Red Hat 3scale 2-saas

Operating Red Hat 3scale API Management

How to automate deployment, scale your environment, and troubleshoot issues

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Abstract

This guide documents development operations with Red Hat 3scale 2-saas.

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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. 3SCALE OPERATIONS AND SCALING

NOTE

This document is not intended for local installations on laptops or similar end user equipment.

This section describes operations and scaling tasks of a Red Hat 3scale 2-saas installation.

Prerequisites

- An installed and initially configured 3scale On-Premises instance on a supported OpenShift version.

To carry out 3scale operations and scaling tasks, perform the steps outlined in the following sections:

- Redeploying APIcast
- Scaling up 3scale on-premise
- Operations troubleshooting

1.1. REDEPLOYING APICAST

You can test and promote system changes through the 3scale Admin Portal.

Prerequisites

- A deployed instance of 3scale On-premises.
- You have chosen your APIcast deployment method.

By default, APIcast deployments on OpenShift, both embedded and on other OpenShift clusters, are configured to allow you to publish changes to your staging and production gateways through the 3scale Admin Portal.

To redeploy APIcast on OpenShift:

Procedure

1. Make system changes.
2. In the Admin Portal, deploy to staging and test.
3. In the Admin Portal, promote to production.

By default, APIcast retrieves and publishes the promoted update once every 5 minutes.

If you are using APIcast on the Docker containerized environment or a native installation, configure your staging and production gateways, and indicate how often the gateway retrieves published changes. After you have configured your APIcast gateways, you can redeploy APIcast through the 3scale Admin Portal.

To redeploy APIcast on the Docker containerized environment or a native installations:

Procedure

1. Configure your APIcast gateway and connect it to 3scale On-premises.
2. Make system changes.
3. In the Admin Portal, deploy to staging and test.
4. In the Admin Portal, promote to production.

APIcast retrieves and publishes the promoted update at the configured frequency.

1.2. SCALING UP 3SCALE ON-PREMISE

As your APIcast deployment grows, you may need to increase the amount of storage available. How you scale up storage depends on which type of file system you are using for your persistent storage.

If you are using a network file system (NFS), you can scale up your persistent volume (PV) using this command:

```
$ oc edit pv <pv_name>
```

If you are using any other storage method, you must scale up your persistent volume manually using one of the methods listed in the following sections.

1.2.1. Method 1: Backing up and swapping persistent volumes

Procedure

1. Back up the data on your existing persistent volume.
2. Create and attach a target persistent volume, scaled for your new size requirements.
3. Create a pre-bound persistent volume claim, specify: The size of your new PVC (PersistentVolumeClaim) and the persistent volume name using the **volumeName** field.
4. Restore data from your backup onto your newly created PV.
5. Modify your deployment configuration with the name of your new PV:

   ```
   $ oc edit dc/system-app
   ```

6. Verify your new PV is configured and working correctly.
7. Delete your previous PVC to release its claimed resources.

1.2.2. Method 2: Backing up and redeploying 3scale

Procedure

1. Back up the data on your existing persistent volume.
2. Shut down your 3scale pods.

3. Create and attach a target persistent volume, scaled for your new size requirements.
4. Restore data from your backup onto your newly created PV.
5. Create a pre-bound persistent volume claim. Specify:
    a. The size of your new PVC
    b. The persistent volume name using the **volumeName** field.
6. Deploy your *amp.yml*.
7. Verify your new PV is configured and working correctly.
8. Delete your previous PVC to release its claimed resources.

1.2.3. Configuring 3scale on-premise deployments

The key deployment configurations to be scaled for 3scale are:

- APIcast production
- Backend listener
- Backend worker

1.2.3.1. Scaling via the OCP

Via OpenShift Container Platform (OCP) using an APIManager CR, you can scale the deployment configuration either up or down.

To scale a particular deployment configuration, use the following:

- Scale up an APIcast production deployment configuration with the following APIManager CR:

```
apiVersion: apps.3scale.net/v1alpha1
kind: APIManager
metadata:
  name: example-apimanager
spec:
  apicast:
    productionSpec:
      replicas: X
```

- Scale up the backend listener, backend worker, and backend cron components of your deployment configuration with the following APIManager CR:

```
apiVersion: apps.3scale.net/v1alpha1
kind: APIManager
metadata:
  name: example-apimanager
spec:
  backend:
    listenerSpec:
      replicas: X
    workerSpec:
```

```
    replicas: Y
  cronSpec:
    replicas: Z
```

- Set the appropriate environment variable to the desired number of processes per pod.
  - **PUMA_WORKERS** for **backend-listener** pods:

    ```
    $ oc set env dc/backend-listener --overwrite PUMA_WORKERS=
    <number_of_processes>
    ```

  - **UNICORN_WORKERS** for **system-app** pods:

    ```
    $ oc set env dc/system-app --overwrite UNICORN_WORKERS=
    <number_of_processes>
    ```

1.2.3.2. Vertical and horizontal hardware scaling

You can increase the performance of your 3scale deployment on OpenShift by adding resources. You can add more compute nodes as pods to your OpenShift cluster, as horizontal scaling or you can allocate more resources to existing compute nodes as vertical scaling.

Horizontal scaling

You can add more compute nodes as pods to your OpenShift. If the additional compute nodes match the existing nodes in your cluster, you do not have to reconfigure any environment variables.

Vertical scaling

You can allocate more resources to existing compute nodes. If you allocate more resources, you must add additional processes to your pods to increase performance.

NOTE

Avoid the use of computing nodes with different specifications and configurations in your 3scale deployment.

1.2.3.3. Scaling up routers

As traffic increases, ensure your Red Hat OCP routers can adequately handle requests. If your routers are limiting the throughput of your requests, you must scale up your router nodes.

1.3. OPERATIONS TROUBLESHOOTING

This section explains how to configure 3scale audit logging to display on OpenShift, and how to access 3scale logs and job queues on OpenShift.

1.3.1. Configuring 3scale audit logging on OpenShift

This enables all logs to be in one place for querying by Elasticsearch, Fluentd, and Kibana (EFK) logging tools. These tools provide increased visibility on changes made to your 3scale configuration, who made these changes, and when. For example, this includes changes to billing, application plans, API configuration, and more.

Prerequisites

- A 3scale 2-saas deployment.

Procedure

Configure audit logging to **stdout** to forward all application logs to standard OpenShift pod logs.

Some considerations:

- By default, audit logging to **stdout** is disabled when 3scale is deployed on-premises; you need to configure this feature to have it fully functional.
- Audit logging to **stdout** is not available for 3scale hosted.

1.3.2. Enabling audit logging

3scale uses a **features.yml** configuration file to enable some global features. To enable audit logging to **stdout**, you must mount this file from a **ConfigMap** to replace the default file. The OpenShift pods that depend on **features.yml** are **system-app** and **system-sidekiq**.

Prerequisites

- You must have administrator access for the 3scale project.

Procedure

1. Enter the following command to enable audit logging to **stdout**:

```
oc patch configmap system -p '{"data": {"features.yml": "features: &default\n  logging:\n
audits_to_stdout: true\n\nproduction:\n  <<: *default\n"}}'
```

2. Export the following environment variable:

```
export PATCH_SYSTEM_VOLUMES='{"spec":{"template":{"spec":{"volumes":[{"emptyDir":
{"medium":"Memory"},"name":"system-tmp"},{"configMap":{"items":
[{"key":"zync.yml","path":"zync.yml"},
{"key":"rolling_updates.yml","path":"rolling_updates.yml"},
{"key":"service_discovery.yml","path":"service_discovery.yml"},
{"key":"features.yml","path":"features.yml"}],"name":"system"},"name":"system-config"}]}}}}'
```

3. Enter the following command to apply the updated deployment configuration to the relevant OpenShift pods:

```
oc patch dc system-app -p $PATCH_SYSTEM_VOLUMES
oc patch dc system-sidekiq -p $PATCH_SYSTEM_VOLUMES
```

1.3.3. Configuring logging for Red Hat OpenShift

When you have enabled audit logging to forward 3scale application logs to OpenShift, you can use logging tools to monitor your 3scale applications.

For details on configuring logging on Red Hat OpenShift, see the following:

- Understanding the logging subsystem for Red Hat OpenShift

1.3.4. Accessing your logs

Each component's deployment configuration contains logs for access and exceptions. If you encounter issues with your deployment, check these logs for details.

Follow these steps to access logs in 3scale:

Procedure

1. Find the ID of the pod you want logs for:

   ```
   oc get pods
   ```

2. Enter **oc logs** and the ID of your chosen pod:

   ```
   oc logs <pod>
   ```

   The system pod has two containers, each with a separate log. To access a container's log, specify the **--container** parameter with the **system-provider** and **system-developer** pods:

   ```
   oc logs <pod> --container=system-provider
   oc logs <pod> --container=system-developer
   ```

1.3.5. Checking job queues

Job queues contain logs of information sent from the **system-sidekiq** pods. Use these logs to check if your cluster is processing data. You can query the logs using the OpenShift CLI:

```
oc get jobs
```

```
oc logs <job>
```

1.3.6. Preventing monotonic growth

To prevent monotonic growth, 3scale schedules by default, automatic purging of the following tables:

- *user_sessions* - clean up is triggered once a week, deletes records older than two weeks.
- *audits* - clean up is triggered once a day, deletes records older than three months.
- *log_entries* - clean up triggered once a day, deletes records older than six months.
- *event_store_events* - clean up is triggered once a week, deletes records older than a week.

With the exception of the above listed table, the following table requires manual purging by the database administrator:

- *alerts*

Table 1.1. SQL purging commands

Database type	SQL command
MySQL	`DELETE FROM alerts WHERE timestamp < NOW() - INTERVAL 14 DAY;`
PostgreSQL	`DELETE FROM alerts WHERE timestamp < NOW() - INTERVAL '14 day';`
Oracle	`DELETE FROM alerts WHERE timestamp <= TRUNC(SYSDATE) - 14;`

Additional resources

- For more information about the Openshift Container Platform (OCP), see the OCP documentation.
- Automatically scaling pods.
- Adding Compute Nodes.
- Optimizing Routing.

CHAPTER 2. 3SCALE AUTOMATION USING WEBHOOKS

Webhooks is a feature that facilitates automation, and is also used to integrate other systems based on events that occur in 3scale. When specified events happen within the 3scale system, your applications will be notified with a webhook message. As an example, by configuring webhooks, you can use the data from a new account signup to populate your Developer Portal.

2.1. OVERVIEW OF WEBHOOKS

A webhook is a custom HTTP callback triggered by an event selected from the available ones in the **Webhooks** configuration window. When one of these events occurs, the 3scale system makes an HTTP or HTTPS request to the URL address specified in the webhooks section. With webhooks, you can configure the listener to invoke some desired behavior such as event tracking.

The format of the webhook is always the same. It makes a post to the endpoint with an XML document of the following structure:

```
<?xml version="1.0" encoding="UTF-8"?>
<event>
  <type>application</type>
  <action>updated</action>
  <object>
    THE APPLICATION OBJECT AS WOULD BE RETURNED BY A GET ON THE ACCOUNT
MANAGEMENT
    API
  </object>
</event>
```

Each element provides information:

- **<type>**: Gives you the subject of the event such as *application*, *account*, and so on.
- **<action>**: Specifies what has been done, by using values such as *updated*, *created*, *deleted*.
- **<object>**: Constitutes the XML object itself in the same format that is returned by the Account Management API. To check this, you can use our interactive ActiveDocs.

If you need to provide assurance that the webhook was issued by 3scale, expose an HTTPS webhook URL and add a custom parameter to your webhook declaration in 3scale. For example: https://your-webhook-endpoint?someSecretParameterName=someSecretParameterValue. Decide on the parameter name and value. Then, inside your webhook endpoint, check for the presence of this parameter value.

2.2. CONFIGURING WEBHOOKS

Procedure

1. Select **Account Settings** from the **Dashboard** menu, then navigate to **Integrate > Webhooks**.
2. Indicate the behavior for webhooks. There are two options:
   - **Webhooks enabled**: Select this checkbox to enable or disable webhooks.

- **Actions in the admin portal also trigger webhooks** Select this checkbox to trigger a webhook when an event happens. Consider the following:
    - When making calls to the internal 3scale APIs configured with the triggering events, use an access token; not a provider key.
    - If you leave this checkbox cleared, only actions in the Developer Portal trigger webhooks.

3. Specify the URL address for notification of the selected events when they trigger.
4. Select the events that will trigger the callback to the indicated URL address.

Once you have configured the settings, click **Update webhooks settings** to save your changes.

2.3. TROUBLESHOOTING WEBHOOKS

If you experience an outage for your listening endpoint, you can recover failed deliveries. 3scale will consider a webhook delivered if your endpoint responds with a **200** code. Otherwise, it will retry 5 times with a 60 seconds gap. After any recovery from an outage, or periodically, you should run a check and if applicable clean up the queue. You can find more information about the following methods in ActiveDocs:

- Webhooks list failed deliveries
- Webhooks delete failed deliveries

CHAPTER 3. THE 3SCALE TOOLBOX

The 3scale toolbox is a Ruby client that enables you to manage 3scale products from the command line.

Within 3scale documentation, there is information about the installation of the 3scale toolbox, supported toolbox commands, services, plans, troubleshooting issues with SSL and TLS, etc. Refer to one of the sections below for more details:

- Installing the toolbox
- Supported toolbox commands
- Importing services
- Copying services
- Copying service settings only
- OpenAPI authentication
- Importing OpenAPI definitions
- Importing a 3scale backend from an OpenAPI definition
- Managing remote access credentials
- Creating application plans
- Creating metrics
- Creating methods
- Creating services
- Creating ActiveDocs
- Listing proxy configurations
- Copying a policy registry
- Listing applications
- Exporting products
- Importing products
- Export and import a product policy chain
- Copying API backends
- Troubleshooting issues with SSL and TLS

3.1. INSTALLING THE TOOLBOX

The officially supported method of installing the 3scale toolbox is using the 3scale toolbox container image.

3.1.1. Installing the toolbox container image

This section explains how to install the toolbox container image.

Prerequisites

- See the 3scale toolbox image in the Red Hat Ecosystem Catalog .
- You must have a Red Hat registry service account.
- The examples in this topic assume that you have Podman installed.

Procedure

1. Log in to the Red Hat Ecosystem Catalog:

```
$ podman login registry.redhat.io
Username: ${REGISTRY-SERVICE-ACCOUNT-USERNAME}
Password: ${REGISTRY-SERVICE-ACCOUNT-PASSWORD}
Login Succeeded!
```

2. Pull the toolbox container image:

```
$ podman pull registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13
```

3. Verify the installation:

```
$ podman run registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13 3scale help
```

Additional resources

- For details on installing the toolbox image with OpenShift, Podman, or Docker, see the instructions on getting the image in the Red Hat Ecosystem Catalog .
- See also the instructions for installing the 3scale toolbox on Kubernetes . You must use the correct image name and the **oc** command instead of **kubectl** on OpenShift.

3.2. SUPPORTED TOOLBOX COMMANDS

Use the 3scale toolbox to manage your API from the command line tool (CLI).

NOTE

The **update** command has been removed and replaced by the **copy** command.

The following commands are supported:

```
COMMANDS
   account             account super command
   activedocs          activedocs super command
   application         application super command
   application-plan    application-plan super command
   backend             backend super command
```

```
    copy              copy super command
    help              print help
    import            import super command
    method            method super command
    metric            metric super command
    policy-registry   policy-registry super command
    product           product super command
    proxy-config      proxy-config super command
    remote            remotes super command
    service           services super command

OPTIONS
    -c --config-file=<value>     3scale toolbox configuration file
                                 (default: $HOME/.3scalerc.yaml)
    -h --help                    show help for this command
    -k --insecure                Proceed and operate even for server
                                 connections otherwise considered insecure
    -v --version                 Prints the version of this command
       --verbose                 Verbose mode
```

3.3. IMPORTING SERVICES

Import services from a CSV file by specifying the following fields in the order specified below. Include these headers in your CSV file:

```
service_name,endpoint_name,endpoint_http_method,endpoint_path,auth_mode,endpoint_system_nam
e,type
```

You need the following information:

- A 3scale admin account: **{3SCALE_ADMIN}**
- The domain your 3scale instance is running on: **{DOMAIN_NAME}**
  - If you are using hosted APICast this is 3scale.net
- The access key of your account: **{ACCESS_KEY}**
- The CSV file of services, for example: **examples/import_example.csv**

Import the services by running:

Example

```
$ podman run -v $PWD/examples/import_example.csv:/tmp/import_example.csv
registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13 3scale import csv --
destination=https://{ACCESS_KEY}@{3SCALE_ADMIN}-admin.{DOMAIN_NAME} --
file=/tmp/import_example.csv
```

This example uses a Podman volume to mount the resource file in the container. It assumes that the file is available in the current **$PWD** folder.

3.4. COPYING SERVICES

Create a new service based on an existing one from the same account or from another account. When you copy a service, the relevant ActiveDocs are also copied.

You need the following information:

- The service id you want to copy: **{SERVICE_ID}**
- A 3scale admin account: **{3SCALE_ADMIN}**
- The domain your 3scale instance is running on: **{DOMAIN_NAME}**
  - If you are using hosted APICast this is 3scale.net
- The access key of your account: **{ACCESS_KEY}**
- The access key of the destination account if you are copying to a different account: **{DEST_KEY}**
- The name for the new service: **{NEW_NAME}**

Example

```
$ podman run registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13 3scale copy service
{SERVICE_ID} --source=https://{ACCESS_KEY}@{3SCALE_ADMIN}-admin.{DOMAIN_NAME} --
destination=https://{DEST_KEY}@{3SCALE_ADMIN}-admin.{DOMAIN_NAME} --
target_system_name={NEW_NAME}
```

NOTE

If the service to be copied has custom policies, make sure that their respective custom policy definitions already exist in the destination where the service is to be copied. To learn more about copying custom policy definitions check out the Copying a policy registry

3.5. COPYING SERVICE SETTINGS ONLY

You can bulk copy the service and proxy settings, metrics, methods, application plans, application plan limits, as well as mapping rules from a service to another existing service.

You need the following information:

- The service id you want to copy: **{SERVICE_ID}**
- The service id of the destination: **{DEST_ID}**
- A 3scale admin account: **{3SCALE_ADMIN}**
- The domain your 3scale instance is running on: **{DOMAIN_NAME}**
  - If you are using hosted APICast this is 3scale.net
- The access key of your account: **{ACCESS_KEY}**
- The access key of the destination account: **{DEST_KEY}**

Additionally, you can use the optional flags:

- The **-f** flag to remove existing target service mapping rules before copying.
- The **-r** flag to copy only mapping rules to target service.

NOTE

The **update** command has been removed and replaced by the **copy** command.

The following example command does a bulk copy from one service to another existing service:

```
$ podman run registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13 3scale copy [opts] service --
source=https://{ACCESS_KEY}@{3SCALE_ADMIN}-admin.{DOMAIN_NAME} --
destination=https://{DEST_KEY}@{3SCALE_ADMIN}-admin.{DOMAIN_NAME} {SERVICE_ID}
{DEST_ID}
```

3.6. OPENAPI AUTHENTICATION

By implementing OpenAPI authentication with the 3scale toolbox, you can ensure that only authorized users have access to your APIs, safeguard sensitive data, and efficiently manage API usage. This approach will reinforces your API infrastructure and fosters trust among developers and consumers.

NOTE

Only one top-level security requirement is supported; operation-level security requirements are not supported.

Supported security schemes: **apiKey** and **oauth2** with any flow type.

For the apiKey security scheme type:

- The credentials location is read from the OpenAPI in field of the security scheme object.
- Auth user key is read from the OpenAPI name field of the security scheme object.

Partial example of OpenAPI 3.0.2 with apiKey security requirement:

```
openapi: "3.0.2"
security:
  - petstore_api_key: []
components:
  securitySchemes:
    petstore_api_key:
      type: apiKey
      name: api_key
      in: header
      ...
```

For the **oauth2** security scheme type:

- The credentials location is hard-coded to **headers**.
- OpenID Connect Issuer Type defaults to **rest**. You can be override this using the **--oidc-issuer-type=<value>** command option.

- OpenID Connect Issuer is not read from OpenAPI. Since 3scale requires that the issuer URL must include a client secret, the issue must be set using this **--oidc-issuer-endpoint=<value>** command option.
- OIDC AUTHORIZATION FLOW is read from the flows field of the security scheme object.

Partial example of OpenAPI 3.0.2 with oauth2 security requirement:

```
openapi: "3.0.2"
security:
    - petstore_oauth:
      - write:pets
      - read:pets
  components:
    securitySchemes:
      petstore_oauth:
        type: oauth2
        flows:
          clientCredentials:
            tokenUrl: http://example.org/api/oauth/dialog
            scopes:
              write:pets: modify pets in your account
              read:pets: read your pets
              ...
```

When OpenAPI does not specify any security requirements:

- The product is considered as an *Open API*.
- The **default_credentials** 3scale policy is added. **Note:** This is also called as **anonymous_policy**.
- You require the command **--default-credentials-userkey**. **Note:** The command fails if is not provided.

Additional resources

- Security Scheme Object

3.7. IMPORTING OPENAPI DEFINITIONS

To create a new service or to update an existing service, you can import the OpenAPI definition from a local file or a URL. The default service name for the import is specified by the **info.title** in the OpenAPI definition. However, you can override this service name using **--target_system_name=<NEW NAME>**. This will update the service name if it already exists, or create a new service name if it does not.

The **import openapi** command has the following format:

```
$ 3scale import openapi [opts] -d=<destination> <specification>
```

The OpenAPI **<specification>** can be one of the following:

- **/path/to/your/definition/file.[json|yaml|yml]**
- **http[s]://domain/resource/path.[json|yaml|yml]**

Example

```
$ podman run registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13 3scale import openapi [opts] -
d=https://{DEST_KEY}@{3SCALE_ADMIN}-admin.{DOMAIN_NAME}  my-test-api.json
```

Command options

The **import openapi** command options include:

-d --destination=<value>
: 3scale target instance in format: **http[s]://<authentication>@3scale_domain**.

-t --target_system_name=<value>
: 3scale target system name.

--backend-api-secret-token=<value>
: Custom secret token sent by the API gateway to the backend API.

--backend-api-host-header=<value>
: Custom host header sent by the API gateway to the backend API.

For more options, see the **3scale import openapi --help** command.

OpenAPI import rules

The supported security schemes are **apiKey** and **oauth2** with any OAuth flow type.

The OpenAPI specification must be one of the following:

- Filename in the available path.
- URL from where toolbox can download the content. The supported schemes are **http** and **https**.
- Read from **stdin** standard input stream. This is controlled by setting the **-** value.

The following additional rules apply when importing OpenAPI definitions:

- Definitions are validated as OpenAPI 2.0 or OpenAPI 3.0.
- All mapping rules from the OpenAPI definition are imported. You can view these in **API** > **Integration**.
- All mapping rules in the 3scale product are replaced.
- Only methods included in the OpenAPI definition are modified.
- All methods that were present only in the OpenAPI definition are attached to the **Hits** metric.
- To replace methods, the method names must be identical to the methods defined in the OpenAPI definition **operation.operationId** by using exact pattern matching.

NOTE

The toolbox will add a **default_credentials** policy, which is also known as an **anonymous_policy**, if it is not already in the policy chain. The **default_credentials** policy will be configured with the *userkey* provided in an optional parameter **--default-credentials-userkey**.

OpenAPI 3.0 provides a way to specify security for your API using its security schemes and security requirements features. For more information, see the official Swagger Authentication and Authorization documentation.

OpenAPI 3.0 limitations

The following limitations apply when importing OpenAPI 3.0 definitions:

- Only the first **server.url** element in the **servers** list is parsed as a private URL. The **server.url** element's **path** component will be used as the OpenAPI's **basePath** property.
- The toolbox will not parse servers in the path item and servers in the operation objects.
- Multiple flows in the security scheme object not supported.

3.8. IMPORTING A 3SCALE BACKEND FROM AN OPENAPI DEFINITION

You can use the toolbox **import** command to import an OpenAPI definition and create a 3scale backend API. The command line option **--backend** enables this feature. 3scale uses the OpenAPI definition to create and store a backend and its private base URL, as well as its mapping rules and methods.

Prerequisites

- A user account with administrator privileges for a 3scale 2-saas On-Premises instance.
- An OAS document that defines your API.

Procedure

- Use the following format to run the **import** command to create a backend:

```
$ 3scale import openapi -d <remote> --backend <OAS>
```

- Replace **<remote>** with the URL for the 3scale instance in which to create the backend. Use this format: **http[s]://<authentication>@3scale_domain**
- Replace **<OAS>** with the **/path/to/your/oasdoc.yaml**.

Table 3.1. Additional OpenAPI definition options

Options	Description
-o --output=<value>	The output format. Can be either JSON or YAML.

Options	Description
--override-private-base-url=<value>	3scale reads the backend's private endpoint from the OpenAPI definition's **servers[0].url** field. To override the setting in that field, specify this option and replace **<value>** with the private base URL of your choice. When the OpenAPI definition does not specify a value in the **servers[0].url** field and you do not specify the this option in the **import** command, execution fails.
--prefix-matching	Use prefix matching instead of strict matching on mapping rules derived from OpenAPI operations.
--skip-openapi-validation	Skip OpenAPI schema validation.
-t --target_system_name=<value>	Target system name is a unique key in your tenant. System name can be inferred from the OpenAPI definition, however you can override that with your own name by using this parameter.

3.9. MANAGING REMOTE ACCESS CREDENTIALS

To facilitate working with remote 3scale instances, you can use the 3scale toolbox to define the remote URL addresses and authentication details to access those remote instances in a configuration file. You can then refer to these remotes using a short name in any toolbox command.

The default location for the configuration file is **$HOME/.3scalerc.yaml**. However, you can specify another location using the **THREESCALE_CLI_CONFIG** environment variable or the **--config-file <config_file>** toolbox option.

When adding remote access credentials, you can specify an **access_token** or a **provider_key**:

- **http[s]://<access_token>@<3scale-instance-domain>**
- **http[s]://<provider_key>@<3scale-instance-domain>**

3.9.1. Adding remote access credentials

The following example command adds a remote 3scale instance with the short **<name>** at **<url>**:

```
3scale remote add [--config-file <config_file>] <name> <url>
```

Example

```
$ podman run --name toolbox-container registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13
3scale remote add instance_a https://123456789@example_a.net

$ podman commit toolbox-container toolbox
```

This example creates the remote instance and commits the container to create a new image. You can then run the new image with the remote information included. For example, the following command uses the new image to show the newly added remote:

```
$ podman run toolbox 3scale remote list
instance_a https://example_a.net 123456789
```

Other toolbox commands can then use the newly created image to access the added remotes. This example uses an image named **toolbox** instead of **registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13**.

> **WARNING**
>
> Storing secrets for toolbox in a container is a potential security risk, for example when distributing the container with secrets to other users or using the container for automation. Use secured volumes in Podman or secrets in OpenShift.

Additional resources

For more details on using Podman, see:

- Building, running, and managing Linux containers on Red Hat Enterprise Linux 8

3.9.2. Listing remote access credentials

The following example command shows how to list remote access credentials:

```
3scale remote list [--config-file <config_file>]
```

This command shows the list of added remote 3scale instances in the following format: **<name> <URL> <authentication-key>**:

Example

```
$ podman run <toolbox_image_with_remotes_added> 3scale remote list
instance_a https://example_a.net 123456789
instance_b https://example_b.net 987654321
```

3.9.3. Removing remote access credentials

The following example command shows how to remove remote access credentials:

```
3scale remote remove [--config-file <config_file>] <name>
```

This command removes the remote 3scale instance with the short **<name>**:

Example

```
$ podman run <toolbox_image_with_remote_added> 3scale remote remove instance_a
```

3.9.4. Renaming remote access credentials

The following example command shows how to rename remote access credentials:

```
3scale remote rename [--config-file <config_file>] <old_name> <new_name>
```

This command renames the remote 3scale instance with the short **<old_name>** to **<new_name>**:

Example

```
$ podman run <toolbox_image_with_remote_added> 3scale remote rename instance_a instance_b
```

3.10. CREATING APPLICATION PLANS

Use the 3scale toolbox to create, update, list, delete, show, or export/import application plans in your Developer Portal.

3.10.1. Creating a new application plan

Use the following steps to create a new application plan:

- You have to provide the application plan name.
- To override the **system-name**, use the optional parameter.
- If an application plan with the same name already exists, you will see an error message.
- Set as **default** the application plan by using the **--default** flag.
- Create a **published** application plan by using the **--publish** flag.
  - By default, it will be **hidden**.
- Create a **disabled** application plan by using the **--disabled** flag.
  - By default, it will be **enabled**.

NOTE

- The **service** positional argument is a service reference and can be either service **id** or service **system_name**.
  - The toolbox uses either one.

The following command creates a new application plan:

```
3scale application-plan create [opts] <remote> <service> <plan-name>
```

Use the following options while creating application plans:

```
Options
```

```
      --approval-required=<value>    The application requires approval:
                                     true or false
      --cost-per-month=<value>       Cost per month
      --default                      Make the default application plan
      --disabled                     Disable all methods and metrics in
                                     the application plan
   -o --output=<value>               Output format on stdout:
                                     one of json|yaml
   -p --published                    Publish the application plan
      --setup-fee=<value>            Set-up fee
   -t --system-name=<value>          Set application plan system name
      --trial-period-days=<value>    The trial period in days

Options for application-plan
   -c --config-file=<value>          3scale toolbox configuration file:
                                     defaults to $HOME/.3scalerc.yaml
   -h --help                         Print help for this command
   -k --insecure                     Proceed and operate even for server
                                     connections otherwise considered
                                     insecure
   -v --version                      Print the version of this command
      --verbose                      Verbose mode
```

3.10.2. Creating or updating application plans

Use the following steps to create a new application plan if it does not exist, or to update an existing one:

- Update the **default** application plan by using the **--default** flag.
- Update the **published** application plan by using the **--publish** flag.
- Update the **hidden** application plan by using the **--hide** flag.
- Update the **disabled** application plan by using the **--disabled** flag.
- Update the **enabled** application plan by using the **--enabled** flag.

NOTE

- The **service** positional argument is a service reference and can be either service **id** or service **system_name**.
    - The toolbox uses either one.
- The **plan** positional argument is a plan reference and can be either plan **id** or plan **system_name**.
    - The toolbox uses either one.

The following command updates the application plan:

```
3scale application-plan create [opts] <remote> <service> <plan>
```

Use the following options while updating application plans:

```
Options
      --approval-required=<value>    The application requires approval:
                              true or false
      --cost-per-month=<value>       Cost per month
      --default                      Make the default application plan
      --disabled                     Disable all methods and metrics in
                              the application plan
      --enabled                      Enable the application plan
      --hide                         Hide the application plan
   -n --name=<value>                 Set the plan name
   -o --output=<value>               Output format on stdout:
                              one of json|yaml
   -p --publish                      Publish the application plan
      --setup-fee=<value>            Set-up fee
      --trial-period-days=<value>    The trial period in days

Options for application-plan
   -c --config-file=<value>          3scale toolbox configuration file:
                              defaults to $HOME/.3scalerc.yaml
   -h --help                         Print help for this command
   -k --insecure                     Proceed and operate even for server
                              connections otherwise considered
                              insecure
   -v --version                      Print the version of this command
      --verbose                      Verbose mode
```

3.10.3. Listing application plans

The following command lists the application plan:

```
3scale application-plan list [opts] <remote> <service>
```

Use the following options while listing application plans:

```
Options
   -o --output=<value>          Output format on stdout:
                          one of json|yaml

Options for application-plan
   -c --config-file=<value>     3scale toolbox configuration file:
                          defaults to $HOME/.3scalerc.yaml
   -h --help                    Print help for this command
   -k --insecure                Proceed and operate even for server
                          connections otherwise considered insecure
   -v --version                 Print the version of this command
      --verbose                 Verbose mode
```

3.10.4. Showing application plans

The following command shows the application plan:

```
3scale application-plan show [opts] <remote> <service> <plan>
```

Use the following options while showing application plans:

```
Options
    -o --output=<value>          Output format on stdout:
                                 one of json|yaml

Options for application-plan
    -c --config-file=<value>     3scale toolbox configuration file:
                                 defaults to $HOME/.3scalerc.yaml
    -h --help                    Print help for this command
    -k --insecure                Proceed and operate even for server
                                 connections otherwise considered insecure
    -v --version                 Print the version of this command
       --verbose                 Verbose mode
```

3.10.5. Deleting application plans

The following command deletes the application plan:

```
3scale application-plan delete [opts] <remote> <service> <plan>
```

Use the following options while deleting application plans:

```
Options for application-plan
    -c --config-file=<value>     3scale toolbox configuration file:
                                 defaults to $HOME/.3scalerc.yaml
    -h --help                    Print help for this command
    -k --insecure                Proceed and operate even for server
                                 connections otherwise considered insecure
    -v --version                 Print the version of this command
       --verbose                 Verbose mode
```

3.10.6. Exporting/importing application plans

You can export or import a single application plan to or from **yaml** content.

Note the following:

- Limits defined in the application plan are included.
- Pricing rules defined in the application plan are included.
- Metrics/methods referenced by limits and pricing rules are included.
- Features defined in the application plan are included.
- Service can be referenced by **id** or **system_name**.
- Application Plan can be referenced by **id** or **system_name**.

3.10.6.1. Exporting an application plan to a file

The following command exports the application plan:

```
3scale application-plan export [opts] <remote> <service_system_name> <plan_system_name>
```

Example

```
$ podman run -u root -v $PWD:/tmp registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13 3scale
application-plan export --file=/tmp/plan.yaml remote_name service_name plan_name
```

This example uses a Podman volume to mount the exported file in the container for output to the current **$PWD** folder.

NOTE

Specific to the export command:

- Read only operation on remote service and application plan.
- Command output can be **stdout** or file.
  - If not specified by **-f** option, by default, **yaml** content will be written on **stdout**.

Use the following options while exporting application plans:

```
Options
    -f --file=<value>            Write to file instead of stdout

Options for application-plan
    -c --config-file=<value>      3scale toolbox configuration file:
                                 defaults to $HOME/.3scalerc.yaml
    -h --help                    Print help for this command
    -k --insecure                 Proceed and operate even for server
                                 connections otherwise considered insecure
    -v --version                 Print the version of this command
       --verbose                 Verbose mode
```

3.10.6.2. Importing an application plan from a file

The following command imports the application plan:

```
3scale application-plan import [opts] <remote> <service_system_name>
```

Example

```
$ podman run -v $PWD/plan.yaml:/tmp/plan.yaml registry.redhat.io/3scale-amp2/toolbox-
rhel8:3scale2.13 3scale application-plan import --file=/tmp/plan.yaml remote_name service_name
```

This example uses a Podman volume to mount the imported file in the container from the current **$PWD** folder.

3.10.6.3. Importing an application plan from a URL

```
3scale application-plan import -f http[s]://domain/resource/path.yaml remote_name service_name
```

NOTE

Specific to import command:

- Command input content can be **stdin**, file or URL format.
    - If not specified by **-f** option, by default, **yaml** content will be read from **stdin**.
- If application plan cannot be found in remote service, it will be created.
- Optional param **-p**, **--plan** to override remote target application plan **id** or **system_name**.
    - If not specified by **-p** option, by default, application plan will be referenced by plan attribute **system_name** from **yaml** content.
- Any metric or method from yaml content that cannot be found in remote service, will be created.

Use the following options while importing application plans:

```
Options
    -f --file=<value>                Read from file or URL instead of
                                     stdin
    -p --plan=<value>                Override application plan reference

Options for application-plan
    -c --config-file=<value>         3scale toolbox configuration file:
                                     defaults to $HOME/.3scalerc.yaml
    -h --help                        Print help for this command
    -k --insecure                    Proceed and operate even for server
                                     connections otherwise considered
                                     insecure
    -v --version                     Print the version of this command
       --verbose                     Verbose mode
```

3.11. CREATING METRICS

Use the 3scale toolbox to create, update, list, and delete metrics in your Developer Portal.

Use the following steps for creating metrics:

- You have to provide the metric name.
- To override the **system-name**, use the optional parameter.
- If metrics with the same name already exist, you will see an error message.
- Create a **disabled** metric by using the **--disabled** flag.
    - By default, it will be **enabled**.

NOTE

- The **service** positional argument is a service reference and can be either service **id** or service **system_name**.
  - The toolbox uses either one.

The following command creates metrics:

```
3scale metric create [opts] <remote> <service> <metric-name>
```

Use the following options while creating metrics:

```
Options
    --description=<value>      Set a metric description
    --disabled                 Disable this metric in all application
                               plans
 -o --output=<value>           Output format on stdout:
                               one of json|yaml
 -t --system-name=<value>      Set the application plan system name
    --unit=<value>             Metric unit: default hit

Options for metric
 -c --config-file=<value>      3scale toolbox configuration file:
                               defaults to $HOME/.3scalerc.yaml
 -h --help                     Print help for this command
 -k --insecure                 Proceed and operate even for server
                               connections otherwise considered insecure
 -v --version                  Print the version of this command
    --verbose                  Verbose mode
```

3.11.1. Creating or updating metrics

Use the following steps to create new metrics if they do not exist, or to update an existing one:

- If metrics with the same name already exist, you will see an error message.
- Update a **disabled** metric by using the **--disabled** flag.
- Update to **enabled** metric by using the **--enabled** flag.

NOTE

- The **service** positional argument is a service reference and can be either service **id** or service **system_name**.
  - The toolbox uses either one.
- The **metric** positional argument is a metric reference and can be either metric **id** or metric **system_name**.
  - The toolbox uses either one.

The following commmand updates metrics:

```
3scale metric apply [opts] <remote> <service> <metric>
```

Use the following options while updating metrics:

```
Options
      --description=<value>      Set a metric description
      --disabled                 Disable this metric in all application
                                 plans
      --enabled                  Enable this metric in all application
                                 plans
   -n --name=<value>             This will set the metric name
      --unit=<value>             Metric unit: default hit
   -o --output=<value>           Output format on stdout:
                                 one of json|yaml

Options for metric
   -c --config-file=<value>      3scale toolbox configuration file:
                                 defaults to $HOME/.3scalerc.yaml
   -h --help                     Print help for this command
   -k --insecure                 Proceed and operate even for server
                                 connections otherwise considered insecure
   -v --version                  Print the version of this command
      --verbose                  Verbose mode
```

3.11.2. Listing metrics

The following command lists metrics:

```
3scale metric list [opts] <remote> <service>
```

Use the following options while listing metrics:

```
Options
   -o --output=<value>           Output format on stdout:
                                 one of json|yaml

Options for metric
   -c --config-file=<value>      3scale toolbox configuration file:
                                 defaults to $HOME/.3scalerc.yaml
   -h --help                     Print help for this command
   -k --insecure                 Proceed and operate even for server
                                 connections otherwise considered insecure
   -v --version                  Print the version of this command
      --verbose                  Verbose mode
```

3.11.3. Deleting metrics

The following command deletes metrics:

```
3scale metric delete [opts] <remote> <service> <metric>
```

Use the following options while deleting metrics:

```
Options for metric
   -c --config-file=<value>      3scale toolbox configuration file:
                                 defaults to $HOME/.3scalerc.yaml
   -h --help                     Print help for this command
   -k --insecure                 Proceed and operate even for server
                                 connections otherwise considered insecure
   -v --version                  Print the version of this command
      --verbose                  Verbose mode
```

3.12. CREATING METHODS

Use the 3scale toolbox to create, apply, list, and delete methods in your Developer Portal.

3.12.1. Creating methods

Use the following steps for creating methods:

- You have to provide the method name.
- To override the **system-name**, use the optional parameter.
- If a method with the same name already exists, you will see an error message.
- Create a **disabled** method by **--disabled** flag.
  - By default, it will be **enabled**.

NOTE

- The **service** positional argument is a service reference and can be either service **id** or service **system_name**.
  - The toolbox uses either one.

The following command creates a method:

```
3scale method create [opts] <remote> <service> <method-name>
```

Use the following options while creating methods:

```
Options
      --description=<value>      Set a method description
      --disabled                 Disable this method in all
                                 application plans
   -o --output=<value>           Output format on stdout:
                                 one of json|yaml
   -t --system-name=<value>      Set the method system name

Options for method
   -c --config-file=<value>      3scale toolbox configuration file:
                                 defaults to $HOME/.3scalerc.yaml
   -h --help                     Print help for this command
   -k --insecure                 Proceed and operate even for server
```

```
                    connections otherwise considered insecure
   -v --version            Print the version of this command
      --verbose            Verbose mode
```

3.12.2. Creating or updating methods

Use the steps below for creating new methods if they do not exist, or to update existing ones:

- If a method with the same name already exists, the command will return an error message.
- Update to **disabled** method by using **--disabled flag**.
- Update to **enabled** method by using **--enabled flag**.

NOTE

- The **service** positional argument is a service reference and can be either service **id** or service **system_name**.
  - The toolbox uses either one.
- The **method** positional argument is a method reference and can be either method **id** or method **system_name**.
  - The toolbox uses either one.

The following command updates a method:

```
3scale method apply [opts] <remote> <service> <method>
```

Use the following options while updating methods:

```
Options
      --description=<value>      Set a method description
      --disabled                 Disable this method in all
                                 application plans
      --enabled                  Enable this method in all
                                 application plans
   -n --name=<value>             Set the method name
   -o --output=<value>           Output format on stdout:
                                 one of json|yaml

Options for method
   -c --config-file=<value>      3scale toolbox configuration file:
                                 defaults to $HOME/.3scalerc.yaml
   -h --help                     Print help for this command
   -k --insecure                 Proceed and operate even for server
                                 connections otherwise considered insecure
   -v --version                  Print the version of this command
      --verbose                  Verbose mode
```

3.12.3. Listing methods

The following command lists methods:

```
3scale method list [opts] <remote> <service>
```

Use the following options while listing methods:

```
Options
    -o --output=<value>          Output format on stdout:
                                  one of json|yaml

Options for method
    -c --config-file=<value>      3scale toolbox configuration file:
                                  defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                 Proceed and operate even for server
                                  connections otherwise considered insecure
    -v --version                  Print the version of this command
       --verbose                  Verbose mode
```

3.12.4. Deleting methods

The following command deletes methods:

```
3scale method delete [opts] <remote> <service> <metric>
```

Use the following options while deleting methods:

```
Options for method
    -c --config-file=<value>      3scale toolbox configuration file:
                                  defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                 Proceed and operate even for server
                                  connections otherwise considered insecure
    -v --version                  Print the version of this command
       --verbose                  Verbose mode
```

3.13. CREATING SERVICES

Use the 3scale toolbox to create, apply, list, show, or delete services in your Developer Portal.

3.13.1. Creating a new service

The following command creates a new service:

```
3scale service create [options] <remote> <service-name>
```

Use the following options while creating services:

```
Options
    -a --authentication-mode=<value>     Specify authentication mode of
                                         the service:
                                          - '1' for API key
                                          - '2' for App Id/App Key
                                          - 'oauth' for OAuth mode
```

```
                               - 'oidc' for OpenID Connect
    -d --deployment-mode=<value>        Specify the deployment mode of
                               the service
       --description=<value>            Specify the description of the
                               service
    -o --output=<value>              Output format on stdout:
                               one of json|yaml
    -s --system-name=<value>            Specify the system-name of the
                               service
       --support-email=<value>          Specify the support email of the
                               service

Options for service
    -c --config-file=<value>            3scale toolbox configuration file:
                               defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                    Proceed and operate even for
                               server connections otherwise
                               considered insecure
    -v --version                    Print the version of this command
       --verbose                    Verbose mode
```

3.13.2. Creating or updating services

Use the following to create new services if they do not exist, or to update an existing one:

NOTE

- **service-id_or_system-name** positional argument is a service reference.
  - It can be either service **id**, or service **system_name**.
  - Toolbox will automatically figure this out.
- This command is **idempotent**.

The following command updates services:

```
3scale service apply <remote> <service-id_or_system-name>
```

Use the following options while updating services:

```
Options
    -a --authentication-mode=<value>     Specify authentication mode of
                               the service:
                                - '1' for API key
                                - '2' for App Id/App Key
                                - 'oauth' for OAuth mode
                                - 'oidc' for OpenID Connect
    -d --deployment-mode=<value>        Specify the deployment mode of
                               the service
       --description=<value>            Specify the description of the
                               service
    -n --name=<value>                Specify the name of the metric
```

```
      --support-email=<value>          Specify the support email of the
                              service
    -o --output=<value>               Output format on stdout:
                              one of json|yaml

Options for services
    -c --config-file=<value>           3scale toolbox configuration file:
                              defaults to $HOME/.3scalerc.yaml
    -h --help                      Print help for this command
    -k --insecure                    Proceed and operate even for
                              server connections otherwise
                              considered insecure
    -v --version                    Print the version of this command
      --verbose                    Verbose mode
```

3.13.3. Listing services

The following command lists services:

```
3scale service list <remote>
```

Use the following options while listing services:

```
Options
    -o --output=<value>          Output format on stdout:
                          one of json|yaml

Options for services
    -c --config-file=<value>      3scale toolbox configuration file:
                          defaults to $HOME/.3scalerc.yaml
    -h --help                  Print help for this command
    -k --insecure                Proceed and operate even for server
                          connections otherwise considered insecure
    -v --version                Print the version of this command
      --verbose                Verbose mode
```

3.13.4. Showing services

The following command shows services:

```
3scale service show <remote> <service-id_or_system-name>
```

Use the following options while showing services:

```
Options
    -o --output=<value>          Output format on stdout:
                          one of json|yaml

Options for services
    -c --config-file=<value>      3scale toolbox configuration file:
                          defaults to $HOME/.3scalerc.yaml
    -h --help                  Print help for this command
    -k --insecure                Proceed and operate even for server
```

```
                        connections otherwise considered insecure
    -v --version              Print the version of this command
       --verbose              Verbose mode
```

3.13.5. Deleting services

The following command deletes services:

```
3scale service delete <remote> <service-id_or_system-name>
```

Use the following options while deleting services:

```
Options for services
    -c --config-file=<value>      3scale toolbox configuration file:
                        defaults to $HOME/.3scalerc.yaml
    -h --help                 Print help for this command
    -k --insecure               Proceed and operate even for server
                        connections otherwise considered insecure
    -v --version              Print the version of this command
       --verbose              Verbose mode
```

3.14. CREATING ACTIVEDOCS

Use the 3scale toolbox to create, update, list, or delete ActiveDocs in your Developer Portal.

3.14.1. Creating new ActiveDocs

To create a new ActiveDocs from your API definition compliant with the OpenAPI specification:

1. Add your API definition to 3scale, optionally giving it a name:

   ```
   3scale activedocs create <remote> <activedocs-name> <specification>
   ```

   The OpenAPI specification for the ActiveDocs is required and must be one of the following values:

   - Filename in the available path.
   - URL from where toolbox can download the content. The supported schemes are **http** and **https**.
   - Read from **stdin** standard input stream. This is controlled by setting the **-** value.
     Use the following options while creating ActiveDocs:

     ```
     Options
         -d --description=<value>        Specify the description of
                             the ActiveDocs
         -i --service-id=<value>         Specify the Service ID
                             associated to the ActiveDocs
         -o --output=<value>            Output format on stdout: one
                             of json|yaml
         -p --published                 Specify to publish the
                             ActiveDocs on the Developer
     ```

```
                                  Portal. Otherwise it is hidden.
    -s --system-name=<value>       Specify the system-name of
                                  the ActiveDocs
       --skip-swagger-validations   Specify to skip validation
                                  of the Swagger specification
Options for ActiveDocs
    -c --config-file=<value>       toolbox configuration file.
                                  Defaults to $HOME/.3scalerc.yaml
    -h --help                      Print help for this command
    -k --insecure                  Proceed and operate even for
                                  server connections otherwise
                                  considered insecure
    -v --version                   Print the version of this command
       --verbose                   Verbose mode
```

2. Publish the definition in your Developer Portal.

3.14.2. Creating or updating ActiveDocs

Use the following command to create new ActiveDocs if they do not exist, or to update existing ActiveDocs with a new API definition:

```
3scale activedocs apply <remote> <activedocs_id_or_system_name>
```

Use the following options while updating ActiveDocs:

```
Options
 -d --description=<value>            Specify the description of the
                                ActiveDocs
    --hide                          Specify to hide the ActiveDocs
                                on the Developer Portal
-i --service-id=<value>              Specify the Service ID associated
                                to the ActiveDocs
-o --output=<value>                  Output format on stdout:
                                one of json|yaml
   --openapi-spec=<value>            Specify the Swagger specification.
                                Can be a file, a URL or '-' to read
                                from stdin. This is a mandatory
                                option when applying the ActiveDoc
                                for the first time.
-p --publish                         Specify to publish the ActiveDocs
                                on the Developer Portal. Otherwise
                                it is hidden
-s --name=<value>                    Specify the name of the ActiveDocs
   --skip-swagger-validations=<value>  Specify whether to skip validation
                                of the Swagger specification: true
                                or false. Defaults to true.

Options for ActiveDocs
   -c --config-file=<value>          3scale toolbox configuration file:
                                defaults to $HOME/.3scalerc.yaml
   -h --help                         Print help for this command
   -k --insecure                     Proceed and operate even for server
                                connections otherwise considered
```

```
                              insecure
    -v --version                   Print the version of this command
       --verbose                   Verbose mode
```

NOTE

The behavior of **activedocs apply --skip-swagger-validations** changed in 3scale 2.8. You may need to update existing scripts using **activedocs apply**. Previously, if you did not specify this option in each **activedocs apply** command, validation was not skipped. Now, **--skip-swagger-validations** is **true** by default.

3.14.3. Listing ActiveDocs

Use the following command to get information about all ActiveDocs in the Developer Portal, including:

- id
- name
- system name
- description
- published (which means it can be shown in the developer portal)
- creation date
- latest updated date

The following command lists all defined ActiveDocs:

```
3scale activedocs list <remote>
```

Use the following options while listing ActiveDocs:

```
Options
    -o --output=<value>           Output format on stdout:
                              one of json|yaml
    -s --service-ref=<value>      Filter the ActiveDocs by service
                              reference
Options for ActiveDocs
    -c --config-file=<value>      3scale toolbox configuration file:
                              defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                 Proceed and operate even for server
                              connections otherwise considered insecure
    -v --version                  Print the version of this command
       --verbose                  Verbose mode
```

3.14.4. Deleting ActiveDocs

The following command removes ActiveDocs:

```
3scale activedocs delete <remote> <activedocs-id_or-system-name>
```

Use the following options while deleting ActiveDocs:

```
Options for ActiveDocs
    -c --config-file=<value>      3scale toolbox configuration file:
                                  defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                 Proceed and operate even for server
                                  connections otherwise considered insecure
    -v --version                  Print the version of this command
       --verbose                  Verbose mode
```

3.15. LISTING PROXY CONFIGURATIONS

Use the 3scale toolbox to list, show, promote all defined proxy configurations in your Developer Portal.

The following command lists proxy configurations:

```
3scale proxy-config list <remote> <service> <environment>
```

Use the following options while listing proxy configurations:

```
Options
    -o --output=<value>           Output format on stdout:
                                  one of json|yaml

Options for proxy-config
    -c --config-file=<value>      3scale toolbox configuration file:
                                  defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                 Proceed and operate even for server
                                  connections otherwise considered insecure
    -v --version                  Print the version of this command
       --verbose                  Verbose mode
```

3.15.1. Showing proxy configurations

The following command shows proxy configurations:

```
3scale proxy-config show <remote> <service> <environment>
```

Use the following options while showing proxy configurations:

```
Options
       --config-version=<value>   Specify the proxy configuration version.
                                  If not specified, defaults to latest
    -o --output=<value>           Output format on stdout:
                                  one of json|yaml

Options for proxy-config
    -c --config-file=<value>      3scale toolbox configuration file:
                                  defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                 Proceed and operate even for server
```

```
                          connections otherwise considered
                          insecure
    -v --version              Print the version of this command
      --verbose               Verbose mode
```

3.15.2. Promoting proxy configurations

The following command promotes the latest staging proxy configuration to the production environment:

```
3scale proxy-config promote <remote> <service>
```

Use the following options while promoting the latest staging proxy configurations to the production environment:

```
Options for proxy-config
    -c --config-file=<value>      3scale toolbox configuration file:
                          defaults to $HOME/.3scalerc.yaml
    -h --help                 Print help for this command
    -k --insecure                 Proceed and operate even for server
                          connections otherwise considered insecure
    -v --version              Print the version of this command
      --verbose               Verbose mode
```

3.15.3. Exporting proxy configurations

Use the **proxy-config export** command, for example, if you have a self-managed APIcast gateway not connected to your 3scale instance. In this scenario, inject the 3scale configuration manually or by using the APICast deployment and configuration options . In both cases, you must provide the 3scale configuration.

The following command exports a configuration that you can inject into the APIcast gateway:

```
3scale proxy-config export <remote>
```

You can specify the following options when exporting a proxy configuration for the provider account that will be used as a 3scale configuration file:

```
Options for proxy-config
--environment=<value>      Gateway environment. Must be 'sandbox' or
                     'production' (default: sandbox)
-o --output=<value>        Output format. One of: json|yaml
```

3.15.4. Deploying proxy configurations

The following **deploy** command promotes your APIcast configuration to the staging environment in 3scale or to a production environment if you are using Service Mesh.

```
3scale proxy deploy <remote> <service>
```

You can specify the following option when using the **deploy** command to promote your APIcast configuration to the staging environment:

```
-o --output=<value>      Output format. One of: json|yaml
```

3.15.5. Updating proxy configurations

The following **update** command updates your APIcast configuration.

```
3scale proxy update <remote> <service>
```

You can specify the following options when using the **update** command to update your APIcast configuration:

```
-o --output=<value>        Output format. One of: json|yaml
-p --param=<value>          APIcast configuration parameters. Format:
                         [--param key=value]. Multiple options allowed.
```

3.15.6. Showing proxy configurations

The following **show** command fetches your undeployed APIcast configuration.

```
3scale proxy show <remote> <service>
```

You can specify the following options when using the **show** command to fetch your undeployed APIcast configuration:

```
-o --output=<value>        Output format. One of: json|yaml
```

3.15.7. Deploying proxy configurations (Deprecated)

NOTE

In 3scale 2.12, support for the **proxy-config deploy** command is deprecated.

Use the the following commands:

- **proxy deploy**
- **proxy update**
- **proxy show**

For more information, see Deploying proxy configurations.

The following **deploy** command promotes your APIcast configuration to the staging environment in 3scale or to a production environment if you are using Service Mesh.

```
3scale proxy-config deploy <remote> <service>
```

You can specify the following option when using the **deploy** command to promote your APIcast configuration to the staging environment:

```
-o --output=<value>      Output format. One of: json|yaml
```

Additional resources

- Remotes

3.16. COPYING A POLICY REGISTRY

Use the toolbox command to copy a policy registry from a 3scale source account to a target account when:

- Missing custom policies are being created in target account.
- Matching custom policies are being updated in target account.
- This copy command is idempotent.

NOTE

- Missing custom policies are defined as custom policies that exist in source account and do not exist in an account tenant.
- Matching custom policies are defined as custom policies that exists in both source and target account.

The following command copies a policy registry:

```
3scale policy-registry copy [opts] <source_remote> <target_remote>
```

```
Option for policy-registry
    -c --config-file=<value>      3scale toolbox configuration file:
                                  defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                 Proceed and operate even for server
                                  connections otherwise considered insecure
    -v --version                  Print the version of this command
       --verbose                  Verbose mode
```

3.17. LISTING APPLICATIONS

Use the 3scale toolbox to list, create, show, apply, or delete applications Developer Portal.

The following command lists applications:

```
3scale application list [opts] <remote>
```

Use the following options while listing applications:

```
OPTIONS
       --account=<value>          Filter by account
    -o --output=<value>           Output format on stdout:
                                  one of json|yaml
       --plan=<value>             Filter by application plan. Service
                                  option required.
       --service=<value>          Filter by service
```

```
OPTIONS FOR APPLICATION
    -c --config-file=<value>      3scale toolbox configuration file:
                                  defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                 Proceed and operate even for server
                                  connections otherwise considered insecure
    -v --version                  Print the version of this command
       --verbose                  Verbose mode
```

3.17.1. Creating applications

Use the create command to create one application linked to a given 3scale account and application plan.

The required positional paramaters are as follows:

- **<service>** reference. It can be either service **id**, or service **system_name**.
- **<account>** reference. It can be one of the following:
  - Account **id**
  - **username**, **email**, or **user_id** of the admin user of the account
  - **provider_key**
- **<application plan>** reference. It can be either plan **id**, or plan **system_name**.
- **<name>** application name.

The following command creates applications:

```
3scale application create [opts] <remote> <account> <service> <application-plan> <name>
```

Use the following options while creating applications:

```
OPTIONS
       --application-id=<value>     App ID or Client ID (for OAuth and
                                    OpenID Connect authentication modes)
                                    of the application to be created.
       --application-key=<value>    App Key(s) or Client Secret (for OAuth
                                    and OpenID Connect authentication
                                    modes) of the application created.
       --description=<value>        Application description
    -o --output=<value>             Output format on stdout:
                                    one of json|yaml
       --redirect-url=<value>       OpenID Connect redirect url
       --user-key=<value>           User Key (API Key) of the application
                                    to be created.

OPTIONS FOR APPLICATION
    -c --config-file=<value>      3scale toolbox configuration file:
                                  defaults to $HOME/.3scalerc.yaml
    -h --help                     Print help for this command
    -k --insecure                 Proceed and operate even for server
```

```
                        connections otherwise considered insecure
    -v --version            Print the version of this command
       --verbose            Verbose mode
```

3.17.2. Showing applications

The following command shows applications:

```
3scale application show [opts] <remote> <application>
```

Application parameters allow:

- **User_key** - API key
- **App_id** - from app_id/app_key pair or *Client ID* for *OAuth* and *OpenID Connect* (OIDC) authentication modes
- Application internal **id**

```
OPTIONS
    -o --output=<value>         Output format on stdout:
                        one of json|yaml

OPTIONS FOR APPLICATION
    -c --config-file=<value>    3scale toolbox configuration file:
                        defaults to $HOME/.3scalerc.yaml
    -h --help               Print help for this command
    -k --insecure           Proceed and operate even for server
                        connections otherwise considered insecure
    -v --version            Print the version of this command
       --verbose            Verbose mode
```

3.17.3. Creating or updating applications

Use the following command to create new applications if they do not exist, or to update existing applications:

```
3scale application apply [opts] <remote> <application>
```

Application parameters allow:

- **User_key** - API key
- **App_id** - from app_id/app_key pair or *Client ID* for *OAuth* and *OIDC* authentication modes
- Application internal **id**
- **account** optional argument is required when application is not found and needs to be created. It can be one of the following:
  - Account **id**
  - **username**, **email**, or **user_id** of the administrator user of the 3scale account

- **provider_key**

- **name** cannot be used as unique identifier because application name is not unique in 3scale.
- Resume a suspended application by **--resume** flag.
- Suspends an application - changes the state to suspended by the **--suspend** flag.

Use the following options while updating applications:

```
OPTIONS
    --account=<value>          Application's account. Required when
                               creating
    --application-key=<value>  App Key(s) or Client Secret (for OAuth
                               and OpenID Connect authentication
                               modes) of the application to be
                               created. Only used when application
                               does not exist.
    --description=<value>      Application description
    --name=<value>             Application name
 -o --output=<value>           Output format on stdout:
                               one of json|yaml
    --plan=<value>             Application's plan. Required when
                               creating.
    --redirect-url=<value>     OpenID Connect redirect url
    --resume                   Resume a suspended application
    --service=<value>          Application's service. Required when
                               creating.
    --suspend                  Suspends an application (changes the
                               state to suspended)
    --user-key=<value>         User Key (API Key) of the application
                               to be created.

OPTIONS FOR APPLICATION
 -c --config-file=<value>      3scale toolbox configuration file:
                              defaults to $HOME/.3scalerc.yaml
 -h --help                     Show help for this command
 -k --insecure                 Proceed and operate even for server
                              connections otherwise considered insecure
 -v --version                  Print the version of this command
    --verbose                  Verbose mode.
```

3.17.4. Deleting applications

The following command deletes an application:

```
3scale application delete [opts] <remote> <application>
```

Application parameters allow:

- **User_key** - API key
- **App_id** - from app_id/app_key pair or *Client ID* for *OAuth* and *OIDC* authentication modes
- Application internal **id**

3.18. EXPORTING PRODUCTS

You can export a 3scale product definition in **.yaml** format so that you can import that product into a 3scale instance that has no connectivity with the source 3scale instance. You must set up a 3scale product before you can export that product. See Creating new products to test API calls .

When two 3scale instances have network connectivity, use the toolbox **3scale copy** command when you want to use the same 3scale product in both 3scale instances.

Description

When you export a 3scale product, the toolbox serializes the product definition in **yaml** format that adheres to the Product and Backend custom resource definitions (CRDs).

Along with the basic information for the product, the output **yaml** includes:

- Backends that are linked to the product.
- Metrics, methods and mapping rules for linked backends.
- Limits and pricing rules defined in application plans.
- Metrics and methods that are referenced by limits and pricing rules.

Exporting a product is a read-only operation. In other words, it is safe to repeatedly export a product. The toolbox does not change the product being exported. If you want to, you can modify the **.yaml** output before you import it into another 3scale instance.

Exporting a 3scale product is intended for the following situations:

- There is no connectivity between the source and destination 3scale instances. For example, there might be severe network restrictions that prevent running the toolbox **3scale copy** command when you want to use the same product in more than one 3scale instance.
- You want to use Git or some other source control system to maintain 3scale product definitions in **.yaml** format.

The 3scale toolbox **export** and **import** commands might also be useful for backing up and restoring product definitions.

Format

Use this format for running the **export** command:

```
$ 3scale product export [-f output-file] <remote> <product>
```

The **export** command can send output to **stdout** or to a file. The default is **stdout**. To send output to a file, specify the **-f** or **--file** option with the name of a **.yaml** file.

Replace **<remote>** with a 3scale provider account alias or URL that is associated with the 3scale instance from which you are exporting the product. For more information about specifying this, see Managing remote access credentials.

Replace **<product>** with the system name or 3scale ID of the product that you want to export. This product must be associated with the 3scale provider account that you specified. You can find a product's system name in the 3scale GUI on the product's **Overview** page. To obtain a product's 3scale ID, run the toolbox **3scale services show** command.

Example

The following command exports the **petstore** product from the 3scale instance associated with the **my-3scale-1** provider account and outputs it to the **petstore-product.yaml** file:

```
$ 3scale product export -f petstore-product.yaml my-3scale-1 petstore
```

Following is a serialization example for the **Default API** product:

```
apiVersion: v1
kind: List
items:
- apiVersion: capabilities.3scale.net/v1beta1
  kind: Product
  metadata:
    annotations:
      3scale_toolbox_created_at: '2021-02-17T10:59:23Z'
      3scale_toolbox_version: 0.17.1
    name: api.xysnalcj
  spec:
    name: Default API
    systemName: api
    description: ''
    mappingRules:
    - httpMethod: GET
      pattern: "/v2"
      metricMethodRef: hits
      increment: 1
      last: false
    metrics:
      hits:
        friendlyName: Hits
        unit: hit
        description: Number of API hits
    methods:
      servicemethod01:
        friendlyName: servicemethod01
        description: ''
    policies:
    - name: apicast
      version: builtin
      configuration: {}
      enabled: true
    applicationPlans:
      basic:
        name: Basic
        appsRequireApproval: false
        trialPeriod: 0
        setupFee: 0.0
        custom: false
        state: published
        costMonth: 0.0
        pricingRules:
        - from: 1
          to: 1000
          pricePerUnit: 1.0
          metricMethodRef:
            systemName: hits
        limits:
        - period: hour
          value: 1222222
          metricMethodRef:
            systemName: hits
            backend: backend_01
    backendUsages:
      backend_01:
        path: "/v1/pets"
      backend_02:
        path: "/v1/cats"
    deployment:
      apicastSelfManaged:
        authentication:
          oidc:
            issuerType: rest
            issuerEndpoint: https://hello:test@example.com/auth/realms/3scale-api-consumers
            jwtClaimWithClientID: azp
            jwtClaimWithClientIDType: plain
            authenticationFlow:
              standardFlowEnabled: false
              implicitFlowEnabled: true
              serviceAccountsEnabled: false
              directAccessGrantsEnabled: true
            credentials: query
            security:
              hostHeader: ''
              secretToken: some_secret
            gatewayResponse:
              errorStatusAuthFailed: 403
              errorHeadersAuthFailed: text/plain; charset=us-ascii
              errorAuthFailed: Authentication failed
              errorStatusAuthMissing: 403
              errorHeadersAuthMissing: text/plain; charset=us-ascii
              errorAuthMissing: Authentication parameters missing
              errorStatusNoMatch: 404
              errorHeadersNoMatch: text/plain; charset=us-ascii
              errorNoMatch: No Mapping Rule matched
              errorStatusLimitsExceeded: 429
              errorHeadersLimitsExceeded: text/plain; charset=us-ascii
              errorLimitsExceeded: Usage limit exceeded
        stagingPublicBaseURL: http://staging.example.com:80
        productionPublicBaseURL: http://example.com:80
- apiVersion: capabilities.3scale.net/v1beta1
  kind: Backend
  metadata:
    annotations:
      3scale_toolbox_created_at: '2021-02-17T10:59:34Z'
      3scale_toolbox_version: 0.17.1
    name: backend.01.pcjwxbdu
  spec:
    name: Backend 01
    systemName: backend_01
    privateBaseURL: https://b1.example.com:443
```

```
      description: new desc
      mappingRules:
      - httpMethod: GET
        pattern: "/v1/pets"
        metricMethodRef: hits
        increment: 1
        last: false
      metrics:
        hits:
          friendlyName: Hits
          unit: hit
          description: Number of API hits
      methods:
        mybackendmethod01:
          friendlyName: mybackendmethod01
          description: ''
  - apiVersion: capabilities.3scale.net/v1beta1
    kind: Backend
    metadata:
      annotations:
        3scale_toolbox_created_at: '2021-02-17T10:59:34Z'
        3scale_toolbox_version: 0.17.1
      name: backend.02.tiedgjsk
    spec:
      name: Backend 02
      systemName: backend_02
      privateBaseURL: https://b2.example.com:443
      description: ''
      mappingRules:
      - httpMethod: GET
        pattern: "/v1/cats"
        metricMethodRef: hits
        increment: 1
        last: false
      metrics:
        hits:
          friendlyName: Hits
          unit: hit
          description: Number of API hits
      methods:
        backend02_method01:
          friendlyName: backend02_method01
          description: ''
```

Exporting and piping to Product CRs

When you run the **export** command you can pipe the output to create a product custom resource (CR). Which 3scale instance contains this CR depends on the following:

- If the **threescale-provider-account** secret is defined, the 3scale operator creates the product CR in the 3scale instance identified by that secret.
- If the **threescale-provider-account** secret is not defined, then if there is a 3scale instance installed in the namespace that the new product CR would be in, the 3scale operator creates the product CR in that namespace.

- If the **threescale-provider-account** secret is not defined, and if the namespace that the new product CR would be in does not contain a 3scale instance, then the 3scale operator marks the product CR with a failed status.

Suppose that you run the following command in a namespace that contains a **threescale-provider-account** secret. The toolbox pipes the **petstore** CR to the 3scale instance identified in the **threescale-provider-account** secret:

```
$ 3scale product export my-3scale-1 petstore | oc apply -f -
```

Additional resources

- How the 3scale operator identifies the tenant that a custom resource links to

3.19. IMPORTING PRODUCTS

To use the same 3scale product in more than one 3scale instance when the source and destination 3scale instances do not have network connectivity, export a 3scale product from one 3scale instance and import it into another 3scale instance. To import a product, run the toolbox **3scale product import** command.

When two 3scale instances have network connectivity, use the toolbox **3scale copy** command when you want to use the same 3scale product in both 3scale instances.

Description

When you import a 3scale product, the toolbox expects a serialized product definition in **.yaml** format that adheres to the **Product** and **Backend** custom resource definitions (CRDs). You can obtain this **.yaml** content by running the toolbox **3scale product export** command or by manually creating the **.yaml** formatted product definition.

If you exported the product, the imported definition contains what was exported, which can include:

- Backends that are linked to the product.
- Metrics, methods and mapping rules for linked backends.
- Limits and pricing rules defined in application plans.
- Metrics and methods that are referenced by limits and pricing rules.

If you want to, you can modify exported **.yaml** output before you import it into another 3scale instance.

The **import** command is idempotent. You can run it any number of times to import the same product and the resulting 3scale configuration remains the same. If there is an error during the import process, it is safe to re-run the command. If the **import** process cannot find the product in the 3scale instance, it creates the product. It also creates any metric, method, or backend that is defined in the **.yaml** definition and that it cannot find in the 3scale instance.

Importing a 3scale product is intended for the following situations:

- There is no connectivity between the source and destination 3scale instances. For example, there might be severe network restrictions that prevent running the toolbox **3scale copy** command when you want to use the same product in more than one 3scale instance.

- You want to use Git or some other source control system to maintain 3scale product definitions in **.yaml** format.

The 3scale toolbox **export** and **import** commands might also be useful for backing up and restoring product definitions.

Format

Use this format for running the **import** command:

```
3scale product import [<options>] <remote>
```

The **import** command takes **.yaml** input from **stdin** or from a file. The default is **stdin**.

You can specify these options:

- **-f** or **--file** followed by a file name obtains input from the **.yaml** file that you specify. This file must contain a 3scale product definition that adheres to the 3scale **Product** and **Backend** CRDs.
- **-o** or **--output** followed by **json** or **yaml** outputs the report that lists what was imported in the format that you specify. The default output format is **json**.

Replace **<remote>** with a 3scale provider account alias or URL associated with the 3scale instance into which you want to import the product. For more information about specifying this, see Managing remote access credentials.

Example

The following command imports the product that is defined in **petstore-product.yaml** into the 3scale instance associated with the **my-3scale-2** provider account. By default, the report of what was imported is in **.json** format.

```
3scale product import -f petstore-product.yaml my-3scale-2
```

The **import** command outputs a report that lists the imported items, for example:

```
api:
  product_id: 2555417888846
  backends:
    backend_01:
      backend_id: 73310
      missing_metrics_created: 1
      missing_methods_created: 1
      missing_mapping_rules_created: 1
    backend_02:
      backend_id: 73311
      missing_metrics_created: 0
      missing_methods_created: 2
      missing_mapping_rules_created: 1
  missing_methods_created: 1
  missing_metrics_created: 1
  missing_mapping_rules_created: 2
  missing_application_plans_created: 2
  application_plans:
    basic:
```

```
    application_plan_id: 2357356246461
    missing_limits_created: 7
    missing_pricing_rules_created: 7
  unlimited:
    application_plan_id: 2357356246462
    missing_limits_created: 1
    missing_pricing_rules_created: 0
```

An example of a serialized product definition is at the end of Exporting products.

3.20. EXPORT AND IMPORT A PRODUCT POLICY CHAIN

You can export or import your product's policy chain to or from *yaml* or *json* content. In a command line, reference the product by its **id** or **system** value. You must set up a 3scale product before you can export or import a product's policy chain. See: Creating new products to test API calls .

Features of the**export** command

- The command is a read-only operation for remote products.
- The command will write its output by default to the standard output **stdout**. The **-f** flag can be used to write the command's output to a file.
- Command output formats are in either **json** or **yaml**. Note that the default format is **yaml**.

Help options for the export product policy chain

```
NAME
    export - export product policy chain
USAGE
    3scale policies export [opts] <remote>
    <product>
DESCRIPTION
    export product policy chain
OPTIONS
    -f --file=<value>           Write to file instead of stdout
    -o --output=<value>         Output format. One of: json|yaml
```

Command format

- The following is the format of the command to export the policy chain to a file in *yaml*:

  ```
  $ 3scale policies export -f policies.yaml -o yaml remote_name product_name
  ```

Features of the the**import** command:

- The command will read input from standard input or **stdin**. When **-f FILE** flag is set, input will be read from a file. When **-u** URL flag is set, input will be read from the URL.
- The imported content can be either **yaml** or **json**. You do not need to specify the format because the toolbox automatically detects it.
- The existing policy chain is overwritten with the newly imported one. **SET** semantics are then implemented.

- All content validation is delegated to the 3scale API.

Help options for the import product policy chain

```
NAME
   import - import product policy chain
USAGE
   3scale policies import [opts] <remote>
   <product>
DESCRIPTION
   import product policy chain
OPTIONS
   -f --file=<value>          Read from file
   -u --url=<value>           Read from url
```

Command format

- The following is the format of the command to import the policy chain from a file:

  ```
  $ 3scale policies import -f plan.yaml remote_name product_name
  ```

- The following is the format of the command to import the policy chain from a URI:

  ```
  $ 3scale policies import -f http[s]://domain/resource/path.yaml remote_name product_name
  ```

3.21. COPYING API BACKENDS

Create a copy of the specified source API backend on the specified 3scale system. The target system is first searched by the source backend system name by default:

- If a backend with the selected system name is not found, it is created.
- If a backend with the selected system name is found, it is replaced. Only missing metrics and methods are created, while mapping rules are entirely replaced with the new ones.

You can override the system name using the **--target_system_name** option.

Copied components

The following API backend components are copied:

- Metrics
- Methods
- Mapping rules: these are copied and replaced.

Procedure

- Enter the following command to copy an API backend:

  ```
  3scale backend copy [opts] -s <source_remote> -d <target_remote> <source_backend>
  ```

  The specified 3scale instance can be a remote name or a URL.

NOTE

You can copy a single API backend only per command. You can copy multiple backends using multiple commands. You can copy the same backend multiple times by specifying a different **--target_system_name name**.

Use following options when copying API backends:

```
Options
   -d --destination=<value>           3scale target instance: URL or
                                      remote name (required).
   -s --source=<value>                3scale source instance: URL or
                                      remote name (required).
   -t --target_system_name=<value>    Target system name: defaults to
                                      source system name.
```

The following example command shows you how to copy an API backend multiple times by specifying a different value for **--target_system_name**:

```
$ podman run registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13 3scale backend copy [-t
target_system_name] -s 3scale1 -d 3scale2 api_backend_01
```

3.22. COPYING API PRODUCTS

Create a copy of the specified source API product on the target 3scale system. By default, the source API product system name first searches the target system:

- If a product with the selected **system-name** is not found, it is created.
- If a product with the selected **system-name** is found, it is updated. Only missing metrics and methods are created, while mapping rules are entirely replaced with the new ones.

You can override the system name using the **--target_system_name** option.

Copied components

The following API product components are copied:

- Configuration and settings
- Metrics and methods
- Mapping rules: these are copied and replaced.
- Application plans, pricing rules, and limits
- Application usage rules
- Policies
- Backends
- ActiveDocs

Procedure

- Enter the following command to copy an API product:

  ```
  3scale product copy [opts] -s <source_remote> -d <target_remote> <source_product>
  ```

  The specified 3scale instance can be a remote name or a URL.

  NOTE

  You can copy a single API product only per command. You can copy multiple products using multiple commands. You can copy the same product multiple times by specifying a different **--target_system_name name**.

Use following options when copying API products:

```
Options
    -d --destination=<value>            3scale target instance: URL or
                                        remote name (required).
    -s --source=<value>                 3scale source instance: URL or
                                        remote name (required).
    -t --target_system_name=<value>     Target system name: defaults to
                                        source system name.
```

The following example command shows you how to copy an API product multiple times by specifying a different value for **--target_system_name**:

```
$ podman run registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.13 3scale product copy [-t
target_system_name] -s 3scale1 -d 3scale2 my_api_product_01
```

3.23. TROUBLESHOOTING ISSUES WITH SSL AND TLS

This section explains how to resolve issues with Secure Sockets Layer/Transport Layer Security (SSL/TLS).

If you are experiencing issues related to self-signed SSL certificates, you can download and use remote host certificates as described in this section. For example, typical errors include **SSL certificate problem: self signed certificate** or **self signed certificate in certificate chain**.

Procedure

1. Download the remote host certificate using **openssl**. For example:

   ```
   $ echo | openssl s_client -showcerts -servername self-signed.badssl.com -connect self-
   signed.badssl.com:443 2>/dev/null | sed -ne '/-BEGIN CERTIFICATE-/,/-END
   CERTIFICATE-/p' > self-signed-cert.pem
   ```

2. Ensure that the certificate is working correctly using **curl**. For example:

   ```
   $ SSL_CERT_FILE=self-signed-cert.pem curl -v https://self-signed.badssl.com
   ```

   If the certificate is working correctly, you will no longer get the SSL error. If the certificate is not working correctly, try running the **curl** command with the **-k** option (or its long form, **--insecure**). This indicates that you want to proceed even for server connections that are otherwise considered insecure.

3. Add the **SSL_CERT_FILE** environment variable to your **3scale** commands. For example:

```
$ podman run --env "SSL_CERT_FILE=/tmp/self-signed-cert.pem" -v $PWD/self-signed-cert.pem:/tmp/self-signed-cert.pem registry.redhat.io/3scale-amp2/toolbox-rhel7:3scale2.13 3scale service list https://{ACCESS_KEY}@{3SCALE_ADMIN}-admin.{DOMAIN_NAME}
```

   This example uses a Podman volume to mount the certificate file in the container. It assumes that the file is available in the current **$PWD** folder.

   An alternative approach would be to create your own toolbox image using the 3scale toolbox image as the base image and then install your own trusted certificate store.

Additional resources

- For more details on SSL certificates, see the Red Hat Certificate System documentation .
- For more details on Podman, see Building, running, and managing Linux containers on Red Hat Enterprise Linux 8.

CHAPTER 4. MAPPING API ENVIRONMENTS IN 3SCALE

An API provider gives access to the APIs managed through the 3scale Admin Portal. You then deploy the API backends in many environments. API backend environments include the following:

- Different environments used for development, quality assurance (QA), staging, and production.
- Different environments used for teams or departments that manage their own set of API backends.

A Red Hat 3scale product represents a single API or subset of an API, but it is also used to map and manage different API backend environments.

To find out about mapping API environments for your 3scale product, see the following section:

- Product per environment

4.1. PRODUCT PER ENVIRONMENT

This method uses a separate 3scale Product for each API backend environment. In each product, configure a production gateway and a staging gateway, so the changes to the gateway configuration can be tested safely and promoted to the production configuration as you would with your API backends.

> Production Product => Production Product APIcast gateway => Production Product API upstream
> Staging Product => Staging Product APIcast gateway => Staging Product API upstream

Configure the product for the API backend environment as follows:

- Create a backend with a base URL for the API backend for the environment.
- Add the backend to the product for the environment with a backend path `/`.

Development environment

- Create development backend
  - **Name:** Dev
  - **Private Base URL:** URL of the API backend
- Create Dev product
  - **Production Public Base URL:** **https://dev-api-backend.yourdomain.com**
  - **Staging Public Base URL:** **https://dev-api-backend.yourdomain.com**
  - Add Dev Backend with a backend path `/`

QA environment

- Create QA backend
  - **Name:** QA
  - **Private Base URL:** URL of the API backend

- Create QA product
  - **Production Public Base URL:** **https://qa-api-backend.yourdomain.com**
  - **Staging Public Base URL:** **https://qa-api-backend.yourdomain.com**
  - Add QA Backend with a backend path `/`

Production environment

- Create production backend
  - **Name:** Prod
  - **Private Base URL:** URL of the API backend
- Create Prod product
  - **Production Public Base URL:** **https://prod-api-backend.yourdomain.com**
  - **Staging Public Base URL:** **https://prod-api-backend.yourdomain.com**
  - Add production Backend with a backend path `/`

Additional resources

- For more information about the 3scale product, see First steps with 3scale.

Additional resources

- For more information about the API provider, see the glossary.
- For more information about the 3scale product, see the glossary.

CHAPTER 5. AUTOMATING API LIFECYCLE WITH 3SCALE TOOLBOX

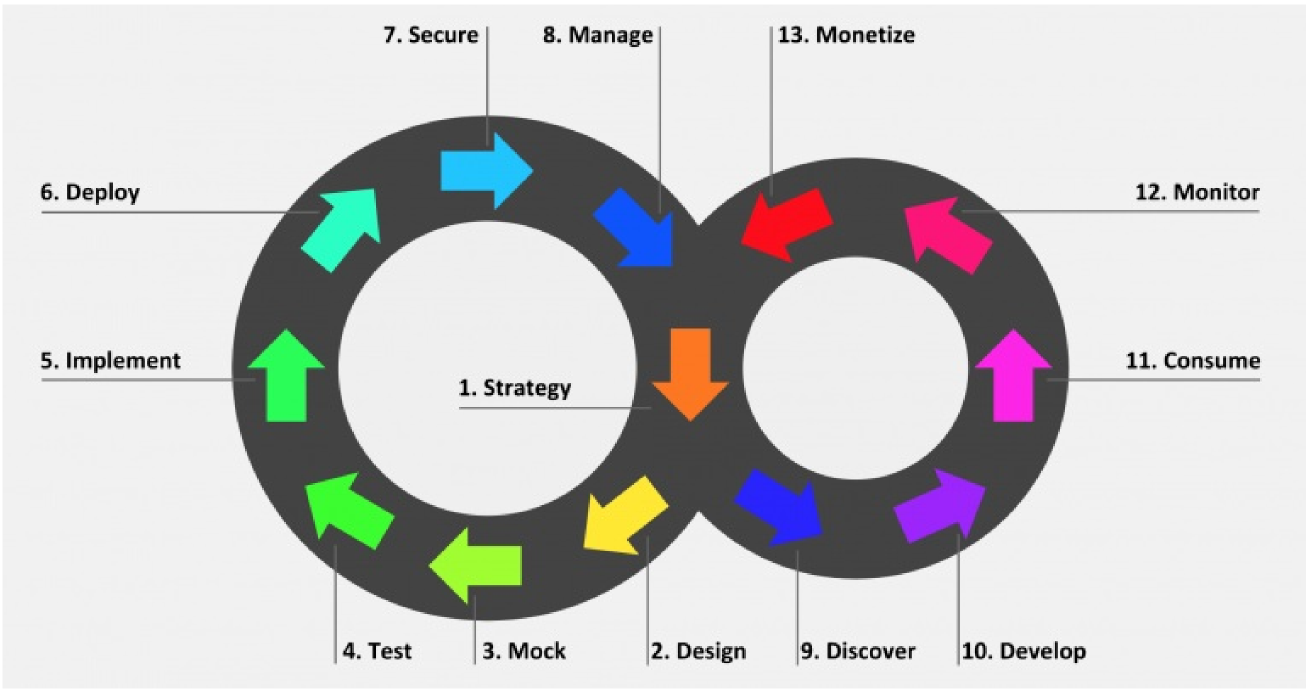
This topic explains the concepts of the API lifecycle with Red Hat 3scale and shows how API providers can automate the deployment stage using Jenkins Continuous Integration/Continuous Deployment (CI/CD) pipelines with 3scale toolbox commands. It describes how to deploy the sample Jenkins CI/CD pipelines, how to create a custom Jenkins pipeline using the 3scale shared library, and how create a custom pipeline from scratch:

- Section 5.1, “Overview of the API lifecycle stages”
- Section 5.2, “Deploying the sample Jenkins CI/CD pipelines”
- Section 5.3, “Creating pipelines using the 3scale Jenkins shared library”
- Section 5.4, “Creating pipelines using a Jenkinsfile”

5.1. OVERVIEW OF THE API LIFECYCLE STAGES

The API lifecycle describes all the required activities from when an API is created until it is deprecated. 3scale enables API providers to perform full API lifecycle management. This section explains each stage in the API lifecycle and describes its goal and expected outcome.

The following diagram shows the API provider-based stages on the left, and the API consumer-based stages on the right:



NOTE

Red Hat currently supports the design, implement, deploy, secure, and manage phases of the API provider cycle, and all phases of the API consumer cycle.

5.1.1. API provider cycle

The API provider cycle stages are based on specifying, developing, and deploying your APIs. The following describes the goal and outcome of each stage:

Table 5.1. API provider lifecycle stages

Stage	*Goal*	*Outcome*
1. Strategy	Determine the corporate strategy for the APIs, including goals, resources, target market, timeframe, and make a plan.	The corporate strategy is defined with a clear plan to achieve the goals.
2. Design	Create the API contract early to break dependencies between projects, gather feedback, and reduce risks and time to market (for example, using Apicurio Studio).	A consumer-focused API contract defines the messages that can be exchanged with the API. The API consumers have provided feedback.
3. Mock	Further specify the API contract with real-world examples and payloads that can be used by API consumers to start their implementation.	A mock API is live and returns real-world examples. The API contract is complete with examples.
4. Test	Further specify the API contract with business expectations that can be used to test the developed API.	A set of acceptance tests is created. The API documentation is complete with business expectations.
5. Implement	Implement the API, using an integration framework such as Red Hat Fuse or a development language of your choice. Ensure that the implementation matches the API contract.	The API is implemented. If custom API management features are required, 3scale APIcast policies are also developed.
6. Deploy	Automate the API integration, tests, deployment, and management using a CI/CD pipeline with 3scale toolbox.	A CI/CD pipeline integrates, tests, deploys, and manages the API to the production environment in an automated way.
7. Secure	Ensure that the API is secure (for example, using secure development practices and automated security testing).	Security guidelines, processes, and gates are in place.
8. Manage	Manage API promotion between environments, versioning, deprecation, and retirement at scale.	Processes and tools are in place to manage APIs at scale (for example, semantic versioning to prevent breaking changes to the API).

5.1.2. API consumer cycle

The API consumer cycle stages are based on promoting, distributing, and refining your APIs for consumption. The following describes the goal and outcome of each stage:

Table 5.2. API consumer lifecycle stages

Stage	*Goal*	*Outcome*
9. Discover	Promote the API to third-party developers, partners, and internal users.	A developer portal is live and up-to-date documentation is continuously pushed to this developer portal (for example, using 3scale ActiveDocs).
10. Develop	Guide and enable third-party developers, partners, and internal users to develop applications based on the API.	The developer portal includes best practices, guides, and recommendations. API developers have access to a mock and test endpoint to develop their software.
11. Consume	Handle the growing API consumption and manage the API consumers at scale.	Staged application plans are available for consumption, and up-to-date prices and limits are continuously pushed. API consumers can integrate API key or client ID/secret generation from their CI/CD pipeline.
12. Monitor	Gather factual and quantified feedback about API health, quality, and developer engagement (for example, a metric for Time to first Hello World!).	A monitoring system is in place. Dashboards show KPIs for the API (for example, uptime, requests per minute, latency, and so on).
13. Monetize	Drive new incomes at scale (this stage is optional).	For example, when targeting a large number of small API consumers, monetization is enabled and consumers are billed based on usage in an automated way.

5.2. DEPLOYING THE SAMPLE JENKINS CI/CD PIPELINES

API lifecycle automation with 3scale toolbox focuses on the deployment stage of the API lifecycle and enables you to use CI/CD pipelines to automate your API management solution. This topic explains how to deploy the sample Jenkins pipelines that call the 3scale toolbox:

- Section 5.2.1, “Sample Jenkins CI/CD pipelines”
- Section 5.2.2, “Setting up your 3scale Hosted environment”

- Section 5.2.3, “Setting up your 3scale On-premises environment”
- Section 5.2.4, “Deploying Red Hat Single Sign-On for OpenID Connect”
- Section 5.2.5, “Installing the 3scale toolbox and enabling access”
- Section 5.2.6, “Deploying the API backends”
- Section 5.2.7, “Deploying self-managed APIcast instances”
- Section 5.2.8, “Installing and deploying the sample pipelines”
- Section 5.2.9, “Limitations of API lifecycle automation with 3scale toolbox”

5.2.1. Sample Jenkins CI/CD pipelines

The following samples are provided in the Red Hat Integration repository as examples of how to create and deploy your Jenkins pipelines for API lifecycle automation:

Table 5.3. Sample Jenkins shared library pipelines

Sample pipeline	*Target environment*	*Security*
SaaS - API key	3scale Hosted	API key
Hybrid - open	3scale Hosted and 3scale On-premises with APIcast self-managed	None
Hybrid - OpenID Connect	3scale Hosted and 3scale On-premises with APIcast self-managed	OpenID Connect (OIDC)
Multi-environment	3scale Hosted on development, test and production, with APIcast self-managed	API key
Semantic versioning	3scale Hosted on development, test and production, with APIcast self-managed	API key, none, OIDC

These samples use a 3scale Jenkins shared library that calls the 3scale toolbox to demonstrate key API management capabilities. After you have performed the setup steps in this topic, you can install the pipelines using the OpenShift templates provided for each of the sample use cases in the Red Hat Integration repository.

IMPORTANT

The sample pipelines and applications are provided as examples only. The underlying APIs, CLIs, and other interfaces leveraged by the sample pipelines are fully supported by Red Hat. Any modifications that you make to the pipelines are not directly supported by Red Hat.

5.2.2. Setting up your 3scale Hosted environment

Setting up a 3scale Hosted environment is required by all of the sample Jenkins CI/CD pipelines.

NOTE

The **SaaS - API key**, **Multi-environment**, and **Semantic versioning** sample pipelines use 3scale Hosted only. The **Hybrid - open** and **Hybrid - OIDC** pipelines also use 3scale On-premises. See also Setting up your 3scale On-premises environment.

Prerequisites

- You must have a Linux workstation.
- You must have a 3scale Hosted environment.
- You must have an OpenShift 3.11 cluster. OpenShift 4 is currently not supported.
  - For more information about supported configurations, see the Red Hat 3scale Supported Configurations page.
- Ensure that wildcard routes have been enabled on the OpenShift router, as explained in the OpenShift documentation.

Procedure

1. Log in to your 3scale Hosted Admin Portal console.
2. Generate a new access token with write access to the Account Management API.
3. Save the generated access token for later use. For example:

```
export SAAS_ACCESS_TOKEN=123...456
```

4. Save the name of your 3scale tenant for later use. This is the string before **-admin.3scale.net** in your Admin Portal URL. For example:

```
export SAAS_TENANT=my_username
```

5. Navigate to **Audience** > **Accounts** > **Listing** in the Admin Portal.
6. Click **Developer**.
7. Save the **Developer Account ID**. This is the last part of the URL after **/buyers/accounts/**. For example:

```
export SAAS_DEVELOPER_ACCOUNT_ID=123...456
```

5.2.3. Setting up your 3scale On-premises environment

Setting up a 3scale on-premises environment is required by the **Hybrid - open** and **Hybrid - OIDC** sample Jenkins CI/CD pipelines only.

NOTE

If you wish to use these **Hybrid** sample pipelines, you must set up a 3scale On-premises environment and a 3scale Hosted environment. See also Setting up your 3scale Hosted environment.

Prerequisites

- You must have a Linux workstation.
- You must have a 3scale on-premises environment. For details on installing 3scale on-premises using a template on OpenShift, see the 3scale installation documentation.
- You must have an OpenShift 3.11 cluster. OpenShift 4 is currently not supported.
  - For more information about supported configurations, see the Red Hat 3scale API Management Supported Configurations page.
- Ensure that wildcard routes have been enabled on the OpenShift router, as explained in the OpenShift documentation.

Procedure

1. Log in to your 3scale On-premises Admin Portal console.
2. Generate a new access token with write access to the Account Management API.
3. Save the generated access token for later use. For example:

```
export SAAS_ACCESS_TOKEN=123...456
```

4. Save the name of your 3scale tenant for later use:

```
export ONPREM_ADMIN_PORTAL_HOSTNAME="$(oc get route system-provider-admin -o
jsonpath='{.spec.host}')"
```

5. Define your wildcard routes:

```
export OPENSHIFT_ROUTER_SUFFIX=app.openshift.test # Replace me!

export APICAST_ONPREM_STAGING_WILDCARD_DOMAIN=onprem-
staging.$OPENSHIFT_ROUTER_SUFFIX

export APICAST_ONPREM_PRODUCTION_WILDCARD_DOMAIN=onprem-
production.$OPENSHIFT_ROUTER_SUFFIX
```

NOTE

You must set the value of **OPENSHIFT_ROUTER_SUFFIX** to the suffix of your OpenShift router (for example, **app.openshift.test**).

6. Add the wildcard routes to your existing 3scale on-premises instance:

```
oc create route edge apicast-wildcard-staging --service=apicast-staging --
```

```
hostname="wildcard.$APICAST_ONPREM_STAGING_WILDCARD_DOMAIN" --insecure-
policy=Allow --wildcard-policy=Subdomain

oc create route edge apicast-wildcard-production --service=apicast-production --
hostname="wildcard.$APICAST_ONPREM_PRODUCTION_WILDCARD_DOMAIN" --
insecure-policy=Allow --wildcard-policy=Subdomain
```

7. Navigate to **Audience** > **Accounts** > **Listing** in the Admin Portal.

8. Click **Developer**.

9. Save the **Developer Account ID**. This is the last part of the URL after **/buyers/accounts/**:

```
export ONPREM_DEVELOPER_ACCOUNT_ID=5
```

5.2.4. Deploying Red Hat Single Sign-On for OpenID Connect

If you are using the **Hybrid - OpenID Connect (OIDC)** or **Semantic versioning** sample pipelines, perform the steps in this section to deploy Red Hat Single Sign-On (RH-SSO) with 3scale. This is required for OIDC authentication, which is used in both samples.

Procedure

1. Deploy RH-SSO 7.3 as explained in the RH-SSO documentation.
   The following example commands provide a short summary:

```
oc replace -n openshift --force -f https://raw.githubusercontent.com/jboss-container-
images/redhat-sso-7-openshift-image/sso73-dev/templates/sso73-image-stream.json

oc replace -n openshift --force -f https://raw.githubusercontent.com/jboss-container-
images/redhat-sso-7-openshift-image/sso73-dev/templates/sso73-x509-postgresql-
persistent.json

oc -n openshift import-image redhat-sso73-openshift:1.0

oc policy add-role-to-user view system:serviceaccount:$(oc project -q):default

oc new-app --template=sso73-x509-postgresql-persistent --name=sso -p
DB_USERNAME=sso -p SSO_ADMIN_USERNAME=admin -p DB_DATABASE=sso
```

2. Save the host name of your RH-SSO installation for later use:

```
export SSO_HOSTNAME="$(oc get route sso -o jsonpath='{.spec.host}')"
```

3. Configure RH-SSO for 3scale as explained in the 3scale Developer Portal documentation.

4. Save the realm name, client ID, and client secret for later use:

```
export REALM=3scale

export CLIENT_ID=3scale-admin

export CLIENT_SECRET=123...456
```

5.2.5. Installing the 3scale toolbox and enabling access

This section describes how to install the toolbox, create your remote 3scale instance, and provision the secret used to access the Admin Portal.

Procedure

1. Install the 3scale toolbox locally as explained in The 3scale toolbox.
2. Run the appropriate toolbox command to create your 3scale remote instance:

   3scale Hosted

   ```
   3scale remote add 3scale-saas "https://$SAAS_ACCESS_TOKEN@$SAAS_TENANT-admin.3scale.net/"
   ```

   3scale On-premises

   ```
   3scale remote add 3scale-onprem
   "https://$ONPREM_ACCESS_TOKEN@$ONPREM_ADMIN_PORTAL_HOSTNAME/"
   ```

3. Run the following OpenShift command to provision the secret containing your 3scale Admin Portal and access token:

   ```
   oc create secret generic 3scale-toolbox -n "$TOOLBOX_NAMESPACE" --from-file="$HOME/.3scalerc.yaml"
   ```

5.2.6. Deploying the API backends

This section shows how to deploy the example API backends provided with the sample pipelines. You can substitute your own API backends as needed when creating and deploying your own pipelines

Procedure

1. Deploy the example Beer Catalog API backend for use with the following samples:
   - **SaaS - API key**
   - **Hybrid - open**
   - **Hybrid - OIDC**

   ```
   oc new-app -n "$TOOLBOX_NAMESPACE" -i openshift/redhat-openjdk18-openshift:1.4
   https://github.com/microcks/api-lifecycle.git --context-dir=/beer-catalog-demo/api-implementation --name=beer-catalog

   oc expose -n "$TOOLBOX_NAMESPACE" svc/beer-catalog
   ```

2. Save the Beer Catalog API host name for later use:

   ```
   export BEER_CATALOG_HOSTNAME="$(oc get route -n "$TOOLBOX_NAMESPACE" beer-catalog -o jsonpath='{.spec.host}')"
   ```

3. Deploy the example Red Hat Event API backend for use with the following samples:
   - **Multi-environment**
   - **Semantic versioning**

   ```
   oc new-app -n "$TOOLBOX_NAMESPACE" -i openshift/nodejs:10
   'https://github.com/nmasse-itix/rhte-api.git#085b015' --name=event-api

   oc expose -n "$TOOLBOX_NAMESPACE" svc/event-api
   ```

4. Save the Event API host name for later use:

   ```
   export EVENT_API_HOSTNAME="$(oc get route -n "$TOOLBOX_NAMESPACE" event-api
   -o jsonpath='{.spec.host}')"
   ```

5.2.7. Deploying self-managed APIcast instances

This section is for use with APIcast self-managed instances in 3scale Hosted environments. It applies to all of the sample pipelines except **SaaS - API key**.

Procedure

1. Define your wildcard routes:

   ```
   export APICAST_SELF_MANAGED_STAGING_WILDCARD_DOMAIN=saas-
   staging.$OPENSHIFT_ROUTER_SUFFIX

   export APICAST_SELF_MANAGED_PRODUCTION_WILDCARD_DOMAIN=saas-
   production.$OPENSHIFT_ROUTER_SUFFIX
   ```

2. Deploy the APIcast self-managed instances in your project:

   ```
   oc create secret generic 3scale-tenant --from-
   literal=password=https://$SAAS_ACCESS_TOKEN@$SAAS_TENANT-admin.3scale.net

   oc create -f https://raw.githubusercontent.com/3scale/apicast/v3.5.0/openshift/apicast-
   template.yml

   oc new-app --template=3scale-gateway --name=apicast-staging -p
   CONFIGURATION_URL_SECRET=3scale-tenant -p CONFIGURATION_CACHE=0 -p
   RESPONSE_CODES=true -p LOG_LEVEL=info -p CONFIGURATION_LOADER=lazy -p
   APICAST_NAME=apicast-staging -p DEPLOYMENT_ENVIRONMENT=sandbox -p
   IMAGE_NAME=registry.redhat.io/3scale-amp2/apicast-gateway-rhel8:3scale2.13

   oc new-app --template=3scale-gateway --name=apicast-production -p
   CONFIGURATION_URL_SECRET=3scale-tenant -p CONFIGURATION_CACHE=60 -p
   RESPONSE_CODES=true -p LOG_LEVEL=info -p CONFIGURATION_LOADER=boot -p
   APICAST_NAME=apicast-production -p DEPLOYMENT_ENVIRONMENT=production -p
   IMAGE_NAME=registry.redhat.io/3scale-amp2/apicast-gateway-rhel8:3scale2.13

   oc scale dc/apicast-staging --replicas=1

   oc scale dc/apicast-production --replicas=1
   ```

```
oc create route edge apicast-staging --service=apicast-staging --
hostname="wildcard.$APICAST_SELF_MANAGED_STAGING_WILDCARD_DOMAIN" --
insecure-policy=Allow --wildcard-policy=Subdomain

oc create route edge apicast-production --service=apicast-production --
hostname="wildcard.$APICAST_SELF_MANAGED_PRODUCTION_WILDCARD_DOMAIN"
--insecure-policy=Allow --wildcard-policy=Subdomain
```

5.2.8. Installing and deploying the sample pipelines

After you have set up the required environments, you can install and deploy the sample pipelines using the OpenShift templates provided for each of the sample use cases in the Red Hat Integration repository. For example, this section shows the **SaaS - API Key** sample only.

Procedure

1. Use the provided OpenShift template to install the Jenkins pipeline:

```
oc process -f saas-usecase-apikey/setup.yaml \
        -p DEVELOPER_ACCOUNT_ID="$SAAS_DEVELOPER_ACCOUNT_ID" \
        -p PRIVATE_BASE_URL="http://$BEER_CATALOG_HOSTNAME" \
        -p NAMESPACE="$TOOLBOX_NAMESPACE" |oc create -f -
```

2. Deploy the sample as follows:

```
oc start-build saas-usecase-apikey
```

Additional resource

- Sample use cases in the Red Hat Integration repository

5.2.9. Limitations of API lifecycle automation with 3scale toolbox

The following limitations apply in this release:

OpenShift support

The sample pipelines are supported on OpenShift 3.11 only. OpenShift 4 is currently not supported. For more information about supported configurations, see the Red Hat 3scale Supported Configurations page.

Updating applications

- You can use the **3scale application apply** toolbox command for applications to both create and update applications. Create commands support account, plan, service, and application key.
- Update commands do not support changes to account, plan, or service. If changes are passed, the pipelines will be triggered, no errors will be shown, but those fields will not be updated.

Copying services

When using the **3scale copy service** toolbox command to copy a service with custom policies, you must copy the custom policies first and separately.

5.3. CREATING PIPELINES USING THE 3SCALE JENKINS SHARED LIBRARY

This section provides best practices for creating a custom Jenkins pipeline that uses the 3scale toolbox. It explains how to write a Jenkins pipeline in Groovy that uses the 3scale Jenkins shared library to call the toolbox based on an example application. For more details, see Jenkins shared libraries.

IMPORTANT

Red Hat supports the Jenkins pipeline samples provided in the Red Hat Integration repository.

Any modifications made to these pipelines are not directly supported by Red Hat. Custom pipelines that you create for your environment are not supported.

Prerequisites

- Deploying the sample Jenkins CI/CD pipelines .
- You must have an OpenAPI specification file for your API. For example, you can generate this using Apicurio Studio.

Procedure

1. Add the following to the beginning of your Jenkins pipeline to reference the 3scale shared library from your pipeline:

```
#!groovy

library identifier: '3scale-toolbox-jenkins@master',
   retriever: modernSCM([$class: 'GitSCMSource',
     remote: 'https://github.com/rh-integration/3scale-toolbox-jenkins.git'])
```

2. Declare a global variable to hold the **ThreescaleService** object so that you can use it from the different stages of your pipeline.

```
def service = null
```

3. Create the **ThreescaleService** with all the relevant information:

```
stage("Prepare") {
  service = toolbox.prepareThreescaleService(
     openapi: [ filename: "swagger.json" ],
     environment: [ baseSystemName: "my_service" ],
     toolbox: [ openshiftProject: "toolbox",
                destination: "3scale-tenant",
                secretName: "3scale-toolbox" ],
     service: [:],
     applications: [
        [ name: "my-test-app", description: "This is used for tests", plan: "test", account: "
<CHANGE_ME>" ]
        ],
     applicationPlans: [
       [ systemName: "test", name: "Test", defaultPlan: true, published: true ],
      [ systemName: "silver", name: "Silver" ],
      [ artefactFile: "https://raw.githubusercontent.com/my_username/API-Lifecycle-
Mockup/master/testcase-01/plan.yaml"],
    ]
  )

  echo "toolbox version = " + service.toolbox.getToolboxVersion()
 }
```

- **openapi.filename** is the path to the file containing the OpenAPI specification.
- **environment.baseSystemName** is used to compute the final **system_name**, based on **environment.environmentName** and the API major version from the OpenAPI specification **info.version**.
- **toolbox.openshiftProject** is the OpenShift project in which Kubernetes jobs will be created.
- **toolbox.secretName** is the name of the Kubernetes secret containing the 3scale toolbox configuration file, as shown in Installing the 3scale toolbox and enabling access .
- **toolbox.destination** is the name of the 3scale toolbox remote instance.
- **applicationPlans** is a list of application plans to create by using a **.yaml** file or by providing application plan property details.

4. Add a pipeline stage to provision the service in 3scale:

```
stage("Import OpenAPI") {
  service.importOpenAPI()
  echo "Service with system_name ${service.environment.targetSystemName} created !"
}
```

5. Add a stage to create the application plans:

```
stage("Create an Application Plan") {
  service.applyApplicationPlans()
}
```

6. Add a global variable and a stage to create the test application:

```
stage("Create an Application") {
  service.applyApplication()
}
```

7. Add a stage to run your integration tests. When using APIcast Hosted instances, you must fetch the proxy definition to extract the staging public URL:

```
stage("Run integration tests") {
  def proxy = service.readProxy("sandbox")
  sh """set -e +x
  curl -f -w "ListBeers: %{http_code}\n" -o /dev/null -s ${proxy.sandbox_endpoint}/api/beer -H
'api-key: ${service.applications[0].userkey}'
  curl -f -w "GetBeer: %{http_code}\n" -o /dev/null -s
${proxy.sandbox_endpoint}/api/beer/Weissbier -H 'api-key: ${service.applications[0].userkey}'
  curl -f -w "FindBeersByStatus: %{http_code}\n" -o /dev/null -s
${proxy.sandbox_endpoint}/api/beer/findByStatus/   available -H 'api-key:
${service.applications[0].userkey}'
  """
}
```

8. Add a stage to promote your API to production:

```
stage("Promote to production") {
  service.promoteToProduction()
}
```

Additional resources

- Creating pipelines using a Jenkinsfile
- The 3scale toolbox

5.4. CREATING PIPELINES USING A JENKINSFILE

This section provides best practices for writing a custom **Jenkinsfile** from scratch in Groovy that uses the 3scale toolbox.

IMPORTANT

Red Hat supports the Jenkins pipeline samples provided in the Red Hat Integration repository.

Any modifications made to these pipelines are not directly supported by Red Hat. Custom pipelines that you create for your environment are not supported. This section is provided for reference only.

Prerequisites

- Deploying the sample Jenkins CI/CD pipelines .
- You must have an OpenAPI specification file for your API. For example, you can generate this using Apicurio Studio.

Procedure

1. Write a utility function to call the 3scale toolbox. The following creates a Kubernetes job that runs the 3scale toolbox:

```
#!groovy

def runToolbox(args) {
  def kubernetesJob = [
    "apiVersion": "batch/v1",
    "kind": "Job",
    "metadata": [
      "name": "toolbox"
    ],
    "spec": [
      "backoffLimit": 0,
      "activeDeadlineSeconds": 300,
      "template": [
        "spec": [
          "restartPolicy": "Never",
          "containers": [
            [
              "name": "job",
              "image": "registry.redhat.io/3scale-amp2/toolbox-rhel7:3scale2.13",
              "imagePullPolicy": "Always",
              "args": [ "3scale", "version" ],
              "env": [
                [ "name": "HOME", "value": "/config" ]
              ],
              "volumeMounts": [
                [ "mountPath": "/config", "name": "toolbox-config" ],
                [ "mountPath": "/artifacts", "name": "artifacts" ]
              ]
            ]
          ],
          "volumes": [
            [ "name": "toolbox-config", "secret": [ "secretName": "3scale-toolbox" ] ],
            [ "name": "artifacts", "configMap": [ "name": "openapi" ] ]
          ]
        ]
      ]
    ]
  ]

  kubernetesJob.spec.template.spec.containers[0].args = args

  sh "rm -f -- job.yaml"
  writeYaml file: "job.yaml", data: kubernetesJob

  sh """set -e
  oc delete job toolbox --ignore-not-found
  sleep 2
  oc create -f job.yaml
  sleep 20 # Adjust the sleep duration to your server velocity
  """

  def logs = sh(script: "set -e; oc logs -f job/toolbox", returnStdout: true)
  echo logs
  return logs
}
```

Kubernetes object template

This function uses a Kubernetes object template to run the 3scale toolbox, which you can adjust to your needs. It sets the 3scale toolbox CLI arguments and writes the resulting Kubernetes job definition to a YAML file, cleans up any previous run of the toolbox, creates the Kubernetes job, and waits:

- You can adjust the wait duration to your server velocity to match the time that a pod needs to transition between the **Created** and the **Running** state. You can refine this step using a polling loop.

- The OpenAPI specification file is fetched from a **ConfigMap** named **openapi**.
- The 3scale Admin Portal hostname and access token are fetched from a secret named **3scale-toolbox**, as shown in Installing the 3scale toolbox and enabling access .
- The **ConfigMap** will be created by the pipeline in step 3. However, the secret was already provisioned outside the pipeline and is subject to Role-Based Access Control (RBAC) for enhanced security.

2. Define the global environment variables to use with 3scale toolbox in your Jenkins pipeline stages. For example:

   3scale Hosted

```
def targetSystemName = "saas-apikey-usecase"
def targetInstance = "3scale-saas"
def privateBaseURL = "http://echo-api.3scale.net"
def testUserKey = "abcdef1234567890"
def developerAccountId = "john"
```

   3scale On-premises

   When using self-managed APIcast or an on-premises installation of 3scale, you must declare two more variables:

```
def publicStagingBaseURL = "http://my-staging-api.example.test"
def publicProductionBaseURL = "http://my-production-api.example.test"
```

   The variables are described as follows:

   - **targetSystemName**: The name of the service to be created.
   - **targetInstance**: This matches the name of the 3scale remote instance created in Installing the 3scale toolbox and enabling access.
   - **privateBaseURL**: The endpoint host of your API backend.
   - **testUserKey**: The user API key used to run the integration tests. It can be hardcoded as shown or generated from an HMAC function.
   - **developerAccountId**: The ID of the target account in which the test application will be created.
   - **publicStagingBaseURL**: The public staging base URL of the service to be created.
   - **publicProductionBaseURL**: The public production base URL of the service to be created.

3. Add a pipeline stage to fetch the OpenAPI specification file and provision it as a **ConfigMap** on OpenShift as follows:

```
node() {
 stage("Fetch OpenAPI") {
   sh """set -e
   curl -sfk -o swagger.json https://raw.githubusercontent.com/microcks/api-
lifecycle/master/beer-catalog-demo/api-contracts/beer-catalog-api-swagger.json
   oc delete configmap openapi --ignore-not-found
```

```
  oc create configmap openapi --from-file="swagger.json"
  """
 }
```

4. Add a pipeline stage that uses the 3scale toolbox to import the API into 3scale:

   3scale Hosted

   ```
   stage("Import OpenAPI") {
     runToolbox([ "3scale", "import", "openapi", "-d", targetInstance, "/artifacts/swagger.json", "--override-private-base-url=${privateBaseURL}", "-t", targetSystemName ])
   }
   ```

   3scale On-premises

   When using self-managed APIcast or an on-premises installation of 3scale, you must also specify the options for the public staging and production base URLs:

   ```
   stage("Import OpenAPI") {
     runToolbox([ "3scale", "import", "openapi", "-d", targetInstance, "/artifacts/swagger.json", "--override-private-base-url=${privateBaseURL}", "-t", targetSystemName, "--production-public-base-url=${publicProductionBaseURL}", "--staging-public-base-url=${publicStagingBaseURL}" ])
   }
   ```

5. Add pipeline stages that use the toolbox to create a 3scale application plan and an application:

   ```
   stage("Create an Application Plan") {
     runToolbox([ "3scale", "application-plan", "apply", targetInstance, targetSystemName, "test", "-n", "Test Plan", "--default" ])
   }

   stage("Create an Application") {
     runToolbox([ "3scale", "application", "apply", targetInstance, testUserKey, "--account=${developerAccountId}", "--name=Test Application", "--description=Created by Jenkins", "--plan=test", "--service=${targetSystemName}" ])
   }
   ```

   ```
   stage("Run integration tests") {
     def proxyDefinition = runToolbox([ "3scale", "proxy", "show", targetInstance, targetSystemName, "sandbox" ])
     def proxy = readJSON text: proxyDefinition
     proxy = proxy.content.proxy

     sh """set -e
     echo "Public Staging Base URL is ${proxy.sandbox_endpoint}"
     echo "userkey is ${testUserKey}"
     curl -vfk ${proxy.sandbox_endpoint}/beer -H 'api-key: ${testUserKey}'
     curl -vfk ${proxy.sandbox_endpoint}/beer/Weissbier -H 'api-key: ${testUserKey}'
     curl -vfk ${proxy.sandbox_endpoint}/beer/findByStatus/available -H 'api-key: ${testUserKey}'
     """
   }
   ```

6. Add a stage that uses the toolbox to promote the API to your production environment.

```
stage("Promote to production") {
  runToolbox([ "3scale", "proxy", "promote", targetInstance,  targetSystemName ])
}
```

Additional resources

- Creating pipelines using a Jenkinsfile
- The 3scale toolbox

CHAPTER 6. THE 3SCALE WEBASSEMBLY MODULE

The **threescale-wasm-auth** module is a WebAssembly module that plugs into Service Mesh and enables it to authorize the incoming requests with Red Hat 3scale. It expands on Service Mesh capabilities and offers full API management capabilities, including authentication, analytics, and billing for your microservices.

Service Mesh focuses on the infrastructure layer with features like traffic management, service discovery, load balancing, and security. API management focuses on creating, publishing, and managing APIs.

Together, Service Mesh and 3scale can improve the reliability, scalability, security, and performance of your microservices and APIs.

NOTE

The **threescale-wasm-auth** module runs on integrations of 3scale 2.11 or later with Red Hat OpenShift Service Mesh 2.1.0 or later.

Prerequisites

- A 3scale account with administrator privileges.
- A Service Mesh 2.4 or later installation.
  - Service Mesh 2.3 currently does not work due to OSSM-3647.
  - For Service Mesh 2.1 and 2.2, refer to Using the 3scale WebAssembly module.
- An application running within Service Mesh.
  - Use the Bookinfo example application.

Cluster administrators on OpenShift Container Platform (OCP) can configure the **threescale-wasm-auth** module to authorize HTTP requests to 3scale through the WasmPlugin custom resource. The Service Mesh then injects the module into sidecars, exposing the host services and allows you to use the module to process proxy requests.

From a 3scale perspective, the **threescale-wasm-auth** module serves as a gateway and replaces APIcast when integrating with Service Mesh. This means some of the APIcast features cannot be used, notably policies and staging and production environments.

6.1. DEPLOYING THE BOOKINFO APPLICATION TO SERVICE MESH

You can use the example Bookinfo application from Service Mesh to demonstrate the procedure of configuring Service Mesh with 3scale.

Procedure

1. Deploy Bookinfo application:
   - See Bookinfo example application.
2. Verify that the application is available:

```
$ export GATEWAY_URL=$(oc -n istio-system get route istio-ingressgateway -o
jsonpath='{.spec.host}')

$ curl -I "http://$GATEWAY_URL/productpage"
HTTP/1.1 200 OK
```

6.2. CREATING A PRODUCT IN 3SCALE

A product is a customer-facing API that can redirect or use multiple internal APIs, called backends. When using 3scale with Service Mesh, backends are not used. The link between a product and the private base URL is made in the mesh. For this reason, only the product is needed.

Procedure

1. Create a new product, application plan, and application. See Creating new products to test API calls.
2. Change deployment to **Istio**:
   - Navigate to **[Your_product_name]** > **Integration** > **Settings**.
   - Change Deployment to **Istio**.
   - Click **Update Product** to update configuration.
3. Promote the configuration:
   - Navigate to **[Your_product_name]** > **Integration** > **Configuration**
   - Click **Update Configuration**.

6.3. CONNECTING 3SCALE WITH SERVICE MESH

IMPORTANT

Create the **ServiceEntry** custom resource (CR) and **DestinationRule** CR in the service-mesh/istio-system namespace or the bookinfo namespace. It should be in a namespace containing ServiceMeshControlPlane.

To reach 3scale from Service Mesh you must configure both tenant and backend URLs as an external service through the **ServiceEntry** and **DestinationRule** (CRs). This enables the **threescale-wasm-auth** module to access both backend, which handles request authorization, and system, from which the product configuration is fetched.

6.3.1. Adding 3scale URLs to Service Mesh

ServiceEntry is needed to allow requests to the service from within the Service Mesh, and **DestinationRule** is there to configure a secure connection for 3scale services.

6.3.1.1. Adding a tenant URL to Service Mesh

Procedure

1. Collect system tenant URLs:
   - This is a URL of the 3scale Admin Portal you used to create the product.
2. Create **ServiceEntry** for system:

```
oc apply -n <bookinfo> -f -<<EOF
apiVersion: networking.istio.io/v1beta1
kind: ServiceEntry
metadata:
  name: <service_entry_threescale_system>
spec:
  hosts:
  - <system_hostname>
  ports:
  - number: 443
    name: https
    protocol: HTTPS
  location: MESH_EXTERNAL
  resolution: DNS
EOF
```

3. Create **DestinationRule** for system:

```
oc apply -n <bookinfo> -f -<<EOF
apiVersion: networking.istio.io/v1beta1
kind: DestinationRule
metadata:
  name: <destination_rule_threescale_system>
spec:
  host: <system_hostname>
  trafficPolicy:
    tls:
      mode: SIMPLE
      sni: <system_hostname>
EOF
```

Additional resources

- Understanding service entries
- Understanding destination rules

6.4. ADDING BACKEND URL TO SERVICE MESH

By incorporating the 3scale backend URL into your Service Mesh setup, you can establish a secure communication channel between your microservices and the 3scale backend. The integration enables the implementation of authentication, analytics, and billing features for managing APIs in the Service Mesh environment. The backend can be accessed externally using the exposed route and internally using the OpenShift service.

6.4.1. Using 3scale on a different cluster from Service Mesh

Procedure

1. Collect backend URLs:
   - For 3scale Hosted, the backend URL is: **su1.3scale.net**
   - For 3scale On-premises, fetch the URL using the following command:

     ```
     $ oc get -n <3scale_namespace> route backend --template="{{.spec.host}}"
     ```

2. Create **ServiceEntry** for backend:

   ```
   oc apply -n <bookinfo> -f -<<EOF
   apiVersion: networking.istio.io/v1beta1
   kind: ServiceEntry
   metadata:
     name: <service_entry_threescale_backend>
   spec:
     hosts:
     - <backend_hostname>
     ports:
     - number: 443
       name: https
       protocol: HTTPS
     location: MESH_EXTERNAL
     resolution: DNS
   EOF
   ```

3. Create **DestinationRule** for backend:

   ```
   oc apply -n <bookinfo> -f -<<EOF
   apiVersion: networking.istio.io/v1beta1
   kind: DestinationRule
   metadata:
     name: <destination_rule_threescale_backend>
   spec:
     host: <backend_hostname>
     trafficPolicy:
       tls:
         mode: SIMPLE
         sni: <backend_hostname>
   EOF
   ```

6.5. USING 3SCALE ON THE SAME CLUSTER AS SERVICE MESH

NOTE

The following procedure is an alternative to Adding backend URL to service mesh .

To have the **threescale-wasm-auth module** authorize requests against 3scale, the module must have access to 3scale services. You can do this within Red Hat OpenShift Service Mesh by applying an external **ServiceEntry** object and a corresponding **DestinationRule** object for *TLS* configuration to use the *HTTPS* protocol.

The custom resources (CRs) set up the service entries and destination rules for secure access from within Service Mesh to 3scale for the backend and system components of the Service Management API and the Account Management API. The Service Management API receives queries for the authorization status of each request. The Account Management API provides API management configuration settings for your services.

Procedure

1. Create **ServiceEntry** for Backend:

```
oc apply -n <bookinfo> -f -<<EOF
apiVersion: networking.istio.io/v1beta1
kind: ServiceEntry
metadata:
  name: <service_entry_threescale_backend>
spec:
  hosts:
  - backend-listener.<3scale_namespace>.svc.cluster.local
  ports:
  - number: 80
    name: http
    protocol: HTTP
  location: MESH_EXTERNAL
  resolution: DNS
EOF
```

2. Create **DestinationRule** for Backend:

```
oc apply -n <bookinfo> -f -<<EOF
apiVersion: networking.istio.io/v1beta1
kind: DestinationRule
metadata:
  name: <destination_rule_threescale_backend>
spec:
  host: backend-listener.<3scale_namespace>.svc.cluster.local
EOF
```

6.6. CREATING A WASMPLUGIN CUSTOM RESOURCE

Service Mesh provides a custom resource definition (CRD) to specify and apply Proxy-WASM extensions to sidecar proxies, known as the **WasmPlugin**. Service Mesh applies the custom resource (CR) to the set of workloads that require *HTTP* API management with 3scale.

Procedure

1. Identify the OpenShift Container Platform (OCP) namespace, for example the bookinfo project, on your Service Mesh deployment that you will apply this module to.

2. Obtain pull secret with registry.redhat.io credentials.

   - Create the new pull secret resource in same namespace as the **WasmPlugin**.

3. You must declare the namespace where the **threescale-wasm-auth** module is deployed, alongside a selector to identify the set of applications the module will apply to. The following example is the YAML format for the CR for **threescale-wasm-auth** module:

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
 namespace: <namespace>
spec:
  url: oci://registry.redhat.io/3scale-amp2/3scale-auth-wasm-rhel8:0.0.3
  imagePullSecret: <pull_secret_resource>
  phase: AUTHZ
  priority: 100
  match:
   - mode: CLIENT
  selector:
    matchLabels:
      app: <selector>
  pluginConfig:
    api: v1
    system:
      name: system
      upstream:
        name: outbound|443||<system_host>
        url: <system_url>
        timeout: 5000
      token: <access_token>

    backend:
      name: backend
      upstream:
        name: outbound|<backend_port>||<backend_host>
        url: <backend_url>
        timeout: 5000
      extensions:
      - no_body
    services:
    - id: '<product_id>'
      authorities:
      - "*"
      credentials:
        user_key:
          - query_string:
              keys:
                - user_key
          - header:
              keys:
                - user_key
```

- The **spec.pluginConfig** field varies depending on the application. All other fields persist across multiple instances of this custom resource.
- This particular **WasmPlugin spec.pluginConfig** is configured with **user_key** authentication provided in a query string.
- Explanation:
  - **name**: Specifies the unique name or identifier for the **WasmPlugin** within 3scale.

  - **namespace**: Namespace of the workload.
  - **imagePullSecret**: The name of the pull secret you created in step 2.
  - **selector**: Workload label selector. Use the productpage of the bookinfo project.
  - **backend-port**: Depends on which 3scale you are using. See Adding 3scale URLs to Service Mesh. For example, internal 3scale Uses port 80 and the external 3scale uses port 443.
  - **backend-host**, **system-host**: Use the same hosts you used in *Adding 3scale URLs to Service Mesh*.
  - **system-url**, **backend-url**: Use their respective hosts and add a protocol. For example, **https://<system-host>**.
  - **access-token**: Access token to the system tenant.
  - **product_id**: The ID of the product you would like to use. If you want multiple products, define multiple products under the services section.

- After you have the module configuration in **spec.pluginConfig** and the rest of the custom resource, apply them with the **oc apply** command:

```
$ oc apply -f threescale-wasm-auth-bookinfo.yaml
```

6.6.1. 3scale WasmPlugin authentication options

These are examples of configuration for 3scale User key (App id/App key) authentication.

User key

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  ...
  pluginConfig:
  ...
    services:
    - id: '<service_id>'
      authorities:
      - "*"
      credentials:
        user_key:
          - query_string:
              keys:
                - user_key
          - header:
              keys:
                - user_key
```

App Id and App key

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  ...
  pluginConfig:
    ...
    services:
    - id: '<service_id>'
      authorities:
      - "*"
      credentials:
        app_id:
          - query_string:
              keys:
                - app_id
          - header:
              keys:
                - app_id
        app_key:
          - query_string:
              keys:
                - app_key
          - header:
              keys:
                - app_key
```

OIDC

Apart from the **WasmPlugin** itself, for OpenID Connect (OIDC) to work you also need additional custom resource called **RequestAuthentication**. When you apply the **RequestAuthentication**, it configures **Envoy** with a native plugin to validate JWT tokens. The proxy validates everything before running the module so any requests that fail do not make it to the 3scale WebAssembly module.

```
apiVersion: security.istio.io/v1beta1
kind: RequestAuthentication
metadata:
  name: jwt-example
  namespace: <bookinfo>
spec:
  selector:
    matchLabels:
      app: <productpage>
  jwtRules:
  - issuer: >-
      "<url>/auth/realms/<realm_name>"
    jwksUri: >-
      "<url>/auth/realms/<realm_name>/protocol/openid-connect/certs"
```

Explanation

- **<url>**: The URL of and OIDC instance, when configured with keycloak, is used to specify the keycloak OIDC provider's metadata endpoint for authentication configuration.

- **<realm_name>**: The name of the realm used in OIDC.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  ...
  pluginConfig:
    ...
    services:
    - id: '<service_id>'
      authorities:
      - "*"
      credentials:
  app_id:
    - filter:
        path:
          - envoy.filters.http.jwt_authn
          - "0"
        keys:
          - azp
          - aud
        ops:
          - take:
              head: 1
```

Additional resources

- Restrict access with JSON Web Token
- Wasm Plugin

6.7. TESTING THE CONFIGURED API

You can verify the effectiveness of your API configuration by conducting an authentication check when making calls to your application. By thoroughly testing the authentication mechanism, you can ensure that only authorized requests are processed, maintaining the security and integrity of your application.

Procedure

1. Try a call to the Bookinfo application with the **WasmPlugin** applied. It should be rejected as we did not include any authentication:

   ```
   $ export GATEWAY_URL=$(oc -n istio-system get route istio-ingressgateway -o
   jsonpath='{.spec.host}')

   $ curl -I "http://$GATEWAY_URL/productpage"
   HTTP/1.1 403
   ```

2. Retrieve user key for authentication:

   - Navigate to **[Your_product_name]** > **Applications** > **Listings**

- Select your application.
- Look for **Authentication** > **User Key**.

3. Try the call again with user key present.

```
$ curl -I "http://$GATEWAY_URL/productpage?user_key=$USER_KEY"
HTTP/1.1 200 OK
```

4. Verify that the hit was registered in metrics.

- Navigate to **[Your_product_name]** > **Analytics** > **Traffic**
- You should see your calls registered.

6.8. THE 3SCALE WEBASSEMBLY MODULE CONFIGURATION

The **WasmPlugin** custom resource spec provides the configuration that the **Proxy-WASM** module reads from.

The spec is embedded in the host and read by the **Proxy-WASM** module. Typically, the configurations are in the JSON file format for the modules to parse. However, the **WasmPlugin** resource can interpret the spec value as YAML and convert it to JSON for consumption by the module.

If you use the **Proxy-WASM** module in stand-alone mode, you must write the configuration using the JSON format. Using the JSON format means using escaping and quoting where needed within the **host** configuration files, for example **Envoy**. When you use the WebAssembly module with the **WasmPlugin** resource, the configuration is in the YAML format. In this case, an invalid configuration forces the module to show diagnostics based on its JSON representation to a sidecar's logging stream.

IMPORTANT

The **EnvoyFilter** custom resource is not a supported API, although it can be used in some 3scale Istio adapter or Service Mesh releases. Using the **EnvoyFilter** custom resource is not recommended. Use the **WasmPlugin** API instead of the **EnvoyFilter** custom resource. If you must use the **EnvoyFilter** custom resource, you must specify the spec in JSON format.

6.8.1. Configuring the 3scale WebAssembly module

The architecture of the 3scale WebAssembly module configuration depends on the 3scale account and authorization service, and the list of services to handle.

Prerequisites

The prerequisites are a set of minimum mandatory fields in all cases:

- For the 3scale account and authorization service: the **backend-listener** URL.
- For the list of services to handle: the service IDs and at least one credential look up method and where to find it.
- You will find examples for dealing with **userkey**, **appid** with **appkey**, and OpenID Connect (OIDC) patterns.
- The WebAssembly module uses the settings you specified in the static configuration. For

example, if you add a mapping rule configuration to the module, it will always apply, even when the 3scale Admin Portal has no such mapping rule. The rest of the **WasmPlugin** resource exists around the **spec.pluginConfig** YAML entry.

6.8.2. The 3scale WebAssembly module api object

The **api** top-level string from the 3scale WebAssembly module defines which version of the configuration the module will use.

NOTE

A non-existent or unsupported version of the **api** object renders the 3scale WebAssembly module inoperable.

The api top-level string example

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
  namespace: <bookinfo>
spec:
  pluginConfig:
    api: v1
...
```

The **api** entry defines the rest of the values for the configuration. The only accepted value is **v1**. New settings that break compatibility with the current configuration or need more logic that modules using **v1** cannot handle will require different values.

6.8.3. The 3scale WebAssembly module system object

The **system** top-level object specifies how to access the 3scale Account Management API for a specific account. The **upstream** field is the most important part of the object. The **system** object is optional, but recommended unless you are providing a fully static configuration for the 3scale WebAssembly module. The later is an option if you do not want to provide connectivity to the *system* component of 3scale.

When you provide static configuration objects in addition to the **system** object, the static ones always take precedence.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
    system:
      name: <saas_porta>
      upstream: <object>
      token: <my_account_token>
      ttl: 300
  ...
```

Table 6.1. **system** object fields

Name	Description	Required
name	An identifier for the 3scale service, currently not referenced elsewhere.	Optional
upstream	The details about a network host to be contacted. **upstream** refers to the 3scale Account Management API host known as system.	Yes
token	A 3scale personal access token with read permissions.	Yes
ttl	The minimum amount of seconds to consider a configuration retrieved from this host as valid before trying to fetch new changes. The default is 600 seconds (10 minutes). **Note:** there is no maximum amount, but the module will generally fetch any configuration within a reasonable amount of time after this TTL elapses.	Optional

6.8.4. The 3scale WebAssembly module upstream object

The **upstream** object describes an external host to which the proxy can perform calls.

```
apiVersion: maistra.io/v1
upstream:
  name: outbound|443||multitenant.3scale.net
  url: "https://myaccount-admin.3scale.net/"
  timeout: 5000
...
```

Table 6.2. **upstream** object fields

Name	Description	Required

Name	Description	Required
name	**name** is not a free-form identifier. It is the identifier for the external host as defined by the proxy configuration. In the case of stand-alone **Envoy** configurations, it maps to the name of a Cluster, also known as **upstream** in other proxies. **Note:** the value of this field, because the Service Mesh and 3scale Istio adapter control plane configure the name according to a format using a vertical bar (|) as the separator of multiple fields. For the purposes of this integration, always use the format: **outbound|<port>||<hostname>**.	Yes
url	The complete URL to access the described service. Unless implied by the scheme, you must include the TCP port.	Yes
Timeout	Timeout in milliseconds so that connections to this service that take more than the amount of time to respond will be considered errors. Default is 1000 seconds.	Optional

6.8.5. The 3scale WebAssembly module backend object

The **backend** top-level object specifies how to access the 3scale Service Management API for authorizing and reporting HTTP requests. This service is provided by the *Backend* component of 3scale.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
    ...
    backend:
      name: backend
      upstream: <object>
    ...
```

Table 6.3. **backend** object fields

Name	Description	Required
name	An identifier for the 3scale backend, currently not referenced elsewhere.	Optional
upstream	The details about a network host to be contacted. This must refer to the 3scale Account Management API host, known, system.	Yes. The most important and required field.

6.8.6. The 3scale WebAssembly module services object

The **services** top-level object specifies which service identifiers are handled by this particular instance of the **module**.

You must specify which ones are handled because accounts have multiple services. The rest of the configuration revolves around how to configure services.

The **services** field is required. It is an array that must contain at least one service to be useful.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
    ...
    services:
    - id: "2555417834789"
      token: service_token
      authorities:
        - "*.app"
        - 0.0.0.0
        - "0.0.0.0:8443"
      credentials: <object>
      mapping_rules: <object>
    ...
```

Each element in the **services** array represents a 3scale service.

Table 6.4. **services** object fields

Name	Description	Required
id	An identifier for this 3scale service, currently not referenced elsewhere.	Yes

Name	Description	Required
token	This **token** can be found in the proxy configuration for your service in System or you can retrieve the it from System with following **curl** command: **curl "\https://<system_host>/admin/api/services/<service_id>/proxy/configs/production/latest.json?access_token=<access_token>" | jq '.proxy_config.content.backend_authentication_value'**	Optional
authorities	An array of strings, each one representing the *Authority* of a *URL* to match. These strings accept glob patterns supporting the asterisk (***), plus sign (*+*), and question mark (*?*) matchers.	Yes
credentials	An object defining which kind of credentials to look for and where.	Yes
mapping_rules	An array of objects representing mapping rules and 3scale methods to hit.	Optional

6.8.7. The 3scale WebAssembly module credentials object

The **credentials** object is a component of the **service** object. **credentials** specifies which kind of credentials to be looked up and the steps to perform this action.

All fields are optional, but you must specify at least one, **user_key** or **app_id**. The order in which you specify each credential is irrelevant because it is pre-established by the module. Only specify one instance of each credential.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
    ...
    services:
    - credentials:
        user_key: <array_of_lookup_queries>
        app_id: <array_of_lookup_queries>
        app_key: <array_of_lookup_queries>
    ...
```

Table 6.5. **credentials** object fields

Name	Description	Required
user_key	This is an array of lookup queries that defines a 3scale user key. A user key is commonly known as an API key.	Optional
app_id	This is an array of lookup queries that define a 3scale application identifier. Application identifiers are provided by 3scale or by using an identity provider like Red Hat Single Sign-On (RH-SS0), or OpenID Connect (OIDC). The resolution of the lookup queries specified here, whenever it is successful and resolves to two values, it sets up the **app_id** and the **app_key**.	Optional
app_key	This is an array of lookup queries that define a 3scale application key. Application keys without a resolved **app_id** are useless, so only specify this field when **app_id** has been specified.	Optional

6.8.8. The 3scale WebAssembly module lookup queries

The **lookup query** object is part of any of the fields in the **credentials** object. It specifies how a given credential field should be found and processed. When evaluated, a successful resolution means that one or more values were found. A failed resolution means that no values were found.

Arrays of **lookup queries** describe a short-circuit or relationship: a successful resolution of one of the queries stops the evaluation of any remaining queries and assigns the value or values to the specified credential-type. Each query in the array is independent of each other.

A **lookup query** is made up of a single field, a source object, which can be one of a number of source types. See the following example:

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
    ...
    services:
    - credentials:
        user_key:
          - <source_type>: <object>
        - <source_type>: <object>
        ...
      app_id:
        - <source_type>: <object>
        ...
      app_key:
        - <source_type>: <object>
        ...
  ...
```

A **source** object exists as part of an array of sources within any of the **credentials** object fields. The object field name, referred to as a **source**-type is any one of the following:

- **header**: The lookup query receives HTTP request headers as input.
- **query_string**: The **lookup query** receives the URL query string parameters as input.
- **filter**: The **lookup query** receives filter metadata as input.

All **source**-type objects have at least the following two fields:

Table 6.6. source-type object fields

Name	Description	Required
keys	An array of strings, each one a **key**, referring to entries found in the input data.	Yes
ops	An array of **operations** that perform a **key** entry match. The array is a pipeline where operations receive inputs and generate outputs on the next operation. An **operation** failing to provide an output resolves the **lookup query** as failed. The pipeline order of the operations determines the evaluation order.	Optional
path	Shows the path in the metadata used to look up data. However, it is not required when **header** or **query_string** source type is used, but it is required when the **filter** source-type is used.	Optional

When a **key** matches the input data, the rest of the keys are not evaluated and the source resolution algorithm jumps to executing the **operations** (**ops**) specified, if any. If no **ops** are specified, the result value of the matching **key**, if any, is returned.

Operations provide a way to specify certain conditions and transformations for inputs you have after the first phase looks up a **key**. Use **operations** when you need to transform, decode, and assert properties, however they do not provide a mature language to deal with all needs and lack *Turing-*

completeness.

A stack stored the outputs of **operations**. When evaluated, the **lookup query** finishes by assigning the value or values at the bottom of the stack, depending on how many values the credential consumes.

6.8.9. The 3scale WebAssembly module operations object

Each element in the **ops** array belonging to a specific **source type** is an **operation** object that either applies transformations to values or performs tests. The field name to use for such an object is the name of the **operation** itself, and any values are the parameters to the **operation**, which could be structure objects, for example, maps with fields and values, lists, or strings.

Most **operations** attend to one or more inputs, and produce one or more outputs. When they consume inputs or produce outputs, they work with a stack of values: each value consumed by the operations is popped from the stack of values and initially populated with any **source** matches. The values outputted by them are pushed to the stack. Other **operations** do not consume or produce outputs other than asserting certain properties, but they inspect a stack of values.

NOTE

When resolution finishes, the values picked up by the next step, such as assigning the values to be an **app_id**, **app_key**, or **user_key**, are taken from the bottom values of the stack.

There are a few different **operations** categories:

- **decode**: These transform an input value by decoding it to get a different format.
- **string**: These take a string value as input and perform transformations and checks on it.
- **stack**: These take a set of values in the input and perform multiple stack transformations and selection of specific positions in the stack.
- **check**: These assert properties about sets of operations in a side-effect free way.
- **control**: These perform operations that allow for modifying the evaluation flow.
- **format**: These parse the format-specific structure of input values and look up values in it.

All operations are specified by the name identifiers as strings.

Additional resources

- Available operations

6.8.10. The 3scale WebAssembly module mapping_rules object

The **mapping_rules** object is part of the **service** object. It specifies a set of REST path patterns and related 3scale metrics and count increments to use when the patterns match.

You need the value if no dynamic configuration is provided in the **system** top-level object. If the object is provided in addition to the **system** top-level entry, then the **mapping_rules** object is evaluated first.

mapping_rules is an array object. Each element of that array is a **mapping_rule** object. The evaluated matching mapping rules on an incoming request provide the set of 3scale **methods** for authorization and reporting to the *APIManager*. When multiple matching rules refer to the same **methods**, there is a summation of **deltas** when calling into 3scale. For example, if two rules increase the *Hits* method twice with **deltas** of 1 and 3, a single method entry for Hits reporting to 3scale has a **delta** of 4.

6.8.11. The 3scale WebAssembly module mapping_rule object

The **mapping_rule** object is part of an array in the **mapping_rules** object.

The **mapping_rule** object fields specify the following information:

- The *HTTP request method* to match.
- A pattern to match the path against.
- The 3scale methods to report along with the amount to report. The order in which you specify the fields determines the evaluation order.

Table 6.7. **mapping_rule** object fields

Name	Description	Required
method	Specifies a string representing an HTTP request method, also known as verb. Values accepted match the any one of the accepted HTTP method names, case-insensitive. A special value of any matches any method.	Yes
pattern	The pattern to match the HTTP request's URI path component. This pattern follows the same syntax as documented by 3scale. It allows wildcards, use of the asterisk (*) character, using any sequence of characters between braces such as **{this}**.	Yes
usages	A list of **usage** objects. When the rule matches, all methods with their **deltas** are added to the list of methods sent to 3scale for authorization and reporting. Embed the **usages** object with the following required fields: • **name**: The **method** system name to report. Note: **name** is case sensitive. • **delta**: For how much to increase that **method** by.	Yes

Name	Description	Required
last	Whether the successful matching of this rule should stop the evaluation of more mapping rules.	Optional Boolean. The default is **false**

The following example is independent of existing hierarchies between methods in 3scale. That is, anything run on the 3scale side will not affect this. For example, the *Hits* metric might be a parent of them all, so it stores 4 hits due to the sum of all reported methods in the authorized request and calls the 3scale **Authrep** API endpoint.

The example below uses a **GET** request to a path, **/products/1/sold**, that matches all the rules.

mapping_rules GET request example

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
    ...
    mapping_rules:
      - method: GET
        pattern: /
        usages:
          - name: hits
            delta: 1
      - method: GET
        pattern: /products/
        usages:
          - name: products
            delta: 1
      - method: ANY
        pattern: /products/{id}/sold
        usages:
          - name: sales
            delta: 1
          - name: products
            delta: 1
    ...
```

All **usages** get added to the request the module performs to 3scale with usage data as follows:

- Hits: 1
- products: 2
- sales: 1

6.9. THE 3SCALE WEBASSEMBLY MODULE EXAMPLES FOR CREDENTIALS USE CASES

You will spend most of your time applying configuration steps to obtain credentials in the requests to your services.

The following are **credentials** examples, which you can modify to adapt to specific use cases.

You can combine them all, although when you specify multiple source objects with their own **lookup queries**, they are evaluated in order until one of them successfully resolves.

6.9.1. API key (user_key) in query string parameters

The following example looks up a **user_key** in a query string parameter or header of the same name:

```
credentials:
  user_key:
    - query_string:
        keys:
          - user_key
    - header:
        keys:
          - user_key
```

6.9.2. Application ID and key

The following example looks up **app_key** and **app_id** credentials in a query or headers.

```
credentials:
  app_id:
    - header:
        keys:
          - app_id
    - query_string:
        keys:
          - app_id
  app_key:
    - header:
        keys:
          - app_key
    - query_string:
        keys:
          - app_key
```

6.9.3. Authorization header

A request includes an **app_id** and **app_key** in an **authorization** header. If there is at least one or two values outputted at the end, then you can assign the **app_key**.

The resolution here assigns the **app_key** if there is one or two outputted at the end.

The **authorization** header specifies a value with the type of authorization and its value is encoded as **Base64**. This means you can split the value by a space character, take the second output and then split it again using a colon (:) as the separator. For example, if you use this format **app_id:app_key**, the header looks like the following example for **credential**:

```
aladdin:opensesame: Authorization: Basic YWxhZGRpbjpvcGVuc2VzYW1l
```

–

You must use lowercase header field names as shown in the following example:

```
credentials:
  app_id:
    - header:
        keys:
          - authorization
        ops:
          - split:
              separator: " "
              max: 2
          - length:
              min: 2
          - drop:
              head: 1
          - base64_urlsafe
          - split:
              max: 2
  app_key:
    - header:
        keys:
          - app_key
```

The previous example use case looks at the headers for an **authorization**:

1. It takes its string value and split it by a space, checking that it generates at least two values of a **credential**-type and the **credential** itself, then dropping the **credential**-type.

2. It then decodes the second value containing the data it needs, and splits it by using a colon (:) character to have an operations stack including first the **app_id**, then the **app_key**, if it exists.

    a. If **app_key** does not exist in the authorization header then its specific sources are checked. For example, the header with the key **app_key** in this case.

3. To add extra conditions to **credentials**, allow **Basic** authorizations, where **app_id** is either **aladdin** or **admin**, or any **app_id** being at least 8 characters in length.

4. **app_key** must contain a value and have a minimum of 64 characters as shown in the following example:

```
credentials:
  app_id:
    - header:
        keys:
          - authorization
        ops:
          - split:
              separator: " "
              max: 2
          - length:
              min: 2
          - reverse
          - glob:
            - Basic
          - drop:
```

```
          tail: 1
      - base64_urlsafe
      - split:
          max: 2
      - test:
          if:
            length:
              min: 2
          then:
            - strlen:
                max: 63
            - or:
                - strlen:
                    min: 1
                - drop:
                    tail: 1
      - assert:
        - and:
          - reverse
          - or:
            - strlen:
                min: 8
            - glob:
              - aladdin
              - admin
```

5. After picking up the **authorization** header value, you get a **Basic credential**-type by reversing the stack so that the type is placed on top.

6. Run a glob match on it. When it validates, and the credential is decoded and split, you get the **app_id** at the bottom of the stack, and potentially the **app_key** at the top.

7. Run a **test:** if there are two values in the stack, meaning an **app_key** was acquired.

    a. Ensure the string length is between 1 and 63, including **app_id** and **app_key**. If the key's length is zero, drop it and continue as if no key exists. If there was only an **app_id** and no **app_key**, the missing else branch indicates a successful test and evaluation continues.

The last operation, **assert**, indicates that no side-effects make it into the stack. You can then modify the stack:

1. Reverse the stack to have the **app_id** at the top.

    a. Whether or not an **app_key** is present, reversing the stack ensures **app_id** is at the top.

2. Use **and** to preserve the contents of the stack across tests.
   Then use one of the following possibilities:

    - Make sure **app_id** has a string length of at least 8.

    - Make sure **app_id** matches either **aladdin** or **admin**.

6.9.4. OpenID Connect (OIDC) use case

For Service Mesh and the 3scale Istio adapter, you must deploy a **RequestAuthentication** as shown in the following example, filling in your own workload data and **jwtRules**:

```
apiVersion: security.istio.io/v1beta1
kind: RequestAuthentication
metadata:
  name: jwt-example
  namespace: <bookinfo>
spec:
  selector:
    matchLabels:
      app: <productpage>
  jwtRules:
  - issuer: >-
      "<url>/auth/realms/<realm_name>"
    jwksUri: >-
      "<url>/auth/realms/<realm_name>/protocol/openid-connect/certs"
```

When you apply the **RequestAuthentication**, it configures **Envoy** with a native plugin to validate **JWT** tokens. The proxy validates everything before running the module so any requests that fail do not make it to the 3scale WebAssembly module.

When a **JWT** token is validated, the proxy stores its contents in an internal metadata object, with an entry whose key depends on the specific configuration of the plugin. This use case gives you the ability to look up structure objects with a single entry containing an unknown key name.

The 3scale **app_id** for OIDC matches the OAuth **client_id**. This is found in the **azp** or **aud** fields of **JWT** tokens.

To get **app_id** field from Envoy's native **JWT** authentication filter, see the following example:

```
credentials:
  app_id:
    - filter:
        path:
          - envoy.filters.http.jwt_authn
          - "0"
        keys:
          - azp
          - aud
        ops:
          - take:
              head: 1
```

The example instructs the module to use the **filter** source type to look up filter metadata for an object from the **Envoy**-specific **JWT** authentication native plugin. This plugin includes the **JWT** token as part of a structure object with a single entry and a pre-configured name. Use **0** to specify that you will only access the single entry.

The resulting value is a structure for which you will resolve two fields:

- **azp**: The value where **app_id** is found.
- **aud**: The value where this information can also be found.

The operation ensures only one value is held for assignment.

6.9.5. Picking up the JWT token from a header

Some setups might have validation processes for **JWT** tokens where the validated token would reach this module via a header in JSON format.

To get the **app_id**, see the following example:

```
credentials:
  app_id:
    - header:
        keys:
          - x-jwt-payload
        ops:
          - base64_urlsafe
          - json:
            - keys:
              - azp
              - aud
          - take:
              head: 1
```

6.10. 3SCALE WEBASSEMBLY MODULE MINIMAL WORKING CONFIGURATION

The following is an example of a 3scale WebAssembly module minimal working configuration. You can copy and paste this and edit it to work with your own configuration.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  url: oci://registry.redhat.io/3scale-amp2/3scale-auth-wasm-rhel8:0.0.3
  imagePullSecret: <pull_secret_resource>
  phase: AUTHZ
  match:
    - mode: SERVER
  priority: 100
  selector:
    matchLabels:
      app: <productpage>
  pluginConfig:
    api: v1
    system:
      name: <system_name>
      upstream:
        name: outbound|443||multitenant.3scale.net
        url: https://istiodevel-admin.3scale.net/
        timeout: 5000
      token: <token>
    backend:
      name: <backend_name>
      upstream:
        name: outbound|443||su1.3scale.net
        url: https://su1.3scale.net/
        timeout: 5000
    extensions:
    - no_body
  services:
  - id: '2555417834780'
    authorities:
    - "*"
    credentials:
      user_key:
        - query_string:
            keys:
              - <user_key>
        - header:
            keys:
              - <user_key>
      app_id:
        - query_string:
            keys:
              - <app_id>
        - header:
            keys:
              - <app_id>
      app_key:
        - query_string:
            keys:
              - <app_key>
        - header:
            keys:
              - <app_key>
```

Additional resources

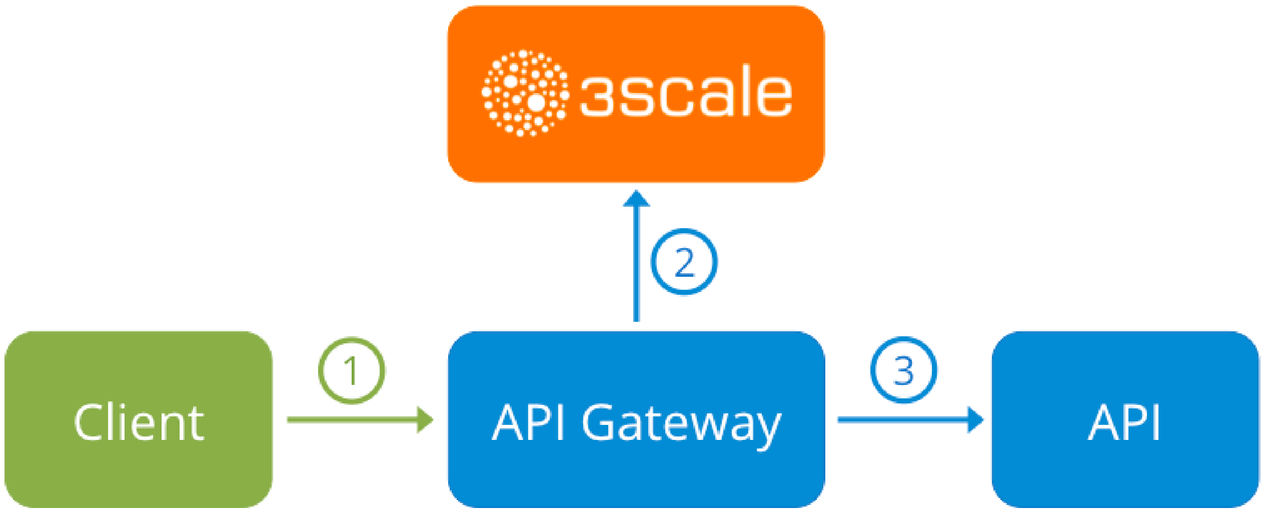
- Migrating from ServiceMeshExtension to WasmPlugin resources
- Kubernetes Custom Resources
- Wasm Plugin

CHAPTER 7. TROUBLESHOOTING THE API INFRASTRUCTURE

This guide aims to help you identify and fix the cause of issues with your API infrastructure.

API Infrastructure is a lengthy and complex topic. However, at a minimum, you will have three moving parts in your Infrastructure:

1. The API gateway
2. 3scale
3. The API



Errors in any of these three elements result in API consumers being unable to access your API. However, it is difficult to find the component that caused the failure. This guide gives you some tips to troubleshoot your infrastructure to identify the problem.

Use the following sections to identify and fix common issues that may occur:

- Section 7.1, “Common integration issues”
- Section 7.2, “Handling API infrastructure issues”
- Section 7.3, “Identifying API request issues”
- Section 7.4, “ActiveDocs issues”
- Section 7.5, “Logging in NGINX”
- Section 7.6, “3scale error codes”

7.1. COMMON INTEGRATION ISSUES

There are some evidences that can point to some very common issues with your integration with 3scale. These will vary depending on whether you are at the beginning of your API project, setting up your infrastructure, or are already live in production.

7.1.1. Integration issues

The following sections attempt to outline some common issues you may see in the APIcast error log during the initial phases of your integration with 3scale: at the beginning using APIcast Hosted and prior to go-live, running the self-managed APIcast.

7.1.1.1. APIcast Hosted

When you are first integrating your API with APIcast Hosted on the Service Integration screen, you might get some of the following errors shown on the page or returned by the test call you make to check for a successful integration.

- **Test request failed: execution expired**
  Check that your API is reachable from the public internet. APIcast Hosted cannot be used with private APIs. If you do not want to make your API publicly available to integrate with APIcast Hosted, you can set up a private secret between APIcast Hosted and your API to reject any calls not coming from the API gateway.

- The accepted format is **protocol://address(:port)**
  Remove any paths at the end of your APIs private base URL. You can add these in the "mapping rules" pattern or at the beginning of the *API test GET request*.

- **Test request failed with HTTP code XXX**
  - **405**: Check that the endpoint accepts GET requests. APIcast only supports GET requests to test the integration.
  - **403: Authentication parameters missing**: If your API already has some authentication in place, APIcast will be unable to make a test request.
  - **403: Authentication failed**: If this is not the first service you have created with 3scale, check that you have created an application under the service with credentials to make the test request. If it is the first service you are integrating, ensure that you have not deleted the test account or application that you created on signup.

7.1.1.2. APIcast self-managed

After you have successfully tested the integration with APIcast self-managed, you might want to host the API gateway yourself. Following are some errors you may encounter when you first install your self-managed gateway and call your API through it.

- **upstream timed out (110: Connection timed out) while connecting to upstream**
  Check that there are no firewalls or proxies between the API Gateway and the public Internet that would prevent your self-managed gateway from reaching 3scale.

- **failed to get list of services: invalid status: 403 (Forbidden)**

```
2018/06/04 08:04:49 [emerg] 14#14: [lua] configuration_loader.lua:134: init(): failed to load configuration,   exiting (code 1)
2018/06/04 08:04:49 [warn] 22#22: *2 [lua] remote_v2.lua:163: call(): failed to get list of services:   invalid status: 403 (Forbidden) url: https://example-admin.3scale.net/admin/api/services.json , context:   ngx.timer
ERROR: /opt/app-root/src/src/apicast/configuration_loader.lua:57: missing configuration
```

  Check that the Access Token that you used in the **THREESCALE_PORTAL_ENDOINT** value is correct and that it has the Account Management API scope. Verify it with a **curl** command: **curl -v "https://example-admin.3scale.net/admin/api/services.json?access_token=<YOUR_ACCESS_TOKEN>"**

It should return a 200 response with a JSON body. If it returns an error status code, check the response body for details.

- **service not found for host apicast.example.com**

  ```
  2018/06/04 11:06:15 [warn] 23#23: *495 [lua] find_service.lua:24: find_service(): service not found for host apicast.example.com, client: 172.17.0.1, server: _, request: "GET / HTTP/1.1", host: "apicast.example.com"
  ```

  This error indicates that the Public Base URL has not been configured properly. You should ensure that the configured Public Base URL is the same that you use for the request to self-managed APIcast. After configuring the correct Public Base URL:

  - Ensure that APIcast is configured for "production" (default configuration for standalone APIcast if not overriden with **THREESCALE_DEPLOYMENT_ENV** variable). Ensure that you promote the configuration to production.
  - Restart APIcast, if you have not configured auto-reloading of configuration using **APICAST_CONFIGURATION_CACHE** and **APICAST_CONFIGURATION_LOADER** environment variables.

Following are some other symptoms that may point to an incorrect APIcast self-managed integration:

- **Mapping rules not matched / Double counting of API calls**Depending on the way you have defined the mapping between methods and actual URL endpoints on your API, you might find that sometimes methods either don’t get matched or get incremented more than once per request. To troubleshoot this, make a test call to your API with the 3scale debug header. This will return a list of all the methods that have been matched by the API call.
- **Authentication parameters not found**: Ensure your are sending the parameters to the correct location as specified in the Service Integration screen. If you do not send credentials as headers, the credentials must be sent as query parameters for GET requests and body parameters for all other HTTP methods. Use the 3scale debug header to double-check the credentials that are being read from the request by the API gateway.

7.1.2. Production issues

It is rare to run into issues with your API gateway after you have fully tested your setup and have been live with your API for a while. However, here are some of the issues you might encounter in a live production environment.

7.1.2.1. Availability issues

Availability issues are normally characterised by **upstream timed out** errors in your nginx error.log; example:

```
upstream timed out (110: Connection timed out) while connecting to upstream, client: X.X.X.X, server: api.example.com, request: "GET /RESOURCE?CREDENTIALS HTTP/1.1", upstream: "http://Y.Y.Y.Y:80/RESOURCE?CREDENTIALS", host: "api.example.com"
```

If you are experiencing intermittent 3scale availability issues, following may be the reasons for this:

- You are resolving to an old 3scale IP that is no longer in use.
  The latest version of the API gateway configuration files defines 3scale as a variable to force IP resolution each time. For a quick fix, reload your NGINX instance. For a long-term fix, ensure

that instead of defining the 3scale backend in an upstream block, you define it as a variable within each server block; example:

```
server {
  # Enabling the Lua code cache is strongly encouraged for production use. Here it is enabled
  .
  .
  .
  set $threescale_backend "https://su1.3scale.net:443";
```

When you refer to it:

```
location = /threescale_authrep {
  internal;
  set $provider_key "YOUR_PROVIDER_KEY";

  proxy_pass $threescale_backend/transactions/authrep.xml?
provider_key=$provider_key&service_id=$service_id&$usage&$credentials&log%5Bcode%5
D=$arg_code&log%5Brequest%5D=$arg_req&log%5Bresponse%5D=$arg_resp;
}
```

- You are missing some 3scale IPs from your whitelist. Following is the current list of IPs that 3scale resolves to:
  - 75.101.142.93
  - 174.129.235.69
  - 184.73.197.122
  - 50.16.225.117
  - 54.83.62.94
  - 54.83.62.186
  - 54.83.63.187
  - 54.235.143.255
    The above issues refer to problems with perceived 3scale availability. However, you might encounter similar issues with your API availability from the API gateway if your API is behind an AWS ELB. This is because NGINX, by default, does DNS resolution at start-up time and then caches the IP addresses. However, ELBs do not ensure static IP addresses and these might change frequently. Whenever the ELB changes to a different IP, NGINX is unable to reach it.

    The solution for this is similar to the above fix for forcing runtime DNS resolution.

    1. Set a specific DNS resolver such as Google DNS, by adding this line at the top of the **http** section: **resolver 8.8.8.8 8.8.4.4;**.
    2. Set your API base URL as a variable anywhere near the top of the **server** section. **set $api_base "http://api.example.com:80";**
    3. Inside the **location** / section, find the **proxy_pass** line and replace it with **proxy_pass $api_base;**.

7.1.3. Post-deploy issues

If you make changes to your API such as adding a new endpoint, you must ensure that you add a new method and URL mapping before downloading a new set of configuration files for your API gateway.

The most common problem when you have modified the configuration downloaded from 3scale will be code errors in the Lua, which will result in a **500 - Internal server error** such as:

```
curl -v -X GET "http://localhost/"
* About to connect() to localhost port 80 (#0)
*   Trying 127.0.0.1... connected
> GET / HTTP/1.1
> User-Agent: curl/7.22.0 (x86_64-pc-linux-gnu) libcurl/7.22.0 OpenSSL/1.0.1 zlib/1.2.3.4 libidn/1.23
librtmp/2.3
> Host: localhost
> Accept: */*
>
< HTTP/1.1 500 Internal Server Error
< Server: openresty/1.5.12.1
< Date: Thu, 04 Feb 2016 10:22:25 GMT
< Content-Type: text/html
< Content-Length: 199
< Connection: close
<

<head><title>500 Internal Server Error</title></head>

<center><h1>500 Internal Server Error</h1></center>
<hr><center>openresty/1.5.12.1</center>


* Closing connection #0
```

You can see the nginx error.log to know the cause, such as:

```
2016/02/04 11:22:25 [error] 8980#0: *1 lua entry thread aborted: runtime error:
/home/pili/NGINX/troubleshooting/nginx.lua:66: bad argument #3 to '_newindex' (number expected,
got nil)
stack traceback:
coroutine 0:
  [C]: in function '_newindex'
  /home/pili/NGINX/troubleshooting/nginx.lua:66: in function 'error_authorization_failed'
  /home/pili/NGINX/troubleshooting/nginx.lua:330: in function 'authrep'
  /home/pili/NGINX/troubleshooting/nginx.lua:283: in function 'authorize'
  /home/pili/NGINX/troubleshooting/nginx.lua:392: in function  while sending to client, client:
127.0.0.1, server: api-2445581381726.staging.apicast.io, request: "GET / HTTP/1.1", host: "localhost"
```

In the access.log this will look like the following:

```
127.0.0.1 - - [04/Feb/2016:11:22:25 +0100] "GET / HTTP/1.1" 500 199 "-" "curl/7.22.0 (x86_64-pc-
linux-gnu) libcurl/7.22.0 OpenSSL/1.0.1 zlib/1.2.3.4 libidn/1.23 librtmp/2.3"
```

The above section gives you a an overview of the most common, well-known issues that you might encounter at any stage of your 3scale journey.

If all of these have been checked and you are still unable to find the cause and solution for your issue, you should proceed to the more detailed section on Identifying API request issues. Start at your API and work your way back to the client in order to try to identify the point of failure.

7.2. HANDLING API INFRASTRUCTURE ISSUES

If you are experiencing failures when connecting to a server, whether that is the API gateway, 3scale, or your API, the following troubleshooting steps should be your first port of call:

7.2.1. Can we connect?

Use telnet to check the basic TCP/IP connectivity **telnet api.example.com 443**

- Success

```
telnet echo-api.3scale.net 80
Trying 52.21.167.109...
Connected to tf-lb-i2t5pgt2cfdnbdfh2c6qqoartm-829217110.us-east-1.elb.amazonaws.com.
Escape character is '^]'.
Connection closed by foreign host.
```

- Failure

```
telnet su1.3scale.net 443
Trying 174.129.235.69...
telnet: Unable to connect to remote host: Connection timed out
```

7.2.2. Server connection issues

Try to connect to the same server from different network locations, devices, and directions. For example, if your client is unable to reach your API, try to connect to your API from a machine that should have access such as the API gateway.

If any of the attempted connections succeed, you can rule out any problems with the actual server and concentrate your troubleshooting on the network between them, as this is where the problem will most likely be.

7.2.3. Is it a DNS issue?

Try to connect to the server by using its IP address instead of its hostname e.g. **telnet 94.125.104.17 80** instead of **telnet apis.io 80**

This will rule out any problems with the DNS.

You can get the IP address for a server using **dig** for example for 3scale **dig su1.3scale.net** or **dig any su1.3scale.net** if you suspect there may be multiple IPs that a host may resolve to.

NB: Some hosts block `dig any`

7.2.4. Is it an SSL issue?

You can use OpenSSL to test:

- Secure connections to a host or IP, such as from the shell prompt **openssl s_client -connect su1.3scale.net:443**
  Output:

```
CONNECTED(00000003)
depth=1 C = US, O = GeoTrust Inc., CN = GeoTrust SSL CA - G3
verify error:num=20:unable to get local issuer certificate
---
Certificate chain
 0 s:/C=ES/ST=Barcelona/L=Barcelona/O=3scale Networks, S.L./OU=IT/CN=*.3scale.net
   i:/C=US/O=GeoTrust Inc./CN=GeoTrust SSL CA - G3
 1 s:/C=US/O=GeoTrust Inc./CN=GeoTrust SSL CA - G3
   i:/C=US/O=GeoTrust Inc./CN=GeoTrust Global CA
---
Server certificate
-----BEGIN CERTIFICATE-----
MIIE8zCCA9ugAwIBAgIQcz2Y9JNxH7f2zpOT0DajUjANBgkqhkiG9w0BAQsFADBE
...
TRUNCATED
...
3FZigX+OpWLVRjYsr0kZzX+HCerYMwc=
-----END CERTIFICATE-----
subject=/C=ES/ST=Barcelona/L=Barcelona/O=3scale Networks,
S.L./OU=IT/CN=*.3scale.net
issuer=/C=US/O=GeoTrust Inc./CN=GeoTrust SSL CA - G3
---
Acceptable client certificate CA names
/C=ES/ST=Barcelona/L=Barcelona/O=3scale Networks, S.L./OU=IT/CN=*.3scale.net
/C=US/O=GeoTrust Inc./CN=GeoTrust SSL CA - G3
Client Certificate Types: RSA sign, DSA sign, ECDSA sign
Requested Signature Algorithms:
RSA+SHA512:DSA+SHA512:ECDSA+SHA512:RSA+SHA384:DSA+SHA384:ECDSA+SHA384
:RSA+SHA256:DSA+SHA256:ECDSA+SHA256:RSA+SHA224:DSA+SHA224:ECDSA+SHA22
4:RSA+SHA1:DSA+SHA1:ECDSA+SHA1:RSA+MD5
Shared Requested Signature Algorithms:
RSA+SHA512:DSA+SHA512:ECDSA+SHA512:RSA+SHA384:DSA+SHA384:ECDSA+SHA384
:RSA+SHA256:DSA+SHA256:ECDSA+SHA256:RSA+SHA224:DSA+SHA224:ECDSA+SHA22
4:RSA+SHA1:DSA+SHA1:ECDSA+SHA1
Peer signing digest: SHA512
Server Temp Key: ECDH, P-256, 256 bits
---
SSL handshake has read 3281 bytes and written 499 bytes
---
New, TLSv1/SSLv3, Cipher is ECDHE-RSA-AES256-GCM-SHA384
Server public key is 2048 bit
Secure Renegotiation IS supported
Compression: NONE
Expansion: NONE
No ALPN negotiated
SSL-Session:
    Protocol  : TLSv1.2
    Cipher    : ECDHE-RSA-AES256-GCM-SHA384
    Session-ID:
A85EFD61D3BFD6C27A979E95E66DA3EC8F2E7B3007C0166A9BCBDA5DCA5477B8
    Session-ID-ctx:
    Master-Key:
```

```
F7E898F1D996B91D13090AE9D5624FF19DFE645D5DEEE2D595D1B6F79B1875CF935B3
A4F6ECCA7A6D5EF852AE3D4108B
    Key-Arg   : None
    PSK identity: None
    PSK identity hint: None
    SRP username: None
    TLS session ticket lifetime hint: 300 (seconds)
    TLS session ticket:
    0000 - a8 8b 6c ac 9c 3c 60 78-2c 5c 8a de 22 88 06 15   ..l..<`x,\..."...
    0010 - eb be 26 6c e6 7b 43 cc-ae 9b c0 27 6c b7 d9 13   ..&l.{C....'l...
    0020 - 84 e4 0d d5 f1 ff 4c 08-7a 09 10 17 f3 00 45 2c   ......L.z.....E,
    0030 - 1b e7 47 0c de dc 32 eb-ca d7 e9 26 33 26 8b 8e   ..G...2....&3&..
    0040 - 0a 86 ee f0 a9 f7 ad 8a-f7 b8 7b bc 8c c2 77 7b   ..........{...w{
    0050 - ae b7 57 a8 40 1b 75 c8-25 4f eb df b0 2b f6 b7   ..W.@.u.%O...+..
    0060 - 8b 8e fc 93 e4 be d6 60-0f 0f 20 f1 0a f2 cf 46   .......`.. ....F
    0070 - b0 e6 a1 e5 31 73 c2 f5-d4 2f 57 d1 b0 8e 51 cc   ....1s.../W...Q.
    0080 - ff dd 6e 4f 35 e4 2c 12-6c a2 34 26 84 b3 0c 19   ..nO5.,.l.4&....
    0090 - 8a eb 80 e0 4d 45 f8 4a-75 8e a2 06 70 84 de 10   ....ME.Ju...p...

    Start Time: 1454932598
    Timeout   : 300 (sec)
    Verify return code: 20 (unable to get local issuer certificate)
---
```

- SSLv3 support (NOT supported by 3scale)
  openssl s_client -ssl3 -connect su.3scale.net:443

  Output

```
CONNECTED(00000003)
140735196860496:error:14094410:SSL routines:ssl3_read_bytes:sslv3 alert handshake
failure:s3_pkt.c:1456:SSL alert number 40
140735196860496:error:1409E0E5:SSL routines:ssl3_write_bytes:ssl handshake
failure:s3_pkt.c:644:
---
no peer certificate available
---
No client certificate CA names sent
---
SSL handshake has read 7 bytes and written 0 bytes
---
New, (NONE), Cipher is (NONE)
Secure Renegotiation IS NOT supported
Compression: NONE
Expansion: NONE
No ALPN negotiated
SSL-Session:
    Protocol  : SSLv3
    Cipher    : 0000
    Session-ID:
    Session-ID-ctx:
    Master-Key:
    Key-Arg   : None
    PSK identity: None
    PSK identity hint: None
    SRP username: None
    Start Time: 1454932872
    Timeout   : 7200 (sec)
    Verify return code: 0 (ok)
---
```

For more details, see the OpenSSL man pages.

7.3. IDENTIFYING API REQUEST ISSUES

To identify where an issue with requests to your API might lie, go through the following checks.

7.3.1. API

To confirm that the API is up and responding to requests, make the same request directly to your API (not going through the API gateway). You should ensure that you are sending the same parameters and headers as the request that goes through the API gateway. If you are unsure of the exact request that is failing, capture the traffic between the API gateway and your API.

If the call succeeds, you can rule out any problems with the API, otherwise you should troubleshoot your API further.

7.3.2. API Gateway > API

To rule out any network issues between the API gateway and the API, make the same call as before – directly to your API – from your API gateway server.

If the call succeeds, you can move on to troubleshooting the API gateway itself.

7.3.3. API gateway

There are a number of steps to go through to check that the API gateway is working correctly.

7.3.3.1. Is the API gateway up and running?

Log in to the machine where the gateway is running. If this fails, your gateway server might be down.

After you have logged in, check that the NGINX process is running. For this, run **ps ax | grep nginx** or **htop**.

NGINX is running if you see **nginx master process** and **nginx worker process** in the list.

7.3.3.2. Are there any errors in the gateway logs?

Following are some common errors you might see in the gateway logs, for example in error.log:

- API gateway can't connect to API

```
upstream timed out (110: Connection timed out) while connecting to upstream, client:
X.X.X.X, server: api.example.com, request: "GET /RESOURCE?CREDENTIALS HTTP/1.1",
upstream: "http://Y.Y.Y.Y:80/RESOURCE?CREDENTIALS", host: "api.example.com"
```

- API gateway cannot connect to 3scale

```
2015/11/20 11:33:51 [error] 3578#0: *1 upstream timed out (110: Connection timed out) while
```

```
connecting to upstream, client: 127.0.0.1, server: , request: "GET /api/activities.json?
user_key=USER_KEY HTTP/1.1", subrequest: "/threescale_authrep", upstream:
"https://54.83.62.186:443/transactions/authrep.xml?
provider_key=YOUR_PROVIDER_KEY&service_id=SERVICE_ID&usage[hits]=1&user_key=U
SER_KEY&log%5Bcode%5D=", host: "localhost"
```

7.3.4. API gateway > 3scale

Once you are sure the API gateway is running correctly, the next step is troubleshooting the connection between the API gateway and 3scale.

7.3.4.1. Can the API gateway reach 3scale?

If you are using NGINX as your API gateway, the following message displays in the nginx error logs when the gateway is unable to contact 3scale.

```
2015/11/20 11:33:51 [error] 3578#0: *1 upstream timed out (110: Connection timed out) while
connecting to upstream, client: 127.0.0.1, server: , request: "GET /api/activities.json?
user_key=USER_KEY HTTP/1.1", subrequest: "/threescale_authrep", upstream:
"https://54.83.62.186:443/transactions/authrep.xml?
provider_key=YOUR_PROVIDER_KEY&service_id=SERVICE_ID&usage[hits]=1&user_key=USER_KE
Y&log%5Bcode%5D=", host: "localhost"
```

Here, note the upstream value. This IP corresponds to one of the IPs that the 3scale product resolves to. This implies that there is a problem reaching 3scale. You can do a reverse DNS lookup to check the domain for an IP by calling **nslookup**.

For example, because the API gateway is unable to reach 3scale, it does not mean that 3scale is down. One of the most common reasons for this would be firewall rules preventing the API gateway from connecting to 3scale.

There may be network issues between the gateway and 3scale that could cause connections to timeout. In this case, you should go through the steps in troubleshooting generic connectivity issues to identify where the problem lies.

To rule out networking issues, use traceroute or MTR to check the routing and packet transmission. You can also run the same command from a machine that is able to connect to 3scale and your API gateway and compare the output.

Additionally, to see the traffic that is being sent between your API gateway and 3scale, you can use tcpdump as long as you temporarily switch to using the HTTP endpoint for the 3scale product (**su1.3scale.net**).

7.3.4.2. Is the API gateway resolving 3scale addresses correctly?

Ensure you have the resolver directive added to your nginx.conf.

For example, in nginx.conf:

```
http {
  lua_shared_dict api_keys 10m;
  server_names_hash_bucket_size 128;
  lua_package_path ";;$prefix/?.lua;";
  init_by_lua 'math.randomseed(ngx.time()) ; cjson = require("cjson")';

  resolver 8.8.8.8 8.8.4.4;
```

You can substitute the Google DNS (8.8.8.8 and 8.8.4.4) with your preferred DNS.

To check DNS resolution from your API gateway, call nslookup as follows with the specified resolver IP:

```
nslookup su1.3scale.net 8.8.8.8
;; connection timed out; no servers could be reached
```

The above example shows the response returned if Google DNS cannot be reached. If this is the case, you must update the resolver IPs. You might also see the following alert in your nginx error.log:

```
2016/05/09 14:15:15 [alert] 9391#0: send() failed (1: Operation not permitted) while resolving,
resolver: 8.8.8.8:53
```

Finally, run **dig any su1.3scale.net** to see the IP addresses currently in operation for the 3scale Service Management API. Note that this is not the entire range of IP addresses that might be used by 3scale. Some may be swapped in and out for capacity reasons. Additionally, you may add more domain names for the 3scale service in the future. For this you should always test against the specific address that are supplied to you during integration, if applicable.

7.3.4.3. Is the API gateway calling 3scale correctly?

If you want to check the request your API gateway is making to 3scale for troubleshooting purposes only you can add the following snippet to the 3scale authrep location in **nginx.conf** (**/threescale_authrep** for API Key and App_id authentication modes):

```
body_filter_by_lua_block{
  if ngx.req.get_headers()["X-3scale-debug"] == ngx.var.provider_key then
    local resp = ""
    ngx.ctx.buffered = (ngx.ctx.buffered or "") .. string.sub(ngx.arg[1], 1, 1000)
    if ngx.arg[2] then
      resp = ngx.ctx.buffered
    end

    ngx.log(0, ngx.req.raw_header())
    ngx.log(0, resp)
  end
}
```

This snippet will add the following extra logging to the nginx error.log when the **X-3scale-debug header** is sent, e.g. **curl -v -H 'X-3scale-debug: YOUR_PROVIDER_KEY' -X GET "https://726e3b99.ngrok.com/api/contacts.json?access_token=7c6f24f5"**

This will produce the following log entries:

```
2016/05/05 14:24:33 [] 7238#0: *57 [lua] body_filter_by_lua:7: GET /api/contacts.json?
access_token=7c6f24f5 HTTP/1.1
Host: 726e3b99.ngrok.io
User-Agent: curl/7.43.0
Accept: */*
X-Forwarded-Proto: https
```

> *X-Forwarded-For: 2.139.235.79*
>
> *while sending to client, client: 127.0.0.1, server: pili-virtualbox, request: "GET /api/contacts.json?access_token=7c6f24f5 HTTP/1.1", subrequest: "/threescale_authrep", upstream: "https://54.83.62.94:443/transactions/oauth_authrep.xml?provider_key=REDACTED&service_id=REDACTED&usage[hits]=1&access_token=7c6f24f5", host: "726e3b99.ngrok.io"*
> *2016/05/05 14:24:33 [] 7238#0: *57 [lua] body_filter_by_lua:8: <?xml version="1.0" encoding="UTF-8"?><error code="access_token_invalid">access_token "7c6f24f5" is invalid: expired or never defined</error> while sending to client, client: 127.0.0.1, server: pili-virtualbox, request: "GET /api/contacts.json?access_token=7c6f24f5 HTTP/1.1", subrequest: "/threescale_authrep", upstream: "https://54.83.62.94:443/transactions/oauth_authrep.xml?provider_key=REDACTED&service_id=REDACTED&usage[hits]=1&access_token=7c6f24f5", host: "726e3b99.ngrok.io"*

The first entry (**2016/05/05 14:24:33 [] 7238#0: *57 [lua] body_filter_by_lua:7:**) prints out the request headers sent to 3scale, in this case: Host, User-Agent, Accept, X-Forwarded-Proto and X-Forwarded-For.

The second entry (**2016/05/05 14:24:33 [] 7238#0: *57 [lua] body_filter_by_lua:8:**) prints out the response from 3scale, in this case: **<error code="access_token_invalid">access_token "7c6f24f5" is invalid: expired or never defined</error>**.

Both will print out the original request (**GET /api/contacts.json?access_token=7c6f24f5**) and subrequest location (**/threescale_authrep**) as well as the upstream request (**upstream: "https://54.83.62.94:443/transactions/threescale_authrep.xml?provider_key=REDACTED&service_id=REDACTED&usage[hits]=1&access_token=7c6f24f5"**.) This last value allows you to see which of the 3scale IPs have been resolved and also the exact request made to 3scale.

7.3.5. 3scale

7.3.5.1. Is 3scale available?

To confirm that 3scale is available, choose one of the following options:

- Check the 3scale status page
- Follow @3scalestatus on Twitter.

7.3.5.2. Is 3scale returning an error?

It is also possible that 3scale is available but is returning an error to your API gateway which would prevent calls going through to your API. Try to make the authorization call directly in 3scale and check the response. If you get an error, check the #troubleshooting-api-error-codes[Error Codes] section to see what the issue is.

7.3.5.3. Use the 3scale debug headers

You can also turn on the 3scale debug headers by making a call to your API with the **X-3scale-debug** header, example:

curl -v -X GET "https://api.example.com/endpoint?user_key" X-3scale-debug: YOUR_SERVICE_TOKEN

This will return the following headers with the API response:

```
X-3scale-matched-rules: /, /api/contacts.json
< X-3scale-credentials: access_token=TOKEN_VALUE
< X-3scale-usage: usage[hits]=2
< X-3scale-hostname: HOSTNAME_VALUE
```

7.3.5.4. Check the integration errors

You can also check the integration errors on your Admin Portal to check for any issues reporting traffic to 3scale. See https://YOUR_DOMAIN-admin.3scale.net/apiconfig/errors.

One of the reasons for integration errors can be sending credentials in the headers with **underscores_in_headers** directive not enabled in server block.

7.3.6. Client API gateway

7.3.6.1. Is the API gateway reachable from the public internet?

Try directing a browser to the IP address (or domain name) of your gateway server. If this fails, ensure that you have opened the firewall on the relevant ports.

7.3.6.2. Is the API gateway reachable by the client?

If possible, try to connect to the API gateway from the client using one of the methods outlined earlier (telnet, curl, etc.) If the connection fails, the problem lies in the network between the two.

Otherwise, you should move on to troubleshooting the client making the calls to the API.

7.3.7. Client

7.3.7.1. Test the same call using a different client

If a request is not returning the expected result, test with a different HTTP client. For example, if you are calling an API with a Java HTTP client and you see something wrong, cross-check with cURL.

You can also call the API through a proxy between the client and the gateway to capture the exact parameters and headers being sent by the client.

7.3.7.2. Inspect the traffic sent by client

Use a tool like Wireshark to see the requests being made by the client. This will allow you to identify if the client is making calls to the API and the details of the request.

7.4. ACTIVEDOCS ISSUES

Sometimes calls that work when you call the API from the command line fail when going through ActiveDocs.

To enable ActiveDocs calls to work, we send these out through a proxy on our side. This proxy will add certain headers that can sometimes cause issues on the API if they are not expected. To identify if this is the case, try the following steps:

7.4.1. Use petstore.swagger.io

Swagger provides a hosted swagger-ui at petstore.swagger.io which you can use to test your Swagger spec and API going through the latest version of swagger-ui. If both swagger-ui and ActiveDocs fail in the same way, you can rule out any issues with ActiveDocs or the ActiveDocs proxy and focus the troubleshooting on your own spec. Alternatively, you can check the swagger-ui GitHub repo for any known issues with the current version of swagger-ui.

7.4.2. Check that firewall allows connections from ActiveDocs proxy

We recommend to not whitelist IP address for clients using your API. The ActiveDocs proxy uses floating IP addresses for high availability and there is currently no mechanism to notify of any changes to these IPs.

7.4.3. Call the API with incorrect credentials

One way to identify whether the ActiveDocs proxy is working correctly is to call your API with invalid credentials. This will help you to confirm or rule out any problems with both the ActiveDocs proxy and your API gateway.

If you get a 403 code back from the API call (or from the code you have configured on your gateway for invalid credentials), the problem lies with your API because the calls are reaching your gateway.

7.4.4. Compare calls

To identify any differences in headers and parameters between calls made from ActiveDocs versus outside of ActiveDocs, run calls through services such as APItools on-premise or Runscope. This will allow you to inspect and compare your HTTP calls before sending them to your API. You will then be able to identify potential headers and/or parameters in the request that could cause issues.

7.5. LOGGING IN NGINX

For a comprehensive guide on this, see the NGINX Logging and Monitoring docs.

7.5.1. Enabling debugging log

To find out more about enabling debugging log, see the NGINX debugging log documentation.

7.6. 3SCALE ERROR CODES

To double-check the error codes that are returned by the 3scale Service Management API endpoints, see the **3scale API Documentation** page by following these steps:

1. Click the question mark (?) icon, which is in the upper-right corner of the Admin Portal.
2. Choose **3scale API Docs**.

The following is a list HTTP response codes returned by 3scale, and the conditions under which they are returned:

- **400:** Bad request. This can be because of:
    - Invalid encoding

  - Payload too large
  - Content type is invalid (for POST calls). Valid values for the **Content-Type** header are: **application/x-www-form-urlencoded**, **multipart/form-data**, or empty header.
- **403:**
  - Credentials are not valid
  - Sending body data to 3scale for a GET request
- **404:** Non-existent entity referenced, such as applications, metrics, etc.
- **409:**
  - Usage limits exceeded
  - Application is not active
  - Application key is invalid or missing (for **app_id/app_key** authentication method)
  - Referrer is not allowed or missing (when referrer filters are enabled and required)
- **422:** Missing required parameters
- **429:** Too many requests - sent when the traffic exceeds contracted limits.

Most of these error responses will also contain an XML body with a machine readable error category and a human readable explanation.

When using the standard API gateway configuration, any return code different from 200 provided by 3scale can result in a response to the client with one of the following codes:

- 403
- 404
- 429