Red Hat OpenStack Platform 13

Federate with Identity Service

Federate with Identity Service using Red Hat Single Sign-On

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Abstract

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MAKING OPEN SOURCE MORE INCLUSIVE

Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see our CTO Chris Wright's message.

CHAPTER 1. INTRODUCTION

WARNING

Red Hat does not support federation at this time. This feature should only be used for testing, and should not be deployed in a production environment.

To configure federation in a high availability Red Hat OpenStack Platform director environment, you must configure the following:

- Red Hat Identity Management
- Red Hat single sign-on (RH-SSO)
- The Red Hat OpenStack Platform overcloud

1.1. OVERVIEW

Federated authentication is a method of providing authentication across disparate services. This authentication solution relies on an identity provider (IdP), a service provider (SP), and is based on the Security Assertion Markup Language (SAML).

When OpenStack is the service provider in a federated authentication solution, members of the Red Hat Identity Management (IdM) group **openstack-users** are mapped into OpenStack Keystone group **federated_users** with the **Member** role for project access. Consequently, you are able to grant users access to OpenStack by adding those users to the IdM group **openstack-users**.

1.2. PREREQUISITES

You will need the following completed before deploying federated authentication:

- You have deployed Red Hat OpenStack Platform director and the overcloud with the following properties:
  - You can use SSH to connect to both Red Hat OpenStack Platform director, and each of the overcloud nodes.
  - All nodes have a fully qualified domain name (FQDN).
  - TLS encryption is used for all external communications.
  - HAProxy terminates TLS front-end connections, and servers running behind HAProxy do not use TLS.
- An RH-SSO server is present, and you either have administrative privileges on the server, or the RH-SSO administrator has created a realm for you and given you administrative privileges on that realm. Because federated IdPs are external by definition, the RH-SSO server is assumed to be external to the Red Hat OpenStack Platform director overcloud. For more information, see Installing and configuring RH-SSO and Creating a realm and user.

- An IdM server is present, and also external to the Red Hat OpenStack Platform director overcloud where users and groups are managed. RH-SSO uses IdM as its User Federation backing store.
- You follow the examples described in the Keystone Federation Configuration Guide.
- On the **undercloud-0** node, you install the helper files into the home directory of the **stack** user, and work in the **stack** user home directory.
- On the **controller-0** node, you install the helper files into the home directory of the **heat-admin** user, and work in the **heat-admin** user home directory.
- If **mod_auth_mellon** was previously installed on your controller nodes, you must reinstall it as the Puppet Apache class will remove any Apache configuration files not under Puppet's control.

NOTE

Only the Red Hat OpenStack overcloud has federation enabled. The director is not federated.

1.3. ACCESSING THE RED HAT OPENSTACK PLATFORM NODES

By default, you must login to Red Hat OpenStack Platform director to access the overcloud nodes.

1. Use SSH to connect to Red Hat OpenStack director:

```
# ssh undercloud-0
```

2. Become the **stack** user:

```
$ su - stack
```

3. Source the **stackrc** configuration to enable the required OpenStack environment variables:

```
$ source stackrc
```

4. After you source **stackrc**, you can issue commands using the **openstack** command line tool, which operates against Red Hat OpenStack Platform director. To directly access one of the overcloud nodes, retrieve the ip address by using **openstack server list** and then using SSH to connect:

```
(undercloud) [stack@director ~]$ openstack server list -c Name -c Networks
+----------------------+-----------------------+
| Name                 | Networks              |
+----------------------+-----------------------+
| rhosp-controller-0   | ctlplane=10.94.101.11 |
| rhosp-controller-1   | ctlplane=10.94.101.14 |
| rhosp-controller-2   | ctlplane=10.94.101.17 |
| rhosp-hypervisor-0   | ctlplane=10.94.101.18 |
| rhosp-hypervisor-1   | ctlplane=10.94.101.20 |
+----------------------+-----------------------+

$ ssh heat-admin@10.94.101.11
```

1.4. OVERVIEW OF TECHNOLOGIES

The following technologies are a part of Red Hat OpenStack Platform.

1.4.1. High availability

Red Hat OpenStack Platform director distributes redundant copies of various OpenStack services across the overcloud deployment. These redundant services are deployed on the overcloud controller nodes, with director naming these nodes **controller-0**, **controller-1**, **controller-2**, and so on, depending on how many controller nodes Red Hat OpenStack Platform director has configured.

The IP addresses of the Controller nodes are not externally visible because the services running on the Controller nodes are HAProxy back-end servers. There is one publicly visible IP address for the set of controller nodes; this is HAProxy's front end. When a request arrives for a service on the public IP address, HAProxy selects a back-end server to service the request.

The overcloud is organized as a high availability cluster. Pacemaker manages the cluster, performs health checks, and can failover to another cluster resource if the resource stops functioning. You use Pacemaker to start and stop these resources.

For more information about high availability, see the {defaultURL}-single/high_availability_deployment_and_usage/[High Availability Deployment and Usage] guide.

1.4.1.1. Managing Pacemaker Services

Do not use the **systemctl** command on a Controller node to manage services that Pacemaker manages. Use the Pacemaker **pcs** command:

```
sudo pcs resource restart haproxy-clone
```

To determine the resource name, use the Pacemaker **status** command:

```
sudo pcs status

Clone Set: haproxy-clone [haproxy]
Started: [controller-1]
Stopped: [controller-0]
```

1.4.2. HAProxy Overview

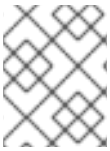
HAProxy serves a similar role to Pacemaker. It performs health checks on the back-end servers and forwards requests to functioning back-end servers. There is a cop of HAProxy running on all Controller nodes.

Although there are *N* copies of HAProxy running, only one is actually fielding requests at any given time; this active HAProxy instance is managed by Pacemaker. This approach prevents conflicts from occurring, and allows multiple copies of HAProxy to coordinate the distribution of requests across multiple back-ends. If Pacemaker detects that HAProxy has failed, it reassigns the front-end IP address to a different HAProxy instance. This HAProxy instance then becomes the controlling HAProxy instance.

1.5. USING A CONIFGURATION SCRIPT

To configure federated authentication, you will need to run long and complex commands. To make that task easier and to allow for repeatability, the commands are saved to a shell script called **configure-**

federation. You can execute a specific step if you pass the name of the step to **configure-federation**. To view the list of possible commands, use the **help** option (-h or --help).



NOTE

For more information on the contents of the script, see Chapter 6, *The configure-federation file*.

To view the commands that are executed after variable substitution, use the following options:

-n

This option provides a dry-run mode that writes its operations to stdout without making changes on the system.

-v

This option provides a verbose mode that writes its operations to stdout before executing. This is useful for logging.

1.6. USING A PROXY OR SSL TERMINATOR

Consider the following key features for environments behind a proxy.

- A back-end server might have a different hostname, listen on different port, or use a different protocol than what a client sees on the front side of the proxy.
  Problems can occur when a server generates a self-referential URL, for example if the server redirects the client to a different URL on the same server. The URL that the server generates must match the public address and port as seen by the client.

- Authentication protocols such as HTTP and HTTPS are sensitive to the host, port, and protocol, because they often need to ensure a request was targeted for a specific server, port and on a secure transport. Proxies can interfere with this information.

  - A proxy transforms a request received on its public front-end before dispatching it to a non-public server in the back-end.

  - Responses from the non-public back-end server sometimes need adjustment so that it appears as if the response came from the public front-end of the proxy.
    There are various approaches to solving this problem. Because SAML is sensitive to host, port, and protocol information, and because you are configuring SAML behind a high availability proxy (HAProxy), you must deal with these issues or your configuration will likely fail.

CHAPTER 2. CONFIGURING RED HAT IDENTITY MANAGEMENT

You can configure Red Hat OpenStack Platform with federated user management with the following features:

- Red Hat Identity Management (IdM) is external to Red Hat OpenStack Platform
- Red Hat IdM is the source of all user and group information
- Red Hat Single Signon (RH-SSO) is configured to use Red Hat IdM for user Federation

2.1. CREATING THE IDM SERVICE ACCOUNT FOR RH-SSO

If you use anonomous binds, some information that is essential for Red Hat Single Sign-On (RH-SSO) is withheld for security reasons. As a result, you need provide the appropriate privileges for RH-SSO in the forma a dedicated account to query the IdM LDAP server for this information:

```
LDAP_URL="ldaps://$FED_IPA_HOST"
DIR_MGR_DN="cn=Directory Manager"
SERVICE_NAME="rhsso"
SERVICE_DN="uid=$service_name,cn=sysaccounts,cn=etc,$FED_IPA_BASE_DN"

$ ldapmodify -H "${LDAP_URL}" -x -D "${DIR_MGR_DN}" -w <_FED_IPA_ADMIN_PASSWD_>
<<EOF
dn: ${SERVICE_DN}
changetype: add
objectclass: account
objectclass: simplesecurityobject
uid: ${SERVICE_NAME}
userPassword: <_FED_IPA_RHSSO_SERVICE_PASSWD_>
passwordExpirationTime: 20380119031407Z
nsIdleTimeout: 0
EOF
```

NOTE

You can use the configure-federation script to perform the above step: **$ ./configure-federation create-ipa-service-account**

2.2. CREATING A TEST USER

Create a user account in IdM for testing:

Procedure

1. Create a user **jdoe** in IdM:

```
$ipa user-add --first John --last Doe --email jdoe@example.com jdoe
```

2. Assign a password to the user:

```
$ipa passwd jdoe
```

2.3. CREATING AN IDM GROUP FOR OPENSTACK USERS

You must have an IdM group **openstack-users** to map to the Keystone group **federated_users**. Map the test user to this group.

Create the **openstack-users** group in Red Hat Identity Management (IdM):

Procedure

1. Ensure that the **openstack-users** group does not exist:

```
$ ipa group-show openstack-users
ipa: ERROR: openstack-users: group not found
```

2. Add the openstack-users group to IdM:

```
ipa group-add openstack-users
```

3. Add the test users to the **openstack-users** group:

```
ipa group-add-member --users jdoe openstack-users
```

4. Verify that the **openstack-users** group exists and has the test user as a member:

```
$ ipa group-show openstack-users
  Group name: openstack-users
  GID: 331400001
  Member users: jdoe
```

CHAPTER 3. CONFIGURING RED HAT SINGLE SIGN-ON

Red Hat Single Sign-On (RH-SSO) supports multi-tenancy, and uses *realms* to allow for separation between tenants. As a result RH-SSO operations always occur within the context of a realm. You can either create the realm manually, or with the **keycloak-httpd-client-install** tool if you have administrative privileges on the RH-SSO server.

Prerequisites

You must have a fully installed RH-SSO server. For more information on installing RH-SSO, see Server installation and configuration guide.

You need definitions for the following variables as they appear below:

<_RH_RHSSO_URL_>	The Red Hat Single Sign-On URL
<_FED_RHSSO_REALM_>	Identifies the RH-SSO realm in use

3.1. CONFIGURING THE RH-SSO REALM

When the Red Hat Single Sign-On (RH-SSO) realm is available, use the RH-SSO web console to configure the realm for user federation against IdM:

Procedure

1. From the drop-down list in the uppper left corner, select your RH-SSO realm.
2. From the **Configure** panel, select **User Federation**.
3. From the **Add provider** drop-down list in the **User Federation** panel, select **ldap**.
4. Provide values for the following parameters. Substitute all site-specific values with values relevant to your environment.

Property	Value
Console Display Name	Red Hat IDM
Edit Mode	READ_ONLY
Sync Registrations	Off
Vendor	Red Hat Directory Server
Username LDAP attribute	uid
RDN LDAP attribute	uid
UUID LDAP attribute	ipaUniqueID
User Object Classes	inetOrgPerson, organizationalPerson

Property	Value
Connection URL	LDAPS://<_FED_IPA_HOST_>
Users DN	cn=users,cn=accounts,<_FED_IPA_BASE_DN_>
Authentication Type	simple
Bind DN	uid=rhsso,cn=sysaccounts,cn=etc,<_FED_IPA_BASE_DN_>
Bind Credential	<_FED_IPA_RHSSO_SERVICE_PASSWD_>

5. Use the Test connection and Test authentication buttons to ensure that user federation is working.
6. Click **Save** to save the new user federation provider.
7. Click the **Mappers** tab at the top of the Red Hat IdM user federation page you created.
8. Create a mapper to retrieve the user group information. A user's group membership returns the SAM assertion. Use group membership later to provide authorization in OpenStack.
9. Click **Create** in the Mappers page.
10. On the **Add user federation mapper** page, select **group-ldap-mapper** from the *Mapper Type* drop-down list, and name it **Group Mapper**. Provide values for the following parameters. Substitute all site-specific values with values relevant to your environment.

Property	Value
LDAP Groups DN	cn=groups,cn=accounts,,<_FED_IPA_BASE_DN_>
Group Name LDAP Attribute	cn
Group Object Classes	groupOfNames
Membership LDAP Attribute	member
Membership Attribute Type	DN
Mode	READ_ONLY
User Groups Retrieve Strategy	GET_GROUPS_FROM_USER_MEMBEROF_ATTRIBUTE

11. Click **Save**.

3.2. ADDING USER ATTRUBUTES USING SAML ASSERTION

Security Assertion Markup Language (SAML) is an open standard that allows the communication of user attributes and authorization credentials between the identity provider (IdP) and a service provider (SP).

You can configure Red Hat Single Sign-On (RH-SSO) to return the attribues that you require in the assertion. When the OpenStack Identity service receives the SAML assertion, it maps those attributes onto OpenStack users. The process of mapping IdP attributes into Identity Service data is called Federated Mapping. For more information, see Section 4.20, "Create the Mapping File and Upload to Keystone".

Use the following process to add attributes to SAML:

Procedure

1. In the RH-SSO administration web console, select <_FED_RHSSO_REALM_> from the drop-down list in the upper left corner.
2. Select **Clients** from the **Configure** panel.
3. Select the service provider client that keycloak-httpd-client-install configured. You can identify the client with the SAML **EntityId**.
4. Select the mappers tab from the horizontal list of tabs.
5. In the Mappers panel, select **Create** or **Add Builtin** to add a protocol mapper to the client.

You can add additional attributes, but you only need the list of groups for which the user is a member. Group membership is how you authorize the user.

3.3. ADDING GROUP INFORMATION TO THE SAML ASSERTION

Procedure

1. Click the **Create** button in the Mappers Panel.
2. In the **Create Protocol Mapper** panel, select Group list from the Mapper tpe drop-down list.
3. Enter Group List as a name in the **Name** field.
4. Enter groups as the name of the SAML attribute in the Group attribute **Name** field.

NOTE

This is the name of the attribute as it appears in the SAML assertion. When the keystone mapper searches for names in the **Remote** section of the mapping declaration, it searches for the SAML attrubute name. When you add an attribute in RH-SSO to be passed in the assertion, specify the SAML attribute name. You define the name in the RH-SSO protocol mapper.

5. In the SAML Attribute NameFormat parameter, select **Basic**.
6. In the Single Group Attribute toggle box, select **On**.
7. Click **Save**.

NOTE

When you run the **keycloak-httpd-client-install** tool, the process adds a group mapper.

CHAPTER 4. CONFIGURING RED HAT OPENSTACK PLATFORM FOR FEDERATION

The following nodes require an assigned Fully-Qualified Domain Name (FQDN):

- The host running the Dashboard (horizon).
- The host running the Identity Service (keystone), referenced in this guide as **$FED_KEYSTONE_HOST**. Note that more than one host will run a service in a high-availability environment, so the IP address is not a host address but rather the IP address bound to the service.
- The host running RH-SSO.
- The host running IdM.

The Red Hat OpenStack Platform director deployment does not configure DNS or assign FQDNs to the nodes, however, the authentication protocols (and TLS) require the use of FQDNs.

4.1. RETRIEVING THE IP ADDRESS

In Red Hat OpenStack Platform, there is one common public IP address for all OpenStack services, separated by port number. To determine the public IP address of the overcloud services, use the **openstack endpoint list** command:

```
(overcloud) [stack@director ~]$ openstack endpoint list -c "Service Name" -c Interface -c URL | grep
public

| swift        | public    | http://10.0.0.101:8080/v1/AUTH_%(tenant_id)s |
| panko        | public    | http://10.0.0.101:8977                       |
| nova         | public    | http://10.0.0.101:8774/v2.1                  |
| glance       | public    | http://10.0.0.101:9292                       |
| neutron      | public    | http://10.0.0.101:9696                       |
| keystone     | public    | http://10.0.0.101:5000                       |
| cinderv2     | public    | http://10.0.0.101:8776/v2/%(tenant_id)s      |
| placement    | public    | http://10.0.0.101:8778/placement             |
| cinderv3     | public    | http://10.0.0.101:8776/v3/%(tenant_id)s      |
| heat         | public    | http://10.0.0.101:8004/v1/%(tenant_id)s      |
| heat-cfn     | public    | http://10.0.0.101:8000/v1                    |
| gnocchi      | public    | http://10.0.0.101:8041                       |
| aodh         | public    | http://10.0.0.101:8042                       |
| cinderv3     | public    | http://10.0.0.101:8776/v3/%(tenant_id)s      |
```

4.2. SETTING THE HOST VARIABLES AND NAMING THE HOST

You must determine the IP address and port to use. In this example, the IP address is 10.0.0.101 and the port is 13000.

1. Confirm this value in overcloudrc:

```
export OS_AUTH_URL=https://10.0.0.101:13000/v2.0
```

2. Assign the IP address a fully qualified domain name (FQDN), and write it to the **/etc/hosts** file. This example uses overcloud.localdomain:

```
10.0.0.101 overcloud.localdomain # FQDN of the external VIP
```

NOTE

Although Red Hat OpenStack Platform director configures the hosts files on the overcloud nodes, you might need to add the host entry on any external hosts that participate.

3. Set the $FED_KEYSTONE_HOST and $FED_KEYSTONE_HTTPS_PORT in the fed_variables file. This example uses the same values:

```
FED_KEYSTONE_HOST="overcloud.localdomain"
FED_KEYSTONE_HTTPS_PORT=13000
```

Because Mellon runs on the Apache server that hosts Identity service (keystone), the Mellon host:port and keystone host:port values must match.

NOTE

If you run the **hostname** command on one of the Controller nodes, is output is similar to **controller-0.localdomain**. This is an internal cluster name, not its public name. Use the public IP address instead.

4.3. INSTALLING HELPER FILES

You must install the helper files as part of the configuration.

- Copy the **configure-federation** and **fed_variables** files that you created as part of Section 1.5, “Using a conifguration script” into the **stack** home directory on **undercloud-0**.

4.4. SETTING YOUR DEPLOYMENT VARIABLES

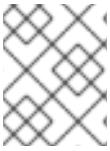
The file **fed_variables** contains variables specific to your federation deployment. These variables are referenced in this guide as well as in the **configure-federation** helper script. Each site-specific federation variable is prefixed with **FED_**. Ensure that every **FED_** variable in fed_variables is provided a value.

4.5. COPYING THE HELPER FILES

You must have the configuration file and variable files on controller-0 to continue.

- Copy the configure-federation and the edited fed_variables from the ~/**stack** home directory on **undercloud-0** to the ~/**heat-admin** home directory on **controller-0**:

```
$ scp configure-federation fed_variables heat-admin@controller-0:/home/heat-admin
```



NOTE

You can use the configure-federation script to perform the above step: **$ ./configure-federation copy-helper-to-controller**

4.6. INITIALIZING THE WORKING ENVIRONMENTS

1. On the undercloud node, as the **stack** user, create the **fed_deployment** directory. This location is the file stash:

```
$ su - stack
$ mkdir fed_deployment
```

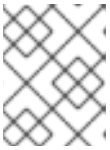
NOTE

You can use the **configure-federation** script to perform the previous step:

```
$ ./configure-federation initialize
```

2. Use SSH to connect to **controller-0**, and create the **~/fed_deployment** directory as the **head-admin** user. This location is the file stash:

```
$ ssh heat-admin@controller-0
$ mkdir fed_deployment
```



NOTE

You can use the **configure-federation** script to perform the previous step. From the **controller-0** node:

```
$ ./configure-federation initialize
```

4.7. INSTALLING MOD_AUTH_MELLON

You must install the **mod_auth_mellon** on each controller in your environment.

- On each controller, run the following:

```
$ ssh heat-admin@controller-n # replace n with controller number
$ sudo dnf install mod_auth_mellon
```

4.8. ADDING THE RH-SSO FQDN TO EACH CONTROLLER

Ensure that every controller is reachable by its fully-qualified domain name (FQDN).

- The mellon service runs on each Controller node and connects to the RH-SSO IdP. If the FQDN of the RH-SSO IdP is not resolvable through DNS, manually add the FQDN to the **/etc/hosts** file on all controller nodes after the **Heat Hosts** section:

```
$ ssh heat-admin@controller-n
```

```
$ sudo vi /etc/hosts

# Add this line (substituting the variables) before this line:
# HEAT_HOSTS_START - Do not edit manually within this section!
...
# HEAT_HOSTS_END
$FED_RHSSO_IP_ADDR $FED_RHSSO_FQDN
```

4.9. INSTALLING AND CONFIGURING MELLON ON THE CONTROLLER NODE

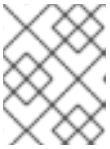
The **keycloak-httpd-client-install** tool performs many of the steps needed to configure **mod_auth_mellon** and have it authenticate against the RH-SSO IdP. Run the **keycloak-httpd-client-install** tool on the node where mellon runs. In this example, mellon runs on the overcloud controllers protecting the Identity service (keystone).

NOTE

Red Hat OpenStack Platform is a high availability deployment with multiple overcloud Controller nodes, each running identical copies. As a result, you must replicate the mellon configuration on each Controller node. To do this, install and configure mellon on controller-0, and collect the configuration files that the **keycloak-httpd-client-install** tool created into a tar file. Use Object Storage (swift) to copy the archive to each Controller and unarchive the files there.

- Run the RH-SSO client installation:

```
$ ssh heat-admin@controller-0
$ dnf -y install keycloak-httpd-client-install
$ sudo keycloak-httpd-client-install \
 --client-originate-method registration \
 --mellon-https-port $FED_KEYSTONE_HTTPS_PORT \
 --mellon-hostname $FED_KEYSTONE_HOST  \
 --mellon-root /v3 \
 --keycloak-server-url $FED_RHSSO_URL  \
 --keycloak-admin-password  $FED_RHSSO_ADMIN_PASSWORD \
 --app-name v3 \
 --keycloak-realm $FED_RHSSO_REALM \
 -l "/v3/auth/OS-FEDERATION/websso/mapped" \
 -l "/v3/auth/OS-FEDERATION/identity_providers/rhsso/protocols/mapped/websso" \
 -l "/v3/OS-FEDERATION/identity_providers/rhsso/protocols/mapped/auth
```



NOTE

You can use the configure-federation script to perform the above step: **$ ./configure-federation client-install**

After the client RPM installation, you should see output similar to this:

```
[Step  1] Connect to Keycloak Server
[Step  2] Create Directories
[Step  3] Set up template environment
[Step  4] Set up Service Provider X509 Certificates
```

```
[Step  5] Build Mellon httpd config file
[Step  6] Build Mellon SP metadata file
[Step  7] Query realms from Keycloak server
[Step  8] Create realm on Keycloak server
[Step  9] Query realm clients from Keycloak server
[Step 10] Get new initial access token
[Step 11] Creating new client using registration service
[Step 12] Enable saml.force.post.binding
[Step 13] Add group attribute mapper to client
[Step 14] Add Redirect URIs to client
[Step 15] Retrieve IdP metadata from Keycloak server
[Step 16] Completed Successfully
```

4.10. EDITING THE MELLON CONFIGURATION

During the IdP-assertion-to-Keystone mapping phase, your groups must be in a semicolon separated list. Use the following procedure to configure mellon so that when it receives multiple values for an attribute, it combines them into a semicolon-separated single value.

Procedure

1. Open the **v3_mellon_keycloak_openstack.conf** configuration file for editing:

```
$ vi /var/lib/config-data/puppet-
generated/keystone/etc/httpd/conf.d/v3_mellon_keycloak_openstack.conf
```

1. Add the **MellonMergeEnvVars** parameter to the <Location /v3> block:

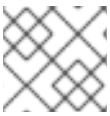
```
<Location /v3>
    ...
    MellonMergeEnvVars On ";"
</Location>
```

4.11. CREATING AN ARCHIVE OF THE GENERATED CONFIGURATION FILES

To replicate the mellon configuration on all Controller nodes, create an archive of the files to install on each Controller node. Store the archive in the **~/fed_deployment** subdirectory.

1. Create the compressed archive:

```
mkdir fed_deployment && cd fed_deployment
tar -czvf rhsso_config.tar.gz \
  --exclude '*.orig' \
  --exclude '*~' \
  /var/lib/config-data/puppet-generated/keystone/etc/httpd/saml2 \
  /var/lib/config-data/puppet-
generated/keystone/etc/httpd/conf.d/v3_mellon_keycloak_openstack.conf
```



NOTE

You can use the **configure-federation** script to perform the previous step:

```
$ ./configure-federation create-sp-archive
```

4.12. RETRIEVING THE MELLON CONFIGURATION ARCHIVE

- On the **undercloud-0** node, retrieve the archive you created and extract the files so that you can access the data as needed in subsequent steps.

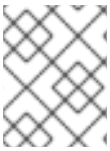
```
$ scp heat-admin@controller-0:/home/heat-admin/fed_deployment/rhsso_config.tar.gz
~/fed_deployment
$ tar -C fed_deployment -xvf fed_deployment/rhsso_config.tar.gz
```

NOTE

You can use the **configure-federation** script to perform the above step: **$ ./configure-federation fetch-sp-archive**

4.13. PREVENTING PUPPET FROM DELETING UNMANAGED HTTPD FILES

By default, the Puppet Apache module purges any files in Apache configuration directories that it does not manage. This prevents Apache from operating against the configuration that Puppet enforces. However, this conflicts with the manual configuration of mellon in the HTTPD configuration directories. The Apache Puppet **apache::purge_configs** flag is enabled by default, which directs Puppet to delete files that belong to the **mod_auth_mellon** RPM. Puppet also deletes the configuration files that **keycloak-httpd-client-install** generates. Until Puppet controls the mellon files, disable the **apache::purge_configs** flag.



NOTE

Disabling the **apache::purge_configs** flag opens the Controller nodes to vulnerabilities. Re-enable it when Puppet adds support managing mellon.

To override the **apache::purge_configs** flag, create a Puppet file that contains the override, and add the override file to the list of Puppet files you use when you run the **overcloud_deploy.sh** script.

1. Create the **fed_deployment/puppet_override_apache.yaml** environment file and add the following content:

```
parameter_defaults:
  ControllerExtraConfig:
    apache::purge_configs: false
```

2. Add **puppet_override_apache.yaml** as the last environment file in the overcloud_deploy.sh script:

```
...
  -e /home/stack/fed_deployment/puppet_override_apache.yaml \
  --log-file overcloud_deployment_14.log &> overcloud_install.log
```

NOTE

You can use the **configure-federation** script to perform the above step: **$ ./configure-federation puppet-override-apache**

4.14. CONFIGURING IDENTITY SERVICE (KEYSTONE) FOR FEDERATION

Keystone domains require extra configuration. However if the keystone Puppet module is enabled, it can perform this extra configuration step.

- In on of the Puppet YAML files, add the following:

```
keystone::using_domain_config: true
```

Set the following values in **/etc/keystone/keystone.conf** to enable federation.

auth:methods

A list of allowed authentication methods. By default the list is: **['external', 'password', 'token', 'oauth1']**. You must enable SAML by using the **mapped** method. Additionally, the **external** method must be excluded. Set the value to the following: **password,token,oauth1,mapped**.

federation:trusted_dashboard

A list of trusted dashboard hosts. Before accepting a Single Sign-On request to return a token, the origin host must be a member of this list. You can use use this configuration option multiple times for different values. You must set this to use web-based SSO flows. For this deployment the value is: **https://$FED_KEYSTONE_HOST/dashboard/auth/websso/** The host is $FED_KEYSTONE_HOST because Red Hat OpenStack Platform director co-locates both keystone and horizon on the same host. If horizon runs on a different host to keystone, you must adjust accordingly.

federation:sso_callback_template

The absolute path to an HTML file that is used as a Single Sign-On callback handler This page redirects the user from the Identity service back to a trusted dashboard host by form encoding a token in a POST request. The default value is sufficient for most deployments.

federation:remote_id_attribute

The value that is used to obtain the entity ID of the Identity provider. For **mod_auth_mellon**, use **Mellon_IDP**. Set this value in the mellon configuration file using the Mellon IDP directive.

- Create the fed_deployment/puppet_override_keystone.yaml file with the following content:

```
parameter_defaults:
  controllerExtraConfig:
    keystone::using_domain_config: true
    keystone::config::keystone_config:
      identity/domain_configurations_from_database:
        value: true
      auth/methods:
        value: external,password,token,oauth1,mapped
      federation/trusted_dashboard:
        value: https://$FED_KEYSTONE_HOST/dashboard/auth/websso/
      federation/sso_callback_template:
        value: /etc/keystone/sso_callback_template.html
      federation/remote_id_attribute:
        value: MELLON_IDP
```

- Append the created environment file at the end of the **overcloud_deploy.sh** script.

```
...
-e /home/stack/fed_deployment/puppet_override_keystone.yaml \
--log-file overcloud_deployment_14.log &> overcloud_install.log
```

NOTE

You can use the **configure-federation** script to perform the above step: **$ ./configure-federation puppet-override-keystone**

4.15. DEPLOYING THE MELLON CONFIGURATION ARCHIVE

- Use Object Storage (swift) artifacts to install the mellon configuration files on each Controller node.

```
$ source ~/stackrc
$ upload-swift-artifacts -f fed_deployment/rhsso_config.tar.gz
```

NOTE

You can use the configure-federation script to perform the above step: `./configure-federation deploy-mellon-configuration `

4.16. REDEPLOYING THE OVERCLOUD

- To apply the changes from the Puppet YAML configuration files and Object Storage artifacts, run the deploy command:

```
./overcloud_deploy.sh
```

Important: When you make additional changes to the Controller nodes by re-running Puppet, the **overcloud_deploy.sh** script might overwrite previous configurations. Do not apply the Puppet configuration after this procedure to avoid losing manual edits that you make to the configuration files on the overcloud Controller nodes.

4.17. USE PROXY PERSISTENCE FOR THE IDENTITY SERVICE (KEYSTONE) ON EACH CONTROLLER

When **mod_auth_mellon** establishes a session, it cannot share its state information across multiple servers. Because the high number of redirections used by SAML involves state information, the same server must process all transactions. Therefore, you must configure HAProxy to direct each client's requests to the same server each time.

There are two way that HAProxy can bind a client to the same server:

Affinity

Use affinity when information from a layer below the application layer is used to pin a client request to a single server.

Persistence

Use persistence when the application layer information binds a client to a single server sticky session. Persistence is much more accurate than affinity. Use the following procedure to implement persistence.

The HAProxy cookie directive names a cookie and its parameters for persistence. The HAProxy server directive has a cookie option that sets the value of the cookie to the name of the server. If an incoming request does not have a cookie identifying the back-end server, then HAProxy selects a server based on its configured balancing algorithm.

Procedure

1. To enable persistence in the **keystone_public** block of the **/var/lib/config-data/puppet-generated/haproxy/etc/haproxy/haproxy.cfg** configuration file, add the following line:

```
cookie SERVERID insert indirect nocache
```

   This setting states that **SERVERID** is the name of the persistence cookie.

2. Edit each **server** line and add **cookie <server-name>** as an additional option:

```
server controller-0 cookie controller-0
server controller-1 cookie controller-1
```

4.18. CREATING FEDERATED RESOURCES

Create the Identity service (keystone) targets, users, and groups for consumption by the identity provider (IdP).

Procedure

1. Source the **overcloudrc** file on the undercloud as the stack user, and run the following commands:

```
$ openstack domain create federated_domain
$ openstack project create  --domain federated_domain federated_project
$ openstack group create federated_users --domain federated_domain
$ openstack role add --group federated_users --group-domain federated_domain --domain federated_domain _member_
$ openstack role add --group federated_users --group-domain federated_domain --project federated_project _member_
```

NOTE

You can use the **configure-federation** script to perform the above step: **$ ./configure-federation create-federated-resources**

4.19. CREATING THE IDENTITY PROVIDER IN RED HAT OPENSTACK PLATFORM

The IdP must be registered in the Identity service (keystone), which creates a binding between the **entityID** in the SAML assertion and the name of the IdP in the Identity service.

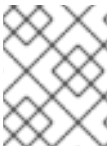
Procedure

1. Locate the **entityID** of the RH-SSO IdP, which is located in the IdP metadata. The IdP metadata is stored in the **/var/lib/config-data/puppet-generated/keystone/etc/httpd/saml2/v3_keycloak_$FED_RHSSO_REALM_idp_metadata.xml** file. You can also find the IdP metadata in the **fed_deployment/var/lib/config-data/puppet-generated/keystone/etc/httpd/saml2/v3_keycloak_$FED_RHSSO_REALM_idp_metadata.xml** file.

2. Note the value of the entityID attribute, which is in the IdP metadata file within the **<EntityDescriptor>** element. Assign the **$FED_IDP_ENTITY_ID** variable this value.

3. Name your IdP **rhsso**, which is assigned to the variable **$FED_OPENSTACK_IDP_NAME**:

```
$ openstack identity provider create --remote-id $FED_IDP_ENTITY_ID
$FED_OPENSTACK_IDP_NAME
```



NOTE

You can use the **configure-federation** script to perform the above step: **$ ./configure-federation openstack-create-idp**

4.20. CREATE THE MAPPING FILE AND UPLOAD TO KEYSTONE

Keystone performs a mapping to match the IdP's SAML assertion into a format that keystone can understand. The mapping is performed by keystone's mapping engine and is based on a set of mapping rules that are bound to the IdP.

1. These are the mapping rules used in this example (as described in the introduction):

```
[
    {
        "local": [
            {
                "user": {
                    "name": "{0}"
                },
                "group": {
                    "domain": {
                        "name": "federated_domain"
                    },
                    "name": "federated_users"
                }
            }
        ],
        "remote": [
            {
                "type": "MELLON_NAME_ID"
            },
            {
                "type": "MELLON_groups",
                "any_one_of": ["openstack-users"]
            }
        ]
    }
]
```

This mapping file contains only one rule. Rules are divided into two parts: **local** and **remote**. The mapping engine works by iterating over the list of rules until one matches, and then executing it. A rule is considered a match only if *all* the conditions in the **remote** part of the rule match. In this example the **remote** conditions specify:

1. The assertion must contain a value called **MELLON_NAME_ID**.
2. The assertion must contain a values called **MELLON_groups** and at least one of the groups in the group list must be **openstack-users**.

If the rule matches, then:

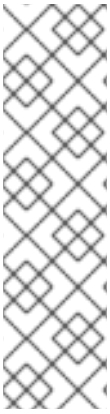
1. The keystone **user** name will be assigned the value from **MELLON_NAME_ID**.
2. The user will be assigned to the keystone group **federated_users** in the **federated_domain** domain.

In summary, if the IdP successfully authenticates the user, and the IdP asserts that user belongs to the group **openstack-users**, then keystone will allow that user to access OpenStack with the privileges bound to the **federated_users** group in keystone.

4.20.1. Create the mapping

1. To create the mapping in keystone, create a file containing the mapping rules and then upload it into keystone, giving it a reference name. Create the mapping file in the **fed_deployment** directory (for example, in **fed_deployment/mapping_${FED_OPENSTACK_IDP_NAME}_saml2.json**), and assign the name **$FED_OPENSTACK_MAPPING_NAME** to the mapping rules. For example:

```
$ openstack mapping create --rules fed_deployment/mapping_rhsso_saml2.json
$FED_OPENSTACK_MAPPING_NAME
```



NOTE

You can use the **configure-federation** script to perform the above procedure as two steps:

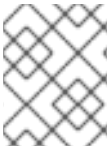
```
$ ./configure-federation create-mapping
$ ./configure-federation openstack-create-mapping
```

- **create-mapping** - creates the mapping file.
- **openstack-create-mapping** - performs the upload of the file.

4.21. CREATE A KEYSTONE FEDERATION PROTOCOL

1. Keystone uses the **Mapped** protocol to bind an IdP to a mapping. To establish this binding:

```
$ openstack federation protocol create \
--identity-provider $FED_OPENSTACK_IDP_NAME \
--mapping $FED_OPENSTACK_MAPPING_NAME \
mapped"
```



NOTE

You can use the **configure-federation** script to perform the above step: **$ ./configure-federation openstack-create-protocol**

4.22. FULLY-QUALIFY THE KEYSTONE SETTINGS

1. On each controller node, edit **/var/lib/config-data/puppet-generated/keystone/etc/httpd/conf.d/10-keystone_wsgi_main.conf** to confirm that the **ServerName** directive inside the **VirtualHost** block includes the HTTPS scheme, the public hostname, and the public port. You must also enable the **UseCanonicalName** directive. For example:

```
<VirtualHost>
  ServerName https:$FED_KEYSTONE_HOST:$FED_KEYSTONE_HTTPS_PORT
  UseCanonicalName On
  ...
</VirtualHost>
```

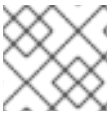
NOTE

Be sure to substitute the **$FED_** variables with the values specific to your deployment.

4.23. CONFIGURE HORIZON TO USE FEDERATION

1. On each controller node, edit **/var/lib/config-data/puppet-generated/horizon/etc/openstack-dashboard/local_settings** and make sure the following configuration values are set:

```
OPENSTACK_KEYSTONE_URL =
"https://$FED_KEYSTONE_HOST:$FED_KEYSTONE_HTTPS_PORT/v3"
OPENSTACK_KEYSTONE_DEFAULT_ROLE = "_member_"
WEBSSO_ENABLED = True
WEBSSO_INITIAL_CHOICE = "mapped"
WEBSSO_CHOICES = (
    ("mapped", _("RH-SSO")),
    ("credentials", _("Keystone Credentials")),
)
```



NOTE

Be sure to substitute the **$FED_** variables with the values specific to your deployment.

4.24. CONFIGURE HORIZON TO USE THE X-FORWARDED-PROTO HTTP HEADER

1. On each controller node, edit **/var/lib/config-data/puppet-generated/horizon/etc/openstack-dashboard/local_settings** and uncomment the line:

```
#SECURE_PROXY_SSL_HEADER = ('HTTP_X_FORWARDED_PROTO', 'https')
```

NOTE

You must restart a container for configuration changes to take effect.

CHAPTER 5. TROUBLESHOOTING

5.1. TEST THE KEYSTONE MAPPING RULES

It is recommended you verify that your mapping rules work as expected. The **keystone-manage** command line tool allows you to exercise a set of mapping rules (read from a file) against assertion data which is also read from a file. For example:

1. The file **mapping_rules.json** has this content:

```
[
    {
        "local": [
            {
                "user": {
                    "name": "{0}"
                },
                "group": {
                    "domain": {
                        "name": "Default"
                    },
                    "name": "federated_users"
                }
            }
        ],
        "remote": [
            {
                "type": "MELLON_NAME_ID"
            },
            {
                "type": "MELLON_groups",
                "any_one_of": ["openstack-users"]
            }
        ]
    }
]
```

2. The file **assertion_data.txt** has this content:

```
MELLON_NAME_ID: 'G-90eb44bc-06dc-4a90-aa6e-fb2aa5d5b0de
MELLON_groups: openstack-users;ipausers
```

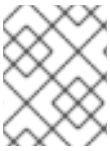
3. If you then run this command:

```
$ keystone-manage mapping_engine --rules mapping_rules.json --input assertion_data.txt
```

4. You should get this mapped result:

```
{
  "group_ids": [],
  "user": {
    "domain": {
      "id": "Federated"
    },
```

```
    "type": "ephemeral",
    "name": "'G-90eb44bc-06dc-4a90-aa6e-fb2aa5d5b0de"
   },
   "group_names": [
    {
     "domain": {
      "name": "Default"
     },
     "name": "federated_users"
    }
   ]
}
```



NOTE

You can also include the **--engine-debug** command line argument, which will output diagnostic information describing how the mapping rules are being evaluated.

5.2. DETERMINE THE ACTUAL ASSERTION VALUES RECEIVED BY KEYSTONE

The *mapped* assertion values that keystone will use are passed as CGI environment variables. To retrieve a dump of those environment variables:

1. Create the following test script in **/var/www/cgi-bin/keystone/test** with the following content:

```
import pprint
import webob
import webob.dec


@webob.dec.wsgify
def application(req):
    return webob.Response(pprint.pformat(req.environ),
                          content_type='application/json')
```

2. Edit the **/var/lib/config-data/puppet-generated/keystone/etc/httpd/conf.d/10-keystone_wsgi_main.conf** file setting it to run the **test** script by temporarily modifying the **WSGIScriptAlias** directive:

```
WSGIScriptAlias "/v3/auth/OS-FEDERATION/websso/mapped" "/var/www/cgi-bin/keystone/test"
```

3. Restart *httpd*:

```
systemctl restart httpd
```

4. Attempt to login, and review the information that the script dumps out. When finished, remember to restore the **WSGIScriptAlias** directive, and restart the HTTPD service again.

5.3. REVIEW THE SAML MESSAGES EXCHANGED BETWEEN THE SP AND IDP

The **SAMLTracer** Firefox add-on is a useful tool for capturing and displaying the SAML messages exchanged between the SP and the IdP.

1. Install **SAMLTracer** from this URL: https://addons.mozilla.org/en-US/firefox/addon/saml-tracer/

2. Enable **SAMLTracer** from the Firefox menu. A **SAMLTracer** pop-up window will appear in which all browser requests are displayed. If a request is detected as a SAML message a special **SAML** icon is added to the request.

3. Initiate a SSO login from the Firefox browser.

4. In the **SAMLTracer** window find the first **SAML** message and click on it. Use the **SAML** tab in the window to see the decoded SAML message (note, the tool is not capable of decrypting encrypted content in the body of the message, if you need to see encrypted content you must disable encryption in the metadata). The first SAML message should be an **AuthnRequest** sent by the SP to the IdP. The second SAML message should be the assertion response sent by the IdP. Since the SAML HTTP-Redirect profile is being used the Assertion response will be wrapped in a POST. Click on the **SAML** tab to see the contents of the assertion.

CHAPTER 6. THE CONFIGURE-FEDERATION FILE

```
#!/bin/sh


prog_name=`basename $0`
action=
dry_run=0
verbose=0

base_dir=$(pwd)
stage_dir="${base_dir}/fed_deployment"

mellon_root="/v3"
mellon_endpoint="mellon"
mellon_app_name="v3"

overcloud_deploy_script="overcloud_deploy.sh"
overcloudrc_file="./overcloudrc"

function cmd_template {
    local status=0
    local cmd="$1"
    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    $cmd
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
    fi
    return $status
}

function cmds_template {
    local return_status=0
    declare -a cmds=(
        "date"
        "ls xxx"
        "head $0"
    )

    if [ $dry_run -ne 0 ]; then
        for cmd in "${cmds[@]}"; do
            echo $cmd
        done
    else
        for cmd in "${cmds[@]}"; do
            if [ $verbose -ne 0 ]; then
                echo $cmd
            fi
```

```
            $cmd
            status=$?
            if [ $status -ne 0 ]; then
                (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
                return_status=$status
            fi
        done
    fi
    return $return_status
}

function show_variables {
    echo "base_dir: $base_dir"
    echo "stage_dir: $stage_dir"
    echo "config_tar_filename: $config_tar_filename"
    echo "config_tar_pathname: $config_tar_pathname"
    echo "overcloud_deploy_script: $overcloud_deploy_script"
    echo "overcloudrc_file: $overcloudrc_file"

    echo "puppet_override_apache_pathname: $puppet_override_apache_pathname"
    echo "puppet_override_keystone_pathname: $puppet_override_keystone_pathname"

    echo

    echo "FED_RHSSO_URL: $FED_RHSSO_URL"
    echo "FED_RHSSO_ADMIN_PASSWORD: $FED_RHSSO_ADMIN_PASSWORD"
    echo "FED_RHSSO_REALM: $FED_RHSSO_REALM"

    echo

    echo "FED_KEYSTONE_HOST: $FED_KEYSTONE_HOST"
    echo "FED_KEYSTONE_HTTPS_PORT: $FED_KEYSTONE_HTTPS_PORT"
    echo "mellon_http_url: $mellon_http_url"
    echo "mellon_root: $mellon_root"
    echo "mellon_endpoint: $mellon_endpoint"
    echo "mellon_app_name: $mellon_app_name"
    echo "mellon_endpoint_path: $mellon_endpoint_path"
    echo "mellon_entity_id: $mellon_entity_id"

    echo

    echo "FED_OPENSTACK_IDP_NAME: $FED_OPENSTACK_IDP_NAME"
    echo "openstack_mapping_pathname: $openstack_mapping_pathname"
    echo "FED_OPENSTACK_MAPPING_NAME: $FED_OPENSTACK_MAPPING_NAME"

    echo

    echo "idp_metadata_filename: $idp_metadata_filename"
    echo "mellon_httpd_config_filename: $mellon_httpd_config_filename"
}

function initialize {
    local return_status=0
    declare -a cmds=(
        "mkdir -p $stage_dir"
    )
```

```
    if [ $dry_run -ne 0 ]; then
        for cmd in "${cmds[@]}"; do
            echo $cmd
        done
    else
        for cmd in "${cmds[@]}"; do
            if [ $verbose -ne 0 ]; then
                echo $cmd
            fi
            $cmd
            status=$?
            if [ $status -ne 0 ]; then
                (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
                return_status=$status
            fi
        done
    fi
    return $return_status
}

function copy_helper_to_controller {
    local status=0
    local controller=${1:-"controller-0"}
    local cmd="scp configure-federation fed_variables heat-admin@${controller}:/home/heat-admin"
    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    $cmd
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
    fi
    return $status
}

function install_mod_auth_mellon {
    local status=0
    local cmd="sudo yum -y install mod_auth_mellon"

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    $cmd
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
    fi
```

```
    return $status
}

function create_ipa_service_account {
    # Note, after setting up the service account it can be tested
    # by performing a user search like this:
    # ldapsearch -H $ldap_url -x -D "$service_dn" -w "$FED_IPA_RHSSO_SERVICE_PASSWD" -b
"cn=users,cn=accounts,$FED_IPA_BASE_DN"

    local status=0
    local ldap_url="ldaps://$FED_IPA_HOST"
    local dir_mgr_dn="cn=Directory Manager"
    local service_name="rhsso"
    local service_dn="uid=$service_name,cn=sysaccounts,cn=etc,$FED_IPA_BASE_DN"
    local cmd="ldapmodify -H \"$ldap_url\" -x -D \"$dir_mgr_dn\" -w \"$FED_IPA_ADMIN_PASSWD\""

    read -r -d '' contents <<EOF
dn: $service_dn
changetype: add
objectclass: account
objectclass: simplesecurityobject
uid: $service_name
userPassword: $FED_IPA_RHSSO_SERVICE_PASSWD
passwordExpirationTime: 20380119031407Z
nsIdleTimeout: 0

EOF

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd
        echo -e "$contents"
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    sh <<< "$cmd <<< \"$contents\""
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
    fi

    return $status
}



function client_install {
    local status=0
    local cmd_client_install="sudo yum -y install keycloak-httpd-client-install"
    local cmd="sudo keycloak-httpd-client-install \
   --client-originate-method registration \
   --mellon-https-port $FED_KEYSTONE_HTTPS_PORT \
   --mellon-hostname $FED_KEYSTONE_HOST  \
   --mellon-root $mellon_root \
   --keycloak-server-url $FED_RHSSO_URL  \
```

```
    --keycloak-admin-password  $FED_RHSSO_ADMIN_PASSWORD \
    --app-name $mellon_app_name \
    --keycloak-realm $FED_RHSSO_REALM \
    -l "/v3/auth/OS-FEDERATION/websso/mapped" \
    -l "/v3/auth/OS-FEDERATION/identity_providers/rhsso/protocols/mapped/websso" \
    -l "/v3/OS-FEDERATION/identity_providers/rhsso/protocols/mapped/auth"
"
    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd_client_install
        echo $cmd
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    $cmd_client_install
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd_client_install\" failed\nstatus = $status")
    else
        $cmd
        status=$?
        if [ $status -ne 0 ]; then
            (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
        fi
    fi
    return $status
}

function create_sp_archive {
    # Note, we put the exclude patterns in a file because it is
    # insanely difficult to put --exclude patttern in the $cmd shell
    # variable and get the final quoting correct.

    local status=0
    local cmd="tar -cvzf $config_tar_pathname --exclude-from $stage_dir/tar_excludes /var/lib/config-
data/puppet-generated/keystone/etc/httpd/saml2 /var/lib/config-data/puppet-
generated/keystone/etc/httpd/conf.d/$mellon_httpd_config_filename"
    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    cat <<'EOF' > $stage_dir/tar_excludes
*.orig
*~
EOF

    $cmd
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
    fi
    return $status
```

```
}

function fetch_sp_archive {
    local return_status=0
    declare -a cmds=(
        "scp heat-admin@controller-0:/home/heat-admin/fed_deployment/$config_tar_filename
$stage_dir"
        "tar -C $stage_dir -xvf $config_tar_pathname"
    )

    if [ $dry_run -ne 0 ]; then
        for cmd in "${cmds[@]}"; do
            echo $cmd
        done
    else
        for cmd in "${cmds[@]}"; do
            if [ $verbose -ne 0 ]; then
                echo $cmd
            fi
            $cmd
            status=$?
            if [ $status -ne 0 ]; then
                (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
                return_status=$status
            fi
        done
    fi
    return $return_status
}

function deploy_mellon_configuration {
    local status=0
    local cmd="upload-swift-artifacts -f $config_tar_pathname"
    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    $cmd
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
    fi
    return $status
}

function idp_entity_id {
    local metadata_file=${1:-$idp_metadata_filename}

    # Extract the entitID from the metadata file, should really be parsed
    # with an XML xpath but a simple string match is probably OK

    entity_id=`sed -rne 's/^.*entityID="([^"]*)".*$/\1/p' ${metadata_file}`
    status=$?
```

```
    if [ $status -ne 0 -o "$entity_id"x = "x" ]; then
        (>&2 echo -e "ERROR search for entityID in ${metadata_file} failed\nstatus = $status")
        return 1
    fi
    echo $entity_id
    return 0
}

function append_deploy_script {
    local status=0
    local deploy_script=$1
    local extra_line=$2
    local count

    count=$(grep -c -e "$extra_line" $deploy_script)
    if [ $count -eq 1 ]; then
        echo -e "SKIP appending:\n$extra_line"
        echo "already present in $deploy_script"
        return $status
    elif [ $count -gt 1 ]; then
        status=1
        (>&2 echo -e "ERROR multiple copies of line in  ${deploy_script}\nstatus =
$status\nline=$extra_line")
        return $status
    fi

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo "appending $deploy_script with:"
        echo -e $extra_line
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    # insert line after last -e line already in script
    #
    # This is not easy with sed, we'll use tac and awk instead.  Here
    # is how this works: The logic is easier if you insert before the
    # first line rather than trying to find the last line and insert
    # after it. We use tac to reverse the lines in the file. Then the
    # awk script looks for the candidate line. If found it outputs the
    # line we're adding, sets a flag (p) to indicate it's already been
    # printed. The "; 1" pattern always output the input line. Then we
    # run the output through tac again to set things back in the
    # original order.

    local tmp_file=$(mktemp)

    tac $deploy_script | awk "!p && /^-e/{print \"${extra_line} \\\\\"; p=1}; 1" | tac > $tmp_file

    count=$(grep -c -e "${extra_line}" $tmp_file)
    if [ $count -ne 1 ]; then
        status=1
    fi
    if [ $status -ne 0 ]; then
        rm $tmp_file
```

```
        (>&2 echo -e "ERROR failed to append ${deploy_script}\nstatus = $status\nline=$extra_line")
    else
        mv $tmp_file $deploy_script
    fi


    return $status
}

function puppet_override_apache {
    local status=0
    local pathname=${1:-$puppet_override_apache_pathname}
    local deploy_cmd="-e $pathname"

    read -r -d '' contents <<'EOF'
parameter_defaults:
  ControllerExtraConfig:
    apache::purge_configs: false
EOF

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo "writing pathname = $pathname with contents"
        echo -e "$contents"
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    echo -e "$contents" > $pathname
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR failed to write ${pathname}\nstatus = $status")
    fi

    append_deploy_script $overcloud_deploy_script "$deploy_cmd"
    status=$?

    return $status
}

function puppet_override_keystone {
    local status=0
    local pathname=${1:-$puppet_override_keystone_pathname}
    local deploy_cmd="-e $pathname"

    read -r -d '' contents <<EOF
parameter_defaults:
  controllerExtraConfig:
    keystone::using_domain_config: true
    keystone::config::keystone_config:
      identity/domain_configurations_from_database:
        value: true
      auth/methods:
        value: external,password,token,oauth1,mapped
      federation/trusted_dashboard:
        value: https://$FED_KEYSTONE_HOST/dashboard/auth/websso/
```

```
    federation/sso_callback_template:
      value: /etc/keystone/sso_callback_template.html
    federation/remote_id_attribute:
      value: MELLON_IDP

EOF

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo "writing pathname = $pathname with contents"
        echo -e "$contents"
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    echo -e "$contents" > $pathname
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR failed to write ${pathname}\nstatus = $status")
    fi

    append_deploy_script $overcloud_deploy_script "$deploy_cmd"
    status=$?

    return $status
}

function create_federated_resources {
    # follow example in Keystone federation documentation
    # http://docs.openstack.org/developer/keystone/federation/federated_identity.html#create-
keystone-groups-and-assign-roles
    local return_status=0
    declare -a cmds=(
    "openstack domain create federated_domain"
    "openstack project create  --domain federated_domain federated_project"
    "openstack group create federated_users --domain federated_domain"
    "openstack role add --group federated_users --group-domain federated_domain --domain
federated_domain _member_"
    "openstack role add --group federated_users --project federated_project Member"
    )

    if [ $dry_run -ne 0 ]; then
        for cmd in "${cmds[@]}"; do
            echo $cmd
        done
    else
        for cmd in "${cmds[@]}"; do
            if [ $verbose -ne 0 ]; then
                echo $cmd
            fi
            $cmd
            status=$?
            if [ $status -ne 0 ]; then
                (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
                return_status=$status
            fi
```

```
        done
    fi
    return $return_status
}

function create_mapping {
    # Matches documentation
    # http://docs.openstack.org/developer/keystone/federation/federated_identity.html#create-
keystone-groups-and-assign-roles
    local status=0
    local pathname=${1:-$openstack_mapping_pathname}

    read -r -d '' contents <<'EOF'
[
    {
        "local": [
            {
                "user": {
                    "name": "{0}"
                },
                "group": {
                    "domain": {
                        "name": "federated_domain"
                    },
                    "name": "federated_users"
                }
            }
        ],
        "remote": [
            {
                "type": "MELLON_NAME_ID"
            },
            {
                "type": "MELLON_groups",
                "any_one_of": ["openstack-users"]
            }
        ]
    }
]
EOF

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo "writing pathname = $pathname with contents"
        echo -e "$contents"
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi


    echo -e "$contents" > $pathname
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR failed to write ${pathname}\nstatus = $status")
    fi
```

```
    return $status
}

function create_v3_rcfile {
    local status=0
    local input_file=${1:-$overcloudrc_file}
    local output_file="${input_file}.v3"

    source $input_file
    #clear the old environment
    NEW_OS_AUTH_URL=`echo $OS_AUTH_URL | sed 's!v2.0!v3!'`

    read -r -d '' contents <<EOF
for key in \$( set | sed 's!=.*!!g'  | grep -E '^OS_') ; do unset $key ; done
export OS_AUTH_URL=$NEW_OS_AUTH_URL
export OS_USERNAME=$OS_USERNAME
export OS_PASSWORD=$OS_PASSWORD
export OS_USER_DOMAIN_NAME=Default
export OS_PROJECT_DOMAIN_NAME=Default
export OS_PROJECT_NAME=$OS_TENANT_NAME
export OS_IDENTITY_API_VERSION=3
EOF

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo "writeing output_file = $output_file with contents:"
        echo -e "$contents"
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    echo -e "$contents" > $output_file
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR failed to write ${output_file}\nstatus = $status")
    fi

    return $status
}

function openstack_create_idp {
    local status=0
    local metadata_file="$stage_dir/var/lib/config-data/puppet-
generated/keystone/etc/httpd/saml2/$idp_metadata_filename"
    local entity_id
    entity_id=$(idp_entity_id $metadata_file)
    status=$?
    if [ $status -ne 0 ]; then
        return $status
    fi

    local cmd="openstack identity provider create --remote-id $entity_id
$FED_OPENSTACK_IDP_NAME"

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd
```

```
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    $cmd
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
    fi
    return $status
}

function openstack_create_mapping {
    local status=0
    local mapping_file=${1:-$openstack_mapping_pathname}
    local mapping_name=${2:-$FED_OPENSTACK_MAPPING_NAME}
    cmd="openstack mapping create --rules $mapping_file $mapping_name"

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    $cmd
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
    fi
    return $status
}

function openstack_create_protocol {
    local status=0
    local idp_name=${1:-$FED_OPENSTACK_IDP_NAME}
    local mapping_name=${2:-$FED_OPENSTACK_MAPPING_NAME}
    cmd="openstack federation protocol create --identity-provider $idp_name --mapping
$mapping_name mapped"

    if [ $verbose -ne 0 -o $dry_run -ne 0 ]; then
        echo $cmd
    fi
    if [ $dry_run -ne 0 ]; then
        return $status
    fi

    $cmd
    status=$?
    if [ $status -ne 0 ]; then
        (>&2 echo -e "ERROR cmd \"$cmd\" failed\nstatus = $status")
    fi
    return $status
}
```

```
function usage {
cat <<EOF
$prog_name action

-h --help        print usage
-n --dry-run     dry run, just print computed command
-v --verbose     be chatty

action may be one of:

show-variables
initialize
copy-helper-to-controller
install-mod-auth-mellon
create-ipa-service-account
client-install
create-sp-archive
fetch-sp-archive
deploy-mellon-configuration
puppet-override-apache
puppet-override-keystone
create-federated-resources
create-mapping
create-v3-rcfile
openstack-create-idp
openstack-create-mapping
openstack-create-protocol

EOF
}

#-------------------------------------------------------------------------------
# options may be followed by one colon to indicate they have a required argument
if ! options=$(getopt -o hnv -l help,dry-run,verbose -- "$@")
then
    # something went wrong, getopt will put out an error message for us
    exit 1
fi

eval set -- "$options"

while [ $# -gt 0 ]
do
    case $1 in
    -h|--help) usage; exit 1 ;;
    -n|--dry-run) dry_run=1 ;;
    -v|--verbose) verbose=1 ;;
    # for options with required arguments, an additional shift is required
    (--) shift; break;;
    (-*) echo "$0: error - unrecognized option $1" 1>&2; exit 1;;
    (*) break;;
    esac
    shift
done
#-------------------------------------------------------------------------------
source ./fed_variables
```

```
# Strip leading and trailing space and slash from these variables
mellon_root=`echo ${mellon_root} | perl -pe 's!^[ /]*(.*?)[ /]*$!\1!'`
mellon_endpoint=`echo ${mellon_endpoint} | perl -pe 's!^[ /]*(.*?)[ /]*$!\1!'`

mellon_root="/${mellon_root}"

mellon_endpoint_path="${mellon_root}/${mellon_endpoint}"
mellon_http_url="https://${FED_KEYSTONE_HOST}:${FED_KEYSTONE_HTTPS_PORT}"
mellon_entity_id="${mellon_http_url}${mellon_endpoint_path}/metadata"

openstack_mapping_pathname="${stage_dir}/mapping_${FED_OPENSTACK_IDP_NAME}_saml2.json
"
idp_metadata_filename="${mellon_app_name}_keycloak_${FED_RHSSO_REALM}_idp_metadata.xml"

mellon_httpd_config_filename="${mellon_app_name}_mellon_keycloak_${FED_RHSSO_REALM}.conf"

config_tar_filename="rhsso_config.tar.gz"
config_tar_pathname="${stage_dir}/${config_tar_filename}"
puppet_override_apache_pathname="${stage_dir}/puppet_override_apache.yaml"
puppet_override_keystone_pathname="${stage_dir}/puppet_override_keystone.yaml"

#--------------------------------------------------------------------------

if [ $# -lt 1 ]; then
  echo "ERROR: no action specified"
  exit 1
fi
action="$1"; shift

if [ $dry_run -ne 0 ]; then
    echo "Dry Run Enabled!"
fi

case $action in
    show-var*)
        show_variables ;;
    initialize)
        initialize ;;
    copy-helper-to-controller)
        copy_helper_to_controller "$1" ;;
    install-mod-auth-mellon)
        install_mod_auth_mellon ;;
    create-ipa-service-account)
        create_ipa_service_account ;;
    client-install)
        client_install ;;
    create-sp-archive)
        create_sp_archive ;;
    fetch-sp-archive)
        fetch_sp_archive ;;
    deploy-mellon-configuration)
        deploy_mellon_configuration ;;
    create-v3-rcfile)
        create_v3_rcfile "$1" ;;
```

```
    puppet-override-apache)
        puppet_override_apache "$1" ;;
    puppet-override-keystone)
        puppet_override_keystone "$1" ;;
    create-federated-resources)
        create_federated_resources ;;
    create-mapping)
        create_mapping "$1" ;;
    openstack-create-idp)
        openstack_create_idp "$1" ;;
    openstack-create-mapping)
        openstack_create_mapping "$1" "$2" ;;
    openstack-create-protocol)
        openstack_create_protocol "$1" "$2" ;;
    *)
        echo "unknown action: $action"
        usage
        exit 1
        ;;
esac
```

CHAPTER 7. THE FED_VARIABLES FILE

```
# FQDN of IPA server
FED_IPA_HOST="jdennis-ipa.example.com"

# Base DN of IPA server
FED_IPA_BASE_DN="dc=example,dc=com"

# IPA administrator password
FED_IPA_ADMIN_PASSWD="FreeIPA4All"

# Password used by RH-SSO service to authenticate to IPA
# when RH-SSO obtains user/group information from IPA as part of
# RH-SSO's User Federation.
FED_IPA_RHSSO_SERVICE_PASSWD="rhsso-passwd"

# RH-SSO server IP address
FED_RHSSO_IP_ADDR="10.0.0.12"

# RH-SSO server FQDN
FED_RHSSO_FQDN="jdennis-rhsso-7"

# URL used to access the RH-SSO server
FED_RHSSO_URL="https://$FED_RHSSO_FQDN"

# Administrator password for RH-SSO server
FED_RHSSO_ADMIN_PASSWORD=FreeIPA4All

# Name of the RH-SSO realm
FED_RHSSO_REALM="openstack"

# Host name of the mellon server
# Note, this is identical to the Keystone server since Keystone is
# being front by Apache which is protecting it's resources with mellon.
FED_KEYSTONE_HOST="overcloud.localdomain"

# Port number mellon is running on the FED_KEYSTONE_HOST
# Note, this is identical to the Keystone server port
FED_KEYSTONE_HTTPS_PORT=13000

# Name assigned in OpenStack to our IdP
FED_OPENSTACK_IDP_NAME="rhsso"

# Name of our Keystone mapping rules
FED_OPENSTACK_MAPPING_NAME="${FED_OPENSTACK_IDP_NAME}_mapping"
```