Red Hat 3scale API Management 2.11

Operating 3scale

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

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Abstract

This guide documents development operations with Red Hat 3scale API Management 2.11.

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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 GENERAL CONFIGURATION OPTIONS

As a Red Hat 3scale API Management administrator, there are general configuration options available to you in your installation or account to adjust settings.

1.1. CONFIGURING A VALID LOGIN SESSION LENGTH

As a Red Hat 3scale API Management administrator, you can configure a valid login session length for both the Admin Portal and the Developer Portal so there is a limit for maximum timeout and inactivity.

To implement a valid login session length you must set **USER_SESSION_TTL** to seconds. For example 7,200 seconds is 2 hours. If the value is **null**, that is, not set or is set to an empty string, the session length is for 2 weeks.

Prerequisites

- A 3scale account with administrator privileges.

Procedure

- Update the environment variable to the time in seconds you require:

  ```
  $ oc set env dc/system-app --overwrite USER_SESSION_TTL=7200
  ```

CHAPTER 2. 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 API Management 2.11 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

2.1. 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.

2.2. 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.

2.2.1. 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.

2.2.2. 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.

2.2.3. Scaling up performance

Scaling up performance is done via the total number of pods. The more hardware resources you have, the more pods you deploy.

Use the following command to scale up performance via the number of pods:

```
oc scale dc dc-name --replicas=X
```

2.2.4. Configuring 3scale on-premise deployments

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

- APIcast production
- Backend listener
- Backend worker

2.2.4.1. Scaling via the OCP command line interface

Via the OpenShift Container Platform (OCP) command line interface (CLI), 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 command:

  ```
  oc scale dc apicast-production --replicas=X
  ```

- Scale up the Backend listener deployment configuration with the following command:

  ```
  oc scale dc backend-listener --replicas=Y
  ```

- Scale up the Backend worker deployment configuration with the following command:

  ```
  oc scale dc  backend-worker --replicas=Z
  ```

2.2.4.2. 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.

2.2.4.3. 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.

2.3. 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.

2.3.1. 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 2.11 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.

2.3.2. 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 cluster administrator access on OpenShift.

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
```

2.3.3. Configuring EFK logging

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

For details on how to configure EFK logging on OpenShift, see the following:

- Deploying EFK on OCP 3.11
- Deploying EFK on OCP 4.1

2.3.4. 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
   ```

2.3.5. 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>
```

2.3.6. 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 2.1. 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;`

For other tables not specified in this section, the database administrator must manually clean the tables that the system does not automatically purge.

Additional resources

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

CHAPTER 3. MONITORING 3SCALE

Prometheus is container-native software built for storing historical data and for monitoring large, scalable systems. It gathers data over an extended time, rather than just for the currently running session. Alerting rules in Prometheus are managed by Alertmanager.

You use Prometheus and Alertmanager to monitor and store 3scale data so that you can use a graphical tool, such as Grafana, to visualize and run queries on the data.

IMPORTANT

Prometheus is an open-source system monitoring toolkit and Grafana is an open-source dashboard toolkit. Red Hat support for Prometheus and Grafana is limited to the configuration recommendations provided in Red Hat product documentation.

The 3scale operator allows you to use an existing Prometheus and Grafana operator installation to monitor 3scale usage and resources.

NOTE

The 3scale operator creates monitoring resources, but does not prevent modification of those resources.

Prerequisites

- The 3scale operator is installed.
- The Prometheus operator is installed in the cluster. The Prometheus operator is an operator for creating and managing Prometheus instances. It provides the **Prometheus** custom resource definition required by 3scale monitoring.
  The following Prometheus operator and image versions are tested with 3scale:
  - Prometheus operator **v0.37.0**
  - Prometheus image: **quay.io/prometheus/prometheus:v2.16.0**
- The Grafana operator is installed in the cluster. The Grafana operator is an operator for creating and managing Grafana instances. It provides the **GrafanaDashboard** custom resource definition required by 3scale monitoring.
  The following Grafana operator and image versions are tested with 3scale:
  - Grafana operator **v3.9.0**
  - Grafana image: **registry.hub.docker.com/grafana/grafana:7.1.1**

IMPORTANT

If your cluster is exposed on the Internet, make sure to protect the Prometheus and Grafana services.

This section describes how to enable monitoring of a 3scale instance, so that you can view the Grafana dashboards.

- Enabling monitoring for 3scale

- Configuring Prometheus to monitor 3scale
- Configuring Grafana to monitor 3scale
- Viewing metrics for 3scale

3.1. ENABLING MONITORING FOR 3SCALE

To monitor 3scale, you must enable monitoring by setting an APIManager custom resource.

Procedure

1. Configure 3scale to enable monitoring by setting the **spec.monitoring.enabled** parameter of the 3scale deployment YAML to **true**. For example:

   a. Create an APIManager custom resource named **3scale-monitoring.yml** to enable monitoring:

   ```
   apiVersion: apps.3scale.net/v1alpha1
   kind: APIManager
   metadata:
     name: apimanager1
   spec:
     wildcardDomain: example.com
     monitoring:
       enabled: true
       enablePrometheusRules: false (1)
   ```

   (1) You can optionally disable **PrometheusRules**, which is otherwise enabled by default.

   b. Log in to your OpenShift cluster. You must log in as a user with an *edit* cluster role in the OpenShift project of the 3scale, for example, **cluster-admin**.

   ```
   oc login
   ```

   c. Switch to your 3scale project.

   ```
   oc project <project_name>
   ```

   d. Deploy the custom resource:

   ```
   $ oc apply -f 3scale-monitoring.yml
   ```

Additional resources

- Deployment configuration options for 3scale on OpenShift using the operator .
- 3scale PrometheusRules.

3.2. CONFIGURING PROMETHEUS TO MONITOR 3SCALE

You must deploy and configure Prometheus using the **Prometheus** custom resource to enable monitoring of 3scale.

NOTE

Make sure permissions are set correctly as described in Prometheus documentation.

Procedure

1. Deploy the Prometheus custom resource as follows depending on whether you want to monitor all resources in the cluster or only 3scale resources:
   - To monitor all resources in the cluster, set the **spec.podMonitorSelector** attribute to **{}** and set the **spec.ruleSelector** attribute to **{}**. For example, apply the following custom resource:

     ```
     apiVersion: monitoring.coreos.com/v1
     kind: Prometheus
     metadata:
       name: example
     spec:
       podMonitorSelector: {}
       ruleSelector: {}
     ```

   - If you deployed 3scale and the Prometheus operator in the same OpenShift project, and assuming the value of **APP_LABEL** is set to the default **3scale-api-management**, monitor 3scale resources using the following steps:
     a. Set the **spec.podMonitorSelector** attribute to:

        ```
        podMonitorSelector:
         matchExpressions:
         - key: app
             operator: In
             values:
             - 3scale-api-management
        ```

     b. Set the **spec.ruleSelector** attribute to:

        ```
         matchExpressions:
         - key: app
           operator: In
           values:
           - 3scale-api-management
        ```

        For example, apply the following custom resource:

        ```
        apiVersion: monitoring.coreos.com/v1
        kind: Prometheus
        metadata:
          name: example
        spec:
         podMonitorSelector:
          matchExpressions:
          - key: app
        ```

```
      operator: In
      values:
      - 3scale-api-management
  ruleSelector:
    matchExpressions:
    - key: app
      operator: In
      values:
      - 3scale-api-management
```

- If you deployed 3scale and the Prometheus operator in different OpenShift projects, monitor 3scale resources using the following steps:

  a. Label the OpenShift project where 3scale is deployed with **MYLABELKEY=MYLABELVALUE**

  b. Use a **podMonitorNamespaceSelector** filter to select the 3scale pods. For example, apply the following custom resource:

```
apiVersion: monitoring.coreos.com/v1
kind: Prometheus
metadata:
  name: example
spec:
 podMonitorSelector: {}
 ruleSelector: {}
 podMonitorNamespaceSelector:
   matchExpressions:
   - key: MYLABELKEY
     operator: In
     values:
     - MYLABELVALUE
```

2. To ensure that dashboards and alerts work as expected, you must incorporate Kubernetes metrics, that is, kube-state-metrics, by performing one of the following:

   - Federate the Prometheus instance with the cluster default Prometheus instance.

   - Configure your own scraping jobs to get metrics from kubelet, etcd and others.

Additional resources

- For more information about Prometheus, see the Prometheus documentation.

3.3. CONFIGURING GRAFANA TO MONITOR 3SCALE

You must configure Grafana in order to enable monitoring of 3scale.

Procedure

1. Make sure Grafana services are configured to monitor the **GrafanaDashboards** resources by overwriting the **app=3scale-api-management** label. For example, apply the following custom resource:

```
apiVersion: integreatly.org/v1alpha1
```

```
kind: Grafana
metadata:
  name: grafana
spec:
  dashboardLabelSelector:
  - matchExpressions:
    - key: app
      operator: In
      values:
      - 3scale-api-management
```

Grafana Dashboards created by the 3scale operator are labeled as follows:

```
app: 3scale-api-management
monitoring-key: middleware
```

2. If the Grafana operator is installed in a different namespace than 3scale, configure it to monitor resources outside the namespace using the **--namespaces** or **--scan-all** operator flags. See the Grafana documentation for more information about the operator flags.

3. Create a **GrafanaDataSource** custom resource of type **prometheus** to make the Prometheus data available in Grafana. For example:

```
apiVersion: integreatly.org/v1alpha1
kind: GrafanaDataSource
metadata:
  name: prometheus
spec:
  name: middleware
  datasources:
    - name: Prometheus
      type: prometheus
      access: proxy
      url: http://prometheus-operated:9090
      isDefault: true
      version: 1
      editable: true
      jsonData:
        timeInterval: "5s"
```

where **http://prometheus-operated:9090** is the Prometheus route.

4. Make sure permissions are set correctly as described in the Grafana documentation.

Additional resources

- For more information about Grafana, see the Grafana documentation.

3.4. VIEWING METRICS FOR 3SCALE

After configuring 3scale, Prometheus, and Grafana you can view the metrics described in this section.

Procedure

1. Log into the Grafana console.
2. Check that you can view metrics for the following:
   - Kubernetes resources at pod and namespace level where 3scale is installed
   - APIcast Staging
   - APIcast Production
   - Backend worker
   - Backend listener
   - System
   - Zync

3.5. 3SCALE SYSTEM METRICS EXPOSED TO PROMETHEUS

You can configure the following ports to use 3scale system pods with Prometheus endpoints to expose metrics.

Table 3.1. 3scale system ports

system-app	Port
system-developer	9394
system-master	9395
system-provider	9396

system-sidekiq	Port
system-sidekiq	9394

The endpoints are only accessible internally using:

```
http://${service}:${port}/metrics
```

For example:

```
http://system-developer:9394/metrics
```

Additional resources

- For information about monitoring APIcast, see the Exposing 3scale APIcast Metrics to Prometheus guide.
- For information about securing Prometheus, see the Prometheus security documentation.

- For information about securing Grafana, see the permissions and security Grafana documentation.

CHAPTER 4. 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.

4.1. 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.

4.2. CONFIGURING WEBHOOKS

Procedure

1. Navigate to **Account Settings** > **Integrate** > **Webhooks Account Settings** is the gear icon located in the upper right of the window.
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.

4.3. 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 5. 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:

- Section 5.1, “Installing the toolbox”
- Section 5.2, “Supported toolbox commands”
- Section 5.3, “Importing services”
- Section 5.4, “Copying services”
- Section 5.5, “Copying service settings only”
- Section 5.6, “Importing OpenAPI definitions”
- Section 5.7, “Managing remote access credentials”
- Section 5.8, “Creating application plans”
- Section 5.9, “Creating metrics”
- Section 5.10, “Creating methods”
- Section 5.11, “Creating services”
- Section 5.12, “Creating ActiveDocs”
- Section 5.13, “Listing proxy configurations”
- Section 5.14, “Copying a policy registry”
- Section 5.15, “Listing applications”
- Section 5.16, “Exporting products”
- Section 5.17, “Importing products”
- Section 5.18, “Export and import a product policy chain”
- Section 5.19, “Copying API backends”
- Section 5.21, “Troubleshooting issues with SSL and TLS”

5.1. INSTALLING THE TOOLBOX

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

5.1.1. 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-rhel8:3scale2.11
```

3. Verify the installation:

```
$ podman run registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.11 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.

5.2. SUPPORTED TOOLBOX COMMANDS

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

NOTE

The *update* command has been deprecated and replaced by the *copy* command. The use of deprecated commands is not supported.

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
  update           [DEPRECATED] update 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
```

5.3. 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_name,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-rhel8:3scale2.11 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.

5.4. 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-rhel8:3scale2.11 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

5.5. COPYING SERVICE SETTINGS ONLY

You can bulk copy and update 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 deprecated and replaced by the **copy** command. The use of deprecated commands is not supported.

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

```
$ podman run registry.redhat.io/3scale-amp2/toolbox-rhel8:3scale2.11 3scale update [opts] service --source=https://{ACCESS_KEY}@{3SCALE_ADMIN}-admin.{DOMAIN_NAME} --destination=https://{DEST_KEY}@{3SCALE_ADMIN}-admin.{DOMAIN_NAME} {SERVICE_ID} {DEST_ID}
```

5.6. 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-rhel8:3scale2.11 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

While there is no security requirement in the specification, the service is considered as an *OpenAPI*. 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 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.

5.7. 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>**

5.7.1. 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-rhel8:3scale2.11
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-rhel8:3scale2.11**.

> **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

5.7.2. 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
```

5.7.3. 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
```

5.7.4. 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
```

5.8. CREATING APPLICATION PLANS

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

5.8.1. 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
```

5.8.2. 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
```

5.8.3. 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
```

5.8.4. 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
```

5.8.5. 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
```

5.8.6. 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**.

5.8.6.1. 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-rhel8:3scale2.11 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
```

5.8.6.2. 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-
rhel8:3scale2.11 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.

5.8.6.3. 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
```

5.9. 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
```

5.9.1. 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
```

5.9.2. 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
```

5.9.3. 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
```

5.10. CREATING METHODS

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

5.10.1. 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
```

5.10.2. 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
```

5.10.3. 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
```

5.10.4. 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
```

5.11. CREATING SERVICES

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

5.11.1. 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
```

5.11.2. 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
```

5.11.3. 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
```

5.11.4. 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
```

5.11.5. 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
```

5.12. CREATING ACTIVEDOCS

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

5.12.1. 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.

5.12.2. 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.

5.12.3. 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
```

5.12.4. 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
```

5.13. 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
```

5.13.1. 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
```

5.13.2. 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
```

5.13.3. 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
```

5.13.4. 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-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

5.14. 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
```

5.15. 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
```

5.15.1. 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
```

5.15.2. 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
```

5.15.3. 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.
```

5.15.4. 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**

5.16. 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 -
```

For details, see How the 3scale operator identifies the tenant that a custom resource links to .

5.17. 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.

5.18. 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
  ```

5.19. 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-rhel8:3scale2.11 3scale backend copy [-t
target_system_name] -s 3scale1 -d 3scale2 api_backend_01
```

5.20. 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-rhel8:3scale2.11 3scale product copy [-t
target_system_name] -s 3scale1 -d 3scale2 my_api_product_01
```

5.21. 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 egistry.redhat.io/3scale-amp2/toolbox-rhel7:3scale2.11 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 6. 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 API Management 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 sections:

- Product per environment
- 3scale On-premises instances
- 3scale mixed approach
- 3scale with APIcast gateways

6.1. 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.

6.2. 3SCALE ON-PREMISES INSTANCES

For 3scale On-premises instances, there are multiple ways to set up 3scale to manage API back-end environments.

- A separate 3scale instance for each API back-end environment
- A single 3scale instance that uses the multitenancy feature

6.2.1. Separating 3scale instances per environment

In this approach a separate 3scale instance is deployed for each API back-end environment. The benefit of this architecture is that each environment will be isolated from one another, therefore there are no shared databases or other resources. For example, any load testing being done in one environment will not impact the resources in other environments.

NOTE

This separation of installations has benefits as described above, however, it would require more operational resources and maintenance. These additional resources would be required on the OpenShift administration layer and not necessarily on the 3scale layer.

6.2.2. Separating 3scale tenants per environment

In this approach a single 3scale instance is used but the multitenancy feature is used to support multiple API back ends.

There are two options:

- Create a 1-to-1 mapping between environments and 3scale products within a single tenant.
- Create a 1-to-1 mapping between environments and tenants with one or more products per tenant as required.
  - There would be three tenants corresponding to API back-end environments - dev-tenant, qa-tenant, prod-tenant. The benefit of this approach is that it allows for a logical separation of environments but uses shared physical resources.

NOTE

Shared physical resources will ultimately need to be taken into consideration when analysing the best strategy for mapping API environments to a single installation with multiple tenants.

6.3. 3SCALE MIXED APPROACH

The approaches described in 3scale On-premises instances can be combined. For example:

- A separate 3scale instance for production
- A separate 3scale instance with separate tenant for non-production environments in dev and qa

6.4. 3SCALE WITH APICAST GATEWAYS

For 3scale On-premises instances, there are two alternatives to set up 3scale to manage API backend environments:

- Each 3scale installation comes with two built-in APIcast gateways, for staging and production.
- Deploy additional APIcast gateways externally to the OpenShift cluster where 3scale is running.

6.4.1. APIcast built-in default gateways

When APIcast built-in gateways are used, the API back end configured using the above approaches described in 3scale with APIcast gateways will be handled automatically. When a tenant is added by a 3scale Master Admin, a route is created for the tenant in production and staging built-in APIcast gateways. See Understanding multitenancy subdomains

- **<API_NAME>-<TENANT_NAME>-apicast.staging.<WILDCARD_DOMAIN>**
- **<API_NAME>-<TENANT_NAME>-apicast.production.<WIDLCARD_DOMAIN>**

Therefore, each API back-end environment mapped to a different tenant would get its own route. For example:

- Dev **<API_NAME>-dev-apicast.staging.<WILDCARD_DOMAIN>**

- QA **<API_NAME>-qa-apicast.staging.<WILDCARD_DOMAIN>**
- Prod **<API_NAME>-prod-apicast.staging.<WILDCARD_DOMAIN>**

6.4.2. Additional APIcast gateways

Additional APIcast gateways are those deployed on a different OpenShift cluster than the one on which 3scale instance is running. There is more than one way to set up and use additional APIcast gateways. The value of environment variable **THREESCALE_PORTAL_ENDPOINT** used when starting APIcast depends how the additional APIcast gateways are set up.

A separate APIcast gateway can be used for each API back-end environment. For example:

> DEV_APICAST -> DEV_TENANT ; DEV_APICAST started with THREESCALE_PORTAL_ENDPOINT = admin portal for DEV_TENANT
> QA_APICAST -> QA_TENANT ; QA_APICAST started with THREESCALE_PORTAL_ENDPOINT = admin portal for QA_APICAST
> PROD_APICAST -> PROD_TENANT ; PROD_APICAST started with THREESCALE_PORTAL_ENDPOINT = admin portal for PROD_APICAST

The **THREESCALE_PORTAL_ENDPOINT** is used by APIcast to download the configuration. Each tenant that maps to an API backend environment uses a separate APIcast gateway. The **THREESCALE_PORTAL_ENDPOINT** is set to the Admin Portal for the tenant containing all the product configurations specific to that API backend environment.

A single APIcast gateway can be used with multiple API back-end environments. In this case **THREESCALE_PORTAL_ENDPOINT** is set to the Master Admin Portal.

Additional resources

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

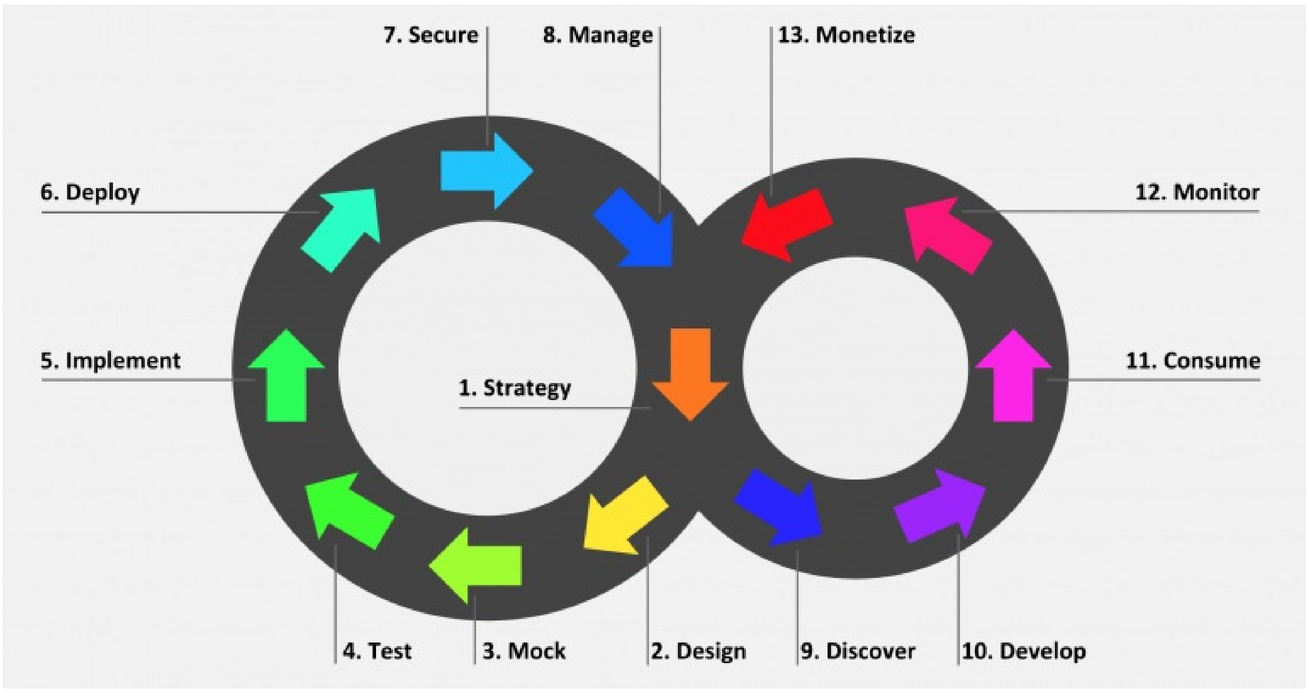
CHAPTER 7. AUTOMATING API LIFECYCLE WITH 3SCALE TOOLBOX

This topic explains the concepts of the API lifecycle with Red Hat 3scale API Management 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:

7.1. 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.

7.1.1. 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 7.1. 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).

7.1.2. 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 7.2. 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.

7.2. 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 7.2.1, “Sample Jenkins CI/CD pipelines”
- Section 7.2.2, “Setting up your 3scale Hosted environment”

- Section 7.2.3, “Setting up your 3scale On-premises environment”
- Section 7.2.4, “Deploying Red Hat Single Sign-On for OpenID Connect”
- Section 7.2.5, “Installing the 3scale toolbox and enabling access”
- Section 7.2.6, “Deploying the API backends”
- Section 7.2.7, “Deploying self-managed APIcast instances”
- Section 7.2.8, “Installing and deploying the sample pipelines”
- Section 7.2.9, “Limitations of API lifecycle automation with 3scale toolbox”

7.2.1. 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 7.3. 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.

7.2.2. 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 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 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
```

7.2.3. 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
```

7.2.4. 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
```

7.2.5. 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"
   ```

7.2.6. 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}')"
   ```

7.2.7. 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-rhel8:3scale2.11

   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-rhel8:3scale2.11

   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
```

7.2.8. 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

7.2.9. 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 API Management 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.

7.3. 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

7.4. 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-rhel7:3scale2.11",
                "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 8. USING THE 3SCALE OPERATOR TO CONFIGURE AND PROVISION 3SCALE

As a 3scale administrator, you can use the 3scale operator to configure 3scale services and provision 3scale resources. You use the operator in the OpenShift Container Platform (OCP) user interface. Using the operator is an alternative to configuring and provisioning 3scale in the Admin Portal or by using the 3scale internal API.

When you use the 3scale operator to configure a service or provision a resource the only way to update that service or resource is to update its custom resource (CR). While new services and resources appear in the Admin Portal, you cannot update the service or resource in the Admin Portal or by using the internal 3scale API. If you try to, the operator reverts updates and the CR remains as it was.

IMPORTANT

3scale operator for capabilities is a Technology Preview feature only. Technology Preview features are not supported with Red Hat production service level agreements (SLAs) and might not be functionally complete. Red Hat does not recommend using them in production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process. For more information about the support scope of Red Hat Technology Preview features, see Technology Preview Features Support Scope .

This chapter includes details about how operator application capabilities work and how to use the operator to deploy custom resources:

- Your first 3scale product and backend
- Promoting a product’s APIcast configuration
- Backend custom resources related to capabilities
- Product custom resources related to capabilities
- Tenant custom resources
- Developer account custom resources

Additionally, there is information about the limitations of capabilities when using the 3scale operator.

8.1. GENERAL PREREQUISITES

To configure and provision 3scale by using the 3scale operator, these are the required elements:

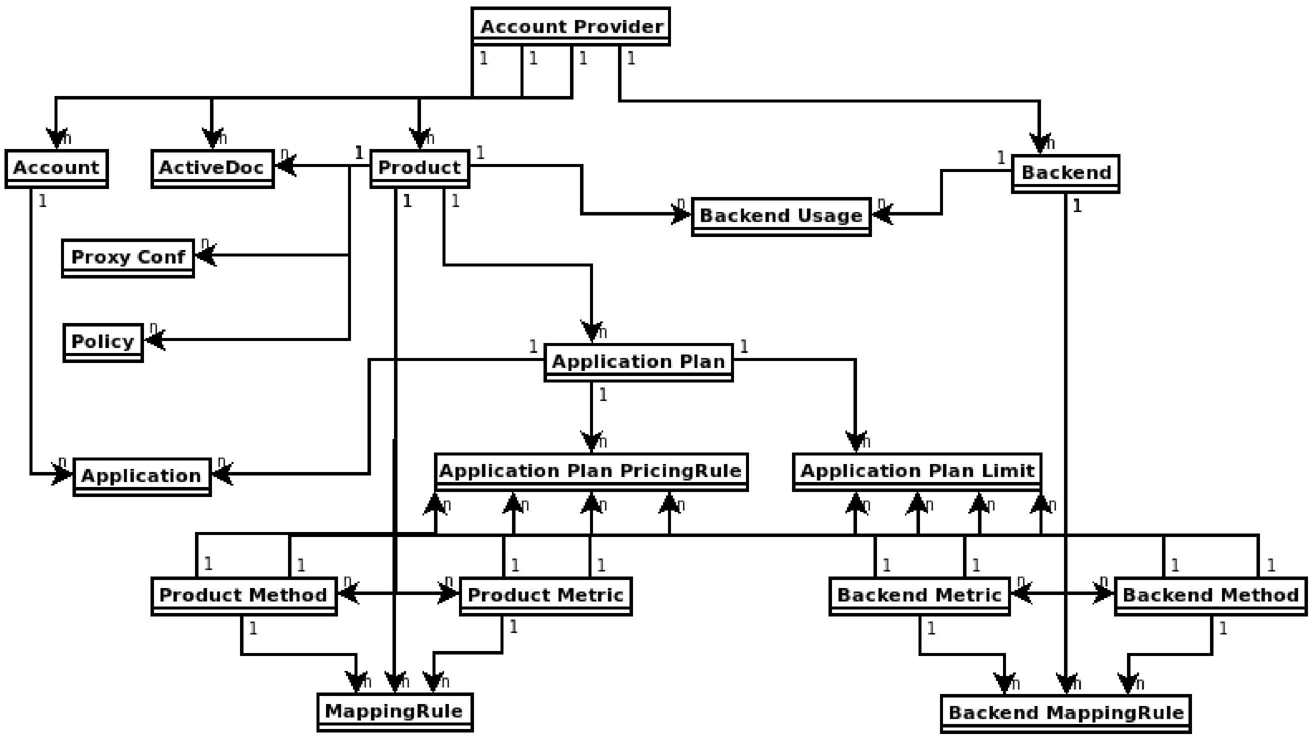
- A user account with administrator privileges for 3scale 2.11 On-Premises instance
- 3scale operator installed.
- OpenShift Container Platform 4 with a user account that has administrator privileges in the OpenShift cluster.
  - **Note:** OCP 4 supports deployment of 3scale using the operator only.
  - For more information about supported configurations, see the Red Hat 3scale API Management Supported Configurations page.

8.2. APPLICATION CAPABILITIES VIA THE 3SCALE OPERATOR

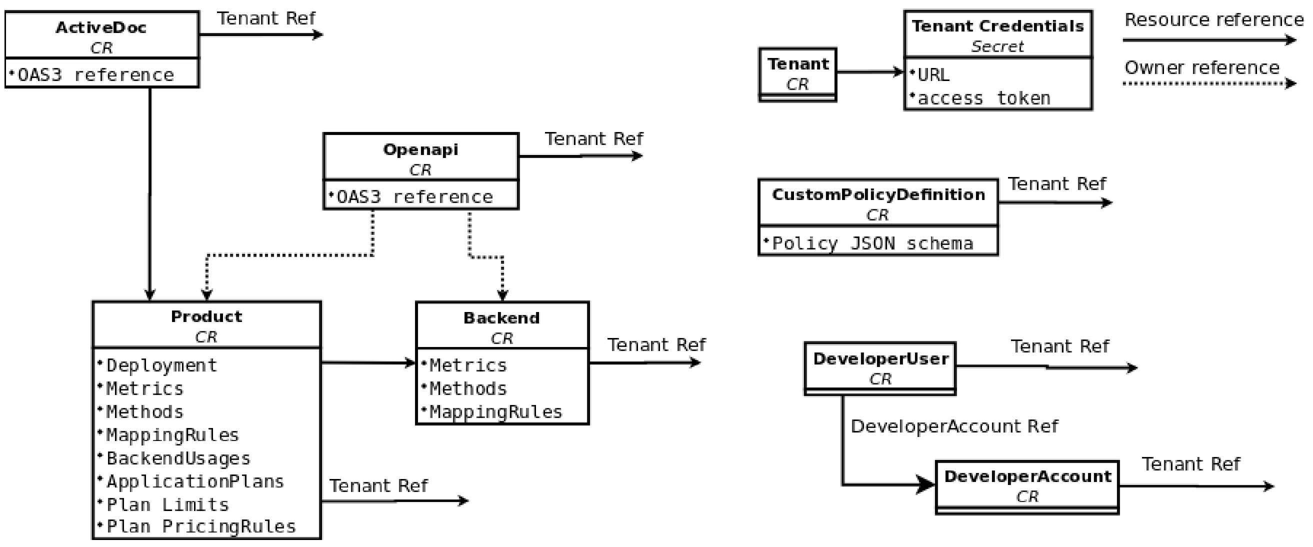
The 3scale operator contains these featured capabilities:

- Allows interaction with the underlying Red Hat 3scale API Management solution.
- Manages the 3scale application declaratively using custom resources from OpenShift.

The diagram below shows 3scale entities and relations that are eligible for management using OpenShift custom resources in a declarative way. Products contain one or more backends. At the product level, you can configure applications, application plans, as well as mapping rules. At the backend level, you can set up metrics, methods and mapping rules for each backend.



The 3scale operator provides custom resource definitions and their relations, which are visible in the following diagram.



8.3. DEPLOYING YOUR FIRST 3SCALE PRODUCT AND BACKEND

Using Openshift Container Platform in your newly created tenant, you will deploy your first 3scale product and backend with the minimum required configuration.

Prerequisites

The same installation requirements as listed in General prerequisites, with these considerations:

- The 3scale account can be local in the working OpenShift namespace or a remote installation.
- The required parameters from this account are the 3scale Admin URL address and the access token.

Procedure

1. Create a secret for the 3scale provider account using the credentials from the 3scale Admin Portal. For example: **adminURL=https://3scale-admin.example.com** and **token=123456**.

   ```
   oc create secret generic threescale-provider-account --from-literal=adminURL=https://3scale-admin.example.com --from-literal=token=123456
   ```

2. Configure the 3scale backend with the upstream API URL:

   a. Create a YAML file with the following content:

   ```
   apiVersion: capabilities.3scale.net/v1beta1
   kind: Backend
   metadata:
     name: backend1
   spec:
     name: "Operated Backend 1"
     systemName: "backend1"
     privateBaseURL: "https://api.example.com"
   ```

   - Once you create the file, the operator will confirm if the step was successful.
   - For more details about the fields of Backend custom resource and possible values, see the Backend CRD Reference.

   b. Create a custom resource:

   ```
   oc create -f backend1.yaml
   ```

3. Configure the 3scale product:

   a. Create a product with all the default settings applied to the previously created backend:

   ```
   apiVersion: capabilities.3scale.net/v1beta1
   kind: Product
   metadata:
     name: product1
   spec:
     name: "OperatedProduct 1"
     systemName: "operatedproduct1"
     backendUsages:
       backend1:
         path: /
   ```

- Once you create the file, the operator will confirm if the step was successful.
- For more details about the fields of the Product custom resource and possible values, see the Product CRD Reference.

b. Create a custom resource:

```
oc create -f product1.yaml
```

4. Created custom resources will take a few seconds to populate your 3scale instance. To confirm when resources are synchronized, you can choose one of these alternatives:

- Verify the *status* field of the object.
- Use the **oc wait** commands:

```
oc wait --for=condition=Synced --timeout=-1s backend/backend1
oc wait --for=condition=Synced --timeout=-1s product/product1
```

8.4. PROMOTING A PRODUCT'S APICAST CONFIGURATION

Using the 3scale operator, you can promote the product's APIcast configuration to staging or production. The **ProxyConfigPromote** custom resource (CR) promotes the latest APIcast configuration to the staging environment. Optionally, you can configure the **ProxyConfigPromote** CR to promote to the production environment as well.

NOTE

ProxyConfigPromote objects only take effect when created. After creation, any updates on them are not reconciled.

Prerequisites

The same installation requirements as listed in General prerequisites, including:

- Have a product CR already created.

Procedure

1. Create and save a YAML file with the following content:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: ProxyConfigPromote
metadata:
  name: proxyconfigpromote-sample
spec:
  productCRName: product1-sample
```

To promote the APIcast configuration to the production environment, set the optional field **spec.production** to **true**:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: ProxyConfigPromote
metadata:
  name: proxyconfigpromote-sample
spec:
  productCRName: product1-sample
  production: true
```

To delete the **ProxyConfigPromote object** after a successful promotion, set the optional field **spec.deleteCR** to **true**:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: ProxyConfigPromote
metadata:
  name: proxyconfigpromote-sample
spec:
  productCRName: product1-sample
  deleteCR: true
```

2. To check the status condition of the file, type the following command:

```
oc get proxyconfigpromote proxyconfigpromote-sample -o yaml
```

   a. The output should show the satus is **Ready**:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: ProxyConfigPromote
metadata:
  name: proxyconfigpromote-sample
spec:
  productCRName: product1-sample
status:
  conditions:
  - lastTransitionTime: "2022-10-28T11:35:19Z"
    status: "True"
    type: Ready
```

3. Create the custom resource:

```
oc create -f proxyconfigpromote-sample.yaml
```

   - For the given example, the output would be:

```
proxyconfigpromote.capabilities.3scale.net/proxyconfigpromote-sample created
```

Additional resources

- ProxyConfigPromote CRD Reference

8.5. HOW THE 3SCALE OPERATOR IDENTIFIES THE TENANT THAT A CUSTOM RESOURCE LINKS TO

You can deploy 3scale custom resources (CRs) to manage a variety of 3scale objects. A 3scale CR links to exactly one tenant.

If the 3scale operator is installed in the same namespace as 3scale the default behavior is that a 3scale CR links to that 3scale instance's default tenant. To link a 3scale CR to a different tenant, you can do one of the following:

- Create the **threescale-provider-account** secret in the namespace that contains the 3scale CR. When you deploy a 3scale CR, the operator reads this secret to identify the tenant that the CR links to. For the operator to use this secret, one of the following must be true:
  - The 3scale CR specifies the **spec.providerAccountRef** field as null.
  - The 3scale CR omits the **spec.providerAccountRef** field.
    The **threescale-provider-account** secret identifies the tenant that the CR links to. The secret must contain a reference to a 3scale instance in the form of a URL and credentials for accessing a tenant in that 3scale instance in the form of a token. For example:

    ```
    oc create secret generic threescale-provider-account --from-
    literal=adminURL=https://3scale-admin.example.com --from-literal=token=123456
    ```

    The **threescale-provider-account** secret can identify any tenant in any 3scale instance as long as the HTTP connection is available. In other words, a 3scale CR and the 3scale instance that contains the tenant that the CR links to can be in different namespaces, or in different OpenShift clusters.
- In the 3scale CR, specify **spec.providerAccountRef** and set it to the name of a local reference to an OpenShift **Secret** that identifies the tenant. In the following 3scale **DeveloperAccount** CR example, **mytenant** is the secret:

  ```
  apiVersion: capabilities.3scale.net/v1beta1
  kind: DeveloperAccount
  metadata:
    name: developeraccount-simple-sample
  spec:
    orgName: Ecorp
    providerAccountRef:
      name: mytenant
  ```

  In the secret:
  - **adminURL** specifies the URL for a 3scale instance that can be in any namespace.
  - **token** specifies credentials for access to one tenant in that 3scale instance. This tenant can be the default tenant or any other tenant in that instance.
    Typically, when you deploy a tenant custom resource you create this secret. For example:

    ```
    apiVersion: v1
    kind: Secret
    metadata:
      name: mytenant
    type: Opaque
    stringData:
      adminURL: https://my3scale-admin.example.com:443
      token: "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
    ```

If the 3scale operator cannot identify the tenant that a CR links to, the operator generates an error message.

8.6. DEPLOYING 3SCALE OPENAPI CUSTOM RESOURCES

An **OpenAPI** custom resource (CR) is one way to import an OpenAPI Specification (OAS) document that you can use for ActiveDocs in the Developer Portal. The OAS is a standard that does not tie you to using one particular programming language for your APIs. Humans and computers can more easily understand the capabilities of the API product without source code access, documentation, or network traffic inspection.

Prerequisites

- A user account with administrator privileges for a 3scale 2.11 On-Premises instance.
- An OAS document that defines your API.
- An understanding of how an **OpenAPI** CR links to a tenant.

8.6.1. Deploying a 3scale OpenAPI custom resource that imports an OAS document from a secret

Deploy an **OpenAPI** custom resource (CR) so that you can create 3scale backends and products.

NOTE

The operator reads only the content in the secret. The operator does not read the field name in the secret.

Prerequisites

You understand How the 3scale operator identifies the tenant that a custom resource links to .

Procedure

1. Define a secret that contains an OAS document. For example, you might create the **myoasdoc1.yaml** with this content:

```
openapi: "3.0.2"
info:
  title: "some title"
  description: "some description"
  version: "1.0.0"
paths:
  /pet:
    get:
      operationId: "getPet"
      responses:
        405:
          description: "invalid input"
```

2. Create the secret. For example:

```
$ oc create secret generic myoasdoc1 --from-file myoasdoc1.yaml

secret/myoasdoc1 created
```

3. Define your **OpenAPI** CR. Be sure to specify a reference to the secret that contains your OAS document. For example, you might create the **myopenapicr1.yaml** file:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: OpenAPI
metadata:
  name: myopenapicr1
spec:
  openapiRef:
    secretRef:
      name: myoasdoc1
```

4. Create the resource you just defined. For example:

```
$ oc create -f myopenapicr1.yaml
```

For the given example, the output would be:

```
openapi.capabilities.3scale.net/myopenapicr1 created
```

8.6.2. Features of 3scale OpenAPI custom resource definitions

Knowledge of the **OpenAPI** custom resource definition (CRD) deployment features will help you with configuration of the 3scale product, backend, and the subsequent creation of ActiveDocs for the Developer Portal.

- The OAS document can be read from the following:
  - The Kubernetes secret
  - The URL in both http and https formats
- In an OAS document, the **info.title** setting must not exceed 215 characters. The operator uses this setting to create OpenShift object names, which have length limitations.
- Only the first **servers[0].url** element in a server list is parsed as a private URL. The OpenAPI Specification (OAS) uses its **basePath** component of **servers[0].url** element.
- The **OpenAPI** CRD supports a single top level security requirement, however it does not support operational level security.
- The **OpenAPI** CRD supports the **apiKey** security scheme.

Additional resources

- Product custom resources related to capabilities
- **OpenAPI** CRD Reference
- Object Names and IDs

8.6.3. Import rules when defining OpenAPI custom resources

The import rules specify how the OpenAPI Specification (OAS) works with 3scale when you are setting up an OpenAPI document for your 3scale deployment.

Product name

The default product system name is taken from the **info.title** field in the OpenAPI document. To override the product name in an OpenAPI document, specify the **spec.productSystemName** field in an **OpenAPI** custom resource (CR).

Private base URL

The private base URL is read from the **OpenAPI** CR **servers[0].url** field. You can override this by using the **spec.privateBaseURL** field in your **OpenAPI** CR.

3scale methods

Each operation that is defined in the imported OpenAPI document translates to one 3scale method at the product level. The method name is read from the **operationId** field of the operation object.

3scale mapping rules

Each operation that is defined in the imported OpenAPI document translates to one 3scale mapping rule at the product level. Previously existing mapping rules are replaced by those imported with the **OpenAPI** CR.

In an OpenAPI document, the **paths** object provides mapping rules for verb and pattern properties. 3scale methods are associated accordingly to the **operationId**.

The delta value is hard-coded to **1**.

By default, *Strict matching* policy is configured. Matching policy can be switched to *Prefix matching* using the **spec.PrefixMatching** field of the **OpenAPI** CRD.

Authentication

Just one top level security requirement is supported. Operation level security requirements are not supported.

The supported security scheme is **apiKey**.

The **apiKey** security scheme type:

- *credentials location* will be read from the OpenAPI document **in** field of the security scheme object.
- *Auth user* key will be read from the OpenAPI document **name** field of the security scheme object.

The following is a partial example of OAS 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
```

When the OpenAPI document does not specify any security requirements, the following applies:

- The product authentication will be configured for **apiKey**.
- *credentials location* will default to 3scale value **As query parameters (GET) or body parameters (POST/PUT/DELETE)**.
- The *Auth user* key defaults to 3scale value **user_key**.

3scale *Authentication Security* can be set using the **spec.privateAPIHostHeader** and the **spec.privateAPISecretToken** fields of the **OpenAPI** CRD.

ActiveDocs

No 3scale ActiveDoc is created.

3scale product policy chain

The 3scale policy chain is the default one 3scale creates.

3scale deployment mode

By default, the configured 3scale deployment mode will be APIcast 3scale managed. However, when the **spec.productionPublicBaseURL** or the **spec.stagingPublicBaseURL**, or both fields are present in an **OpenAPI** CR, the product's deployment mode is APIcast self-managed.

Example of a **OpenAPI** CR with custom public base URL:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: OpenAPI
metadata:
  name: openapi1
spec:
  openapiRef:
    url: "https://raw.githubusercontent.com/OAI/OpenAPI-
Specification/master/examples/v3.0/petstore.yaml"
  productionPublicBaseURL: "https://production.my-gateway.example.com"
  stagingPublicBaseURL: "https://staging.my-gateway.example.com"
```

8.6.4. Deploying a 3scale OpenAPI custom resource that imports an OAS document from a URL

You can deploy an **OpenAPI** custom resource that imports an OAS document from a URL that you specify. You can then use this OAS document as the foundation for ActiveDocs for your API in the Developer Portal.

Prerequisites

- If you are creating an **OpenAPI** custom resource that does not link to the default tenant in the 3scale instance that is in the same namespace then the namespace that will contain the **OpenAPI** CR contains a secret that identifies the tenant that the **OpenAPI** CR links to. The name of the secret is one of the following:
    - **threescale-provider-account**
    - User defined

  This secret contains the URL for a 3scale instance and a token that contains credentials for access to one tenant in that 3scale instance.

Procedure

1. In your OpenShift account, navigate to **Operators > Installed operators**.
2. Click the 3scale operator.
3. Choose the *YAML* tab.
4. Create an **OpenAPI** custom resource. For example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: OpenAPI
metadata:
  name: openapi1
spec:
  openapiRef:
    url: "https://raw.githubusercontent.com/OAI/OpenAPI-
Specification/master/examples/v3.0/petstore.yaml"
  providerAccountRef:
    name: mytenant
```

5. Click **Save**. It takes a few seconds for the 3scale operator to create the **OpenAPI** CR.

Verification

1. In OpenShift, in the **3scale Product Overview** page, confirm that the *Synced* condition is marked as **True**.
2. Go to your 3scale account.
3. Confirm that the OAS document is present. For the example above, you would see a new OAS document named **openapi1**.

8.6.5. Additional resources

- OpenAPI Specification
- OpenAPI CRD Reference.
- Deploying optional tenants custom resource

8.7. DEPLOYING 3SCALE ACTIVEDOC CUSTOM RESOURCES

Red Hat 3scale API Management ActiveDocs are based on API definition documents that define RESTful web services that conform to the OpenAPI Specification. An **ActiveDoc** custom resource (CR) is one way to import an OpenAPI Specification (OAS) document that you can use for ActiveDocs in the Developer Portal. The OAS is a standard that does not tie you to using one particular programming language for your APIs. Humans and computers can more easily understand the capabilities of the API product without source code access, documentation, or network traffic inspection.

Prerequisites

- A user account with administrator privileges for a 3scale 2.11 On-Premises instance.
- An OAS document that defines your API.

- An understanding of how an **ActiveDoc** CR links to a tenant.

8.7.1. Deploying a 3scale ActiveDoc custom resource that imports an OAS document from a secret

Deploy an **ActiveDoc** custom resource (CR) so that you can create 3scale backends and products.

NOTE

The operator reads only the content in the secret. The operator does not read the field name in the secret. For example, data is structured in **key: value** pairs where **value** represents the content of a file and **key** is the file name. The file name is ignored by the operator in this context of ActiveDoc CRD. The operator reads only the content of the file.

Prerequisites

- You understand How the 3scale operator identifies the tenant that a custom resource links to .
- Define a secret that contains an OAS (OpenAPI Specification) document. For example, you might create the **myoasdoc1.yaml** with this content:

```
openapi: "3.0.2"
info:
  title: "some title"
  description: "some description"
  version: "1.0.0"
paths:
  /pet:
    get:
      operationId: "getPet"
      responses:
        405:
          description: "invalid input"
```

Procedure

1. Create the secret. For example:

```
$ oc create secret generic myoasdoc1 --from-file myoasdoc1.yaml

secret/myoasdoc1 created
```

2. Define your **ActiveDoc** CR. Be sure to specify a reference to the secret that contains your OAS document. For example, you might create the **myactivedoccr1.yaml** file:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: ActiveDoc
metadata:
  name: myactivedoccr1
spec:
  name: "Operated ActiveDoc From secret"
```

```
activeDocOpenAPIRef:
  secretRef:
    name: myoasdoc1
```

3. Create the resource you just defined. For example:

   ```
   $ oc create -f myactivedoccr1.yaml
   ```

   For the given example, the output would be:

   ```
   activedoc.capabilities.3scale.net/myactivedoccr1 created
   ```

Verification

1. Log in to your Red Hat OpenShift Container Platform (OCP) administrator account.
2. Navigate to **Operators > Installed Operators**.
3. Click *Red Hat Integration - 3scale* .
4. Click the *Active Doc* tab.
5. Confirm that the OAS document is present. For the example above, you would see a new OAS document named **myactivedoccr1**.

8.7.2. Features of 3scale ActiveDoc custom resource definitions

The **ActiveDoc** custom resource definition (CRD) concerns product documentation in the **OpenAPI** document format for developers. Knowledge of the **ActiveDoc** CRD deployment features help you with the creation of ActiveDocs for the Developer Portal.

- An **ActiveDoc** CR, can read and OpenAPI document from either of the following:
  - Secret
  - A URL in either **http** or **https** format
- Optionally, you can link the **ActiveDoc** CR with a 3scale product using the **productSystemName** field. The value must be the **system_name** of the 3scale product's CR.
- You can publish or hide the **ActiveDoc** document in 3scale using the **published** field. By default, this is set to be **hidden**.
- You can skip OpenAPI 3.0 validation using the **skipSwaggerValidations** field. By default, the **ActiveDoc** CR is validated.

Additional resources

- Product custom resources related to capabilities
- **ActiveDoc** CRD Reference

8.7.3. Deploying a 3scale ActiveDoc custom resource that imports an OAS document from a URL

You can deploy an **ActiveDoc** custom resource (CR) that imports an OAS (OpenAPI Specification) document from a URL that you specify. You can then use this OAS document as the foundation for ActiveDocs for your API in the Developer Portal.

Prerequisites

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

Procedure

1. In your OpenShift account, navigate to **Operators > Installed operators**.
2. Click the 3scale operator.
3. Click the *Active Doc* tab.
4. Create an **ActiveDoc** CR. For example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: ActiveDoc
metadata:
  name: myactivedoccr1
spec:
  openapiRef:
    url: "https://raw.githubusercontent.com/OAI/OpenAPI-
Specification/master/examples/v3.0/petstore.yaml"
  providerAccountRef:
    name: mytenant
```

5. Optional. For self-managed APIcast, in the **ActiveDoc** CR, set the **productionPublicBaseURL** and **stagingPublicBaseURL** fields to the URLs for your deployment. For example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: ActiveDoc
metadata:
  name: myactivedoccr1
spec:
  openapiRef:
    url: "https://raw.githubusercontent.com/OAI/OpenAPI-
Specification/master/examples/v3.0/petstore.yaml"
  productionPublicBaseURL: "https://production.my-gateway.example.com"
  stagingPublicBaseURL: "https://staging.my-gateway.example.com"
```

6. Click **Save**. It takes a few seconds for the 3scale operator to create the **ActiveDoc** CR.

Verification

1. Log in to your Red Hat OpenShift Container Platform (OCP) administrator account.
2. Navigate to **Operators > Installed Operators**.
3. Click *Red Hat Integration 3scale* .
4. Click the *Active Doc* tab.

5. Confirm that the OAS document is present. For the example above, you would see a new OAS document named **myactivedoccr1**.

8.7.4. Additional resources

- OpenAPI Specification
- **ActiveDoc** CRD Reference
- Deploying optional tenants custom resource

8.8. BACKEND CUSTOM RESOURCES RELATED TO CAPABILITIES

Using Openshift Container Platform in your newly created tenant, you will configure backends, their corresponding metrics, methods, and mapping rules. You will also learn about the status of the backend custom resource, and how the backend is linked to a tenant account.

Prerequisites

The same installation requirements as listed in General prerequisites, with the following consideration:

- The minimum required parameters from the 3scale account are the Admin Portal URL address, and the access token.

8.8.1. Deploying backend custom resources related to capabilities

Using Openshift Container Platform in your newly created tenant, you will configure a new backend.

Procedure

1. In your OpenShift account, navigate to **Installed operators**.
2. Click on the 3scale operator.
3. Under **3scale Backend**, click *Create Instance*.
4. Choose the YAML View.
5. Create a 3scale backend pointing to a specific 3scale Admin URL address:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Backend
metadata:
  name: <your_backend_OpenShift_name>
spec:
  name: "<your_backend_name>"
  privateBaseURL: "<your_admin_portal_URL>"
```

For example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Backend
metadata:
  name: backend-1
```

```
spec:
  name: "My Backend Name"
  privateBaseURL: "https://api.example.com"
```

6. To save your changes, click **Create**.
7. Wait a few seconds to have the backend created both in OpenShift, as well as in your 3scale account. Then, you can perform the following verifications:
    a. Confirm that the backend has been created in OpenShift, by checking in the **3scale Backend Overview** page that the *Synced* condition is marked as **True**.
    b. Go to your 3scale account, and you will see that the backend has been created. In the example above, you will see a new backend called **My Backend Name**.

8.8.2. Defining backend metrics

Using Openshift Container Platform with your newly created 3scale tenant, define desired backend metrics in your backend custom resource.

Consider these observations:

- **metrics** map key names will be used as **system_name**. In the example below: **metric01**, **metric02** and **hits**.
- **metrics** map key names must be unique among all metrics and methods.
- **unit** and **friendlyName** are required fields.
- If you do not add a **hits** metric, this metric will be created by the operator.

Procedure

- Add backend metrics to the new 3scale backend, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Backend
metadata:
  name: backend-1
spec:
  name: "My Backend Name"
  privateBaseURL: "https://api.example.com"
  metrics:
    metric01:
      friendlyName: Metric01
      unit: "1"
    metric02:
      friendlyName: Metric02
      unit: "1"
    hits:
      description: Number of API hits
      friendlyName: Hits
      unit: "hit
```

8.8.3. Defining backend methods

Using Openshift Container Platform with your newly created 3scale tenant, define desired backend methods in your backend custom resource.

Consider these observations:

- **methods** map key names will be used as **system_name**. In the example below: **Method01** and **Method02**.
- **methods** map key names must be unique among all metrics and methods.
- **friendlyName** is a required field.

Procedure

- Add backend methods to the new 3scale backend, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Backend
metadata:
  name: backend-1
spec:
  name: "My Backend Name"
  privateBaseURL: "https://api.example.com"
  methods:
    method01:
      friendlyName: Method01
    method02:
      friendlyName: Method02
```

8.8.4. Defining backend mapping rules

Using Openshift Container Platform with your newly created 3scale tenant, define desired backend mapping rules in your backend custom resource.

Consider these observations:

- **httpMethod**, **pattern**, **increment** and **metricMethodRef** are required fields.
- **metricMethodRef** holds a reference to the existing metric or method map key name **system_name**. In the example below, **hits**.

Procedure

- Add backend mapping rules to the new 3scale backend, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Backend
metadata:
  name: backend-1
spec:
  name: "My Backend Name"
  privateBaseURL: "https://api.example.com"
  mappingRules:
    - httpMethod: GET
      pattern: "/pets"
```

```
        increment: 1
        metricMethodRef: hits
      - httpMethod: GET
        pattern: "/pets/id"
        increment: 1
        metricMethodRef: hits
    metrics:
      hits:
        description: Number of API hits
        friendlyName: Hits
        unit: "hit"
```

8.8.5. Status of the backend custom resource

The *status* field shows resource information useful for the end user. It is not intended to be updated manually and it is synchronized on every change of the resource.

These are the attributes of the *status* field:

- **backendId**: The internal identifier of a 3scale backend.
- **conditions**: Represents the **status.Conditions** Kubernetes common pattern. It has these types, or states:
  - *Invalid*: The combination of configuration in the **BackendSpec** is not supported. This is not a transient error, but indicates a state that must be fixed before progress can be made.
  - *Synced*: The backend has been successfully synchronized.
  - *Failed*: An error occurred during synchronization.
- **observedGeneration**: It is a helper field to confirm that the status information is updated with the latest resource specification.

Example of a synchronized resource:

```
status:
    backendId: 59978
    conditions:
    - lastTransitionTime: "2020-06-22T10:50:33Z"
      status: "False"
      type: Failed
    - lastTransitionTime: "2020-06-22T10:50:33Z"
      status: "False"
      type: Invalid
    - lastTransitionTime: "2020-06-22T10:50:33Z"
      status: "True"
      type: Synced
    observedGeneration: 2
```

8.8.6. The backend custom resource linked to a tenant account

When the 3scale operator finds new 3scale resources, the *LookupProviderAccount* process starts with the purpose of identifying the tenant owning the resource.

The process checks tenant credential sources. If none is found, an error is raised.

The following steps describe how the process verifies the tenant credential sources:

1. Checks credentials from the *providerAccountRef* resource attribute. This is a secret local reference; for instance **mytenant**:

   ```
   apiVersion: capabilities.3scale.net/v1beta1
   kind: Backend
   metadata:
     name: backend-1
   spec:
     name: "My Backend Name"
     privateBaseURL: "https://api.example.com"
     providerAccountRef:
       name: mytenant
   ```

   The **mytenant** secret must have *adminURL* and *token* fields filled with tenant credentials. For example:

   ```
   apiVersion: v1
   kind: Secret
   metadata:
     name: mytenant
   type: Opaque
   stringData:
     adminURL: https://my3scale-admin.example.com:443
     token: "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
   ```

2. Checks the default **threescale-provider-account** secret. For example: **adminURL=https://3scale-admin.example.com** and **token=123456**:

   ```
   oc create secret generic threescale-provider-account --from-literal=adminURL=https://3scale-admin.example.com --from-literal=token=123456
   ```

3. Checks the default provider account in the same namespace of the 3scale deployment: The operator will gather required credentials automatically for the default 3scale tenant (provider account), if the 3scale installation is located in the same namespace as the custom resource.

8.9. PRODUCT CUSTOM RESOURCES RELATED TO CAPABILITIES

Using Openshift Container Platform in your newly created tenant, you will configure products, and their corresponding metrics, methods, application plans, and mapping rules, as well as define product backend usages and link your product to your tenant account.

Prerequisites

The same installation requirements as listed in General prerequisites, with the following consideration:

- The minimum required parameter from the 3scale account is the product name.

8.9.1. Deploying product custom resources related to capabilities

Using Openshift Container Platform in your newly created tenant, you will configure a new product.

8.9.1.1. Deploying a basic product custom resource

Procedure

1. In your OpenShift account, navigate to **Installed operators**.
2. Click on the 3scale operator.
3. Under **3scale Product**, click *Create Instance*.
4. Choose the YAML View.
5. Create a 3scale product:

   ```
   apiVersion: capabilities.3scale.net/v1beta1
   kind: Product
   metadata:
     name: <your_product_OpenShift_name>
   spec:
     name: "<your_product_name>"
   ```

   For example:

   ```
   apiVersion: capabilities.3scale.net/v1beta1
   kind: Product
   metadata:
     name: product1
   spec:
     name: "OperatedProduct 1"
   ```

6. To save your changes, click **Create**.
7. Wait a few seconds to have the product created both in OpenShift, as well as in your 3scale account. Then, you can perform the following verifications:
   a. Confirm that the product has been created in OpenShift, by checking in the **3scale Product Overview** page that the *Synced* condition is marked as **True**.
   b. Go to your 3scale account, and you will see that the product has been created. In the example above, you will see a new product called **OperatedProduct 1**.

Additionally, you can specify the APIcast deployment mode for each product that you create. There are two alternatives:

- APIcast hosted
- APIcast self-managed

8.9.1.2. Deploying a product with APIcast hosted

Configure your product with APIcast hosted:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
```

```
  name: product1
spec:
  name: "OperatedProduct 1"
  deployment:
    apicastHosted: {}
```

8.9.1.3. Deploying a product with APIcast self-managed

Configure your product with APIcast self-managed. In this case, specify a **stagingPublicBaseURL** and a **productionPublicBaseURL**:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  deployment:
    apicastSelfManaged:
      stagingPublicBaseURL: "https://staging.api.example.com"
      productionPublicBaseURL: "https://production.api.example.com"
```

8.9.2. Defining product application plans

Using Openshift Container Platform with your newly created 3scale tenant, define desired application plans in your product custom resource, by using the **applicationPlans** object.

Consider this observation:

- **applicationPlans** map key names will be used as **system_name**. In the example below: **plan01** and **plan02**.

NOTE

setupFee and **costMonth** are generic 3scale concepts. You must enter details for these when you create an application plan in the 3scale user interface. See Configuring an application plan with your pricing rules.

Procedure

- Add application plans to the new 3scale product, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  applicationPlans:
    plan01:
      name: "My Plan 01"
      setupFee: "14.56"
    plan02:
      name: "My Plan 02"
      trialPeriod: 3
      costMonth: 3
```

8.9.3. Defining limits for product application plans

Using Openshift Container Platform with your newly created 3scale tenant, define desired limits for your product application plans, by using the **applicationPlans.limits** list.

Consider these observations:

- **period**, **value** and **metricMethodRef** are required fields.
- The **metricMethodRef** reference can be either a product or a backend reference. Use the optional **backend** field to reference the owner of the backend metric.

Procedure

- Define limits for the application plans of an 3scale product, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  metrics:
    hits:
      description: Number of API hits
      friendlyName: Hits
      unit: "hit"
  applicationPlans:
    plan01:
      name: "My Plan 01"
      limits:
        - period: month
          value: 300
          metricMethodRef:
            systemName: hits
            backend: backendA
        - period: week
          value: 100
          metricMethodRef:
            systemName: hits
```

8.9.4. Defining pricing rules for product application plans

Using Openshift Container Platform with your newly created 3scale tenant, define desired pricing rules for your product application plans, by using the **applicationPlans.pricingRules** list.

Consider these observations:

- **from**, **to**, **pricePerUnit** and **metricMethodRef** are required fields.

- **from** and **to** will be validated. For any rule, values of **from** less than **to** and overlapping ranges for the same metric are not allowed.
- The **metricMethodRef** reference can be either a product or a backend reference. Use the optional **backend** field to reference the owner of the backend metric.

Procedure

- Define pricing rules for the application plans of an 3scale product, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  metrics:
    hits:
      description: Number of API hits
      friendlyName: Hits
      unit: "hit"
  applicationPlans:
    plan01:
      name: "My Plan 01"
      pricingRules:
        - from: 1
          to: 100
          pricePerUnit: "15.45"
          metricMethodRef:
            systemName: hits
        - from: 1
          to: 300
          pricePerUnit: "15.45"
          metricMethodRef:
            systemName: hits
            backend: backendA
```

8.9.5. Defining product authentication using OpenID Connect

You can deploy a **Product** custom resource for a 3scale product that uses OpenID Connect (OIDC) for authentication for any OAuth 2.0 flow. 3scale integrates with third-party Identity Providers (IdP), such as OpenID Connect, to authenticate API requests. For more information about OpenID Connect, see OpenID Connect integration. After integration with a third-party IdP, you will have two types of data to include with the product custom resource:

- **issuerType**: The **keycloak** value when using Red Hat Single Sign-On (RH-SSO) and the **rest** value when integrating with the third-party IdP.
- **issuerEndpoint**: A URL with the necessary credentials in it.

Prerequisites

- You must configure RH-SSO. See Configuring Red Hat Single Sign-On .
- You must Configure HTTP integration with third-party Identity Providers .

NOTE

The credentials **CLIENT_ID** and **CLIENT_CREDENTIALS** provided in **issuerEndpoint** must have sufficient permissions to manage other clients in the realm.

Procedure

1. Determine the endpoint **issuerEndpoint**, which defines the location of your OpenID Provider and use this format in the product custom resource:

```
https://<client_id>:<client_secret>@<host>:<port_number>/auth/realms/<realm_name>`
```

2. Define or update a 3scale **Product** CR that specifies OpenID Connect (OIDC) authentication for any OAuth 2.0 flow. For example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  deployment:
    <any>:
      authentication:
        oidc:
          issuerType: "keycloak"
          issuerEndpoint:
"https://myclientid:myclientsecret@mykeycloack.example.com/auth/realms/myrealm"
          authenticationFlow:
            standardFlowEnabled: false
            implicitFlowEnabled: true
            serviceAccountsEnabled: true
            directAccessGrantsEnabled: true
          jwtClaimWithClientID: "azp"
          jwtClaimWithClientIDType: "plain"
```

3. Create the resource you just defined. For example:

```
oc create -f product1.yaml
```

For the given example, the output would be:

```
product.capabilities.3scale.net/product1 created
```

Additional resources

- Product CRD Reference.

8.9.6. Defining product metrics

Using Openshift Container Platform with your newly created 3scale tenant, define desired metrics in your product custom resource, by using the **metrics** object.

Consider these observations:

- **metrics** map key names will be used as **system_name**. In the example below: **metric01** and **hits**.
- **metrics** map key names must be unique among all metrics and methods.
- **unit** and **friendlyName** are required fields.
- If you do not add a **hits** metric, it will be created by the operator.

Procedure

- Add product metrics to the new 3scale backend, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  metrics:
    metric01:
      friendlyName: Metric01
      unit: "1"
    hits:
      description: Number of API hits
      friendlyName: Hits
      unit: "hit"
```

8.9.7. Defining product methods

Using Openshift Container Platform with your newly created 3scale tenant, define desired methods in your product custom resource, by using the **methods** object.

Consider these observations:

- **methods** map key names will be used as **system_name**. In the example below: **Method01** and **Method02**.
- **methods** map key names must be unique among all metrics and methods.
- **friendlyName** is a required field.

Procedure

- Add methods to the new 3scale product, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  methods:
    method01:
```

```
    friendlyName: Method01
  method02:
    friendlyName: Method02
```

8.9.8. Defining product mapping rules

Using Openshift Container Platform with your newly created 3scale tenant, define desired mapping rules in your product custom resource, by using the **mappingRules** object.

Consider these observations:

- **httpMethod**, **pattern**, **increment** and **metricMethodRef** are required fields.
- **metricMethodRef** holds a reference to the existing metric or method map key name **system_name**. In the example below, **hits**.

Procedure

- Add product mapping rules to the new 3scale backend, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  metrics:
    hits:
      description: Number of API hits
      friendlyName: Hits
      unit: "hit"
  methods:
    method01:
      friendlyName: Method01
  mappingRules:
    - httpMethod: GET
      pattern: "/pets"
      increment: 1
      metricMethodRef: hits
    - httpMethod: GET
      pattern: "/cars"
      increment: 1
      metricMethodRef: method01
```

8.9.9. Defining product backend usage

Using Openshift Container Platform with your newly created 3scale tenant, define desired backends to be added to a product declaratively, by applying the **backendUsages** object.

Consider these observations:

- **path** is a required field.
- **backendUsages** map key names are references to the backend's **system_name**. In the example below: **backendA** and **backendB**.

Procedure

- Add a backend to a product to define its usage declaratively, as in this example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  backendUsages:
    backendA:
      path: /A
    backendB:
      path: /B
```

8.9.10. Configuring gateway responses in 3scale Product custom resources

As a 3scale administrator, you can configure a **Product** custom resource to specify the gateway responses to requests to the exposed API for that API product. After you deploy the CR, 3scale ensures that the gateway returns the responses and error messages you specify.

In a **Product** CR, the **gatewayResponse** object contains the responses that you want the gateway to return.

Procedure

1. In a new or deployed **Product** CR, configure one or more responses in the **gatewayResponse** object. The following example shows response configuration for an Apicast hosted deployment with an authentication mode called **userKey**:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  deployment:
    apicastHosted:
      authentication:
        userkey:
          gatewayResponse:
            errorStatusAuthFailed: 500
            errorHeadersAuthFailed: "text/plain; charset=mycharset"
            errorAuthFailed: "My custom reponse body"
            errorStatusAuthMissing: 500
            errorHeadersAuthMissing: "text/plain; charset=mycharset"
            errorAuthMissing: "My custom reponse body"
            errorStatusNoMatch: 501
            errorHeadersNoMatch: "text/plain; charset=mycharset"
            errorNoMatch: "My custom reponse body"
            errorStatusLimitsExceeded: 502
            errorHeadersLimitsExceeded: "text/plain; charset=mycharset"
            errorLimitsExceeded: "My custom reponse body"
```

2. Deploy the **Product** CR that contains the gateway responses. For example, if you updated the **product1.yaml** file, you would run the following command:

```
oc create -f product1.yaml
```

   For the given example, the output would be:

```
product.capabilities.3scale.net/product1 created
```

8.9.11. Configuring policy chains in 3scale Product custom resources

As a 3scale administrator, you can configure a **Product** custom resource to specify the policy chain that you want to apply to that API product. After you deploy the CR, 3scale applies the configured policies to requests to the product's upstream, exposed API.

Procedure

1. In a new or deployed **Product** CR, configure one or more policies in the **policies** object. For example:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: Product
metadata:
  name: product1
spec:
  name: "OperatedProduct 1"
  policies:
  - configuration:
      http_proxy: http://example.com
      https_proxy: https://example.com
    enabled: true
    name: camel
    version: builtin
  - configuration: {}
    enabled: true
    name: apicast
    version: builtin
```

   For each policy, specify these fields:

   - **configuration** is a pair of empty braces when a policy has no parameters. When a policy has parameters, specify them here. For the names of any parameters that you need to specify, see the documentation for the relevant policy in Administering the API Gateway, APIcast standard policies.
   - **enabled** is a Boolean switch for turning the policy on or off.
   - **name** identifies the policy. This is a unique name in the scope of the tenant that the **Product** custom resource links to. To identify policy names, see the documentation for the relevant policy in Administering the API Gateway, APIcast standard policies .
   - **version** is **builtin** for standard policies or a user-defined string for custom policies. For example, you could set the version of a custom policy to **1.0**.
     If a **Product** CR does not specify the **apicast** policy, the operator adds it.

If a policy chain is already defined in the Admin Portal, you can run the 3scale toolbox **export** command to export the policy chain in **.yaml** format. You can paste the **export** output into a **Product** CR. For example, if **api-provider-account-one** is the name of your 3scale provider account, and **my-api-product-one** is the name of the product whose policy chain you want to export, you would run the following command:

```
3scale policies export api-provider-account-one my-api-product-one
```

2. Deploy the **Product** CR that contains the policy chain. For example, if you updated the **product1.yaml** file, you would run the following command:

```
oc create -f product1.yaml
```

For the given example, the output would be:

```
product.capabilities.3scale.net/product1 created
```

8.9.12. Status of the product custom resource

The *status* field shows resource information useful for the end user. It is not intended to be updated manually and it is synchronized on every change of the resource.

These are the attributes of the *status* field:

- **productId**: The internal identifier of a 3scale product.
- **conditions**: Represents the **status.Conditions** Kubernetes common pattern. It has these types, or states:
  - *Failed*: An error occurred during synchronization. The operation will retry.
  - *Synced*: The product has been successfully synchronized.
  - *Invalid*: Invalid object. This is not a transient error, but it reports about an invalid specification and it should be changed. The operator will not retry.
  - *Orphan*: The specification references a resource that does not exist. The operator will retry.
- **observedGeneration**: Confirms that the status information is updated with the latest resource specification.
- **state**: The 3scale product internal state read from the 3scale API.
- **providerAccountHost**: The 3scale provider account URL to which the backend is synchronized.

Example of a synchronized resource:

```
status:
  conditions:
  - lastTransitionTime: "2020-10-21T18:07:01Z"
    status: "False"
    type: Failed
  - lastTransitionTime: "2020-10-21T18:06:54Z"
    status: "False"
    type: Invalid
```

```
- lastTransitionTime: "2020-10-21T18:07:01Z"
  status: "False"
  type: Orphan
- lastTransitionTime: "2020-10-21T18:07:01Z"
  status: "True"
  type: Synced
observedGeneration: 1
productId: 2555417872138
providerAccountHost: https://3scale-admin.example.com
state: incomplete
```

8.9.13. The product custom resource linked to a tenant account

When the 3scale operator finds new 3scale resources, the *LookupProviderAccount* process starts with the purpose of identifying the tenant owning the resource.

The process checks tenant credential sources. If none is found, an error is raised.

The following steps describe how the process verifies the tenant credential sources:

1. Checks credentials from the *providerAccountRef* resource attribute. This is a secret local reference; for instance **mytenant**:

   ```
   apiVersion: capabilities.3scale.net/v1beta1
   kind: Product
   metadata:
     name: product1
   spec:
     name: "OperatedProduct 1"
     providerAccountRef:
       name: mytenant
   ```

   The **mytenant** secret must have *adminURL* and *token* fields filled with tenant credentials. For example:

   ```
   apiVersion: v1
   kind: Secret
   metadata:
     name: mytenant
   type: Opaque
   stringData:
     adminURL: https://my3scale-admin.example.com:443
     token: "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
   ```

2. Checks the default **threescale-provider-account** secret. For example: **adminURL=https://3scale-admin.example.com** and **token=123456**:

   ```
   oc create secret generic threescale-provider-account --from-literal=adminURL=https://3scale-admin.example.com --from-literal=token=123456
   ```

3. Checks the default provider account in the same namespace of the 3scale deployment: The operator will gather required credentials automatically for the default 3scale tenant (provider account), if the 3scale installation is located in the same namespace as the custom resource.

8.10. DEPLOYING 3SCALE CUSTOMPOLICYDEFINITION CUSTOM RESOURCES

You can use a **CustomPolicyDefinition** CRD to configure your custom policy in a 3scale product from the Admin Portal.

When the 3scale operator finds a new **CustomPolicyDefinition** CR, the operator identifies the tenant that owns the CR as described in How the 3scale operator identifies the tenant that a custom resource links to.

Prerequisites

- The 3scale operator is installed.
- You have a custom policy file ready to be deployed.
- You have already injected the custom policy in the gateway.

Procedure

1. Define a **CustomPolicyDefinition** custom resource and save it in, for example, the **my-apicast-custom-policy-definition.yaml** file:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: CustomPolicyDefinition
metadata:
  name: custompolicydefinition-sample
spec:
  version: "0.1"
  name: "APIcast Example Policy"
  schema:
    name: "APIcast Example Policy"
    version: "0.1"
    $schema: "http://apicast.io/policy-v1/schema#manifest#"
    summary: "This is just an example."
    configuration:
      type: object
      properties: {}
```

2. Deploy the **CustomPolicyDefinition** CR:

```
oc create -f my-apicast-custom-policy-definition.yaml
```

Additional resources

- **CustomPolicyDefinition** CRD Reference.

8.11. DEPLOYING A TENANT CUSTOM RESOURCE

A tenant custom resource is also known as the *Provider Account*.

Creating the APIManager custom resource indicates the operator to deploy 3scale. A default 3scale installation includes a default tenant ready to be used. Optionally, you may create other tenants creating tenant custom resource objects.

Prerequisites

To deploy a new tenant in your 3scale instance, you need some preparation steps:

1. Obtain or create the 3scale master credentials secret: MASTER_SECRET
   You can perform tenant management tasks by only using the 3scale master account credentials, preferably an access token. You have the following options:

   - If the tenant resource is created in the same namespace as 3scale, the secret with master account credentials has been created already and it is called **system-seed**.
   - If the tenant resource is not created in the same namespace as 3scale, create a secret with the master account credentials. In this command, the name of the secret is optional. The secret name will be used in the tenant custom resource:

     ```
     oc create secret generic system-seed --from-literal=MASTER_ACCESS_TOKEN=
     <master access token>
     ```

2. Create a new secret to store the password for the admin account of the new tenant: ADMIN_SECRET. In this command, the name of the secret is optional. The secret name will be used in the tenant custom resource.

   ```
   oc create secret generic ecorp-admin-secret --from-literal=admin_password=<admin
   password value>
   ```

3. Get the 3scale master account hostname: MASTER_HOSTNAME. When you deploy 3scale using the operator, the master account has a fixed URL with this pattern: **master.${wildcardDomain}**

   - If you have access to the namespace where 3scale is installed, get the master account hostname:

     ```
     oc get routes --field-selector=spec.to.name==system-master -o jsonpath="
     {.items[].spec.host}"
     ```

Procedure

1. Deploy the new tenant custom resource:

   ```
   apiVersion: capabilities.3scale.net/v1alpha1
   kind: Tenant
   metadata:
     name: ecorp-tenant
   spec:
     username: admin
     systemMasterUrl: https://<MASTER_HOSTNAME>
     email: admin@ecorp.com
     organizationName: ECorp
     masterCredentialsRef:
       name: <MASTER_SECRET>
     passwordCredentialsRef:
       name: <ADMIN_SECRET*>
     tenantSecretRef:
       name: tenant-secret
   ```

2. Create the tenant resource:

```
oc create -f <yaml-name>
```

- This command triggers the creation of a new tenant in your 3scale solution.
- The 3scale operator will create a new secret and store the new tenant credentials in the secret.
- The new tenant **provider_key** and **admin domain url** will be stored in a secret.
- The secret location can be specified using the **tenantSecretRef** tenant specification key.

As a reference, this is an example of the created secret content:

```
apiVersion: v1
kind: Secret
metadata:
  name: tenant-secret
type: Opaque
stringData:
  adminURL: https://my3scale-admin.example.com:443
  token: "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
```

For more details about the fields of tenant custom resource and possible values, see the Tenant CRD Reference.

8.12. MANAGING 3SCALE DEVELOPERS BY DEPLOYING CUSTOM RESOURCES

As a 3scale administrator, you can use custom resources (CRs) to deploy developer accounts that group together individual developer users. These accounts let you organize and manage developer access to 3scale-managed APIs in the Developer Portal.

A tenant can contain any number of developer accounts and each developer account links to exactly one tenant. A developer account can contain any number of developer users and each developer user links to exactly one developer account. The tenant plan determines any limits on how many developer accounts you can create and how many developer users can be grouped in each developer account.

To use developer custom resources, 3scale must have been installed by the 3scale operator. You can deploy developer custom resources in only the namespace that contains the 3scale operator. Deployment of developer custom resources is an alternative to managing developers by using the 3scale Admin Portal or the 3scale internal API.

IMPORTANT

When you create developer accounts or developer users by deploying custom resources you cannot use the Admin Portal or the internal 3scale API to update those developer accounts or developer users. It is important to be aware of this because after you deploy a developer CR, the Admin Portal displays the new developer account or new developer user in its **Accounts** page. If you try to use the Admin Portal or API to update a developer account or developer user that was deployed with a CR, the 3scale operator reverts the changes to reflect the deployed CR. This is a limitation that is expected to be removed in a future release. You can, however, use the Admin Portal or API to delete a developer account or developer user that you created by deploying a CR.

8.12.1. Prerequisites

- 3scale was installed by the 3scale operator.
- Access token with read and write permissions in the **Account Management** API scope, which provides administrator privileges for 3scale.

8.12.2. Managing 3scale developer accounts by deploying DeveloperAccount custom resources

When you use the 3scale operator to install 3scale you can deploy **DeveloperAccount** and **DeveloperUser** custom resources (CRs). These CRs let you create and update accounts for developer access to 3scale-managed APIs in the Developer Portal.

To deploy a new **DeveloperAccount** CR, you must also deploy a **DeveloperUser** CR for a user who has the **admin** role. The procedure provided here is for deploying a new **DeveloperAccount** CR. After you deploy a **DeveloperAccount** CR, the procedure for updating or deleting it is the same as for any other CR.

You can deploy CRs only in the namespace that contains the 3scale operator.

Prerequisites

- An understanding of how the 3scale operator identifies the tenant that a custom resource links to.
- If you are creating a **DeveloperAccount** custom resource that does not link to the default tenant in the 3scale instance that is in the same namespace then the namespace that will contain the **DeveloperAccount** CR contains a secret that identifies the tenant that the **DeveloperAccount** CR links to. The name of the secret is one of the following:
  - **threescale-provider-account**
  - User defined

  This secret contains the URL for a 3scale instance and a token that contains credentials for access to one tenant in that 3scale instance.
- You have the user name, password, and email address for at least one developer user who will have the **admin** role in the new **DeveloperAccount** CR.

Procedure

1. In the namespace that contains the 3scale operator, create and save a resource file that defines a secret that contains the user name and password for a developer user who will have the **admin** role in the new developer account resource. For example, the **myusername01.yaml** file might contain:

   ```
   apiVersion: v1
   kind: Secret
   metadata:
     name: myusername01
   stringData:
     password: "123456"
   ```

2. Create the secret. For example:

```
oc create -f myusername01.yaml
```

For the given example, the output would be:

```
secret/myusername01 created
```

3. Create and save a **.yaml** file that defines a **DeveloperUser** CR for a developer who has the **admin** role. This **DeveloperUser** CR is required for the 3scale operator to deploy a new **DeveloperAccount** CR. For example, the **developeruser01.yaml** file might contain:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: DeveloperUser
metadata:
  name: developeruser01
spec:
  username: myusername01
  email: myusername01@example.com
  passwordCredentialsRef:
    name: myusername01
  role: admin
  developerAccountRef:
    name: developeraccount1
  providerAccountRef:
    name: mytenant
```

In a **DeveloperUser** CR:

- The developer user account name, user name, and email must be unique in the tenant that the containing **DeveloperAccount** links to.
- The developer account name that you specify here must match the name of the **DeveloperAccount** CR that you are deploying in this procedure. It does not matter whether you create the **DeveloperAccount** CR before or after you create this **DeveloperUser** CR.
- The tenant that a **DeveloperUser** CR links to must be the same tenant that the specified **DeveloperAccount** CR links to.

4. Create the resource you just defined. For example:

```
oc create -f developeruser01.yaml
```

For the given example, the output would be:

```
developeruser.capabilities.3scale.net/developeruser01 created
```

5. Create and save a **.yaml** file that defines a **DeveloperAccount** CR. In this **.yaml** file, the **spec.OrgName** field must specify an organization name. For example, the **developeraccount01.yaml** file might contain:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: DeveloperAccount
metadata:
  name: developeraccount01
spec:
  orgName: Ecorp
  providerAccountRef:
    name: mytenant
```

6. Create the resource you just defined. For example:

   ```
   oc create -f developeraccount01.yaml
   ```

   For the given example, the output would be:

   ```
   developeraccount.capabilities.3scale.net/developeraccount01 created
   ```

Next steps

It takes a few seconds for the 3scale operator to update the 3scale configuration to reflect new or updated custom resources. To check whether the operator is propagating custom resource information successfully, check the **DeveloperAccount** custom resource **status** field or run the **oc wait** command, for example:

```
oc wait --for=condition=Ready --timeout=30s developeraccount/developeraccount1
```

In case of failure, the custom resource's **status** field indicates if the error is transient or permanent, and provides an error message that helps fix the problem.

Notify any new developer users that they can log in to the Developer Portal. You might also need to communicate their log-in credentials.

You can update or delete a deployed **DeveloperAccount** custom resource in the same way that you update or delete any other custom resource. However, when you delete a **DeveloperAccount** CR, the 3scale operator does not actually delete it. If you try to deploy a new **DeveloperAccount** CR that has the same name as a **DeveloperAccount** CR that you deleted, you receive a message that a **DeveloperAccount** CR with that name already exists. You must specify a different name for the new **DeveloperAccount** CR.

Additional resources

- DeveloperAccount CRD Reference
- DeveloperUser CRD Reference

8.12.3. Managing 3scale developer users by deploying DeveloperUser custom resources

When you use the 3scale operator to install 3scale you can deploy **DeveloperUser** custom resources (CRs) for managing developer access to 3scale-managed APIs in the Developer Portal. The procedure provided here is for deploying a new **DeveloperUser** CR. After you deploy a **DeveloperUser** CR, the procedure for updating or deleting it is the same as for any other CR.

You can deploy CRs only in the namespace that contains the 3scale operator.

Prerequisites

- An understanding of how the 3scale operator identifies the tenant that a custom resource links to.

- There is at least one deployed **DeveloperAccount** custom resource that contains at least one deployed **DeveloperUser** CR for a user who has the **admin** role. If you are creating a **DeveloperUser** custom resource that does not link to the default tenant in the 3scale instance that is in the same namespace then the namespace that will contain the **DeveloperUser** CR contains a secret that identifies the tenant that the **DeveloperUser** CR links to. The name of the secret is one of the following:
  - **threescale-provider-account**
  - User defined

  This secret contains the URL for a 3scale instance and a token that contains credentials for access to one tenant in that 3scale instance.
- For a new **DeveloperUser** custom resource, you have that developer's user name, password, and email address.

Procedure

1. In the namespace that contains the 3scale operator, create and save a resource file that defines a secret that contains the user name and password for a developer user. For example, the **myusername02.yaml** file might contain:

```
apiVersion: v1
kind: Secret
metadata:
  name: myusername02
stringData:
  password: "987654321"
```

2. Create the secret. For example:

```
oc create -f myusername02.yaml
```

   For the given example, the output would be:

```
secret/myusername02 created
```

3. Create and save a **.yaml** file that defines a **DeveloperUser** CR. In the **spec.role** field, specify **admin** or **member**. For example, the **developeruser02.yaml** file might contain:

```
apiVersion: capabilities.3scale.net/v1beta1
kind: DeveloperUser
metadata:
  name: developeruser02
spec:
  username: myusername02
  email: myusername02@example.com
  passwordCredentialsRef:
    name: myusername02
  role: member
  developerAccountRef:
    name: developeraccount1
  providerAccountRef:
    name: mytenant
```

In a **DeveloperUser** CR:

- The developer user name (specified in the **metadata.name** field), the user name, and email must be unique in the tenant that the containing **DeveloperAccount** links to.
- The **developerAccountRef** field must specify the name of a deployed **DeveloperAccount** CR.
- The tenant that a **DeveloperUser** CR links to must be the same tenant that the specified **DeveloperAccount** CR links to.

4. Create the resource you just defined. For example:

```
oc create -f developefuser02.yaml
```

For the given example, the output would be:

```
developeruser.capabilities.3scale.net/developeruser02 created
```

Next steps

It takes a few seconds for the 3scale operator to update the 3scale configuration to reflect new or updated custom resources. To check whether the operator is propagating custom resource information successfully, check the **DeveloperUser** custom resource **status** field or run the **oc wait** command, for example:

```
oc wait --for=condition=Ready --timeout=30s developeruser/developeruser02
```

In case of failure, the custom resource's **status** field indicates if the error is transient or permanent, and provides an error message that helps fix the problem.

Notify any new developer users that they can log in to the Developer Portal. You might also need to communicate their log-in credentials.

You can update or delete a deployed **DeveloperUser** custom resource in the same way that you update or delete any other custom resource. However, when you delete a **DeveloperUser** CR, the 3scale operator does not actually delete it. If you try to deploy a new **DeveloperUser** CR that has the same account name, user name, or email as a **DeveloperUser** CR that you deleted, you receive a message that the **DeveloperUser** CR already exists. You must specify a different developer user account name, user name, or email for the new **DeveloperUser** CR.

Additional resources

- DeveloperUser CRD Reference

8.13. LIMITATIONS OF 3SCALE OPERATOR CAPABILITIES

In Red Hat 3scale API Management 2.11, 3scale operator contains these limitations with capabilities:

- Deletion of a backend custom resource definition (CRD) is not reconciled: existing backends in 3scale will not be deleted.
- Deletion of a product CRD is not reconciled: existing products in 3scale will not be deleted.
- Deletion of **DeveloperAccount** or **DeveloperUser** custom resources is not reconciled. While

the operator receives the deletion event, the operator does not act on the event. The developer account or developer user remains. If you try to create a new developer account or developer user with the same account name, username or email address as a custom resource that you deleted, you receive an error that the account already exists. You must specify different parameters to create the account.

- Product CRD does not support Single Sign-On (SSO) authentication for the Admin and Developer portals.
- Product CRD does not support OpenID Connect authentication .
- ActiveDocs CRD not currently available.
- Gateway Policy CRD not currently available.
- Product CRD Gateway does not support response custom code and errors
- 3scale operator CRD holding OAS3 does not reference as source of truth for 3scale product configuration.

8.14. ADDITIONAL RESOURCES

For more information, check the following guides:

- Backend CRD Reference
- Product CRD Reference
- CustomPolicyDefinition CRD Reference
- Tenant CRD Reference

CHAPTER 9. 3SCALE BACKUP AND RESTORE

This section provides you, as the administrator of a Red Hat 3scale API Management installation, the information needed to:

- Set up the backup procedures for persistent data.
- Perform a restore from backup of the persistent data.

In case of issues with one or more of the MySQL databases, you will be able to restore 3scale correctly to its previous operational state.

9.1. PREREQUISITES

- A 3scale 2.11 instance. For more information about how to install 3scale, see Installing 3scale on OpenShift.
- jq: For extraction or transformation of JSON data.
- An OpenShift Container Platform 4.x user account with one of the following roles in the OpenShift cluster:
  - cluster-admin
  - admin
  - edit

NOTE

A user with an *edit* cluster role locally binded in the namespace of a 3scale installation can perform backup and restore procedures.

The following sections contain information about persistent volumes, using data sets, setting up the backup procedures for persistent data, as well as restoring system databases and OpenShift secrets:

- Section 9.2, “Persistent volumes and considerations”
- Section 9.3, “Using data sets”
- Section 9.4, “Backing up system databases”
- Section 9.5, “Restoring system databases”

9.2. PERSISTENT VOLUMES AND CONSIDERATIONS

Persistent volumes

In a 3scale deployment on OpenShift:

- A persistent volume (PV) provided to the cluster by the underlying infrastructure.
- Storage service external to the cluster. This can be in the same data center or elsewhere.

Considerations

The backup and restore procedures for persistent data vary depending on the storage type in use. To ensure the backups and restores preserve data consistency, it is not sufficient to backup the underlying PVs for a database. For example, do not capture only partial writes and partial transactions. Use the database's backup mechanisms instead.

Some parts of the data are synchronized between different components. One copy is considered the *source of truth* for the data set. The other is a copy that is not modified locally, but synchronized from the *source of truth*. In these cases, upon completion, the *source of truth* should be restored, and copies in other components synchronized from it.

9.3. USING DATA SETS

This section explains in more detail about different data sets in the different persistent stores, their purpose, the storage type used, and whether or not it is the *source of truth*.

The full state of a 3scale deployment is stored across the following **DeploymentConfig** objects and their PVs:

Name	Description
system-mysql	MySQL database (**mysql-storage**)
system-storage	Volume for Files
backend-redis	Redis database (**backend-redis-storage**)
system-redis	Redis database (**system-redis-storage**)

9.3.1. Defining system-mysql

system-mysql is a relational database which stores information about users, accounts, APIs, plans, and more, in the 3scale Admin Console.

A subset of this information related to services is synchronized to the **Backend** component and stored in **backend-redis**. **system-mysql** is the *source of truth* for this information.

9.3.2. Defining system-storage

NOTE

System can be scaled horizontally with multiple pods uploading and reading said static files, hence the need for a ReadWriteMany (RWX) **PersistentVolume**

system-storage stores files to be read and written by the **System** component.

They fall into two categories:

- Configuration files read by the **System** component at run-time
- Static files, for example, *HTML, CSS, JS*, uploaded to system by its CMS feature, for the purpose of creating a Developer Portal

NOTE

System can be scaled horizontally with multiple pods uploading and reading said static files, hence the need for a ReadWriteMany (RWX) **PersistentVolume**.

9.3.3. Defining **backend-redis**

backend-redis contains multiple data sets used by the **Backend** component:

- **Usages**: This is API usage information aggregated by **Backend**. It is used by **Backend** for rate-limiting decisions and by **System** to display analytics information in the UI or via API.
- **Config**: This is configuration information about services, rate-limits, and more, that is synchronized from **System** via an internal API. This is not the *source of truth* of this information, however **System** and **system-mysql** is.
- **Queues**: This is queues of background jobs to be executed by worker processes. These are ephemeral and are deleted once processed.

9.3.4. Defining **system-redis**

system-redis contains queues for jobs to be processed in background. These are ephemeral and are deleted once processed.

9.4. BACKING UP SYSTEM DATABASES

The following commands are in no specific order and can be used as you need them to back up and archive system databases.

9.4.1. Backing up **system-mysql**

Execute MySQL Backup Command:

```
oc rsh $(oc get pods -l 'deploymentConfig=system-mysql' -o json | jq -r '.items[0].metadata.name')
bash -c 'export MYSQL_PWD=${MYSQL_ROOT_PASSWORD}; mysqldump --single-transaction -
hsystem-mysql -uroot system' | gzip > system-mysql-backup.gz
```

9.4.2. Backing up **system-storage**

Archive the **system-storage** files to another storage:

```
oc rsync $(oc get pods -l 'deploymentConfig=system-app' -o json | jq '.items[0].metadata.name' -
r):/opt/system/public/system ./local/dir
```

9.4.3. Backing up **backend-redis**

Backup the **dump.rdb** file from redis:

```
oc cp $(oc get pods -l 'deploymentConfig=backend-redis' -o json | jq '.items[0].metadata.name' -
r):/var/lib/redis/data/dump.rdb ./backend-redis-dump.rdb
```

9.4.4. Backing up system-redis

Backup the **dump.rdb** file from redis:

```
oc cp $(oc get pods -l 'deploymentConfig=system-redis' -o json | jq '.items[0].metadata.name' -
r):/var/lib/redis/data/dump.rdb ./system-redis-dump.rdb
```

9.4.5. Backing up zync-database

Backup the **zync_production** database:

```
oc rsh $(oc get pods -l 'deploymentConfig=zync-database' -o json | jq -r '.items[0].metadata.name')
bash -c 'pg_dump zync_production' | gzip > zync-database-backup.gz
```

9.4.6. Backing up OpenShift secrets and ConfigMaps

The following is the list of commands for OpenShift secrets and ConfigMaps:

9.4.6.1. OpenShift secrets

```
oc get secrets system-smtp -o json > system-smtp.json
oc get secrets system-seed -o json > system-seed.json
oc get secrets system-database -o json > system-database.json
oc get secrets backend-internal-api -o json > backend-internal-api.json
oc get secrets system-events-hook -o json > system-events-hook.json
oc get secrets system-app -o json > system-app.json
oc get secrets system-recaptcha -o json > system-recaptcha.json
oc get secrets system-redis -o json > system-redis.json
oc get secrets zync -o json > zync.json
oc get secrets system-master-apicast -o json > system-master-apicast.json
```

9.4.6.2. ConfigMaps

```
oc get configmaps system-environment -o json > system-environment.json
oc get configmaps apicast-environment -o json > apicast-environment.json
```

9.5. RESTORING SYSTEM DATABASES

IMPORTANT

Prevent record creation by scaling down pods like **system-app** or disabling routes.

Use the following procedures to restore OpenShift secrets and system databases:

- Restoring a template-based deployment .
- Restoring an operator-based deployment .
- Restoring **system-mysql**.
- Restoring **system-storage**.

- Restoring **zync-database**.
- Ensuring information consistency between **Backend** and **System**.

9.5.1. Restoring a template-based deployment

Use the following steps to restore a template-based deployment.

Procedure

1. Restore secrets before creating deploying template.:

```
oc apply -f system-smtp.json
```

1. Template parameters will be read from copied secrets and configmaps:

```
oc new-app --file /opt/amp/templates/amp.yml \
   --param APP_LABEL=$(cat system-environment.json | jq -r '.metadata.labels.app') \
   --param TENANT_NAME=$(cat system-seed.json | jq -r '.data.TENANT_NAME' | base64 -
d) \
   --param SYSTEM_DATABASE_USER=$(cat system-database.json | jq -r
'.data.DB_USER' | base64 -d) \
   --param SYSTEM_DATABASE_PASSWORD=$(cat system-database.json | jq -r
'.data.DB_PASSWORD' | base64 -d) \
   --param SYSTEM_DATABASE=$(cat system-database.json | jq -r '.data.URL' | base64 -d
| cut -d '/' -f4) \
   --param SYSTEM_DATABASE_ROOT_PASSWORD=$(cat system-database.json | jq -r
'.data.URL' | base64 -d | awk -F '[:@]' '{print $3}') \
   --param WILDCARD_DOMAIN=$(cat system-environment.json | jq -r
'.data.THREESCALE_SUPERDOMAIN') \
   --param SYSTEM_BACKEND_USERNAME=$(cat backend-internal-api.json | jq
'.data.username' -r | base64 -d) \
   --param SYSTEM_BACKEND_PASSWORD=$(cat backend-internal-api.json | jq
'.data.password' -r | base64 -d) \
   --param SYSTEM_BACKEND_SHARED_SECRET=$(cat system-events-hook.json | jq -r
'.data.PASSWORD' | base64 -d) \
   --param SYSTEM_APP_SECRET_KEY_BASE=$(cat system-app.json | jq -r
'.data.SECRET_KEY_BASE' | base64 -d) \
   --param ADMIN_PASSWORD=$(cat system-seed.json | jq -r '.data.ADMIN_PASSWORD'
| base64 -d) \
   --param ADMIN_USERNAME=$(cat system-seed.json | jq -r '.data.ADMIN_USER' |
base64 -d) \
   --param ADMIN_EMAIL=$(cat system-seed.json | jq -r '.data.ADMIN_EMAIL' | base64 -d) \
   --param ADMIN_ACCESS_TOKEN=$(cat system-seed.json | jq -r
'.data.ADMIN_ACCESS_TOKEN' | base64 -d) \
   --param MASTER_NAME=$(cat system-seed.json | jq -r '.data.MASTER_DOMAIN' |
base64 -d) \
   --param MASTER_USER=$(cat system-seed.json | jq -r '.data.MASTER_USER' | base64 -
d) \
   --param MASTER_PASSWORD=$(cat system-seed.json | jq -r
'.data.MASTER_PASSWORD' | base64 -d) \
   --param MASTER_ACCESS_TOKEN=$(cat system-seed.json | jq -r
'.data.MASTER_ACCESS_TOKEN' | base64 -d) \
   --param RECAPTCHA_PUBLIC_KEY="$(cat system-recaptcha.json | jq -r
'.data.PUBLIC_KEY' | base64 -d)" \
   --param RECAPTCHA_PRIVATE_KEY="$(cat system-recaptcha.json | jq -r
'.data.PRIVATE_KEY' | base64 -d)" \
   --param SYSTEM_REDIS_URL=$(cat system-redis.json | jq -r '.data.URL' | base64 -d) \
   --param SYSTEM_MESSAGE_BUS_REDIS_URL="$(cat system-redis.json | jq -r
'.data.MESSAGE_BUS_URL' | base64 -d)" \
   --param SYSTEM_REDIS_NAMESPACE="$(cat system-redis.json | jq -r
'.data.NAMESPACE' | base64 -d)" \
   --param SYSTEM_MESSAGE_BUS_REDIS_NAMESPACE="$(cat system-redis.json | jq -
r '.data.MESSAGE_BUS_NAMESPACE' | base64 -d)" \
   --param ZYNC_DATABASE_PASSWORD=$(cat zync.json | jq -r
'.data.ZYNC_DATABASE_PASSWORD' | base64 -d) \
   --param ZYNC_SECRET_KEY_BASE=$(cat zync.json | jq -r '.data.SECRET_KEY_BASE'
| base64 -d) \
   --param ZYNC_AUTHENTICATION_TOKEN=$(cat zync.json | jq -r
'.data.ZYNC_AUTHENTICATION_TOKEN' | base64 -d) \
   --param APICAST_ACCESS_TOKEN=$(cat system-master-apicast.json | jq -r
'.data.ACCESS_TOKEN' | base64 -d) \
   --param APICAST_MANAGEMENT_API=$(cat apicast-environment.json | jq -r
'.data.APICAST_MANAGEMENT_API') \
   --param APICAST_OPENSSL_VERIFY=$(cat apicast-environment.json | jq -r
'.data.OPENSSL_VERIFY') \
   --param APICAST_RESPONSE_CODES=$(cat apicast-environment.json | jq -r
'.data.APICAST_RESPONSE_CODES') \
   --param APICAST_REGISTRY_URL=$(cat system-environment.json | jq -r
'.data.APICAST_REGISTRY_URL')
```

9.5.2. Restoring an operator-based deployment

Use the following steps to restore operator-based deployments.

Procedure

1. Install the 3scale operator on OpenShift.
2. Restore secrets before creating an APIManager resource:

   ```
   oc apply -f system-smtp.json
   oc apply -f system-seed.json
   oc apply -f system-database.json
   oc apply -f backend-internal-api.json
   oc apply -f system-events-hook.json
   oc apply -f system-app.json
   oc apply -f system-recaptcha.json
   oc apply -f system-redis.json
   oc apply -f zync.json
   oc apply -f system-master-apicast.json
   ```

3. Restore ConfigMaps before creating an APIManager resource:

   ```
   oc apply -f system-environment.json
   oc apply -f apicast-environment.json
   ```

4. Deploy 3scale with the operator using the *APIManager* custom resource.

9.5.3. Restoring system-mysql

Procedure

1. Copy the MySQL dump to the system-mysql pod:

```
oc cp ./system-mysql-backup.gz $(oc get pods -l 'deploymentConfig=system-mysql' -o json |
jq '.items[0].metadata.name' -r):/var/lib/mysql
```

2. Decompress the backup file:

```
oc rsh $(oc get pods -l 'deploymentConfig=system-mysql' -o json | jq -r
'.items[0].metadata.name') bash -c 'gzip -d ${HOME}/system-mysql-backup.gz'
```

3. Restore the MySQL DB Backup file:

```
oc rsh $(oc get pods -l 'deploymentConfig=system-mysql' -o json | jq -r
'.items[0].metadata.name') bash -c 'export MYSQL_PWD=${MYSQL_ROOT_PASSWORD};
mysql -hsystem-mysql -uroot system < ${HOME}/system-mysql-backup'
```

9.5.4. Restoring system-storage

Restore the Backup file to system-storage:

```
oc rsync ./local/dir/system/ $(oc get pods -l 'deploymentConfig=system-app' -o json | jq
'.items[0].metadata.name' -r):/opt/system/public/system
```

9.5.5. Restoring zync-database

Instructions to restore **zync-database** depend on the deployment type applied for 3scale.

9.5.5.1. Template-based deployments

Procedure

1. Scale down the zync DeploymentConfig to 0 pods:

```
oc scale dc zync --replicas=0
oc scale dc zync-que --replicas=0
```

2. Copy the Zync database dump to the **zync-database** pod:

```
oc cp ./zync-database-backup.gz $(oc get pods -l 'deploymentConfig=zync-database' -o json
| jq '.items[0].metadata.name' -r):/var/lib/pgsql/
```

3. Decompress the backup file:

```
oc rsh $(oc get pods -l 'deploymentConfig=zync-database' -o json | jq -r
'.items[0].metadata.name') bash -c 'gzip -d ${HOME}/zync-database-backup.gz'
```

4. Restore the PostgreSQL DB backup file:

```
oc rsh $(oc get pods -l 'deploymentConfig=zync-database' -o json | jq -r
'.items[0].metadata.name') bash -c 'psql -f ${HOME}/zync-database-backup'
```

5. Restore to the original count of replicas, by replacing **${ZYNC_REPLICAS}** with the number of replicas, in the commands below:

```
oc scale dc zync --replicas=${ZYNC_REPLICAS}
oc scale dc zync-que --replicas=${ZYNC_REPLICAS}
```

9.5.5.2. Operator-based deployments

NOTE

Follow the instructions under Deploying 3scale using the operator, in particular Deploying the *APIManager* custom resource to redeploy your 3scale instance.

Procedure

1. Store the number of replicas, by replacing **${DEPLOYMENT_NAME}** with the name you defined when you created your 3scale deployment:

```
ZYNC_SPEC=`oc get APIManager/${DEPLOYMENT_NAME} -o json | jq -r '.spec.zync'`
```

2. Scale down the zync DeploymentConfig to 0 pods:

```
oc patch APIManager/${DEPLOYMENT_NAME} --type merge -p '{"spec": {"zync":
{"appSpec": {"replicas": 0}, "queSpec": {"replicas": 0}}}}'
```

3. Copy the Zync database dump to the **zync-database** pod:

```
oc cp ./zync-database-backup.gz $(oc get pods -l 'deploymentConfig=zync-database' -o json
| jq '.items[0].metadata.name' -r):/var/lib/pgsql/
```

4. Decompress the backup file:

```
oc rsh $(oc get pods -l 'deploymentConfig=zync-database' -o json | jq -r
'.items[0].metadata.name') bash -c 'gzip -d ${HOME}/zync-database-backup.gz'
```

5. Restore the PostgreSQL DB backup file:

```
oc rsh $(oc get pods -l 'deploymentConfig=zync-database' -o json | jq -r
'.items[0].metadata.name') bash -c 'psql -f ${HOME}/zync-database-backup'
```

6. Restore to the original count of replicas:

```
oc patch APIManager ${DEPLOYMENT_NAME} --type merge -p '{"spec":
{"zync":'"${ZYNC_SPEC}"'}}'
```

9.5.5.3. Restoring 3scale options with **backend-redis** and **system-redis**

By restoring 3scale, you will restore **backend-redis** and **system-redis**. These components have the following functions:

***backend-redis**: The database that supports application authentication and rate limiting in 3scale. It is also used for statistics storage and temporary job storage. ***system-redis**: Provides temporary storage for background jobs for 3scale and is also used as a message bus for Ruby processes of **system-app** pods.

The **backend-redis** component

The **backend-redis** component has two databases, **data** and **queues**. In default 3scale deployment, **data** and **queues** are deployed in the Redis database, but in different logical database indexes /**0** and /**1**. Restoring **data** database runs without any issues, however restoring **queues** database can lead to duplicated jobs.

Regarding duplication of jobs, in 3scale the backend workers process background jobs in a matter of milliseconds. If **backend-redis** fails 30 seconds after the last database snapshot and you try to restore it, the background jobs that happened during those 30 seconds are performed twice because backend does not have a system in place to avoid duplication.

In this scenario, you must restore the backup as the /**0** database index contains data that is not saved anywhere else. Restoring /**0** database index means that you must also restore the /**1** database index since one cannot be stored without the other. When you choose to separate databases on different servers and not one database in different indexes, the size of the queue will be approximately zero, so it is preferable not to restore backups and lose a few background jobs. This will be the case in a 3scale Hosted setup you will need to therefore apply different backup and restore strategies for both.

The `system-redis`component

The majority of the 3scale system background jobs are idempotent, that is, identical requests return an identical result no matter how many times you run them.

The following is a list of examples of events handled by background jobs in system:

- Notification jobs such as plan trials about to expire, credit cards about to expire, activation reminders, plan changes, invoice state changes, PDF reports.
- Billing such as invoicing and charging.
- Deletion of complex objects.
- Backend synchronization jobs.
- Indexation jobs, for example with sphinx.
- Sanitisation jobs, for example invoice IDs.
- Janitorial tasks such as purging audits, user sessions, expired tokens, log entries, suspending inactive accounts.
- Traffic updates.
- Proxy configuration change monitoring and proxy deployments.
- Background signup jobs,
- Zync jobs such as Single sign-on (SSO) synchronization, routes creation.

If you are restoring the above list of background jobs, 3scale's system maintains the state of each restored job. It is important to check the integrity of the system after the restoration is complete.

9.5.6. Ensuring information consistency between Backend and System

After restoring **backend-redis** a sync of the Config information from **System** should be forced to ensure the information in **Backend** is consistent with that in **System**, which is the *source of truth*.

9.5.6.1. Managing the deployment configuration for backend-redis

These steps are intended for running instances of **backend-redis**.

Procedure

1. Edit the **redis-config** configmap:

```
oc edit configmap redis-config
```

2. Comment **SAVE** commands in the **redis-config** configmap:

```
 #save 900 1
 #save 300 10
 #save 60 10000
```

3. Set **appendonly** to *no* in the **redis-config** configmap:

```
appendonly no
```

4. Redeploy **backend-redis** to load the new configurations:

```
oc rollout latest dc/backend-redis
```

5. Check the status of the rollout to ensure it has finished:

```
oc rollout status dc/backend-redis
```

6. Rename the **dump.rdb** file:

```
oc rsh $(oc get pods -l 'deploymentConfig=backend-redis' -o json | jq
'.items[0].metadata.name' -r) bash -c 'mv ${HOME}/data/dump.rdb ${HOME}/data/dump.rdb-
old'
```

7. Rename the **appendonly.aof** file:

```
oc rsh $(oc get pods -l 'deploymentConfig=backend-redis' -o json | jq
'.items[0].metadata.name' -r) bash -c 'mv ${HOME}/data/appendonly.aof
${HOME}/data/appendonly.aof-old'
```

8. Move the backup file to the POD:

```
oc cp ./backend-redis-dump.rdb $(oc get pods -l 'deploymentConfig=backend-redis' -o json |
jq '.items[0].metadata.name' -r):/var/lib/redis/data/dump.rdb
```

9. Redeploy **backend-redis** to load the backup:

```
oc rollout latest dc/backend-redis
```

10. Check the status of the rollout to ensure it has finished:

```
oc rollout status dc/backend-redis
```

11. Create the **appendonly** file:

```
oc rsh $(oc get pods -l 'deploymentConfig=backend-redis' -o json | jq
'.items[0].metadata.name' -r) bash -c 'redis-cli BGREWRITEAOF'
```

12. After a while, ensure that the AOF rewrite is complete:

```
oc rsh $(oc get pods -l 'deploymentConfig=backend-redis' -o json | jq
'.items[0].metadata.name' -r) bash -c 'redis-cli info' | grep aof_rewrite_in_progress
```

- While **aof_rewrite_in_progress = 1**, the execution is in progress.
- Check periodically until **aof_rewrite_in_progress = 0**. Zero indicates that the execution is complete.

13. Edit the **redis-config** configmap:

```
oc edit configmap redis-config
```

14. Uncomment **SAVE** commands in the **redis-config** configmap:

```
 save 900 1
 save 300 10
 save 60 10000
```

15. Set **appendonly** to *yes* in the **redis-config** configmap:

```
appendonly yes
```

16. Redeploy **backend-redis** to reload the default configurations:

```
oc rollout latest dc/backend-redis
```

17. Check the status of the rollout to ensure it has finished:

```
oc rollout status dc/backend-redis
```

9.5.6.2. Managing the deployment configuration for **system-redis**

These steps are intended for running instances of **system-redis**.

Procedure

1. Edit the **redis-config** configmap:

```
oc edit configmap redis-config
```

2. Comment **SAVE** commands in the **redis-config** configmap:

```
 #save 900 1
 #save 300 10
 #save 60 10000
```

3. Set **appendonly** to *no* in the **redis-config** configmap:

```
appendonly no
```

4. Redeploy **system-redis** to load the new configurations:

```
oc rollout latest dc/system-redis
```

5. Check the status of the rollout to ensure it has finished:

```
oc rollout status dc/system-redis
```

6. Rename the **dump.rdb** file:

```
oc rsh $(oc get pods -l 'deploymentConfig=system-redis' -o json | jq
'.items[0].metadata.name' -r) bash -c 'mv ${HOME}/data/dump.rdb ${HOME}/data/dump.rdb-
old'
```

7. Rename the **appendonly.aof** file:

```
oc rsh $(oc get pods -l 'deploymentConfig=system-redis' -o json | jq
'.items[0].metadata.name' -r) bash -c 'mv ${HOME}/data/appendonly.aof
${HOME}/data/appendonly.aof-old'
```

8. Move the **Backup** file to the POD:

```
oc cp ./system-redis-dump.rdb $(oc get pods -l 'deploymentConfig=system-redis' -o json | jq
'.items[0].metadata.name' -r):/var/lib/redis/data/dump.rdb
```

9. Redeploy **system-redis** to load the backup:

```
oc rollout latest dc/system-redis
```

10. Check the status of the rollout to ensure it has finished:

```
oc rollout status dc/system-redis
```

11. Create the **appendonly** file:

```
oc rsh $(oc get pods -l 'deploymentConfig=system-redis' -o json | jq
'.items[0].metadata.name' -r) bash -c 'redis-cli BGREWRITEAOF'
```

12. After a while, ensure that the AOF rewrite is complete:

```
oc rsh $(oc get pods -l 'deploymentConfig=system-redis' -o json | jq
'.items[0].metadata.name' -r) bash -c 'redis-cli info' | grep aof_rewrite_in_progress
```

- While **aof_rewrite_in_progress = 1**, the execution is in progress.
- Check periodically until **aof_rewrite_in_progress = 0**. Zero indicates that the execution is complete.

13. Edit the **redis-config** configmap:

    ```
    oc edit configmap redis-config
    ```

14. Uncomment **SAVE** commands in the **redis-config** configmap:

    ```
     save 900 1
     save 300 10
     save 60 10000
    ```

15. Set **appendonly** to *yes* in the **redis-config** configmap:

    ```
    appendonly yes
    ```

16. Redeploy **system-redis** to reload the default configurations:

    ```
    oc rollout latest dc/system-redis
    ```

17. Check the status of the rollout to ensure it has finished:

    ```
    oc rollout status dc/system-redis
    ```

9.5.7. Restoring backend-worker

Restore to the latest version of **backend-worker**:

```
oc rollout latest dc/backend-worker
```

1. Check the status of the rollout to ensure it has finished:

   ```
   oc rollout status dc/backend-worker
   ```

9.5.8. Restoring system-app

Restore to the latest version of **system-app**:

```
oc rollout latest dc/system-app
```

1. Check the status of the rollout to ensure it has finished:

   ```
   oc rollout status dc/system-app
   ```

9.5.9. Restoring **system-sidekiq**

1. Restore to the latest version of **system-sidekiq**:

```
oc rollout latest dc/system-sidekiq
```

2. Check the status of the rollout to ensure it has finished:

```
oc rollout status dc/system-sidekiq
```

9.5.9.1. Restoring **system-sphinx**

1. Restore to the latest version of **system-sphinx**:

```
oc rollout latest dc/system-sphinx
```

2. Check the status of the rollout to ensure it has finished:

```
oc rollout status dc/system-sphinx
```

9.5.9.2. Restoring OpenShift routes managed by Zync

1. Force Zync to recreate missing OpenShift routes:

```
oc rsh $(oc get pods -l 'deploymentConfig=system-sidekiq' -o json | jq
'.items[0].metadata.name' -r) bash -c 'bundle exec rake zync:resync:domains'
```

CHAPTER 10. 3SCALE BACKUP AND RESTORE USING CUSTOM RESOURCES

This chapter includes details about the backup and restore functionality for a Red Hat 3scale API Management installation deployed using the *APIManager* custom resource (CR). In this context, the CRD is provided by the 3scale operator.

Custom resources from operator capabilities are not part of the 3scale installation For this reason, the custom resources are not included as part of the 3scale installation backup and restore functionality.

IMPORTANT

3scale backup and restore using operators is a Technology Preview feature only. Technology Preview features are not supported with Red Hat production service level agreements (SLAs) and might not be functionally complete. Red Hat does not recommend using them in production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process. For more information about the support scope of Red Hat Technology Preview features, see Technology Preview Features Support Scope .

Prerequisites

- A 3scale installation

The following sections contain the procedures to perform 3scale backup and restore using the operator.

- Section 10.1, “Backing up 3scale using the operator”
- Section 10.2, “Restoring 3scale using the operator”

10.1. BACKING UP 3SCALE USING THE OPERATOR

The following section provides the information and procedure you require to backup a 3scale installation that was deployed by an *APIManager* custom resource.

10.1.1. Backup compatible scenarios

To see the 3scale installation configurations that can be backed up, see the following sections:

- Backup scenarios scope
- Backed up data

Prerequisites

- Backup the 3scale external databases:
  - **backend-redis**
  - **system-redis**
  - **system-database** - MySQL or PostgreSQL
- Provision enough space for the PVC to contain the data backed up.

NOTE

A 3scale deployment, which is deployed using *APIManager* cannot be backed up using S3 as System’s FileStorage.

10.1.2. Backup scenarios scope

Backup functionality is available when the following databases are configured externally:

- Backend Redis database
- System Redis database
- System database - MySQL or PostgreSQL

10.1.3. Backed up data

The following table shows a list of the data that is backed up.

Table 10.1. Data that is backed up

Object	Object-type data
Secrets	• system-smtp • system-seed • backend-internal-api • backend-listener • system-events-hook • system-app • system-recaptcha • zync • system-master-apicast • system-memcache • system-database • backend-redis • system-redis
ConfigMaps	• system-environment • apicast-environment
APIManager	*APIManager* custom resource Kubernetes object definition - json schema definition

Object	Object-type data
System FileStorage	When the location of System FileStorage is in a PersistentVolumeClaim (PVC)

10.1.4. Backing up 3scale

To backup a 3scale installation deployed with an existing *APIManager*, use the following steps:

Procedure

1. Backup the following Kubernetes secrets:
    - **backend-redis**
    - **system-redis**
    - **system-database**
2. Create the **APIManagerBackup** custom resource in the same namespace where the 3scale installation managed by the *APIManager* object is deployed, as in example one:

    Example 1

    ```
    apiVersion: apps.3scale.net/v1alpha1
    kind: APIManagerBackup
    metadata:
     name: example-apimanagerbackup-pvc
    spec:
      backupDestination:
        persistentVolumeClaim:
          resources:
            requests: "10Gi"
    ```

    Example 2 provides a pre-existing PersistentVolume name:

    ```
    apiVersion: apps.3scale.net/v1alpha1
    kind: APIManagerBackup
    metadata:
     name: example-apimanagerbackup-pvc
    spec:
      backupDestination:
        persistentVolumeClaim:
          # resources specification is required but ignored when providing a volumeName as per
    K8s PVCs requirements behavior
          resources:
            requests: "10Gi"
          volumeName: "my-preexisting-persistent-volume"
    ```

3. Wait until **APIManagerBackup** finishes. Check this by obtaining the content of **APIManagerBackup** and waiting until the **.status.completed** field is set to true.

The backup contents is detailed in Backed up data.

Other fields in the status section of the **APIManagerBackup** show details of the backup, such as the name of the PVC where the data has been backed up when the configured backup destination has been a PVC.

For future references, take note of the value of **status.backupPersistentVolumeClaimName** field. When restoring an *APIManager* installation with **APIManagerRestore**, one of the fields it requires is the **PersistentVolumeClaimName** backup source.

10.2. RESTORING 3SCALE USING THE OPERATOR

The following section provides the information and procedure you require to restore a 3scale installation that was previously deployed by an *APIManager* custom resource and backed up by **APIManagerBackup**.

10.2.1. Restore compatible scenarios

To see the 3scale installation configurations that can be restored, see the following sections:

- Restore scenarios scope
- Restored data

Prerequisites

- Restore the 3scale external databases:
  - **backend-redis**
  - **system-redis**
  - **system-database** - MySQL or PostgreSQL

10.2.2. Restore scenarios scope

The restore functionality of the 3scale operator is available using a backup generated from an **APIManagerBackup** custom resource.

For a list of the 3scale solution scenarios you can backup, see Backed up data for reference.

The following are not in the scope of the restore functionality of the operator:

- Restoring backup data that was not performed using an **APIManagerBackup** custom resource.
- Restoring backup data provided through an **APIManagerBackup** from different 3scale versions.

10.2.3. Restored data

The following table shows a list of the data that is restored.

Table 10.2. Data that is restored

Object	Object-type data
Secrets	• system-smtp • system-seed • backend-internal-api • system-events-hook • system-app • system-recaptcha • zync • system-master-apicast
ConfigMaps	• system-environment • apicast-environment
APIManager	*APIManager* custom resource Kubernetes object definition - json schema definition
System FileStorage	When the location of System FileStorage is in a PersistentVolumeClaim (PVC)
Routes	3scale-related OpenShift routes, for example master and tenants

10.2.4. Restoring 3scale

To restore a 3scale installation previously deployed with an *APIManager* that was backed up using an **APIManagerBackup** custom resource, follow these steps:

1. Ensure that the project where you are performing the restoration does not contain an *APIManager* custom resource and its corresponding 3scale installation.

2. Restore the following Kubernetes secrets:

   - **backend-redis**
   - **system-redis**
   - **system-database**

3. Create the **APIManagerRestore** custom resource and specify the backup data of the installation that was previously backed up by an **APIManagerBackup** custom resource. For details, see Backup scenarios scope.

   The following is an example of an **APIManagerRestore** custom resource:

```
apiVersion: apps.3scale.net/v1alpha1
kind: APIManagerRestore
```

```
metadata:
  name: example-apimanagerrestore-pvc
spec:
 restoreSource:
   persistentVolumeClaim:
     claimSource:
       claimName: example-apimanagerbackup-pvc # Name of the PVC produced as the
backup result of an `APIManagerBackup`
       readOnly: true
```

4. Wait until **APIManagerRestore** finishes. Check this by obtaining the content of **APIManagerRestore** and waiting until the **.status.completed** field is set to true.
   You should see a new *APIManager* custom resource has been created and a 3scale installation deployed.

CHAPTER 11. CONFIGURING RECAPTCHA FOR 3SCALE

This document describes how to configure reCAPTCHA for Red Hat 3scale API Management On-premises to protect against spam.

Prerequisites

- An installed and configured 3scale On-Premises instance on a supported OpenShift version.
- Get a site key and the secret key for reCAPTCHA v2. See the Register a new site web page.
- Add the Developer Portal domain to an allowlist if you want to use domain name validation.

To configure reCAPTCHA for 3scale, perform the steps outlined in the following procedure:

- Section 11.1, “Configuring reCAPTCHA for spam protection in 3scale”

11.1. CONFIGURING RECAPTCHA FOR SPAM PROTECTION IN 3SCALE

To configure reCAPTCHA for spam protection, you have two options how to patch the secret file that contains the reCAPTCHA. These options are in the OpenShift Container Platform (OCP) user interface or using the command line interface (CLI).

Procedure

1. **OCP 4.x:** Navigate to **Project: [Your_project_name] > Workloads > Secrets**
2. Edit the **system-recaptcha** secret file.
   The **PRIVATE_KEY** and **PUBLIC_KEY** from the reCAPTHCA service must be in base64 format encoding. Transform the keys to base64 encoding manually.

> **NOTE**
>
> The CLI reCAPTCHA option does not require base64 format encoding.

- **CLI:** Type the following command:

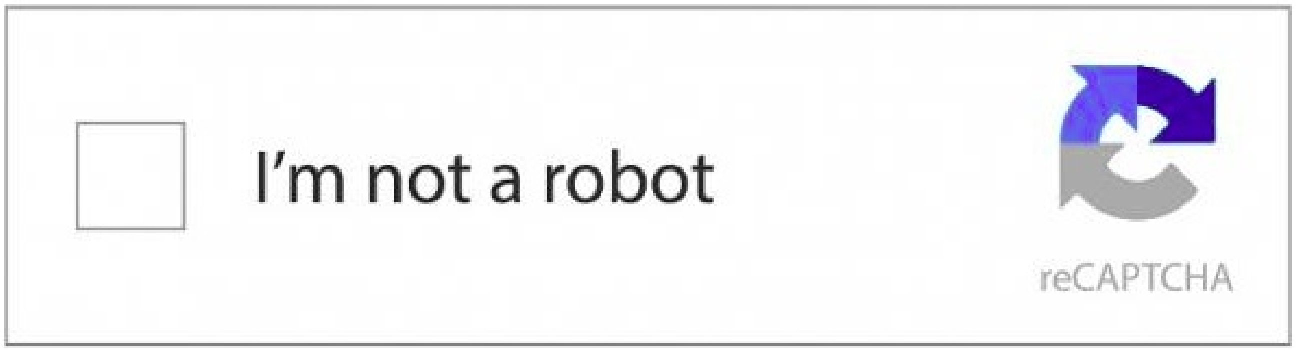
```
oc patch secret/system-recaptcha -p '{"stringData": {"PUBLIC_KEY": "public-key-from-service", "PRIVATE_KEY": "private-key-from-service"}}'
```

Post-procedure steps

- Redeploy the system pod after you have completed one of the above options.
- In the 3scale Admin Portal turn on spam protection against users that are not signed:
  1. Navigate to **Audience > Developer Portal > Spam Protection**
  2. Select one of the following options:
     - *Always* - reCAPTCHA will always appear when a form is presented to a user who is not logged in.

  - *Suspicious only* - reCAPTCHA is only shown if the automated checks detect a possible spammer.
  - *Never* - turns off Spam protection.

After **system-app** has redeployed, the pages that use spam protection on the Developer Portal will show the reCAPTCHA *I'm not a robot* checkbox.



Additional resources

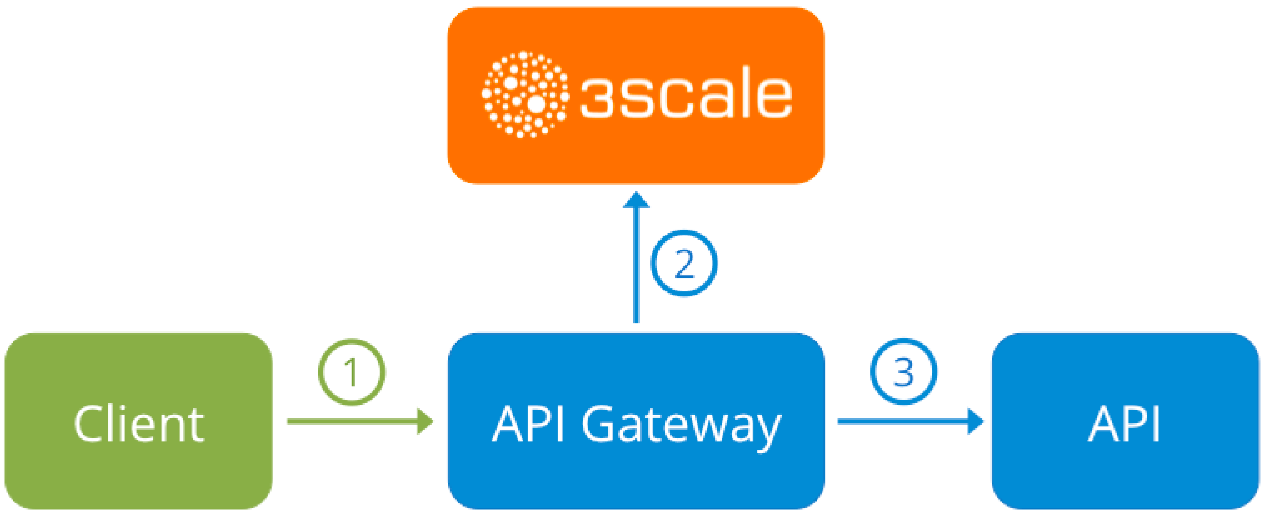
- See ReCAPTCHA home page for more information, guides, and support.

CHAPTER 12. 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 12.1, “Common integration issues”
- Section 12.2, “Handling API infrastructure issues”
- Section 12.3, “Identifying API request issues”
- Section 12.4, “ActiveDocs issues”
- Section 12.5, “Logging in NGINX”
- Section 12.6, “3scale error codes”

12.1. 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.

12.1.1. 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.

12.1.1.1. 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.

12.1.1.2. 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.

12.1.2. 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.

12.1.2.1. 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;**.

12.1.3. 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.

12.2. 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:

12.2.1. 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
```

12.2.2. 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.

12.2.3. 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`

12.2.4. 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.

12.3. IDENTIFYING API REQUEST ISSUES

To identify where an issue with requests to your API might lie, go through the following checks.

12.3.1. 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.

12.3.2. 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.

12.3.3. API gateway

There are a number of steps to go through to check that the API gateway is working correctly.

12.3.3.1. 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.

12.3.3.2. 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"
```

12.3.4. 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.

12.3.4.1. 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**).

12.3.4.2. 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.

12.3.4.3. 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.

12.3.5. 3scale

12.3.5.1. 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.

12.3.5.2. 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
```

12.3.5.3. 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.

12.3.6. Client API gateway

12.3.6.1. 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.

12.3.6.2. 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.

12.3.7. Client

12.3.7.1. 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.

12.3.7.2. 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.

12.4. 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:

12.4.1. 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.

12.4.2. 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.

12.4.3. 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.

12.4.4. 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.

12.5. LOGGING IN NGINX

For a comprehensive guide on this, see the NGINX Logging and Monitoring docs.

12.5.1. Enabling debugging log

To find out more about enabling debugging log, see the NGINX debugging log documentation.

12.6. 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

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