service accounts (such as keystone and glance), and authorization management (permissions and roles) will remain in the Identity Service database. Permissions and roles are assigned to the IdM accounts using Identity Service management tools.

**High availability options**

This configuration creates a dependency on the availability of a single IdM server: Project users will be affected if Identity Service is unable to authenticate to the IdM Server. It is not recommended to place a load balancer in front of IdM, however you can configure keystone to query a different IdM server, should one become unavailable.

**Outage requirements**

- The Identity Service will need to be restarted in order to add the IdM back end.
- Users will be unable to access the dashboard until their accounts have been created in IdM. To reduce downtime, consider pre-staging the IdM accounts well in advance of this change.

**Firewall configuration**

Communication between IdM and OpenStack consists of the following:

- Authenticating users
- IdM retrieval of the certificate revocation list (CRL) from the controllers every two hours
- Certmonger requests for new certificates upon expiration

**NOTE**

A periodic certmonger task will continue to request new certificates if the initial request fails.

If firewalls are filtering traffic between IdM and OpenStack, you will need to allow access through the following port:

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>Type</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>OpenStack Controller Node</td>
<td>Red Hat Identity Management</td>
<td>LDAPS</td>
<td>TCP 636</td>
</tr>
</tbody>
</table>
2.2. IDENTITY MANAGEMENT (IDM) SERVER RECOMMENDATIONS FOR OPENSTACK

Red Hat provides the following information to help you integrate your IdM server and OpenStack environment.

For information on preparing Red Hat Enterprise Linux for an IdM installation, see Installing Identity Management.

Run the `ipa-server-install` command to install and configure IdM. You can use command parameters to skip interactive prompts. Use the following recommendations so that your IdM server can integrate with your Red Hat OpenStack Platform environment:

### Table 2.1. Parameter recommendations

<table>
<thead>
<tr>
<th>Option</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>--admin-password</code></td>
<td>Note the value you provide. You will need this password when configuring Red Hat OpenStack Platform to work with IdM.</td>
</tr>
<tr>
<td><code>--ip-address</code></td>
<td>Note the value you provide. The undercloud and overcloud nodes require network access to this ip address.</td>
</tr>
<tr>
<td><code>--setup-dns</code></td>
<td>Use this option to install an integrated DNS service on the IdM server. The undercloud and overcloud nodes use the IdM server for domain name resolution.</td>
</tr>
<tr>
<td><code>--auto-forwarders</code></td>
<td>Use this option to use the addresses in <code>/etc/resolv.conf</code> as DNS forwarders.</td>
</tr>
<tr>
<td><code>--auto-reverse</code></td>
<td>Use this option to resolve reverse records and zones for the IdM server IP addresses. If neither reverse records or zones are resolvable, IdM creates the reverse zones. This simplifies the IdM deployment.</td>
</tr>
<tr>
<td><code>--ntp-server, --ntp-pool</code></td>
<td>You can use both or either of these options to configure your NTP source. Both the IdM server and your OpenStack environment must have correct and synchronized time.</td>
</tr>
</tbody>
</table>

You must open the firewall ports required by IdM to enable communication with Red Hat OpenStack Platform nodes. For more information, see Opening the ports required by IdM.

Additional resources

- Configuring and Managing Identity Management
- Red Hat Identity Management Documentation

2.3. IMPLEMENTING TLS-E WITH ANSIBLE
You can use the new **tripleo-ipa** method to enable SSL/TLS on overcloud endpoints, called TLS everywhere (TLS-e). Due to the number of certificates required, Red Hat OpenStack Platform integrates with Red Hat Identity management (IdM). When you use **tripleo-ipa** to configure TLS-e, IdM is the certificate authority.

**Prerequisites**

Ensure that all configuration steps for the undercloud, such as the creation of the stack user, are complete. For more details, see **Director Installation and Usage** for more details.

**Procedure**

Use the following procedure to implement TLS-e on a new installation of Red Hat OpenStack Platform, or an existing deployment that you want to configure with TLS-e. You must use this method if you deploy Red Hat OpenStack Platform with TLS-e on pre-provisioned nodes.

**NOTE**

If you are implementing TLS-e for an existing environment, you are required to run commands such as `openstack undercloud install`, and `openstack overcloud deploy`. These procedures are idempotent and only adjust your existing deployment configuration to match updated templates and configuration files.

1. Configure the `/etc/resolv.conf` file:
   Set the appropriate search domains and the nameserver on the undercloud in `/etc/resolv.conf`. For example, if the deployment domain is `example.com`, and the domain of the FreeIPA server is `bigcorp.com`, then add the following lines to `/etc/resolv.conf`:
   ```
   search example.com bigcorp.com
   nameserver $IDM_SERVER_IP_ADDR
   ```

2. Install required software:
   ```
   sudo dnf install -y python3-ipalib python3-ipaclient krb5-devel
   ```

3. Export environmental variables with values specific to your environment.:
   ```
   export IPA_DOMAIN=bigcorp.com
   export IPA_REALM=BIGCORP.COM
   export IPA_ADMIN_USER=$IPA_USER
   export IPA_ADMIN_PASSWORD=$IPA_PASSWORD
   export IPA_SERVER_HOSTNAME=ipa.bigcorp.com
   export UNDERCLOUD_FQDN=undercloud.example.com
   export USER=stack
   export CLOUD_DOMAIN=example.com
   ```

**NOTE**

The IdM user credentials must be an administrative user that can add new hosts and services.

4. Run the **undercloud-ipa-install.yaml** ansible playbook on the undercloud:
5. Add the following parameters to undercloud.conf

```
undercloud_nameservers = $IDM_SERVER_IP_ADDR
overcloud_domain_name = example.com
```

6. Deploy the undercloud:

```
openstack undercloud install
```

**Verification**

Verify that the undercloud was enrolled correctly by completing the following steps:

1. List the hosts in IdM:

   ```
   $ kinit admin
   $ ipa host-find
   ```

2. Confirm that `/etc/novajoin/krb5.keytab` exists on the undercloud.

   ```
   ls /etc/novajoin/krb5.keytab
   ```

**NOTE**

The **novajoin** directory name is for legacy naming purposes only.

**Configuring TLS-e on the overcloud**

When you deploy the overcloud with TLS everywhere (TLS-e), IP addresses from the Undercloud and Overcloud will automatically be registered with IdM.

**NOTE**

To disable automatic IP address registration, set the `IDMModifyDNS` heat parameter to `false`:

```
parameter_defaults:
   ... 
   IdMModifyDNS: false
```

1. Before deploying the overcloud, create a YAML file `tls-parameters.yaml` with contents similar to the following. The values you select will be specific for your environment:

   - The **DnsServers** parameter should have a value that reflects the IP address of the IdM server.

   - If the domain of the IdM server is different than the cloud domain, include it in the **DnsSearchDomains** parameter. For example: `DnsSearchDomains: ["example.com", "bigcorp.com"]`
If you have preprovisioned nodes, set the value of the `IDMInstallClientPackages` parameter to `true` to install required packages on overcloud nodes.

The shown value of the `OS::TripleO::Services::IpaClient` parameter overrides the default setting in the `enable-internal-tls.yaml` file. You must ensure the `tls-parameters.yaml` file follows `enable-internal-tls.yaml` in the `openstack overcloud deploy` command.

If you are running a distributed compute node (DCN) architecture with cinder configured as active-active, you must add and set the `EnableEtcdInternalTLS` parameter to `true`.

```yaml
parameter_defaults:
  DnsSearchDomains: ["example.com"]
  DnsServers: ["192.168.1.13"]
  CloudDomain: example.com
  CloudName: overcloud.example.com
  CloudNameInternal: overcloud.internalapi.example.com
  CloudNameStorage: overcloud.storage.example.com
  CloudNameStorageManagement: overcloud.storagemgmt.example.com
  CloudNameCtlplane: overcloud.ctlplane.example.com
  IdMServer: freeipa-0.redhat.local
  IdMDomain: redhat.local
  IdMInstallClientPackages: False

resource_registry:
  OS::TripleO::Services::IpaClient: /usr/share/openstack-tripleo-heat-templates/deployment/ipa/ipaservices-baremetal-ansible.yaml
```

2. Deploy the overcloud. You will need to include the `tls-parameters.yaml` in the deployment command:

```
DEFAULT_TEMPLATES=/usr/share/openstack-tripleo-heat-templates/
CUSTOM_TEMPLATES=/home/stack/templates
openstack overcloud deploy \
-e ${DEFAULT_TEMPLATES}/environments/ssl/tls-everywhere-endpoints-dns.yaml \
-e ${DEFAULT_TEMPLATES}/environments/services/haproxy-public-tls-certmonger.yaml \
-e ${DEFAULT_TEMPLATES}/environments/ssl/enable-internal-tls.yaml \
-e ${CUSTOM_TEMPLATES}/tls-parameters.yaml \
...
```

3. Confirm each endpoint is using HTTPS by querying keystone for a list of endpoints:

```
openstack endpoint list
```

### 2.4. Encrypting Memcached Traffic Under TLS Everywhere (TLS-E)

You can now encrypt memcached traffic with TLS-e. This feature works with both `novajoin` and `tripleo-IPA`:

1. Create an environment file called `memcached.yaml` with the following contents to add TLS support for memcached:

```yaml
```
parameter_defaults:
  MemcachedTLS: true
  MemcachedPort: 11212

2. Include the `memcached.yaml` environment file in the overcloud deployment process:

```bash
openstack overcloud deploy --templates \
  -e /usr/share/openstack-tripleo-heat-templates/environments/ssl/enable-internal-tls.yaml \
  -e /usr/share/openstack-tripleo-heat-templates/environments/ssl/tls-everywhere-endpoints-dns.yaml \
  -e /usr/share/openstack-tripleo-heat-templates/environments/services/haproxy-public-tls-certmonger.yaml \
  -e /home/stack/memcached.yaml \
  ...
```

Additional Resources

- For more information about deploying TLS-e with novajoin, see [Enrolling nodes in Red Hat Identity Manager (IdM) with novajoin](#).
- For more information about deploying TLS-e with tripleo-ipa, see [Implementing TLS-e with Ansible](#).

This feature is available in this release as a Technology Preview, and therefore is not fully supported by Red Hat. It should only be used for testing, and should not be deployed in a production environment. For more information about Technology Preview features, see [Scope of Coverage Details](#).

## 2.5. Configuring Red Hat Identity Manager (IDM) Server Credentials

To configure the Red Hat Identity Manager (IdM) to integrate with OpenStack Identity, set up an LDAP account for Identity service to use, create a user group for Red Hat OpenStack users, and set up the password for the lookup account.

**Prerequisites**

- Red Hat Identity Manager (IdM) is configured and operational.
- Red Hat OpenStack Platform (RHOSP) is configured and operational.
- DNS name resolution is fully functional and all hosts are registered appropriately.
- IdM authentication traffic is encrypted with LDAPS, using port 636.
- Recommended: Implement IdM with a high availability or load balancing solution to avoid a single point of failure.

**Procedure**

Perform this procedure on the IdM server.

1. Create the LDAP lookup account to use in OpenStack Identity Service to query the IdM LDAP service:
# kinit admin
# ipa user-add
First name: OpenStack
Last name: LDAP
User [administrator]: svc-ldap

NOTE
Review the password expiration settings of this account, once created.

2. Create a group for RHOSP users, called `grp-openstack`. Only members of this group can have permissions assigned in OpenStack Identity.

```bash
# ipa group-add --desc="OpenStack Users" grp-openstack
```

3. Set the `svc-ldap` account password and add it to the `grp-openstack` group:

```bash
# ipa passwd svc-ldap
# ipa group-add-member --users=svc-ldap grp-openstack
```

4. Login as `svc-ldap` user and change the password when prompted:

```bash
# kinit svc-ldap
```

### 2.6. INSTALLING THE RED HAT IDENTITY MANAGER (IDM) LDAPS CERTIFICATE

OpenStack Identity (keystone) uses LDAPS queries to validate user accounts. To encrypt this traffic, keystone uses the certificate file defined by `keystone.conf`. To install the LDAPS certificate, copy the certificate from the Red Hat Identity Manager (IdM) server to a location where keystone will be able to reference it, and convert the certificate from `.crt` to `.pem` format.

**NOTE**

When using multiple domains for LDAP authentication, you might receive various errors, such as Unable to retrieve authorized projects, or Peer's Certificate issuer is not recognized. This can arise if keystone uses the incorrect certificate for a certain domain. As a workaround, merge all of the LDAPS public keys into a single `.crt` bundle, and configure all of your keystone domains to use this file.

**Prerequisites**

- IdM server credentials are configured.

**Procedure**

1. In your IdM environment, locate the LDAPS certificate. This file can be located using `/etc/openldap/ldap.conf`:

```bash
TLS_CACERT /etc/ipa/ca.crt
```
2. Copy the file to the Controller node that runs the keystone service. For example, the `scp` command copies the `ca.crt` file to the node `node.lab.local`:

```bash
# scp /etc/ipa/ca.crt root@node.lab.local:/root/
```

3. Copy the `ca.crt` file to the certificate directory. This is the location that the keystone service will use to access the certificate:

```bash
# cp ca.crt /etc/pki/ca-trust/source/anchors
```

4. Optional: If you need to run diagnostic commands, such as `ldapsearch`, you also need to add the certificate to the RHEL certificate store:

a. On the Controller node, convert the `.crt` to `.pem` format:

```bash
# openssl x509 -in ca.crt -out ca.pem -outform PEM
```

b. Install the `.pem` on the Controller node. For example, in Red Hat Enterprise Linux:

```bash
# cp ca.pem /etc/pki/ca-trust/source/anchors/
# update-ca-trust
```

### 2.7. CONFIGURING DIRECTOR TO USE DOMAIN-SPECIFIC LDAP BACKENDS

To configure director to use one or more LDAP backends, set the `KeystoneLDAPDomainEnable` flag to `true` in your heat templates, and set up environment files with the information about each LDAP backend. Director then uses a separate LDAP backend for each keystone domain.

**NOTE**

The default directory for domain configuration files is set to `/etc/keystone/domains/`. You can override this by setting the required path with the `keystone::domain_config_directory` hiera key and adding it as an `ExtraConfig` parameter within an environment file.

**Procedure**

1. In the heat template for your deployment, set the `KeystoneLDAPDomainEnable` flag to `true`. This configures the `domain_specific_drivers_enabled` option in keystone within the `identity` configuration group.

2. Add a specification of the LDAP backend configuration by setting the `KeystoneLDAPBackendConfigs` parameter in `tripleo-heat-templates`, where you can then specify your required LDAP options.

3. Create a copy of the `keystone_domain_specific_ldap_backend.yaml` environment file:

```bash
$ cp /usr/share/openstack-tripleo-heat-templates/environments/services/keystone_domain_specific_ldap_backend.yaml /home/stack/templates/
```
4. Edit the `/home/stack/templates/keystone_domain_specific_ldap_backend.yaml` environment file and set the values to suit your deployment. For example, this parameter create a LDAP configuration for a keystone domain named **testdomain**:

```yaml
parameter_defaults:
  KeystoneLDAPDomainEnable: true
  KeystoneLDAPBackendConfigs:
    testdomain:
      url: ldaps://192.0.2.250
      user: cn=openstack,ou=Users,dc=director,dc=example,dc=com
      password: RedactedComplexPassword
      suffix: dc=director,dc=example,dc=com
      user_tree_dn: ou=Users,dc=director,dc=example,dc=com
      user_filter: "(memberOf=cn=OSuser,ou=Groups,dc=director,dc=example,dc=com)"
      user_objectclass: person
      user_id_attribute: cn
```

**NOTE**

The **keystone_domain_specific_ldap_backend.yaml** environment file contains the following deprecated write parameters:

- `user_allow_create`
- `user_allow_update`
- `user_allow_delete`

The values for these parameters have no effect on the deployment, and can be safely removed.

5. Optional: Add more domains to the environment file. For example:

```yaml
KeystoneLDAPBackendConfigs:
  domain1:
    url: ldaps://domain1.example.com
    user: cn=openstack,ou=Users,dc=director,dc=example,dc=com
    password: RedactedComplexPassword
  ...
  domain2:
    url: ldaps://domain2.example.com
    user: cn=openstack,ou=Users,dc=director,dc=example,dc=com
    password: RedactedComplexPassword
  ...
```

This results in two domains named **domain1** and **domain2**, each will have a different LDAP domain with its own configuration.

### 2.8. GRANTING THE ADMIN USER ACCESS TO THE OPENSTACK IDENTITY DOMAIN

To allow the **admin** user to access the OpenStack Identity (keystone) domain and see the **Domain** tab, get the ID of the domain and the **admin** user, and then assign the **admin** role to the user in the domain.
NOTE

This does not grant the OpenStack admin account any permissions on the external service domain. In this case, the term *domain* refers to OpenStack’s usage of the keystone domain.

Procedure

This procedure uses the **LAB** domain. Replace the domain name with the actual name of the domain that you are configuring.

1. Get the ID of the **LAB** domain:

   ```bash
   $ openstack domain show LAB
   +---------+----------------------------------+
   | Field   | Value                            |
   +---------+----------------------------------+
   | enabled | True                             |
   | id      | 6800b0496429431ab1c4efbb3fe810d4 |
   | name    | LAB                              |
   +---------+----------------------------------+
   
```

2. Get the ID of the **admin** user from the **default** domain:

   ```bash
   $ openstack user list --domain default | grep admin
   | 3d75388d351846c6a880e53b2508172a | admin      |
   
```

3. Get the ID of the **admin** role:

   ```bash
   $ openstack role list
   
   The output depends on the external service you are integrating with:
   
   - **Active Directory Domain Service (AD DS):**
     ```
     +---------+---------------+
     | ID       | Name          |
     +---------+---------------+
     | 01d92614cd224a589bdf3b171afc5488 | admin         |
     | 034e4620ed3d45969de8992af001514 | member        |
     | 0aa377a807df4149b0a8c69b9560b106 | ResellerAdmin |
     | 9369f2bf754443f199c6d6b96479b1fa | heat_stack_user|
     | cfeaa5760d9c948e7b362abc1d06e557f | reader        |
     | d5cb454559e44b47aaa8821d4e11af1 | swiftoperator |
     | ef3d3f510a474d6c860b4098ad658a29 | service       |
     +---------+---------------+
     
   - **Red Hat Identity Manager (IdM):**
     ```
     +---------+---------------+
     | ID       | Name          |
     +---------+---------------+
     | 544d48aaffde48f1b3c31a552c35f01f9 | SwiftOperator |
     | 6d005d783bf0436e882c55c62457d33d | ResellerAdmin |
     ```
4. Use the domain and admin IDs to construct the command that adds the admin user to the admin role of the keystone LAB domain:

```
# openstack role add --domain 6800b0496429431ab1c4efbb3fe810d4 --user
3d75388d351846c6a880e53b2508172a 785c70b150ee4c778fe4de088070b4cf
```

2.9. GRANTING EXTERNAL GROUPS ACCESS TO RED HAT OPENSTACK PLATFORM PROJECTS

To grant multiple authenticated users access to Red Hat OpenStack Platform (RHOSP) resources, you can authorize certain groups from the external user management service to grant access to RHOSP projects, instead of requiring OpenStack administrators to manually allocate each user to a role in a project. As a result, all members of these groups can access pre-determined projects.

Prerequisites

- Ensure that the external service administrator completed the following steps:
  - Creating a group named grp-openstack-admin.
  - Creating a group named grp-openstack-demo.
  - Adding your RHOSP users to one of these groups as needed.
  - Adding your users to the grp-openstack group.

- Create the OpenStack Identity domain. This procedure uses the LAB domain.

- Create or choose a RHOSP project. This procedure uses a project called demo that was created with the openstack project create --domain default --description "Demo Project" demo command.

Procedure

1. Retrieve a list of user groups from the OpenStack Identity domain:

```
# openstack group list --domain LAB
```

The command output depends on the external user management service that you are integrating with:

- Active Directory Domain Service (AD DS):

```
+-----------------+---------+
| ID              | Name    |
+-----------------+---------+
| 185277be62ae17e498a69f98a59b66934fb1d6b77f45f14f5f6953a656b8851 | grp-
openstack |
| a8d17f19f4f64c45f48c18b97e4aa331820f9d3be52654aa8094e698a9182cbb88 | grp-
openstack-admin |
```
2. Retrieve a list of roles:

```bash
# openstack role list
```

The command output depends on the external user management service that you are integrating with:

- **Active Directory Domain Service (AD DS):**

```plaintext
<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>01d92614cd224a589bdf3b171afc5488</td>
<td>admin</td>
</tr>
<tr>
<td>034e4620ed3d45969dfe8992af001514</td>
<td>member</td>
</tr>
<tr>
<td>0aa377a807df4149b0a8c69b9560b106</td>
<td>ResellerAdmin</td>
</tr>
<tr>
<td>9369f2bf754443f199c6d6b96479b1fa</td>
<td>heat_stack_user</td>
</tr>
<tr>
<td>cfeaf5760d9c948e7b362abc1d06e557f</td>
<td>reader</td>
</tr>
<tr>
<td>d5cb454559e44b47aaa8821df4e11af1</td>
<td>swiftoperator</td>
</tr>
<tr>
<td>ef3d3f5f10a474d6c86b04098ad658a29</td>
<td>service</td>
</tr>
</tbody>
</table>
```

- **Red Hat Identity Manager (IdM):**

```plaintext
<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0969957bce5e4f678ca6cef00e1abf8a</td>
<td>ResellerAdmin</td>
</tr>
<tr>
<td>1fcb3c9b50aa46ee8196aaec2b76b7</td>
<td>admin</td>
</tr>
<tr>
<td>9fe2ff9ee4384b1894a90878d3e92bab</td>
<td><em>member</em></td>
</tr>
<tr>
<td>d3570730eb4b4780a7fed97eba197e1b</td>
<td>SwiftOperator</td>
</tr>
</tbody>
</table>
```

3. Grant the user groups access to RHOSP projects by adding them to one or more of these roles. For example, if you want users in the `grp-openstack-demo` group to be general users of the `demo` project, you must add the group to the `member` or `_member_` role, depending on the external service that you are integrating with:

- **Active Directory Domain Service (AD DS):**
# openstack role add --project demo --group
d971bb3bd5e64a454cbd0cc7af4c0773e78d61b5f81321809f8323216938cae8 member

- Red Hat Identity Manager (IdM):

  $ openstack role add --project demo --group
d971bb3bd5e64a454cbd0cc7af4c0773e78d61b5f81321809f8323216938cae8
  _member_

Result

Members of `grp-openstack-demo` can log in to the dashboard by entering their username and password and entering `LAB` in the `Domain` field:

![Dashboard interface with input fields for domain, user name, and password, and a Connect button.](image)

**NOTE**

If users receive the error `Error: Unable to retrieve container list.`, and expect to be able to manage containers, then they must be added to the `SwiftOperator` role.

Additional resources

- **Section 2.10, “Granting external users access to Red Hat OpenStack Platform projects”**

## 2.10. GRANTING EXTERNAL USERS ACCESS TO RED HAT OPENSTACK PLATFORM PROJECTS

To grant specific authenticated users from the `grp-openstack` group access to OpenStack resources, you can grant these users direct access to Red Hat OpenStack Platform (RHOSP) projects. Use this process in cases where you want to grant access to individual users instead of granting access to groups.

**Prerequisites**

- Ensure that the external service administrator completed the following steps:
  - Adding your RHOSP users to the `grp-openstack` group.
Creating the OpenStack Identity domain. This procedure uses the LAB domain.

Create or choose a RHOSP project. This procedure uses a project called demo that was created with the openstack project create --domain default --description "Demo Project" demo command.

Procedure

1. Retrieve a list of users from the OpenStack Identity domain:

```
# openstack user list --domain LAB
+---------------------------------+----------+
| ID                             | Name     |
+---------------------------------+----------+
| 1f24ec1f11aeb90520079c29f70afa060d22e2ce92b2eba7784c841ac418091e | user1    |
| 12c062faddc5f8b065434d9f6f6f03eb92959379cb341224586e9a38bf1 | user2    |
| afaf48031eb54c3e4e44cb3053f5b612084033ff70f63c22873d181fdae2e73c | user3    |
| e47fc21d0f0d9716d2663766023e2d8dc15a6d9b01453854a898cabb2396826e | user4    |
```

2. Retrieve a list of roles:

```
# openstack role list
```

The command output depends on the external user management service that you are integrating with:

- **Active Directory Domain Service (AD DS):**

```
+---------------------------------+----------+
| ID                             | Name     |
+---------------------------------+----------+
| 01d92614cd224a589df3b171afc5488 | admin    |
| 034e4620ed3d45969de8992af001514 | member   |
| 0aa377a807df4149b0a8c69b9560b106 | ResellerAdmin |
| 9369f2bf754443f199c6d6b96479b1fa | heat_stack_user |
| cfeaa5760d9c948e7b362abc1d06e557f | reader   |
| d5cb454559e44cb47aa8821df4e11af1 | swiftoperator |
| ef33d3f510a474d6c860b4098ad658a29 | service  |
```

- **Red Hat Identity Manager (IdM):**

```
+---------------------------------+----------+
| ID                             | Name     |
+---------------------------------+----------+
| 0969957bbe5e4f678ca6ce0e1abf8a | ResellerAdmin |
| 1fcb3c9b50a46ee8196aaacc2b76b7 | admin    |
| 9e2f999e4384b1894a90878d3e92bab | _member_ |
| d3570730eb4b4780a7fed97eba197e1b | SwiftOperator |
```

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3. Grant users access to RHOSP projects by adding them to one or more of these roles. For example, if you want **user1** to be a general user of the **demo** project, you add them to the **member** or **_member_** role, depending on the external service that you are integrating with:

- Active Directory Domain Service (AD DS):
  ```
  # openstack role add --project demo --user 1f24ec1f11aeb90520079c29f70afa060d22e2ce92b2eba7784c841ac418091e member
  ```

- Red Hat Identity Manager (IdM):
  ```
  # openstack role add --project demo --user 1f24ec1f11aeb90520079c29f70afa060d22e2ce92b2eba7784c841ac418091e _member_
  ```

4. If you want **user1** to be an administrative user of the **demo** project, add the user to the **admin** role:

  ```
  # openstack role add --project demo --user 1f24ec1f11aeb90520079c29f70afa060d22e2ce92b2eba7784c841ac418091e admin
  ```

**Result**

The **user1** user is able to log in to the dashboard by entering their external username and password and entering **LAB** in the **Domain** field:

![Dashboard Login](image)

**NOTE**

If users receive the error **Error: Unable to retrieve container list.**, and expect to be able to manage containers, then they must be added to the **SwiftOperator** role.

**Additional resources**

- Section 2.9, “Granting external groups access to Red Hat OpenStack Platform projects”
2.11. VIEWING THE LIST OF OPENSTACK IDENTITY DOMAINS AND USERS

Use the `openstack domain list` command to list the available entries. Configuring multiple domains in Identity Service enables a new Domain field in the dashboard login page. Users are expected to enter the domain that matches their login credentials.

**IMPORTANT**

After you complete the integration, you need to decide whether to create new projects in the Default domain or in newly created keystone domains. You must consider your workflow and how you administer user accounts. If possible, use the Default domain as an internal domain to manage service accounts and the admin project, and keep your external users in a separate domain.

In this example, external accounts need to specify the LAB domain. The built-in keystone accounts, such as admin, must specify Default as their domain.

**Procedure**

1. **Show the list of domains:**

   ```
   # openstack domain list
   +----------------------------------+---------+---------+-------------------------------------------------------
   | ID                               | Name    | Enabled | Description                                                          |
   +----------------------------------+---------+---------+-------------------------------------------------------
   | 6800b0496431ab1c4efbb3fe810d4    | LAB     | True    |                                                     |
   +----------------------------------+---------+---------+-------------------------------------------------------
   | default                          | Default | True    | Owns users and projects available on Identity API v2. |
   +----------------------------------+---------+---------+-------------------------------------------------------
   ``

2. **Show the list of users in a specific domain.** This command example specifies the --domain LAB and returns users in the LAB domain that are members of the grp-openstack group:

   ```
   # openstack user list --domain LAB
   ``

   You can also append --domain Default to show the built-in keystone accounts:

   ```
   # openstack user list --domain Default
   ```

2.12. CREATING A CREDENTIALS FILE FOR A NON-ADMIN USER

After you configure users and domains for OpenStack Identity, you might need to create a credentials file for a non-admin user.

**Procedure**

- Create a credentials (RC) file for a non-admin user. This example uses the user1 user in the file.
$ cat overcloudrc-v3-user1
# Clear any old environment that may conflict.
for key in $( set | awk '{FS=="="} /^OS_/ {print $1}' ); do unset $key ; done
export OS_USERNAME=user1
export NOVA_VERSION=1.1
export OS_PROJECT_NAME=demo
export OS_PASSWORD=RedactedComplexPassword
export OS_NO_CACHE=True
export COMPUTE_API_VERSION=1.1
export no_proxy=,10.0.0.5,192.168.2.11
export OS_CLOUDNAME=overcloud
export OS_AUTH_URL=https://10.0.0.5:5000/v3
export OS_AUTH_TYPE=password
export PYTHONWARNINGS="ignore:Certificate has no, ignore:A true
SSLContext object is not available"
export OS_IDENTITY_API_VERSION=3
export OS_PROJECT_DOMAIN_NAME=Default
export OS_USER_DOMAIN_NAME=LAB

2.13. TESTING OPENSTACK IDENTITY INTEGRATION WITH AN EXTERNAL USER MANAGEMENT SERVICE

To test that OpenStack Identity (keystone) successfully integrated with Active Directory Domain Service (AD DS), test user access to dashboard features.

Prerequisites

- Integration with an external user management service, such as Active Directory (AD) or Red Hat Identity Manager (IdM)

Procedure

1. Create a test user in the external user management service, and add the user to the _member_ role of the demo project.
2. In Red Hat OpenStack Platform, add the user to the _member_ role of the demo project.
3. Log in to the dashboard with the credentials of the AD test user.
4. Click on each of the tabs to confirm that they are presented successfully without error messages.
5. Use the dashboard to build a test instance.

   **NOTE**

   If you experience issues with these steps, log in to the dashboard with the admin account and perform the subsequent steps as that user. If the test is successful, it means that OpenStack is still working as expected and that an issue exists somewhere in the integration settings between OpenStack Identity and Active Directory.

Additional resources

- [Section 1.10, “Troubleshooting Active Directory integration”](#)
2.14. TROUBLESHOOTING RED HAT IDENTITY MANAGER (IDM) INTEGRATION

If you encounter errors when using the Red Hat Identity Manager (IdM) integration with OpenStack Identity, you might need to test the LDAP connection or test the certificate trust configuration. You might also need to check that the LDAPS port is accessible.

NOTE

Depending on the error type and location, perform only the relevant steps in this procedure.

Procedure

1. Test the LDAP connection by using the `ldapsearch` command to remotely perform test queries against the IdM server. A successful result here indicates that network connectivity is working, and the IdM services are up. In this example, a test query is performed against the server `idm.lab.local` on port 636:

   ```bash
   # ldapsearch -D "cn=directory manager" -H ldaps://idm.lab.local:636 -b "dc=lab,dc=local" -s sub "(objectclass=*)" -w RedactedComplexPassword
   ```

   NOTE

   `ldapsearch` is a part of the `openldap-clients` package. You can install this using
   `# dnf install openldap-clients`.

2. Use the `nc` command to check that LDAPS port 636 is remotely accessible. In this example, a probe is performed against the server `idm.lab.local`. Press `ctrl-c` to exit the prompt.

   ```bash
   # nc -v idm.lab.local 636
   ^C
   ```

   Failure to establish a connection could indicate a firewall configuration issue.