Red Hat Quay 3.6

Deploy Red Hat Quay on OpenShift with the Quay Operator

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Legal Notice

Abstract

Deploy Red Hat Quay on an OpenShift Cluster with the Red Hat Quay Operator

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PREFACE

Red Hat Quay is an enterprise-quality container registry. Use Red Hat Quay to build and store container images, then make them available to deploy across your enterprise.

The Red Hat Quay Operator provides a simple method to deploy and manage Red Hat Quay on an OpenShift cluster.

As of Red Hat Quay 3.4.0, the Operator has been completely re-written to provide an improved out of the box experience as well as support for more Day 2 operations. As a result the new Operator is simpler to use and is more opinionated. The key differences from earlier versions of the Operator are:

- The **QuayEcosystem** custom resource has been replaced with the **QuayRegistry** custom resource
- The default installation options produces a fully supported Quay environment with all managed dependencies (database, caches, object storage, etc) supported for production use (some components may not be highly available)
- A new robust validation library for Quay's configuration which is shared by the Quay application and config tool for consistency
- Object storage can now be managed by the Operator using the **ObjectBucketClaim** Kubernetes API (Red Hat OpenShift Data Foundation can be used to provide a supported implementation of this API on OpenShift)
- Customization of the container images used by deployed pods for testing and development scenarios

CHAPTER 1. INTRODUCTION TO THE RED HAT QUAY OPERATOR

This document outlines the steps for configuring, deploying, managing and upgrading Red Hat Quay on OpenShift using the Red Hat Quay Operator.

It shows you how to:

- Install the Red Hat Quay Operator
- Configure object storage, either managed or unmanaged
- Configure other unmanaged components, if required, including database, Redis, routes, TLS, etc.
- Deploy the Red Hat Quay registry on OpenShift using the Operator
- Use advanced features supported by the Operator
- Upgrade the registry by upgrading the Operator

1.1. QUAYREGISTRY API

The Quay Operator provides the **QuayRegistry** custom resource API to declaratively manage **Quay** container registries on the cluster. Use either the OpenShift UI or a command-line tool to interact with this API.

- Creating a **QuayRegistry** will result in the Operator deploying and configuring all necessary resources needed to run Quay on the cluster.
- Editing a **QuayRegistry** will result in the Operator reconciling the changes and creating/updating/deleting objects to match the desired configuration.
- Deleting a **QuayRegistry** will result in garbage collection of all previously created resources and the **Quay** container registry will no longer be available.

The **QuayRegistry** API is fairly simple, and the fields are outlined in the following sections.

1.2. QUAY OPERATOR COMPONENTS

Quay is a powerful container registry platform and as a result, has a significant number of dependencies. These include a database, object storage, Redis, and others. The Quay Operator manages an opinionated deployment of Quay and its dependencies on Kubernetes. These dependencies are treated as *components* and are configured through the **QuayRegistry** API.

In the **QuayRegistry** custom resource, the **spec.components** field configures components. Each component contains two fields: **kind** - the name of the component, and **managed** - boolean whether the component lifecycle is handled by the Operator. By default (omitting this field), all components are managed and will be autofilled upon reconciliation for visibility:

```
spec:
  components:
    - managed: true
      kind: clair
    - managed: true
  kind: postgres
- managed: true
  kind: objectstorage
- managed: true
  kind: redis
- managed: true
  kind: horizontalpodautoscaler
- managed: true
  kind: route
- managed: true
  kind: mirror
- managed: true
  kind: monitoring
- managed: true
  kind: tls
```

1.3. USING MANAGED COMPONENTS

Unless your **QuayRegistry** custom resource specifies otherwise, the Operator will use defaults for the following managed components:

- **postgres:** For storing the registry metadata, uses a version of Postgres 10 from the Software Collections
- **redis:** Handles Quay builder coordination and some internal logging
- **objectstorage:** For storing image layer blobs, utilizes the **ObjectBucketClaim** Kubernetes API which is provided by Noobaa/RHOCS
- **clair:** Provides image vulnerability scanning
- **horizontalpodautoscaler:** Adjusts the number of Quay pods depending on memory/cpu consumption
- **mirror:** Configures repository mirror workers (to support optional repository mirroring)
- **route:** Provides an external entrypoint to the Quay registry from outside OpenShift
- **monitoring:** Features include a Grafana dashboard, access to individual metrics, and alerting to notify for frequently restarting Quay pods
- **tls:** Configures whether Red Hat Quay or OpenShift handles TLS

The Operator will handle any required configuration and installation work needed for Red Hat Quay to use the managed components. If the opinionated deployment performed by the Quay Operator is unsuitable for your environment, you can provide the Operator with **unmanaged** resources (overrides) as described in the following sections.

1.4. USING UNMANAGED COMPONENTS FOR DEPENDENCIES

If you have existing components such as Postgres, Redis or object storage that you would like to use with Quay, you first configure them within the Quay configuration bundle (**config.yaml**) and then reference the bundle in your **QuayRegistry** (as a Kubernetes **Secret**) while indicating which components are unmanaged.

NOTE

The Quay config editor can also be used to create or modify an existing config bundle and simplifies the process of updating the Kubernetes **Secret**, especially for multiple changes. When Quay's configuration is changed via the config editor and sent to the Operator, the Quay deployment will be updated to reflect the new configuration.

1.5. CONFIG BUNDLE SECRET

The **spec.configBundleSecret** field is a reference to the **metadata.name** of a **Secret** in the same namespace as the **QuayRegistry**. This **Secret** must contain a **config.yaml** key/value pair. This **config.yaml** file is a Quay config YAML file. This field is optional, and will be auto-filled by the Operator if not provided. If provided, it serves as the base set of config fields which are later merged with other fields from any managed components to form a final output **Secret**, which is then mounted into the Quay application pods.

1.6. PREREQUISITES FOR RED HAT QUAY ON OPENSHIFT

Before you begin the deployment of Red Hat Quay Operator on OpenShift, you should consider the following.

1.6.1. OpenShift cluster

You need a privileged account to an OpenShift 4.5 or later cluster on which to deploy the Red Hat Quay Operator. That account must have the ability to create namespaces at the cluster scope.

1.6.2. Resource Requirements

Each Red Hat Quay application pod has the following resource requirements:

- 8Gi of memory
- 2000 millicores of CPU.

The Red Hat Quay Operator will create at least one application pod per Red Hat Quay deployment it manages. Ensure your OpenShift cluster has sufficient compute resources for these requirements.

1.6.3. Object Storage

By default, the Red Hat Quay Operator uses the **ObjectBucketClaim** Kubernetes API to provision object storage. Consuming this API decouples the Operator from any vendor-specific implementation. Red Hat OpenShift Data Foundation provides this API via its NooBaa component, which will be used in this example.

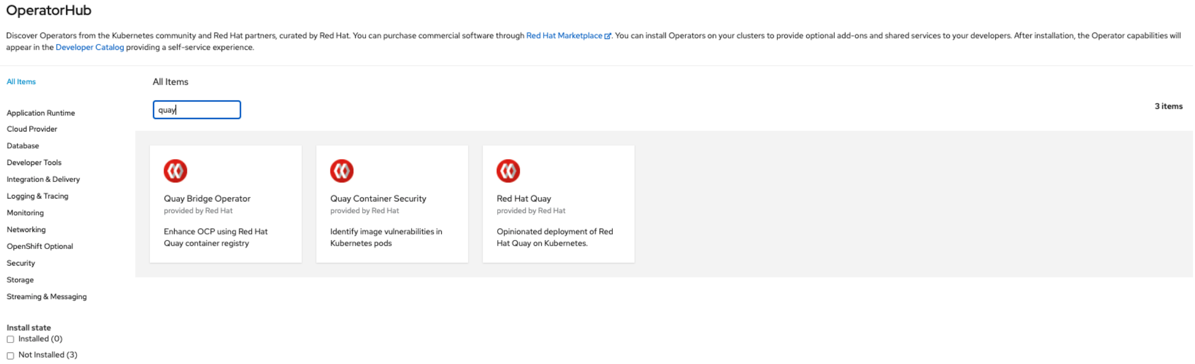
Red Hat Quay can be manually configured to use any of the following supported cloud storage options:

- Amazon S3 (see S3 IAM Bucket Policy for details on configuring an S3 bucket policy for Red Hat Quay)
- Azure Blob Storage
- Google Cloud Storage
- Ceph Object Gateway (RADOS)

- OpenStack Swift
- CloudFront + S3

CHAPTER 2. INSTALLING THE QUAY OPERATOR FROM OPERATORHUB

1. Using the OpenShift console, Select Operators → OperatorHub, then select the Red Hat Quay Operator. If there is more than one, be sure to use the Red Hat certified Operator and not the community version.



OperatorHub

Discover Operators from the Kubernetes community and Red Hat partners, curated by Red Hat. You can purchase commercial software through Red Hat Marketplace. You can install Operators on your clusters to provide optional add-ons and shared services to your developers. After installation, the Operator capabilities will appear in the Developer Catalog providing a self-service experience.

All Items

quay

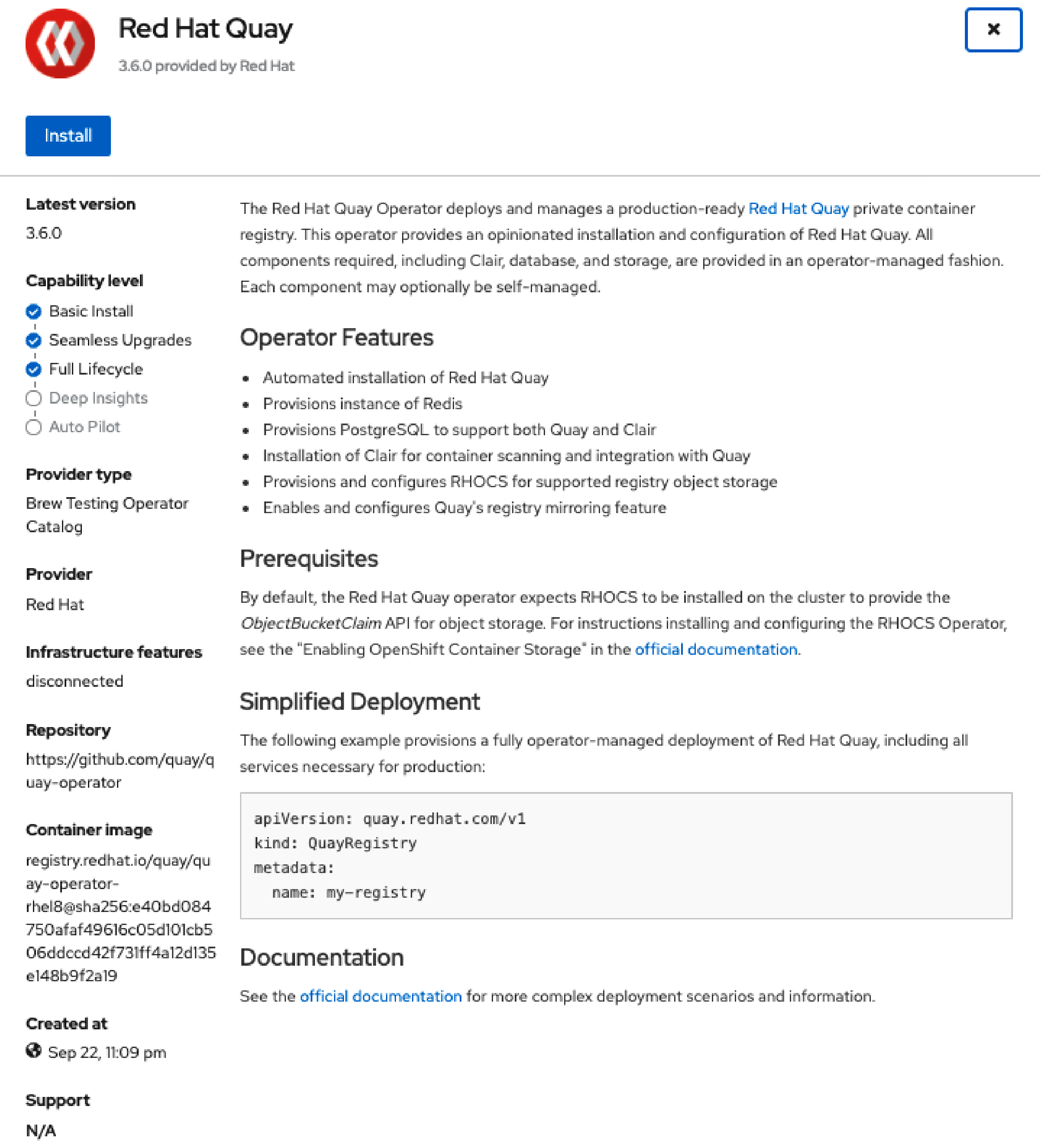
3 items

Quay Bridge Operator
provided by Red Hat
Enhance OCP using Red Hat Quay container registry

Quay Container Security
provided by Red Hat
Identify image vulnerabilities in Kubernetes pods

Red Hat Quay
provided by Red Hat
Opinionated deployment of Red Hat Quay on Kubernetes.

2. The Installation page outlines the features and prerequisites:



Latest version
3.6.0

Capability level
✓ Basic Install
✓ Seamless Upgrades
✓ Full Lifecycle
○ Deep Insights
○ Auto Pilot

Provider type
Brew Testing Operator Catalog

Provider
Red Hat

Infrastructure features
disconnected

Repository
https://github.com/quay/quay-operator

Container image
registry.redhat.io/quay/quay-operator-rhel8@sha256:e40bd084750afaf49616c05d101cb506ddccd42f731ff4a12d135e148b9f2a19

Created at
Sep 22, 11:09 pm

Support
N/A

The Red Hat Quay Operator deploys and manages a production-ready Red Hat Quay private container registry. This operator provides an opinionated installation and configuration of Red Hat Quay. All components required, including Clair, database, and storage, are provided in an operator-managed fashion. Each component may optionally be self-managed.

Operator Features

- Automated installation of Red Hat Quay
- Provisions instance of Redis
- Provisions PostgreSQL to support both Quay and Clair
- Installation of Clair for container scanning and integration with Quay
- Provisions and configures RHOCS for supported registry object storage
- Enables and configures Quay's registry mirroring feature

Prerequisites

By default, the Red Hat Quay operator expects RHOCS to be installed on the cluster to provide the *ObjectBucketClaim* API for object storage. For instructions installing and configuring the RHOCS Operator, see the "Enabling OpenShift Container Storage" in the official documentation.

Simplified Deployment

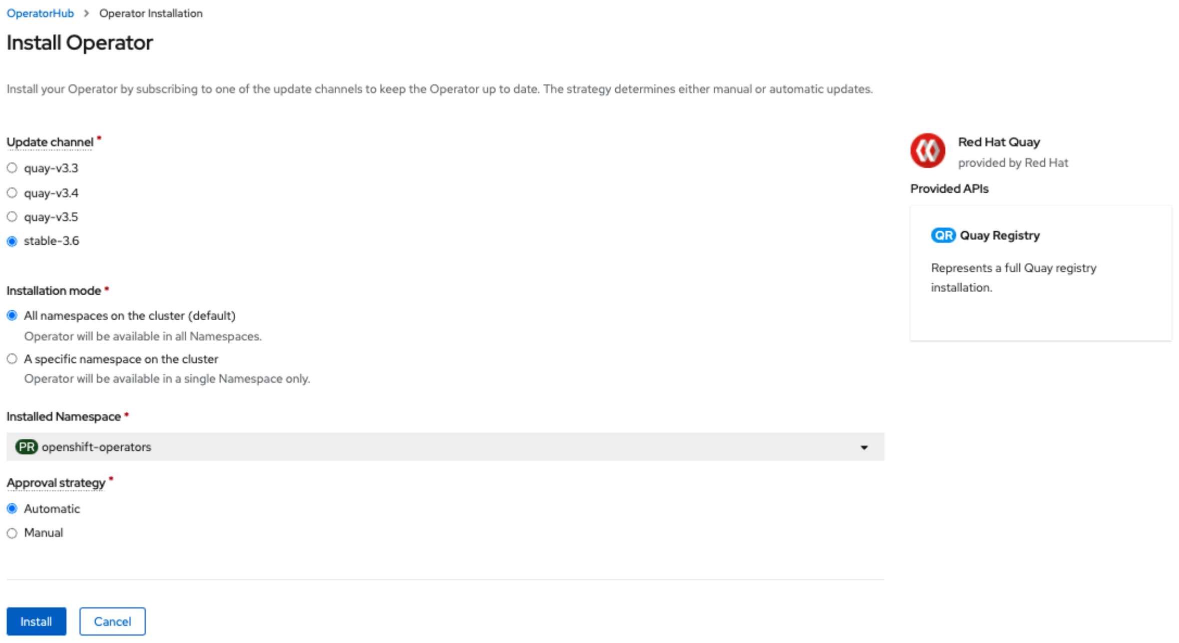
The following example provisions a fully operator-managed deployment of Red Hat Quay, including all services necessary for production:

```
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  name: my-registry
```

Documentation

See the official documentation for more complex deployment scenarios and information.

3. Select Install. The Operator Installation page appears.



OperatorHub > Operator Installation

Install Operator

Install your Operator by subscribing to one of the update channels to keep the Operator up to date. The strategy determines either manual or automatic updates.

Update channel *

○ quay-v3.3
○ quay-v3.4
○ quay-v3.5
● stable-3.6

Installation mode *

● All namespaces on the cluster (default)
Operator will be available in all Namespaces.
○ A specific namespace on the cluster
Operator will be available in a single Namespace only.

Installed Namespace *

PR openshift-operators

Approval strategy *

● Automatic
○ Manual

Red Hat Quay
provided by Red Hat

Provided APIs

QR Quay Registry

Represents a full Quay registry installation.

4. The following choices are available for customizing the installation:

    - **Update Channel:** Choose the update channel, for example, **stable-3.6** for the latest release.

    - **Installation Mode:** Choose **All namespaces on the cluster** if you want the Operator to be available cluster-wide. Choose **A specific namespace on the cluster** if you want it deployed only within a single namespace. It is recommended that you install the Operator cluster-wide. If you choose a single namespace, the monitoring component will not be available by default.

    - **Approval Strategy:** Choose to approve either automatic or manual updates. Automatic update strategy is recommended.

5. Select Install.

6. After a short time, you will see the Operator installed successfully in the Installed Operators page.

CHAPTER 3. CONFIGURING QUAY BEFORE DEPLOYMENT

The Operator can manage all the Red Hat Quay components when deploying on OpenShift, and this is the default configuration. Alternatively, you can manage one or more components externally yourself, where you want more control over the set up, and then allow the Operator to manage the remaining components.

The standard pattern for configuring unmanaged components is:

1. Create a **config.yaml** configuration file with the appropriate settings

2. Create a Secret using the configuration file

   ```
   $ oc create secret generic --from-file config.yaml=./config.yaml config-bundle-secret
   ```

3. Create a QuayRegistry YAML file **quayregistry.yaml**, identifying the unmanaged components and also referencing the created Secret, for example:

   quayregistry.yaml

   ```
   apiVersion: quay.redhat.com/v1
   kind: QuayRegistry
   metadata:
     name: example-registry
     namespace: quay-enterprise
   spec:
     configBundleSecret: config-bundle-secret
     components:
       - kind: objectstorage
         managed: false
   ```

4. Deploy the registry using the YAML file:

   ```
   oc create -f quayregistry.yaml
   ```

3.1. PRE-CONFIGURING QUAY FOR AUTOMATION

Quay has a number of configuration options that support automation. These options can be set before deployment, to minimize the need to interact with the user interface.

3.1.1. Allowing the API to create the first user

Set the config option **FEATURE_USER_INITIALIZE** to **true**, so that you can use the API **/api/v1/user/initialize** to create the first user. This API endpoint does not require authentication, unlike all other registry API calls which require an OAuth token which is generated by an OAuth application in an existing organization.

Once you have deployed Quay, you can use the API to create a user, for example, **quayadmin**, provided no other users have already been created. For more information, see the section on Creating the first user using the API

3.1.2. Enabling general API access

Set the config option **BROWSER_API_CALLS_XHR_ONLY** to **false**, to allow general access to the Quay registry API.

3.1.3. Adding a super user

While you cannot create a user until after deployment, it is convenient to ensure that first user is an administrator with full permissions. It is easier to configure this in advance, using the **SUPER_USER** configuration object.

3.1.4. Restricting user creation

Once you have configured a super user, you can restrict the ability to create new users to the super user group. Set the **FEATURE_USER_CREATION** to **false** to restrict user creation.

3.1.5. Suggested configuration for automation

Create a **config.yaml** configuration file that includes the appropriate settings:

config.yaml

```
...
FEATURE_USER_INITIALIZE: true
BROWSER_API_CALLS_XHR_ONLY: false
SUPER_USERS:
- quayadmin
FEATURE_USER_CREATION: false
...
```

3.1.6. Deploying the Operator using the initial configuration

1. Create a Secret using the configuration file

   ```
   $ oc create secret generic --from-file config.yaml=./config.yaml init-config-bundle-secret
   ```

2. Create a QuayRegistry YAML file **quayregistry.yaml**, identifying the unmanaged components and also referencing the created Secret, for example:

   quayregistry.yaml

   ```
   apiVersion: quay.redhat.com/v1
   kind: QuayRegistry
   metadata:
     name: example-registry
     namespace: quay-enterprise
   spec:
     configBundleSecret: init-config-bundle-secret
   ```

3. Deploy the registry:

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

4. Create the first user, **quayadmin**, using the API

3.2. CONFIGURING OBJECT STORAGE

You need to configure object storage before installing Red Hat Quay, irrespective of whether you are allowing the Operator to manage the storage or managing it yourself.

If you want the Operator to be responsible for managing storage, see the section on Managed storage for information on installing and configuring the NooBaa / RHOCS Operator.

If you are using a separate storage solution, set **objectstorage** as **unmanaged** when configuring the Operator. See the following section. Unmanaged storage, for details of configuring existing storage.

3.2.1. Unmanaged storage

Some configuration examples for unmanaged storage are provided in this section for convenience. See the Red Hat Quay configuration guide for full details for setting up object storage.

3.2.1.1. AWS S3 storage

```
DISTRIBUTED_STORAGE_CONFIG:
  s3Storage:
    - S3Storage
    - host: s3.us-east-2.amazonaws.com
      s3_access_key: ABCDEFGHIJKLMN
      s3_secret_key: OL3ABCDEFGHIJKLMN
      s3_bucket: quay_bucket
      storage_path: /datastorage/registry
DISTRIBUTED_STORAGE_DEFAULT_LOCATIONS: []
DISTRIBUTED_STORAGE_PREFERENCE:
    - s3Storage
```

3.2.1.2. Google cloud storage

```
DISTRIBUTED_STORAGE_CONFIG:
    googleCloudStorage:
        - GoogleCloudStorage
        - access_key: GOOGQIMFB3ABCDEFGHIJKLMN
          bucket_name: quay-bucket
          secret_key: FhDAYe2HeuAKfvZCAGyOioNaaRABCDEFGHIJKLMN
          storage_path: /datastorage/registry
DISTRIBUTED_STORAGE_DEFAULT_LOCATIONS: []
DISTRIBUTED_STORAGE_PREFERENCE:
    - googleCloudStorage
```

3.2.1.3. Azure storage

```
DISTRIBUTED_STORAGE_CONFIG:
  azureStorage:
    - AzureStorage
    - azure_account_name: azure_account_name_here
      azure_account_key: azure_account_key_here
      azure_container: azure_container_here
      sas_token: some/path/
      storage_path: /datastorage/registry
```

```
DISTRIBUTED_STORAGE_DEFAULT_LOCATIONS: []
DISTRIBUTED_STORAGE_PREFERENCE:
    - azureStorage
```

3.2.1.4. NooBaa unmanaged storage

1. Create a NooBaa Object Bucket Claim in the console at Storage → Object Bucket Claims.

2. Retrieve the Object Bucket Claim Data details including the Access Key, Bucket Name, Endpoint (hostname) and Secret Key.

3. Create a **config.yaml** configuration file, using the information for the Object Bucket Claim:

```
DISTRIBUTED_STORAGE_CONFIG:
  default:
    - RHOCSStorage
    - access_key: WmrXtSGk8B3nABCDEFGH
      bucket_name: my-noobaa-bucket-claim-8b844191-dc6c-444e-9ea4-87ece0abcdef
      hostname: s3.openshift-storage.svc.cluster.local
      is_secure: true
      port: "443"
      secret_key: X9P5SDGJtmSuHFCMSLMbdNCMfUABCDEFGH+C5QD
      storage_path: /datastorage/registry
DISTRIBUTED_STORAGE_DEFAULT_LOCATIONS: []
DISTRIBUTED_STORAGE_PREFERENCE:
  - default
```

3.2.2. Managed storage

If you want the Operator to manage object storage for Quay, your cluster needs to be capable of providing object storage via the **ObjectBucketClaim** API. Using the Red Hat OpenShift Data Foundation (ODF) Operator, there are two supported options available:

- A standalone instance of the Multi-Cloud Object Gateway backed by a local Kubernetes **PersistentVolume** storage
  - Not highly available
  - Included in the Quay subscription
  - Does not require a separate subscription for ODF
- A production deployment of ODF with scale-out Object Service and Ceph
  - Highly available
  - Requires a separate subscription for ODF

To use the standalone instance option, continue reading below. For production deployment of ODF, please refer to the official documentation.

> NOTE
>
> Object storage disk space is allocated automatically by the Operator with 50 GiB. This number represents a usable amount of storage for most small to medium Red Hat Quay installations but may not be sufficient for your use cases. Resizing the RHOCS volume is currently not handled by the Operator. See the section below on resizing managed storage for more details.

3.2.2.1. About The Standalone Object Gateway

As part of a Red Hat Quay subscription, users are entitled to use the *Multi-Cloud Object Gateway* (MCG) component of the Red Hat OpenShift Data Foundation Operator (formerly known as OpenShift Container Storage Operator). This gateway component allows you to provide an S3-compatible object storage interface to Quay backed by Kubernetes **PersistentVolume**-based block storage. The usage is limited to a Quay deployment managed by the Operator and to the exact specifications of the MCG instance as documented below.

Since Red Hat Quay does not support local filesystem storage, users can leverage the gateway in combination with Kubernetes **PersistentVolume** storage instead, to provide a supported deployment. A **PersistentVolume** is directly mounted on the gateway instance as a backing store for object storage and any block-based **StorageClass** is supported.

By the nature of **PersistentVolume**, this is not a scale-out, highly available solution and does not replace a scale-out storage system like Red Hat OpenShift Data Foundation (ODF). Only a single instance of the gateway is running. If the pod running the gateway becomes unavailable due to rescheduling, updates or unplanned downtime, this will cause temporary degradation of the connected Quay instances.

3.2.2.1.1. Create A Standalone Object Gateway

To install the ODF (formerly known as OpenShift Container Storage) Operator and configure a single instance Multi-Cloud Gateway service, follow these steps:

1. Open the OpenShift console and select Operators → OperatorHub, then select the OpenShift Data Foundation Operator.

2. Select Install. Accept all default options and select Install again.

3. Within a minute, the Operator will install and create a namespace **openshift-storage**. You can confirm it has completed when the **Status** column is marked **Succeeded**.

    > When the installation of the ODF Operator is complete, you are prompted to create a storage system. Do not follow this instruction. Instead, create NooBaa object storage as outlined the following steps.

4. Create NooBaa object storage. Save the following YAML to a file called **noobaa.yaml**.

    ```
    apiVersion: noobaa.io/v1alpha1
    kind: NooBaa
    metadata:
      name: noobaa
      namespace: openshift-storage
    spec:
     dbResources:
       requests:
         cpu: '0.1'
    ```

```
    memory: 1Gi
dbType: postgres
coreResources:
  requests:
    cpu: '0.1'
    memory: 1Gi
```

This will create a single instance deployment of the *Multi-cloud Object Gateway*.

5. Apply the configuration with the following command:

```
$ oc create -n openshift-storage -f noobaa.yaml
noobaa.noobaa.io/noobaa created
```

6. After a couple of minutes, you should see that the MCG instance has finished provisioning (**PHASE** column will be set to **Ready**):

```
$ oc get -n openshift-storage noobaas noobaa -w
NAME     MGMT-ENDPOINTS              S3-ENDPOINTS                IMAGE
PHASE   AGE
noobaa   [https://10.0.32.3:30318]   [https://10.0.32.3:31958]   registry.redhat.io/ocs4/mcg-core-
rhel8@sha256:56624aa7dd4ca178c1887343c7445a9425a841600b1309f6deace37ce6b8678d
Ready   3d18h
```

7. Next, configure a backing store for the gateway. Save the following YAML to a file called **noobaa-pv-backing-store.yaml**.

noobaa-pv-backing-store.yaml

```
apiVersion: noobaa.io/v1alpha1
kind: BackingStore
metadata:
  finalizers:
  - noobaa.io/finalizer
  labels:
    app: noobaa
  name: noobaa-pv-backing-store
  namespace: openshift-storage
spec:
  pvPool:
    numVolumes: 1
    resources:
      requests:
        storage: 50Gi ①
    storageClass: STORAGE-CLASS-NAME ②
  type: pv-pool
```

① The overall capacity of the object storage service, adjust as needed

② The **StorageClass** to use for the **PersistentVolumes** requested, delete this property to use the cluster default

8. Apply the configuration with the following command:

```
$ oc create -f noobaa-pv-backing-store.yaml
backingstore.noobaa.io/noobaa-pv-backing-store created
```

This creates the backing store configuration for the gateway. All images in Quay will be stored as objects through the gateway in a **PersistentVolume** created by the above configuration.

9. Finally, run the following command to make the **PersistentVolume** backing store the default for all **ObjectBucketClaims** issued by the Operator.

```
$ oc patch bucketclass noobaa-default-bucket-class --patch '{"spec":{"placementPolicy":
{"tiers":[{"backingStores":["noobaa-pv-backing-store"]}]}}}' --type merge -n openshift-storage
```

This concludes the setup of the *Multi-Cloud Object Gateway* instance for Red Hat Quay. Note that this configuration cannot be run in parallel on a cluster with Red Hat OpenShift Data Foundation installed.

3.3. CONFIGURING THE DATABASE

3.3.1. Using an existing Postgres database

1. Create a configuration file **config.yaml** with the necessary database fields:

   config.yaml:

```
DB_URI: postgresql://test-quay-database:postgres@test-quay-database:5432/test-quay-
database
```

2. Create a Secret using the configuration file:

```
$ kubectl create secret generic --from-file config.yaml=./config.yaml config-bundle-secret
```

3. Create a QuayRegistry YAML file **quayregistry.yaml** which marks the **postgres** component as unmanaged and references the created Secret:

   quayregistry.yaml

```
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  name: example-registry
  namespace: quay-enterprise
spec:
  configBundleSecret: config-bundle-secret
  components:
    - kind: postgres
      managed: false
```

4. Deploy the registry as detailed in the following sections.

3.3.2. Database configuration

You configure the connection to the database using the required DB_URI field and optional connection arguments in the DB_CONNECTION_ARGS structure. Some key-value pairs defined under

DB_CONNECTION_ARGS are generic while others are database-specific. In particular, SSL configuration depends on the database you are deploying, and examples for PostgreSQL and MySQL are given below.

3.3.2.1. Database URI

Table 3.1. Database URI

Field	Type	Description
DB_URI (Required)	String	The URI for accessing the database, including any credentials

Example:

```
postgresql://quayuser:quaypass@quay-server.example.com:5432/quay
```

3.3.2.2. Database connection arguments

Table 3.2. Database connection arguments

Field	Type	Description
DB_CONNECTION_ARGS	Object	Optional connection arguments for the database, such as timeouts and SSL
.autorollback	Boolean	Whether to use thread-local connections Should **ALWAYS** be **true**
.threadlocals	Boolean	Whether to use auto-rollback connections Should **ALWAYS** be **true**

3.3.2.2.1. PostgreSQL SSL connection arguments

A sample PostgreSQL SSL configuration is given below:

```
DB_CONNECTION_ARGS:
  sslmode: verify-ca
  sslrootcert: /path/to/cacert
```

The **sslmode** option determines whether or with what priority a secure SSL TCP/IP connection will be negotiated with the server. There are six modes:

- **disable:** only try a non-SSL connection

- **allow:** first try a non-SSL connection; if that fails, try an SSL connection
- **prefer:** (default) first try an SSL connection; if that fails, try a non-SSL connection
- **require:** only try an SSL connection. If a root CA file is present, verify the certificate in the same way as if verify-ca was specified
- **verify-ca:** only try an SSL connection, and verify that the server certificate is issued by a trusted certificate authority (CA)
- **verify-full:** only try an SSL connection, verify that the server certificate is issued by a trusted CA and that the requested server host name matches that in the certificate

More information on the valid arguments for PostgreSQL is available at https://www.postgresql.org/docs/current/libpq-connect.html.

3.3.2.2.2. MySQL SSL connection arguments

A sample MySQL SSL configuration follows:

```
DB_CONNECTION_ARGS:
  ssl:
    ca: /path/to/cacert
```

Information on the valid connection arguments for MySQL is available at https://dev.mysql.com/doc/refman/8.0/en/connecting-using-uri-or-key-value-pairs.html.

3.3.3. Using the managed PostgreSQL

Recommendations:

- Database backups should be performed regularly using either the supplied tools on the Postgres image or your own backup infrastructure. The Operator does not currently ensure the Postgres database is backed up.
- Restoring the Postgres database from a backup must be done using Postgres tools and procedures. Be aware that your Quay **Pods** should not be running while the database restore is in progress.
- Database disk space is allocated automatically by the Operator with 50 GiB. This number represents a usable amount of storage for most small to medium Red Hat Quay installations but may not be sufficient for your use cases. Resizing the database volume is currently not handled by the Operator.

3.4. CONFIGURING TLS AND ROUTES

Support for OpenShift Container Platform Edge-Termination Routes has been added by way of a new managed component, **tls**. This separates the **route** component from TLS and allows users to configure both separately. **EXTERNAL_TLS_TERMINATION: true** is the opinionated setting. Managed **tls** means that the default cluster wildcard cert is used. Unmanaged **tls** means that the user provided cert/key pair will be injected into the **Route**.

ssl.cert and **ssl.key** are now moved to a separate, persistent Secret, which ensures that the cert/key pair is not re-generated upon every reconcile. These are now formatted as **edge** routes and mounted to the same directory in the Quay container.

Multiple permutations are possible when configuring TLS and Routes, but the following rules apply:

- If TLS is **managed**, then route must also be **managed**
- If TLS is **unmanaged** then you must supply certs, either with the config tool or directly in the config bundle

The following table outlines the valid options:

Table 3.3. Valid configuration options for TLS and routes

Option	Route	TLS	Certs provided	Result
My own load balancer handles TLS	Managed	Managed	No	Edge Route with default wildcard cert
Red Hat Quay handles TLS	Managed	Unmanaged	Yes	Passthrough route with certs mounted inside the pod
Red Hat Quay handles TLS	Unmanaged	Unmanaged	Yes	Certificates are set inside the quay pod but route must be created manually

NOTE

Red Hat Quay 3.6 does not support builders when TLS is managed by the Operator.

3.4.1. Creating the config bundle secret with TLS cert, key pair:

To add your own TLS cert and key, include them in the config bundle secret as follows:

```
$ oc create secret generic --from-file config.yaml=./config.yaml --from-file ssl.cert=./ssl.cert --from-file
ssl.key=./ssl.key config-bundle-secret
```

3.5. CONFIGURING OTHER COMPONENTS

3.5.1. Using external Redis

If you wish to use an external Redis database, set the component as unmanaged in the **QuayRegistry** instance:

1. Create a configuration file **config.yaml** with the necessary redis fields:

```
BUILDLOGS_REDIS:
    host: quay-server.example.com
    password: strongpassword
    port: 6379

USER_EVENTS_REDIS:
    host: quay-server.example.com
    password: strongpassword
    port: 6379
```

2. Create a Secret using the configuration file

```
$ oc create secret generic --from-file config.yaml=./config.yaml config-bundle-secret
```

3. Create a QuayRegistry YAML file **quayregistry.yaml** which marks redis component as unmanaged and references the created Secret:

```
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  name: example-registry
  namespace: quay-enterprise
spec:
  configBundleSecret: config-bundle-secret
  components:
    - kind: redis
      managed: false
```

4. Deploy the registry

3.5.1.1. Redis configuration fields

3.5.1.1.1. Build logs

Table 3.4. Build logs configuration

Field	Type	Description
BUILDLOGS_REDIS (Required)	Object	Redis connection details for build logs caching
.host (Required)	String	The hostname at which Redis is accessible **Example:** **quay-server.example.com**
.port (Required)	Number	The port at which Redis is accessible **Example:** **6379**
.password	String	The port at which Redis is accessible **Example:** **strongpassword**

3.5.1.1.2. User events

Table 3.5. User events config

Field	Type	Description
USER_EVENTS_REDIS (Required)	Object	Redis connection details for user event handling
.host (Required)	String	The hostname at which Redis is accessible **Example:** **quay-server.example.com**
.port (Required)	Number	The port at which Redis is accessible **Example:** **6379**
.password	String	The port at which Redis is accessible **Example:** **strongpassword**

3.5.1.1.3. Example redis configuration

```
BUILDLOGS_REDIS:
    host: quay-server.example.com
    password: strongpassword
    port: 6379

USER_EVENTS_REDIS:
    host: quay-server.example.com
    password: strongpassword
    port: 6379
```

3.5.2. Disabling the Horizontal Pod Autoscaler

HorizontalPodAutoscalers have been added to the Clair, Quay, and Mirror pods, so that they now automatically scale during load spikes.

As HPA is configured by default to be **managed**, the number of pods for Quay, Clair and repository mirroring is set to two. This facilitates the avoidance of downtime when updating / reconfiguring Quay via the Operator or during rescheduling events.

If you wish to disable autoscaling or create your own **HorizontalPodAutoscaler**, simply specify the component as unmanaged in the **QuayRegistry** instance:

```
apiVersion: quay.redhat.com/v1
```

```
kind: QuayRegistry
metadata:
  name: example-registry
  namespace: quay-enterprise
spec:
  components:
    - kind: horizontalpodautoscaler
      managed: false
```

3.5.3. Disabling Route Component

To prevent the Operator from creating a **Route**:

1. Mark the component as unmanaged in the **QuayRegistry**:

```
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  name: example-registry
  namespace: quay-enterprise
spec:
  components:
    - kind: route
      managed: false
```

2. Specify that you want Quay to handle TLS in the configuration, by editing the **config.yaml** file:

config.yaml

```
...
EXTERNAL_TLS_TERMINATION: false
...
SERVER_HOSTNAME: example-registry-quay-quay-enterprise.apps.user1.example.com
...
PREFERRED_URL_SCHEME: https
...
```

If you do not configure the unmanaged Route correctly, you will see an error similar to the following:

```
{
  {
    "kind":"QuayRegistry",
    "namespace":"quay-enterprise",
    "name":"example-registry",
    "uid":"d5879ba5-cc92-406c-ba62-8b19cf56d4aa",
    "apiVersion":"quay.redhat.com/v1",
    "resourceVersion":"2418527"
  },
  "reason":"ConfigInvalid",
  "message":"required component `route` marked as unmanaged, but `configBundleSecret` is
missing necessary fields"
}
```

NOTE

Disabling the default **Route** means you are now responsible for creating a **Route**, **Service**, or **Ingress** in order to access the Quay instance and that whatever DNS you use must match the **SERVER_HOSTNAME** in the Quay config.

3.5.4. Unmanaged monitoring

If you install the Quay Operator in a single namespace, the monitoring component is automatically set to 'unmanaged'. To enable monitoring in this scenario, see the section Section 8.2, “Enabling monitoring when Operator is installed in a single namespace”.

To disable monitoring explicitly:

```
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  name: example-registry
  namespace: quay-enterprise
spec:
  components:
    - kind: monitoring
      managed: false
```

3.5.5. Unmanaged mirroring

To disable mirroring explicitly:

```
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  name: example-registry
  namespace: quay-enterprise
spec:
  components:
    - kind: mirroring
      managed: false
```

CHAPTER 4. DEPLOYING QUAY USING THE QUAY OPERATOR

The Operator can be deployed from the command line or from the OpenShift console, but the fundamental steps are the same.

4.1. DEPLOYING RED HAT QUAY FROM THE COMMAND LINE

1. Create a namespace, for example, **quay-enterprise**.

2. Create a secret for the config bundle, if you want to pre-configure any aspects of the deployment

3. Create a **QuayRegistry** custom resource in a file called **quayregistry.yaml**

   a. For a minimal deployment, using all the defaults:

   quayregistry.yaml:

   ```
   apiVersion: quay.redhat.com/v1
   kind: QuayRegistry
   metadata:
     name: example-registry
     namespace: quay-enterprise
   ```

   b. If you want to have some components unmanaged, add this information in the **spec** field. For example, a minimal deployment might look like:

   quayregistry.yaml:

   ```
   apiVersion: quay.redhat.com/v1
   kind: QuayRegistry
   metadata:
     name: example-registry
     namespace: quay-enterprise
   spec:
     components:
       - kind: clair
         managed: false
       - kind: horizontalpodautoscaler
         managed: false
       - kind: mirror
         managed: false
       - kind: monitoring
         managed: false
   ```

   c. If you have created a config bundle, for example, **init-config-bundle-secret**, reference it in the **quayregistry.yaml** file:

   quayregistry.yaml:

   ```
   apiVersion: quay.redhat.com/v1
   kind: QuayRegistry
   metadata:
   ```

```
  name: example-registry
  namespace: quay-enterprise
spec:
  configBundleSecret: init-config-bundle-secret
```

4. Create the **QuayRegistry** in specified namespace:

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

5. See the section Monitoring and debugging the deployment process for information on how to track the progress of the deployment.

6. Wait until the **status.registryEndpoint** is populated.

   ```
   $ oc get quayregistry -n quay-enterprise example-registry -o jsonpath="
   {.status.registryEndpoint}" -w
   ```

4.1.1. Viewing created components using the command line

Use the **oc get pods** command to view the deployed components:

```
$ oc get pods -n quay-enterprise

NAME                                                    READY   STATUS      RESTARTS   AGE
example-registry-clair-app-5ffc9f77d6-jwr9s             1/1     Running     0          3m42s
example-registry-clair-app-5ffc9f77d6-wgp7d             1/1     Running     0          3m41s
example-registry-clair-postgres-54956d6d9c-rgs8l        1/1     Running     0          3m5s
example-registry-quay-app-79c6b86c7b-8qnr2              1/1     Running     4          3m42s
example-registry-quay-app-79c6b86c7b-xk85f              1/1     Running     4          3m41s
example-registry-quay-app-upgrade-5kl5r                 0/1     Completed   4          3m50s
example-registry-quay-config-editor-597b47c995-svqrl    1/1     Running     0          3m42s
example-registry-quay-database-b466fc4d7-tfrnx          1/1     Running     2          3m42s
example-registry-quay-mirror-6d9bd78756-6lj6p           1/1     Running     0          2m58s
example-registry-quay-mirror-6d9bd78756-bv6gq           1/1     Running     0          2m58s
example-registry-quay-postgres-init-dzbmx               0/1     Completed   0          3m43s
example-registry-quay-redis-8bd67b647-skgqx             1/1     Running     0          3m42s
```

4.1.2. Horizontal Pod Autoscaling (HPA)

A default deployment shows the following running pods:

- Two pods for the Quay application itself (**example-registry-quay-app-*`**)
- One Redis pod for Quay logging (**example-registry-quay-redis-***)
- One database pod for PostgreSQL used by Quay for metadata storage (**example-registry-quay-database-***)
- One pod for the Quay config editor (**example-registry-quay-config-editor-***)
- Two Quay mirroring pods (**example-registry-quay-mirror-***)
- Two pods for the Clair application (**example-registry-clair-app-***)

- One PostgreSQL pod for Clair (**example-registry-clair-postgres-***)

As HPA is configured by default to be **managed**, the number of pods for Quay, Clair and repository mirroring is set to two. This facilitates the avoidance of downtime when updating / reconfiguring Quay via the Operator or during rescheduling events.

```
$ oc get hpa -n quay-enterprise
NAME                          REFERENCE                                    TARGETS          MINPODS   MAXPODS
REPLICAS   AGE
example-registry-clair-app     Deployment/example-registry-clair-app     16%/90%, 0%/90%   2
10         2          13d
example-registry-quay-app      Deployment/example-registry-quay-app      31%/90%, 1%/90%   2
20         2          13d
example-registry-quay-mirror   Deployment/example-registry-quay-mirror   27%/90%, 0%/90%   2
20         2          13d
```

4.1.3. Using the API to create the first user

When using the API to create the first user, the following conditions must be met:

- The config option **FEATURE_USER_INITIALIZE** must be set to **true**
- No users can already exist in the database

For more information on pre-configuring the deployment, see the section Pre-configuring Quay for automation

4.1.3.1. Invoking the API

Using the **status.registryEndpoint** URL, invoke the **/api/v1/user/initialize** API, passing in the username, password and email address. You can also request an OAuth token by specifying **"access_token": true**.

```
$ curl -X POST -k https://example-registry-quay-quay-
enterprise.apps.docs.quayteam.org/api/v1/user/initialize --header 'Content-Type: application/json' --
data '{ "username": "quayadmin", "password":"quaypass123", "email": "quayadmin@example.com",
"access_token": true}'
```

```
{"access_token":"6B4QTRSTSD1HMIG915VPX7BMEZBVB9GPNY2FC2ED",
"email":"quayadmin@example.com","encrypted_password":"1nZMLH57RIE5UGdL/yYpDOHLqiNCgi
mb6W9kfF8MjZ1xrfDpRyRs9NUnUuNuAitW","username":"quayadmin"}
```

If successful, the method returns an object with the username, email and encrypted password. If a user already exists in the database, an error is returned:

```
$ curl -X POST -k https://example-registry-quay-quay-
enterprise.apps.docs.quayteam.org/api/v1/user/initialize --header 'Content-Type: application/json' --
data '{ "username": "quayuser2", "password":"quaypass123", "email": "quayuser2@example.com"}'
```

```
{"message":"Cannot initialize user in a non-empty database"}
```

The password must be at least 8 characters and contain no whitespace:

```
 $ curl -X POST -k  https://example-registry-quay-quay-
enterprise.apps.docs.quayteam.org/api/v1/user/initialize --header 'Content-Type: application/json' --
data '{ "username": "quayadmin", "password":"pass123", "email": "quayadmin@example.com"}'
```

```
{"message":"Failed to initialize user: Invalid password, password must be at least 8 characters and
contain no whitespace."}
```

4.1.3.2. Using the OAuth token

You can now invoke the rest of the Quay API specifying the returned OAuth code. For example, to get a list of the current users:

```
$ curl -X GET -k -H "Authorization: Bearer
6B4QTRSTSD1HMIG915VPX7BMEZBVB9GPNY2FC2ED" https://example-registry-quay-quay-
enterprise.apps.docs.quayteam.org/api/v1/superuser/users/
```

```
{
    "users": [
        {
            "kind": "user",
            "name": "quayadmin",
            "username": "quayadmin",
            "email": "quayadmin@example.com",
            "verified": true,
            "avatar": {
                "name": "quayadmin",
                "hash": "3e82e9cbf62d25dec0ed1b4c66ca7c5d47ab9f1f271958298dea856fb26adc4c",
                "color": "#e7ba52",
                "kind": "user"
            },
            "super_user": true,
            "enabled": true
        }
    ]
}
```

In this instance, the details for the **quayadmin** user are returned as it is the only user that has been created so far.

4.1.3.2.1. Create organization

To create an organization, use a POST call to **api/v1/organization/** endpoint:

```
$ curl -X POST -k --header 'Content-Type: application/json' -H "Authorization: Bearer
6B4QTRSTSD1HMIG915VPX7BMEZBVB9GPNY2FC2ED" https://example-registry-quay-quay-
enterprise.apps.docs.quayteam.org/api/v1/organization/ --data '{"name": "testorg", "email":
"testorg@example.com"}'
```

```
"Created"
```

4.1.3.2.2. Get organization details

To retrieve the details of the organization you created:

```
$ curl -X GET -k --header 'Content-Type: application/json' -H "Authorization: Bearer
6B4QTRSTSD1HMIG915VPX7BMEZBVB9GPNY2FC2ED" https://min-registry-quay-quay-
enterprise.apps.docs.quayteam.org/api/v1/organization/testorg
```

```
{
   "name": "testorg",
   "email": "testorg@example.com",
   "avatar": {
      "name": "testorg",
      "hash": "5f113632ad532fc78215c9258a4fb60606d1fa386c91b141116a1317bf9c53c8",
      "color": "#a55194",
      "kind": "user"
   },
   "is_admin": true,
   "is_member": true,
   "teams": {
      "owners": {
         "name": "owners",
         "description": "",
         "role": "admin",
         "avatar": {
            "name": "owners",
            "hash": "6f0e3a8c0eb46e8834b43b03374ece43a030621d92a7437beb48f871e90f8d90",
            "color": "#c7c7c7",
            "kind": "team"
         },
         "can_view": true,
         "repo_count": 0,
         "member_count": 1,
         "is_synced": false
      }
   },
   "ordered_teams": [
      "owners"
   ],
   "invoice_email": false,
   "invoice_email_address": null,
   "tag_expiration_s": 1209600,
   "is_free_account": true
}
```

4.1.4. Monitoring and debugging the deployment process

Red Hat Quay 3.6 provides new functionality to troubleshoot problems during the deployment phase. The status in the QuayRegistry object can help you monitor the health of the components during the deployment an help you debug any problems that may arise:

```
$ oc get quayregistry -n quay-enterprise -o yaml
```

Immediately after deployment, the QuayRegistry object will show the basic configuration:

```
apiVersion: v1
```

```
items:
- apiVersion: quay.redhat.com/v1
  kind: QuayRegistry
  metadata:
    creationTimestamp: "2021-09-14T10:51:22Z"
    generation: 3
    name: example-registry
    namespace: quay-enterprise
    resourceVersion: "50147"
    selfLink: /apis/quay.redhat.com/v1/namespaces/quay-enterprise/quayregistries/example-registry
    uid: e3fc82ba-e716-4646-bb0f-63c26d05e00e
  spec:
    components:
    - kind: postgres
      managed: true
    - kind: clair
      managed: true
    - kind: redis
      managed: true
    - kind: horizontalpodautoscaler
      managed: true
    - kind: objectstorage
      managed: true
    - kind: route
      managed: true
    - kind: mirror
      managed: true
    - kind: monitoring
      managed: true
    - kind: tls
      managed: true
    configBundleSecret: example-registry-config-bundle-kt55s
kind: List
metadata:
  resourceVersion: ""
  selfLink: ""
```

Use the **oc get pods** command to view the current state of the deployed components:

```
$ oc get pods -n quay-enterprise

NAME                                                   READY   STATUS              RESTARTS   AGE
example-registry-clair-app-86554c6b49-ds7bl             0/1     ContainerCreating   0          2s
example-registry-clair-app-86554c6b49-hxp5s             0/1     Running             1          17s
example-registry-clair-postgres-68d8857899-lbc5n        0/1     ContainerCreating   0          17s
example-registry-quay-app-upgrade-h2v7h                 0/1     ContainerCreating   0          9s
example-registry-quay-config-editor-5f646cbcb7-lbnc2    0/1     ContainerCreating   0          17s
example-registry-quay-database-66f495c9bc-wqsjf         0/1     ContainerCreating   0          17s
example-registry-quay-mirror-854c88457b-d845g           0/1     Init:0/1            0          2s
example-registry-quay-mirror-854c88457b-fghxv           0/1     Init:0/1            0          17s
example-registry-quay-postgres-init-bktdt               0/1     Terminating         0          17s
example-registry-quay-redis-f9b9d44bf-4htpz             0/1     ContainerCreating   0          17s
```

While the deployment is in progress, the QuayRegistry object will show the current status. In this instance, database migrations are taking place, and other components are waiting until this completes.

```
  status:
    conditions:
    - lastTransitionTime: "2021-09-14T10:52:04Z"
      lastUpdateTime: "2021-09-14T10:52:04Z"
      message: all objects created/updated successfully
      reason: ComponentsCreationSuccess
      status: "False"
      type: RolloutBlocked
    - lastTransitionTime: "2021-09-14T10:52:05Z"
      lastUpdateTime: "2021-09-14T10:52:05Z"
      message: running database migrations
      reason: MigrationsInProgress
      status: "False"
      type: Available
    configEditorCredentialsSecret: example-registry-quay-config-editor-credentials-btbkcg8dc9
    configEditorEndpoint: https://example-registry-quay-config-editor-quay-
enterprise.apps.docs.quayteam.org
    lastUpdated: 2021-09-14 10:52:05.371425635 +0000 UTC
    unhealthyComponents:
      clair:
      - lastTransitionTime: "2021-09-14T10:51:32Z"
        lastUpdateTime: "2021-09-14T10:51:32Z"
        message: 'Deployment example-registry-clair-postgres: Deployment does not have minimum
availability.'
        reason: MinimumReplicasUnavailable
        status: "False"
        type: Available
      - lastTransitionTime: "2021-09-14T10:51:32Z"
        lastUpdateTime: "2021-09-14T10:51:32Z"
        message: 'Deployment example-registry-clair-app: Deployment does not have minimum
availability.'
        reason: MinimumReplicasUnavailable
        status: "False"
        type: Available
      mirror:
      - lastTransitionTime: "2021-09-14T10:51:32Z"
        lastUpdateTime: "2021-09-14T10:51:32Z"
        message: 'Deployment example-registry-quay-mirror: Deployment does not have minimum
availability.'
        reason: MinimumReplicasUnavailable
        status: "False"
        type: Available
```

When the deployment process finishes successfully, the status in the QuayRegistry object shows no unhealthy components:

```
  status:
    conditions:
    - lastTransitionTime: "2021-09-14T10:52:36Z"
      lastUpdateTime: "2021-09-14T10:52:36Z"
      message: all registry component healthchecks passing
      reason: HealthChecksPassing
      status: "True"
      type: Available
    - lastTransitionTime: "2021-09-14T10:52:46Z"
      lastUpdateTime: "2021-09-14T10:52:46Z"
    message: all objects created/updated successfully
    reason: ComponentsCreationSuccess
    status: "False"
    type: RolloutBlocked
  configEditorCredentialsSecret: example-registry-quay-config-editor-credentials-hg7gg7h57m
  configEditorEndpoint: https://example-registry-quay-config-editor-quay-
enterprise.apps.docs.quayteam.org
  currentVersion: 3.6.0
  lastUpdated: 2021-09-14 10:52:46.104181633 +0000 UTC
  registryEndpoint: https://example-registry-quay-quay-enterprise.apps.docs.quayteam.org
  unhealthyComponents: {}
```

4.2. DEPLOYING RED HAT QUAY FROM THE OPENSHIFT CONSOLE

1. Create a namespace, for example, **quay-enterprise**.

2. Select Operators → Installed Operators, then select the Quay Operator to navigate to the Operator detail view.

3. Click 'Create Instance' on the 'Quay Registry' tile under 'Provided APIs'.

4. Optionally change the 'Name' of the **QuayRegistry**. This will affect the hostname of the registry. All other fields have been populated with defaults.

5. Click 'Create' to submit the **QuayRegistry** to be deployed by the Quay Operator.

6. You should be redirected to the **QuayRegistry** list view. Click on the **QuayRegistry** you just created to see the details view.

7. Once the 'Registry Endpoint' has a value, click it to access your new Quay registry via the UI. You can now select 'Create Account' to create a user and sign in.

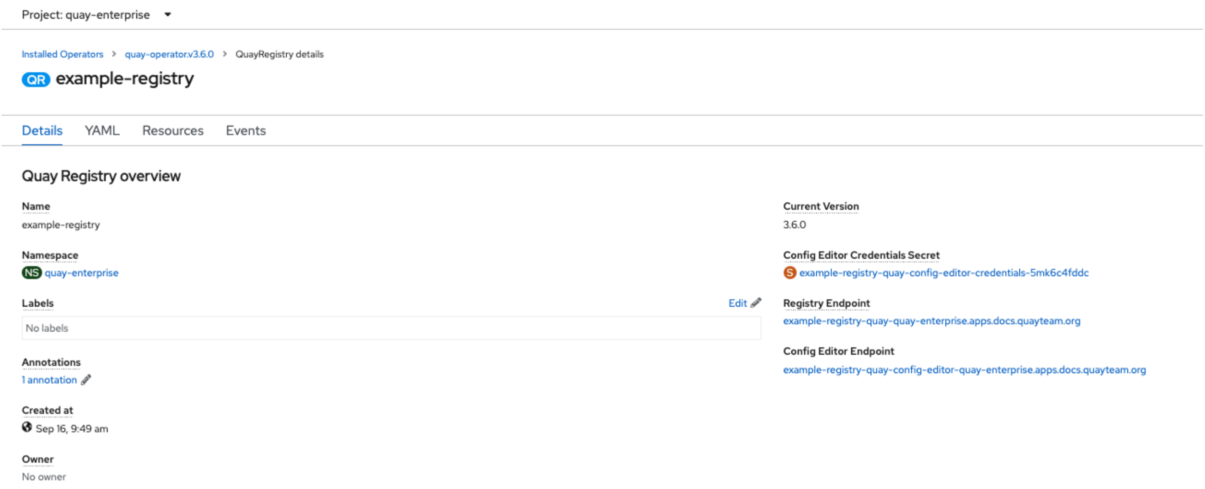
4.2.1. Using the Quay UI to create the first user

NOTE

This procedure assumes that the **FEATURE_USER_CREATION** config option has not been set to **false.** If it is **false**, then the **Create Account** functionality on the UI will be disabled, and you will have to use the API to create the first user.

1. In the OpenShift console, navigate to Operators → Installed Operators, with the appropriate namespace / project.

2. Click on the newly installed QuayRegistry, to view the details:



Quay Registry overview

Name
example-registry

Namespace
NS quay-enterprise

Labels
No labels

Annotations
1 annotation

Created at
Sep 16, 9:49 am

Owner
No owner

Current Version
3.6.0

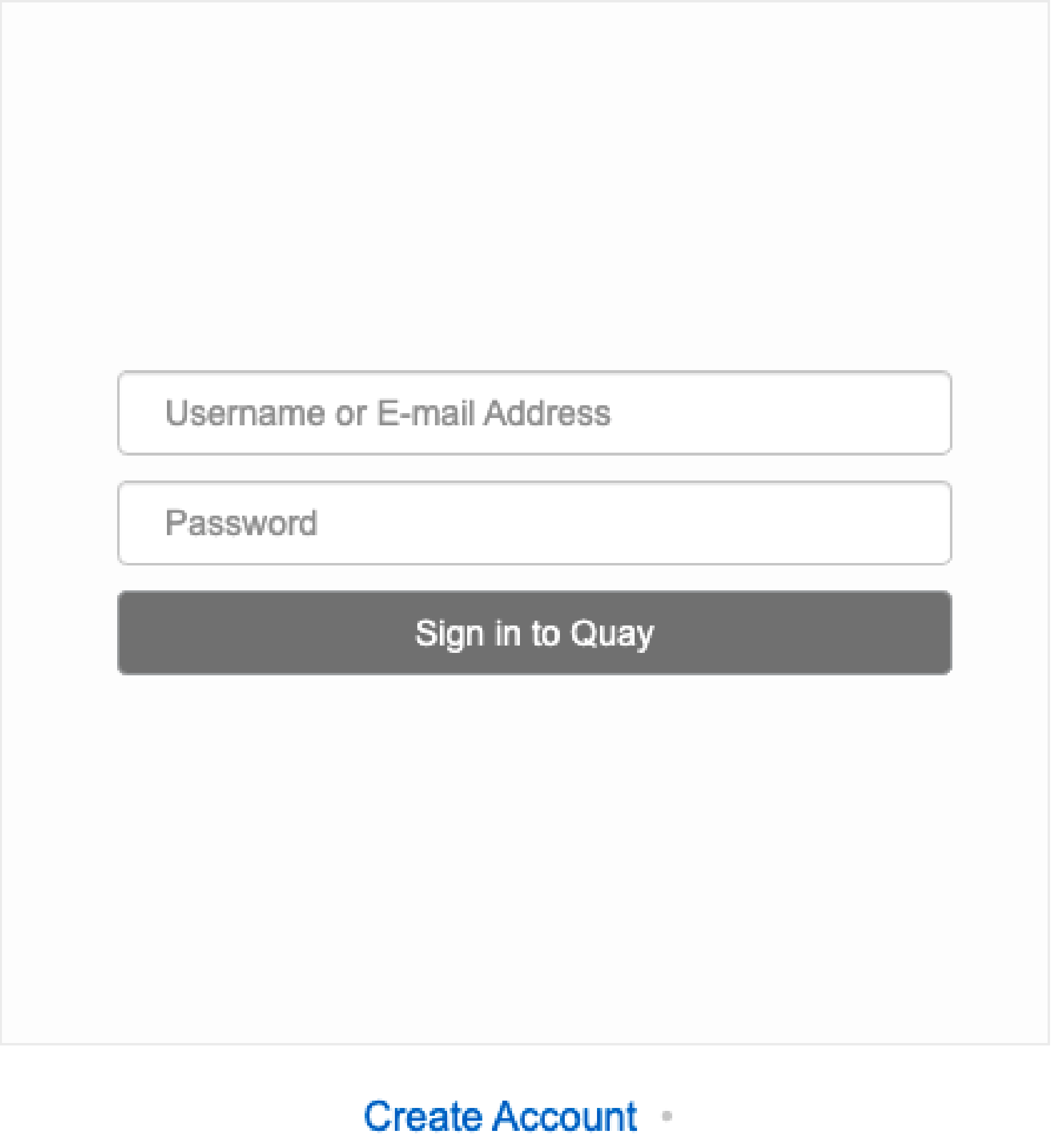
Config Editor Credentials Secret
S example-registry-quay-config-editor-credentials-5mk6c4fddc

Registry Endpoint
example-registry-quay-quay-enterprise.apps.docs.quayteam.org

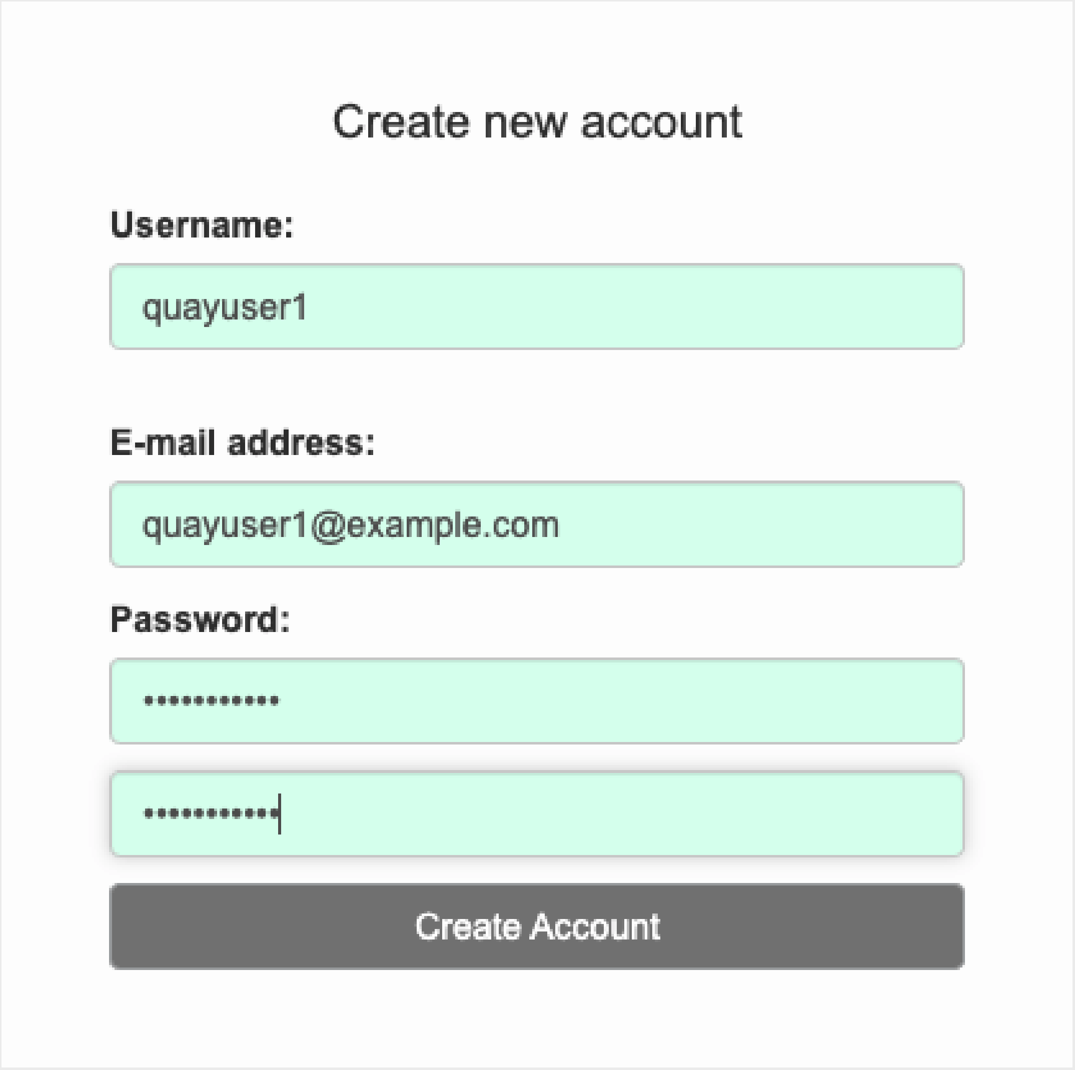
Config Editor Endpoint
example-registry-quay-config-editor-quay-enterprise.apps.docs.quayteam.org

3. Once the **Registry Endpoint** has a value, navigate to this URL in your browser

4. Select 'Create Account' in the Quay registry UI to create a user



5. Enter details for username, password, email and click **Create Account**



Create new account

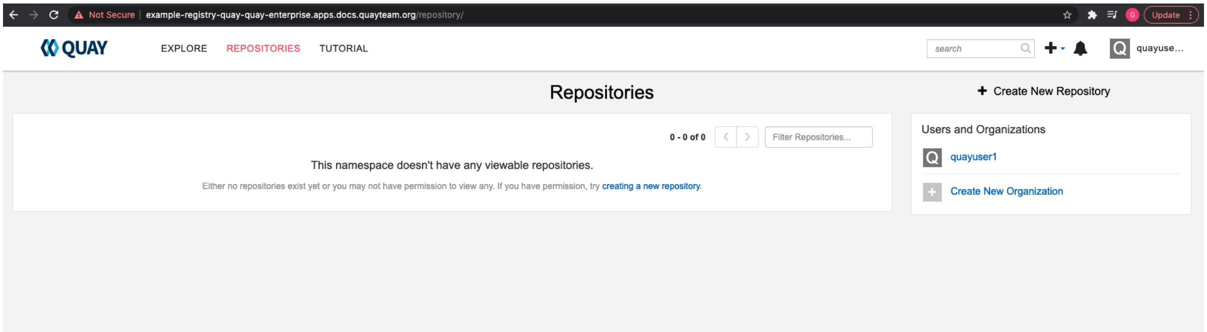
Username: quayuser1

E-mail address: quayuser1@example.com

Password: ●●●●●●●●●●●

●●●●●●●●●●●

6. You are automatically logged in to the Quay registry



Not Secure | example-registry-quay-quay-enterprise.apps.docs.quayteam.org/repository/

Repositories

0 - 0 of 0

This namespace doesn't have any viewable repositories.

Either no repositories exist yet or you may not have permission to view any. If you have permission, try creating a new repository.

Users and Organizations

quayuser1

CHAPTER 5. CONFIGURING QUAY ON OPENSHIFT USING THE COMMAND LINE AND API

Once deployed, you can configure the Quay application by editing the Quay configuration bundle secret **spec.configBundleSecret** and you can also change the managed status of components in the **spec.components** object of the QuayRegistry resource

The Operator does not watch the **spec.configBundleSecret** resource for changes, so it is recommended that configuration changes be made to a new **Secret** resource and that the **spec.configBundleSecret** field is updated to reflect the change. In the event there are issues with the new configuration, it is simple to revert the value of **spec.configBundleSecret** to the older **Secret**.

The procedure for changing the configuration involves:

1. Determining the current endpoints and secrets
2. Downloading the existing configuration bundle, if Red Hat Quay has already been deployed on OpenShift
3. Creating or updating the **config.yaml** configuration file
4. Assembling any SSL certs required for Quay, or custom SSL certs needed for services
5. Creating a new config bundle secret, using the config file and any certs
6. Creating or updating the registry, referencing the new config bundle secret and specifying any over-rides for managing components
7. Monitoring the deployment to ensure successful completion and that the configuration changes have taken effect

Alternatively, you can use the config editor UI to configure the Quay application, as described in the section Chapter 6, *Using the config tool to reconfigure Quay on OpenShift* .

5.1. DETERMINING QUAYREGISTRY ENDPOINTS AND SECRETS

You can examine the QuayRegistry resource, using **oc describe quayregistry** or **oc get quayregistry -o yaml**, to determine the current endpoints and secrets:

```
$ oc get quayregistry example-registry -n quay-enterprise -o yaml

apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  ...
  name: example-registry
  namespace: quay-enterprise
  ...
spec:
  components:
  ...
  configBundleSecret: example-registry-quay-config-bundle-fjpnm
status:
  configEditorCredentialsSecret: example-registry-quay-config-editor-credentials-kk55dc7299
  configEditorEndpoint: https://example-registry-quay-config-editor-quay-
```

```
enterprise.apps.docs.quayteam.org
  currentVersion: 3.6.0
  lastUpdated: 2021-09-21 11:18:13.285192787 +0000 UTC
  registryEndpoint: https://example-registry-quay-quay-enterprise.apps.docs.quayteam.org
  unhealthyComponents: {}
```

The relevant fields are:

- **registryEndpoint**: The URL for your registry, for browser access to the registry UI, and for the registry API endpoint
- **configBundleSecret**: The config bundle secret, containing the **config.yaml** file and any SSL certs
- **configEditorEndpoint**: The URL for the config editor tool, for browser access to the config tool, and for the configuration API
- **configEditorCredentialsSecret**: The secret containing the username (typically **quayconfig**) and the password for the config editor tool

To determine the username and password for the config editor tool:

1. Retrieve the secret:

```
$ oc get secret -n quay-enterprise example-registry-quay-config-editor-credentials-
kk55dc7299 -o yaml

apiVersion: v1
data:
  password: SkZwQkVKTUN0a1BUZmp4dA==
  username: cXVheWNvbmZpZw==
kind: Secret
```

2. Decode the username:

```
$ echo 'cXVheWNvbmZpZw==' | base64 --decode

quayconfig
```

3. Decode the password:

```
$ echo 'SkZwQkVKTUN0a1BUZmp4dA==' | base64 --decode

JFpBEJMCtkPTfjxt
```

5.2. DOWNLOADING THE EXISTING CONFIGURATION

There are a number of methods for accessing the current configuration:

1. Using the config editor endpoint, specifying the username and password for the config editor:

```
$ curl -k -u quayconfig:JFpBEJMCtkPTfjxt https://example-registry-quay-config-editor-quay-
enterprise.apps.docs.quayteam.org/api/v1/config
```

```
{
   "config.yaml": {
      "ALLOW_PULLS_WITHOUT_STRICT_LOGGING": false,
      "AUTHENTICATION_TYPE": "Database",
      ...
      "USER_RECOVERY_TOKEN_LIFETIME": "30m"
   },
   "certs": {
      "extra_ca_certs/service-ca.crt":
"LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSURVVENDQWptZ0F3SUJBZ0lJRE9k
WFhuUXFjMUF3RFFZSktvWklodmNOQVFFTEJRQXdOakUwTURJR0ExVUUKQXd3cmIzQ
mxibk5vYVdaMExYTmxjblpwWTJVdGMyVnlkbWx1WnkxemFXZHVaWEpBTVRZek1UYzNPRE
V3TXpBZQpGdzB5TVRBNU1UWXdOelF4TkRKYUZ..."
   }
}
```

2. Using the config bundle secret

   a. Get the secret data:

```
$ oc get secret -n quay-enterprise example-registry-quay-config-bundle-jkfhs -o
jsonpath='{.data}'
```

```
{
   "config.yaml":
"QUxMT1dfUFVMTFNfV0lUSE9VVF9TVFJJQ1RfTE9HR0lORzogZmFsc2UKQVVUSEVO
VElDQVRJT05fVFlQRTogRGF0YWJhc2UKQVZBVEFSX0tJTkQ6IGxvY2FsCkRBVEFCQ
VNFX1NFQ1JFVF9LRVk6IHhlOEc1VDBNbkllaGxNQzNkTjd3MWR5WWxwVmo0a0R2enl
xZ3l6Ulp5ZjFpODBmWWU3VDUxU1FPZ3hXelpocFlqYlVxNzRKaDllVVVEVWpyCkRFR
...
OgotIDJ3ClRFQU1fUkVTWU5DX1NUQUxFX1RJTUU6IDYwbQpURVNUSU5HOiBmYWx
zZQpVU0VSX1JFQ09WRVJZX1RPS0VOX0xJRkVUSU1FOiAzMG0K",
   "extra_ca_cert_service-ca.crt":
"LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSURVVENDQWptZ0F3SUJBZ0lJR
E9kWFhuUXFjMUF3RFFZSktvWklodmNOQVFFTEJRQXdOakUwTURJR0ExVUUKQXd3
cmIzQmxibk5vYVdaMExYTmxjblpwWTJVdGMyVnlkbWx1WnkxemFXZHVaWEpBTVRZek1
UYzNPREV3TXpBZQpGdzB5TVRBNU1UWXdOelF4TkRKYUZ3MHl
...
XSW1jaApkQXZTWGpFUnZOZEZzN3pHK1VzTmZwN0ZIQkJVWkY4L2RZNWJCR2Mw
WTVaY0J6bFNjQT09Ci0tLS0tRU5EIENFUlRJRklDQVRFLS0tLS0K"
}
```

   b. Decode the data:

```
$ echo 'QUxMT1dfUFVMTFN...U1FOiAzMG0K' | base64 --decode
```

```
ALLOW_PULLS_WITHOUT_STRICT_LOGGING: false
AUTHENTICATION_TYPE: Database
...
TAG_EXPIRATION_OPTIONS:
- 2w
TEAM_RESYNC_STALE_TIME: 60m
TESTING: false
USER_RECOVERY_TOKEN_LIFETIME: 30m
```

5.3. USING THE CONFIG BUNDLE TO CONFIGURE CUSTOM SSL CERTS

You can configure custom SSL certs either before initial deployment or after Red Hat Quay is deployed on OpenShift, by creating a new config bundle secret. If you are adding the cert(s) to an existing deployment, you must include the complete existing **config.yaml** in the new config bundle secret, even if you are not making any configuration changes.

1. Create the secret using embedded data or using files:

   a. Embed the configuration details directly in the Secret resource YAML file, for example:

      custom-ssl-config-bundle.yaml

      ```
      apiVersion: v1
      kind: Secret
      metadata:
        name: custom-ssl-config-bundle-secret
        namespace: quay-enterprise
      data:
        config.yaml: |
          ALLOW_PULLS_WITHOUT_STRICT_LOGGING: false
          AUTHENTICATION_TYPE: Database
          ...
        extra_ca_cert_my-custom-ssl.crt: |
          -----BEGIN CERTIFICATE-----
          MIIDsDCCApigAwIBAgIUCqlzkHjF5i5TXLFy+sepFrZr/UswDQYJKoZIhvcNAQEL

      BQAwbzELMAkGA1UEBhMCSUUxDzANBgNVBAgMBkdBTFdBWTEPMA0GA1UEBwwG
      R0FM
          ....
          -----END CERTIFICATE-----
      ```

      Next, create the secret from the YAML file:

      ```
      $ oc create  -f custom-ssl-config-bundle.yaml
      ```

   b. Alternatively, you can create files containing the desired information, and then create the secret from those files:

      ```
      $ oc create secret generic custom-ssl-config-bundle-secret \
        --from-file=config.yaml \
        --from-file=extra_ca_cert_my-custom-ssl.crt=my-custom-ssl.crt
      ```

2. Create or update the QuayRegistry YAML file **quayregistry.yaml**, referencing the created Secret, for example:

   quayregistry.yaml

   ```
   apiVersion: quay.redhat.com/v1
   kind: QuayRegistry
   metadata:
     name: example-registry
   ```

```
  namespace: quay-enterprise
spec:
  configBundleSecret: custom-ssl-config-bundle-secret
```

3. Deploy or update the registry using the YAML file:

```
oc apply -f quayregistry.yaml
```

5.4. VOLUME SIZE OVERRIDES

As of Red Hat Quay v3.6.2, you can specify the desired size of storage resources provisioned for managed components. The default size for Clair and Quay PostgreSQL databases is **50Gi**. You can now choose a large enough capacity upfront, either for performance reasons or in the case where your storage backend does not have resize capability.

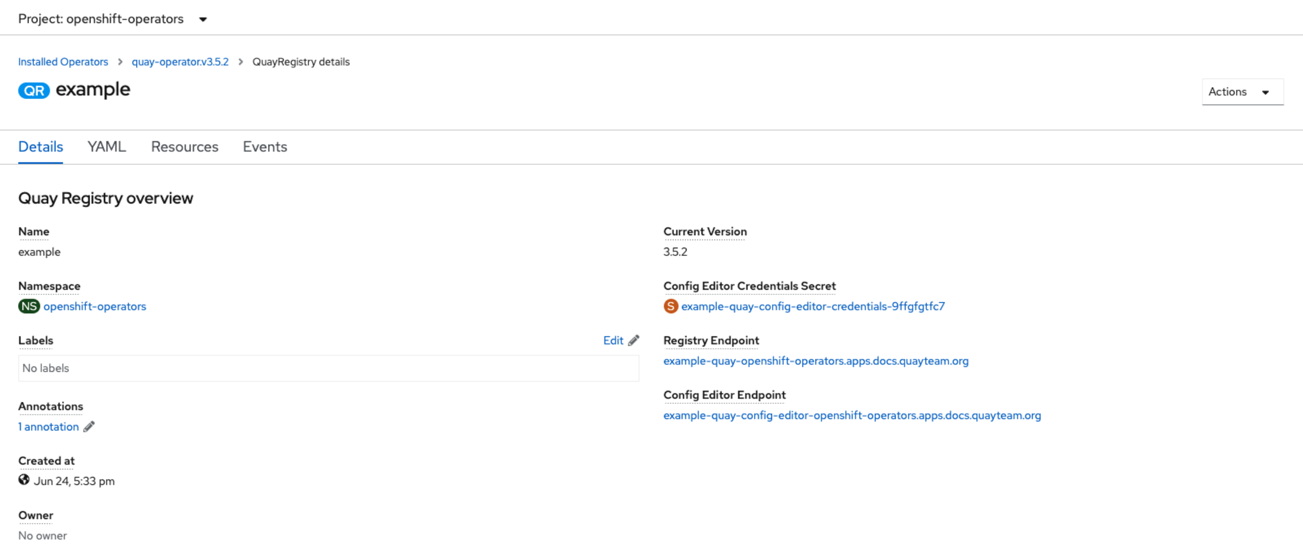
In the following example, the volume size for the Clair and the Quay PostgreSQL databases has been set to **70Gi**:

```
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  name: quay-example
  namespace: quay-enterprise
spec:
  configBundleSecret: config-bundle-secret
  components:
    - kind: objectstorage
      managed: false
    - kind: route
      managed: true
    - kind: tls
      managed: false
    - kind: clair
      managed: true
      overrides:
        volumeSize: 70Gi
    - kind: postgres
      managed: true
      overrides:
        volumeSize: 70Gi
```

CHAPTER 6. USING THE CONFIG TOOL TO RECONFIGURE QUAY ON OPENSHIFT

6.1. ACCESSING THE CONFIG EDITOR

In the Details section of the QuayRegistry screen, the endpoint for the config editor is available, along with a link to the secret containing the credentials for logging into the config editor:


Project: openshift-operators
Installed Operators > quay-operator.v3.5.2 > QuayRegistry details
QR example
Actions
Details
YAML
Resources
Events

Quay Registry overview

Name
example

Namespace
NS openshift-operators

Labels
Edit
No labels

Annotations
1 annotation

Created at
Jun 24, 5:33 pm

Owner
No owner

Current Version
3.5.2

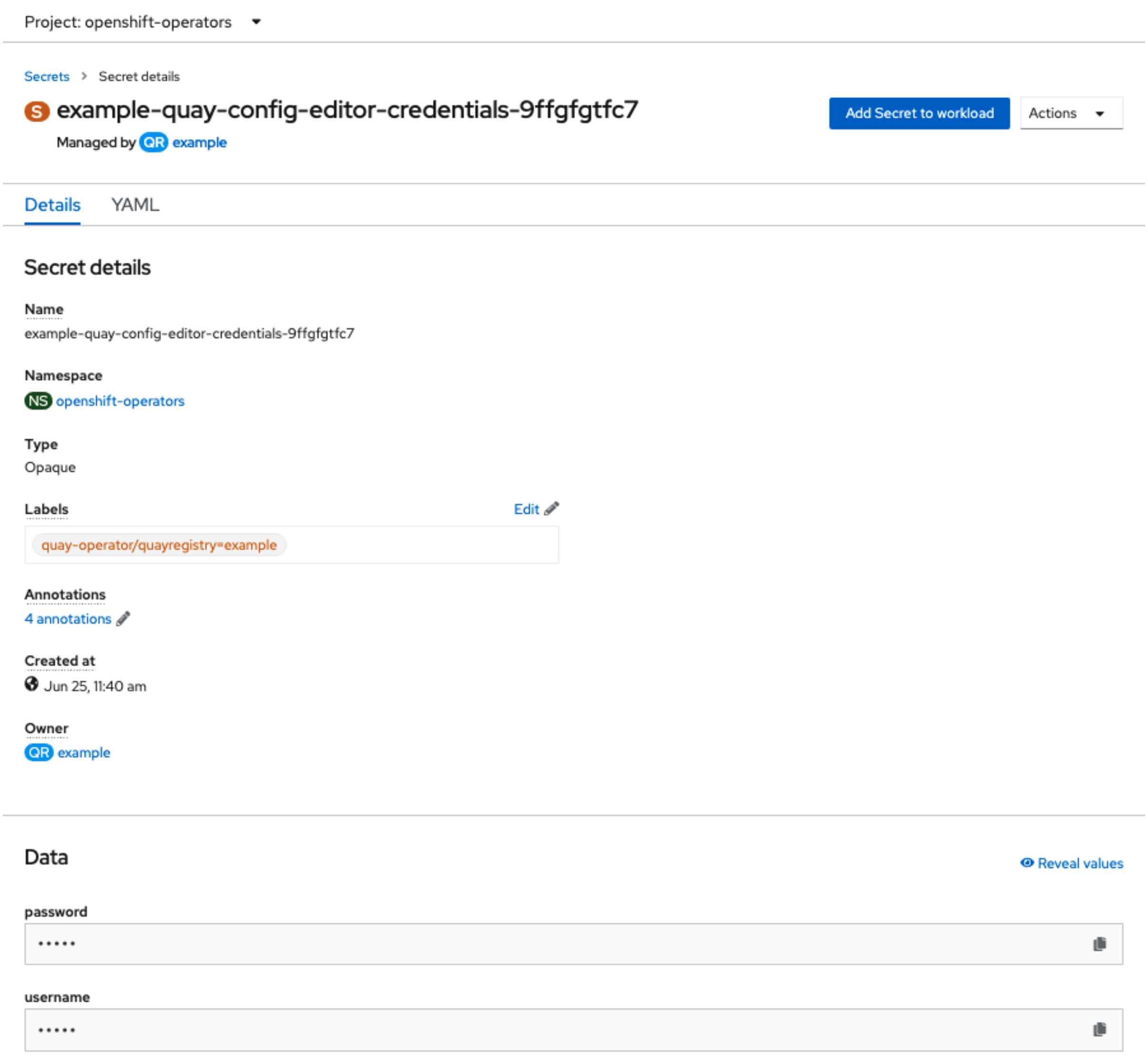
Config Editor Credentials Secret
S example-quay-config-editor-credentials-9ffgfgtfc7

Registry Endpoint
example-quay-openshift-operators.apps.docs.quayteam.org

Config Editor Endpoint
example-quay-config-editor-openshift-operators.apps.docs.quayteam.org

6.1.1. Retrieving the config editor credentials

1. Click on the link for the config editor secret:



Project: openshift-operators

Secrets > Secret details

S example-quay-config-editor-credentials-9ffgfgtfc7

Managed by QR example

Add Secret to workload | Actions

Details | YAML

Secret details

Name
example-quay-config-editor-credentials-9ffgfgtfc7

Namespace
NS openshift-operators

Type
Opaque

Labels
Edit
quay-operator/quayregistry=example

Annotations
4 annotations

Created at
Jun 25, 11:40 am

Owner
QR example

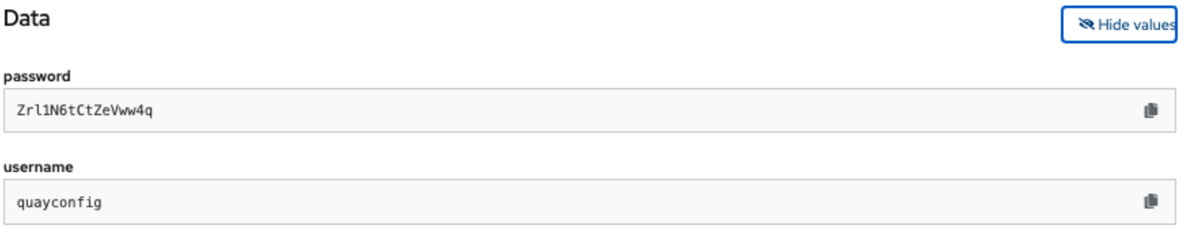
Data

Reveal values

password
•••••

username
•••••

2. In the Data section of the Secret details screen, click **Reveal values** to see the credentials for logging in to the config editor:



Data

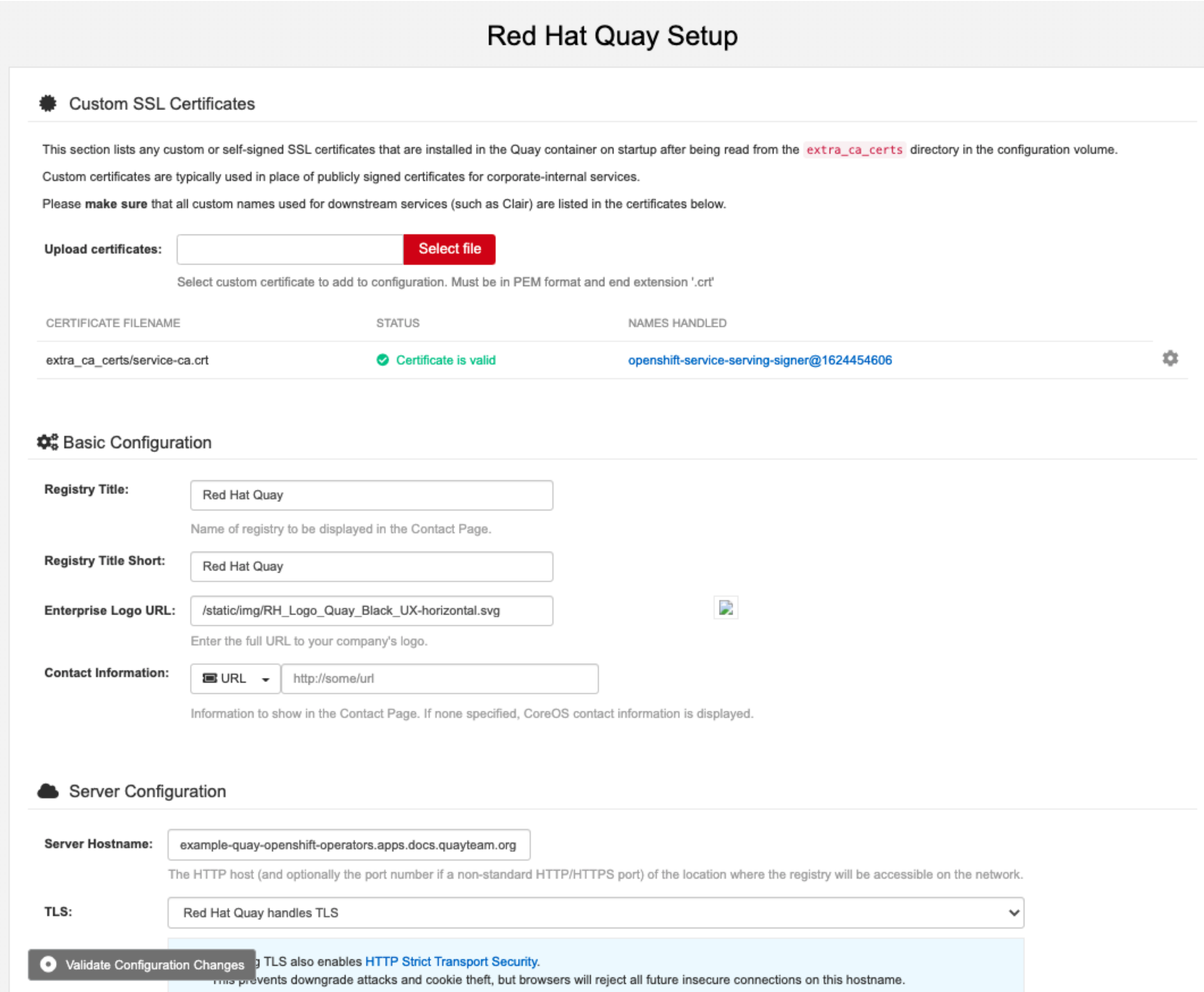
Hide values

password
Zrl1N6tCtZeVww4q

username
quayconfig

6.1.2. Logging in to the config editor

Browse to the config editor endpoint and then enter the username, typically **quayconfig**, and the corresponding password to access the config tool:



Red Hat Quay Setup

Custom SSL Certificates

This section lists any custom or self-signed SSL certificates that are installed in the Quay container on startup after being read from the `extra_ca_certs` directory in the configuration volume.

Custom certificates are typically used in place of publicly signed certificates for corporate-internal services.

Please **make sure** that all custom names used for downstream services (such as Clair) are listed in the certificates below.

Upload certificates: [ ] Select file

Select custom certificate to add to configuration. Must be in PEM format and end extension '.crt'

CERTIFICATE FILENAME	STATUS	NAMES HANDLED
extra_ca_certs/service-ca.crt	✓ Certificate is valid	openshift-service-serving-signer@1624454606

Basic Configuration

Registry Title: Red Hat Quay

Name of registry to be displayed in the Contact Page.

Registry Title Short: Red Hat Quay

Enterprise Logo URL: /static/img/RH_Logo_Quay_Black_UX-horizontal.svg

Enter the full URL to your company's logo.

Contact Information: URL http://some/url

Information to show in the Contact Page. If none specified, CoreOS contact information is displayed.

Server Configuration

Server Hostname: example-quay-openshift-operators.apps.docs.quayteam.org

The HTTP host (and optionally the port number if a non-standard HTTP/HTTPS port) of the location where the registry will be accessible on the network.

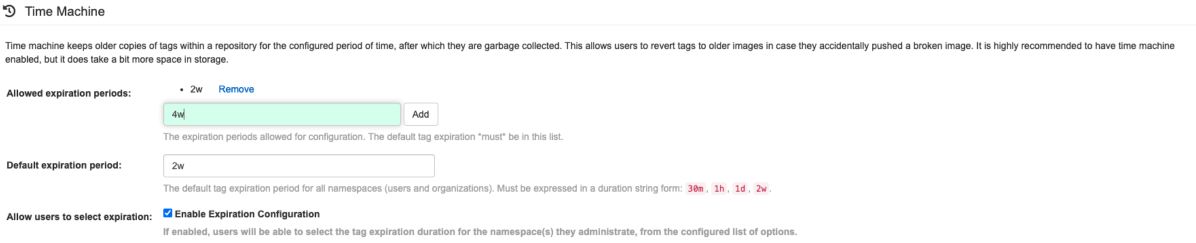
TLS: Red Hat Quay handles TLS

g TLS also enables HTTP Strict Transport Security.
This prevents downgrade attacks and cookie theft, but browsers will reject all future insecure connections on this hostname.

6.1.3. Changing configuration

In this example of updating the configuration, a superuser is added via the config editor tool:

1. Add an expiration period, for example **4w**, for the time machine functionality:



Time Machine

Time machine keeps older copies of tags within a repository for the configured period of time, after which they are garbage collected. This allows users to revert tags to older images in case they accidentally pushed a broken image. It is highly recommended to have time machine enabled, but it does take a bit more space in storage.

Allowed expiration periods:
- 2w Remove

4w Add

The expiration periods allowed for configuration. The default tag expiration *must* be in this list.

Default expiration period: 2w

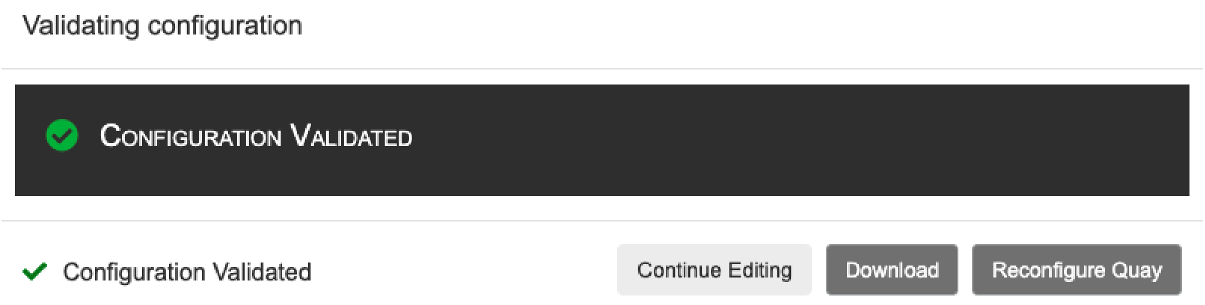
The default tag expiration period for all namespaces (users and organizations). Must be expressed in a duration string form: `30m`, `1h`, `1d`, `2w`.

Allow users to select expiration: ☑ **Enable Expiration Configuration**

If enabled, users will be able to select the tag expiration duration for the namespace(s) they administrate, from the configured list of options.

2. Select **Validate Configuration Changes** to ensure that the changes are valid

3. Apply the changes by pressing the **Reconfigure Quay** button:

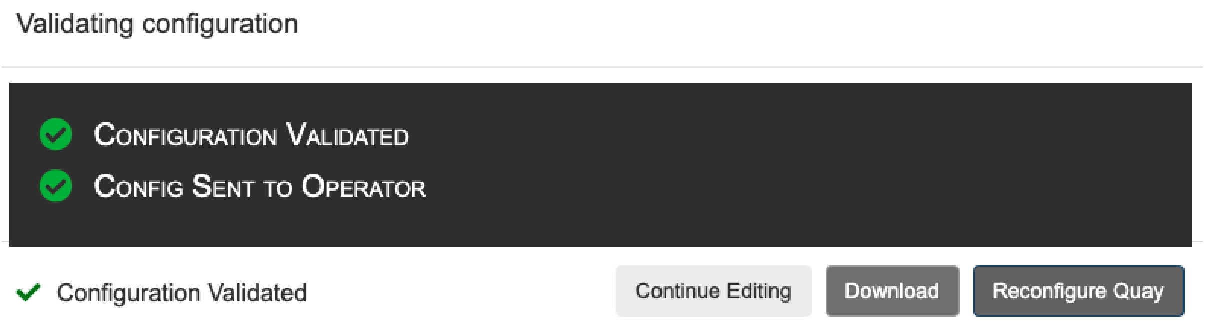


Validating configuration

CONFIGURATION VALIDATED

✓ Configuration Validated

4. The config tool notifies you that the change has been submitted to Quay:



Validating configuration

CONFIGURATION VALIDATED

CONFIG SENT TO OPERATOR

✓ Configuration Validated

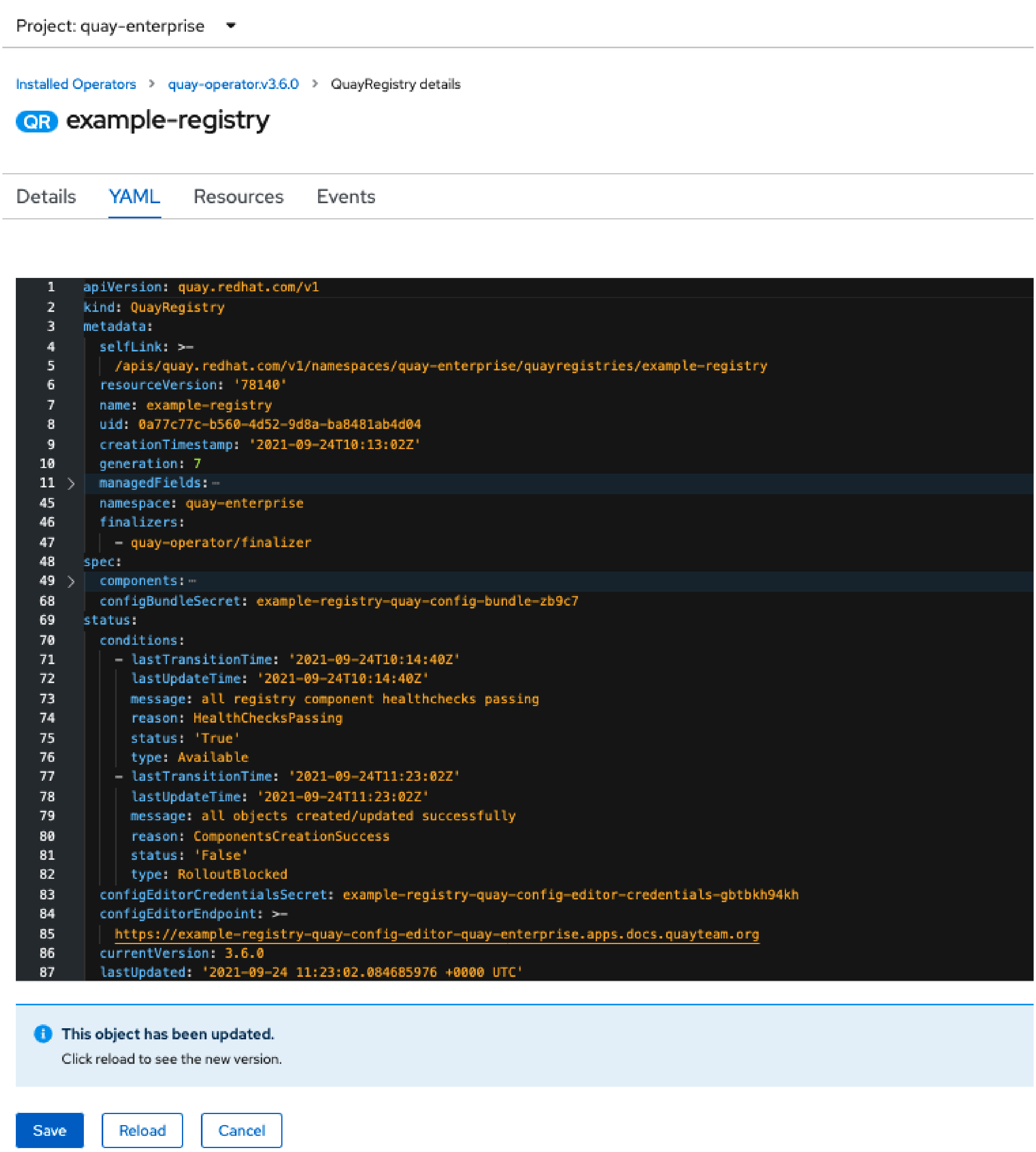
NOTE

Reconfiguring Red Hat Quay using the config tool UI can lead to the registry being unavailable for a short time, while the updated configuration is applied.

6.2. MONITORING RECONFIGURATION IN THE UI

6.2.1. QuayRegistry resource

After reconfiguring the Operator, you can track the progress of the redeployment in the YAML tab for the specific instance of QuayRegistry, in this case, **example-registry**:

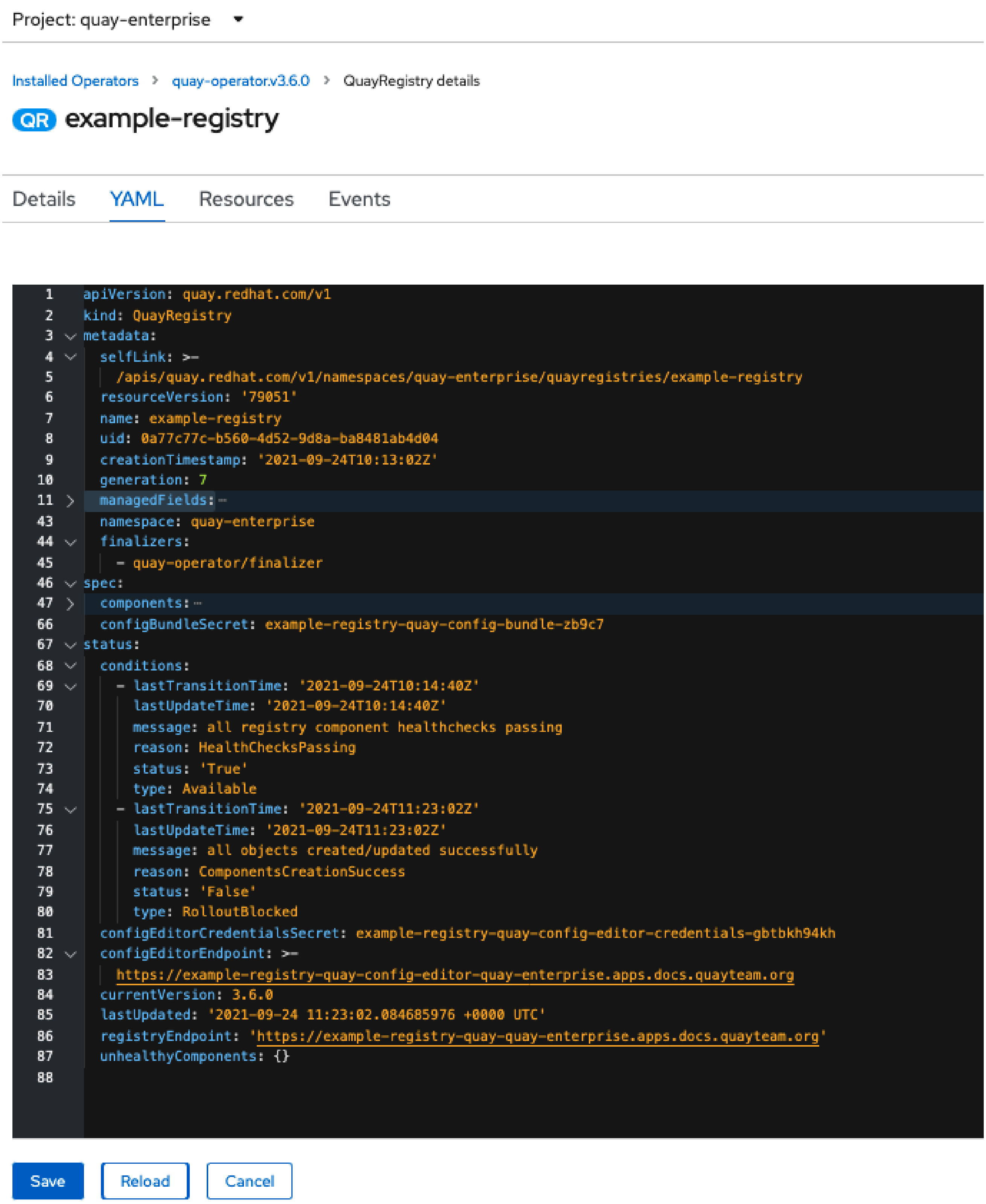


```
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  selfLink: >-
    /apis/quay.redhat.com/v1/namespaces/quay-enterprise/quayregistries/example-registry
  resourceVersion: '78140'
  name: example-registry
  uid: 0a77c77c-b560-4d52-9d8a-ba8481ab4d04
  creationTimestamp: '2021-09-24T10:13:02Z'
  generation: 7
  managedFields: ⋯
  namespace: quay-enterprise
  finalizers:
    - quay-operator/finalizer
spec:
  components: ⋯
  configBundleSecret: example-registry-quay-config-bundle-zb9c7
status:
  conditions:
    - lastTransitionTime: '2021-09-24T10:14:40Z'
      lastUpdateTime: '2021-09-24T10:14:40Z'
      message: all registry component healthchecks passing
      reason: HealthChecksPassing
      status: 'True'
      type: Available
    - lastTransitionTime: '2021-09-24T11:23:02Z'
      lastUpdateTime: '2021-09-24T11:23:02Z'
      message: all objects created/updated successfully
      reason: ComponentsCreationSuccess
      status: 'False'
      type: RolloutBlocked
  configEditorCredentialsSecret: example-registry-quay-config-editor-credentials-gbtbkh94kh
  configEditorEndpoint: >-
    https://example-registry-quay-config-editor-quay-enterprise.apps.docs.quayteam.org
  currentVersion: 3.6.0
  lastUpdated: '2021-09-24 11:23:02.084685976 +0000 UTC'
```

This object has been updated.

Click reload to see the new version.

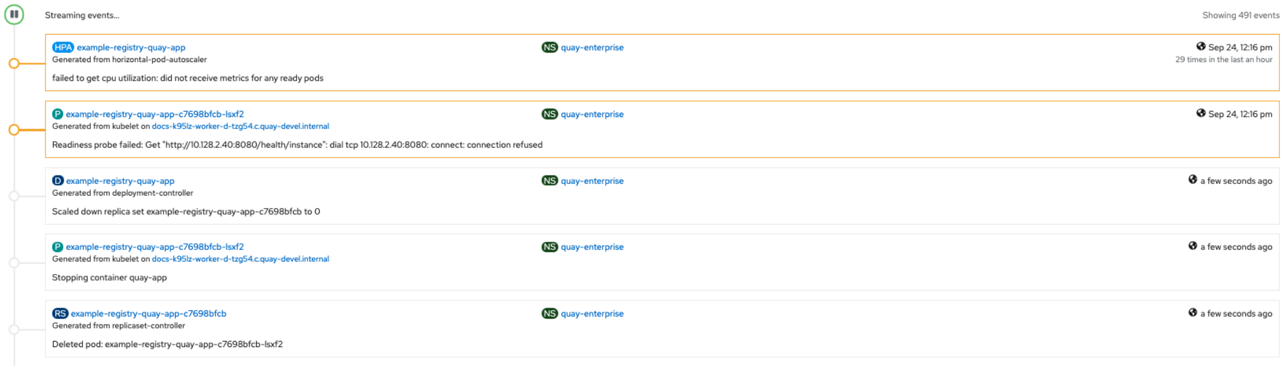
Each time the status changes, you will be prompted to reload the data to see the updated version. Eventually, the Operator will reconcile the changes, and there will be no unhealthy components reported.



```yaml
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  selfLink: >-
    /apis/quay.redhat.com/v1/namespaces/quay-enterprise/quayregistries/example-registry
  resourceVersion: '79051'
  name: example-registry
  uid: 0a77c77c-b560-4d52-9d8a-ba8481ab4d04
  creationTimestamp: '2021-09-24T10:13:02Z'
  generation: 7
  managedFields: ⋯
  namespace: quay-enterprise
  finalizers:
    - quay-operator/finalizer
spec:
  components: ⋯
  configBundleSecret: example-registry-quay-config-bundle-zb9c7
status:
  conditions:
    - lastTransitionTime: '2021-09-24T10:14:40Z'
      lastUpdateTime: '2021-09-24T10:14:40Z'
      message: all registry component healthchecks passing
      reason: HealthChecksPassing
      status: 'True'
      type: Available
    - lastTransitionTime: '2021-09-24T11:23:02Z'
      lastUpdateTime: '2021-09-24T11:23:02Z'
      message: all objects created/updated successfully
      reason: ComponentsCreationSuccess
      status: 'False'
      type: RolloutBlocked
  configEditorCredentialsSecret: example-registry-quay-config-editor-credentials-gbtbkh94kh
  configEditorEndpoint: >-
    https://example-registry-quay-config-editor-quay-enterprise.apps.docs.quayteam.org
  currentVersion: 3.6.0
  lastUpdated: '2021-09-24 11:23:02.084685976 +0000 UTC'
  registryEndpoint: 'https://example-registry-quay-quay-enterprise.apps.docs.quayteam.org'
  unhealthyComponents: {}
```

6.2.2. Events

The Events tab for the QuayRegistry shows some events related to the redeployment:



Streaming events...

Showing 491 events

HPA example-registry-quay-app
Generated from horizontal-pod-autoscaler
NS quay-enterprise
Sep 24, 12:16 pm
29 times in the last an hour
failed to get cpu utilization: did not receive metrics for any ready pods

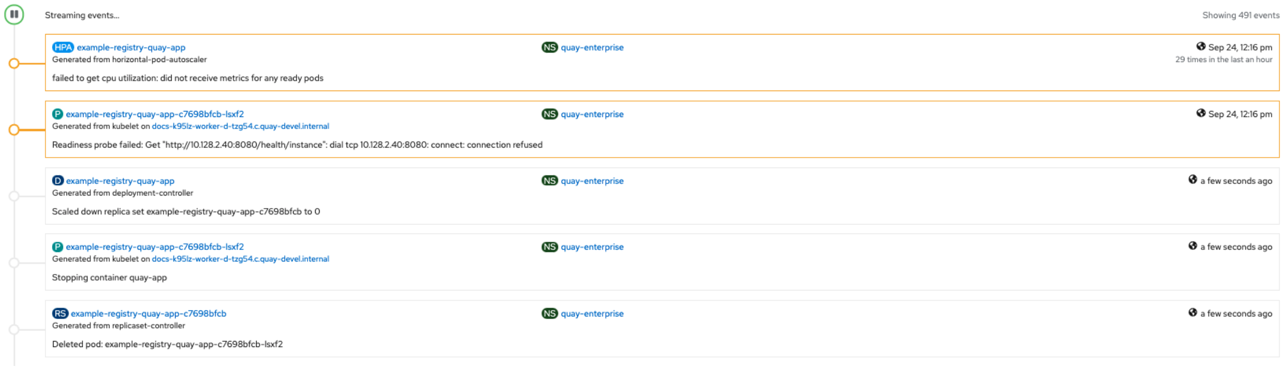
P example-registry-quay-app-c7698bfcb-lsxf2
Generated from kubelet on docs-k95lz-worker-d-tzg54.c.quay-devel.internal
NS quay-enterprise
Sep 24, 12:16 pm
Readiness probe failed: Get "http://10.128.2.40:8080/health/instance": dial tcp 10.128.2.40:8080: connect: connection refused

D example-registry-quay-app
Generated from deployment-controller
NS quay-enterprise
a few seconds ago
Scaled down replica set example-registry-quay-app-c7698bfcb to 0

P example-registry-quay-app-c7698bfcb-lsxf2
Generated from kubelet on docs-k95lz-worker-d-tzg54.c.quay-devel.internal
NS quay-enterprise
a few seconds ago
Stopping container quay-app

RS example-registry-quay-app-c7698bfcb
Generated from replicaset-controller
NS quay-enterprise
a few seconds ago
Deleted pod: example-registry-quay-app-c7698bfcb-lsxf2

Streaming events, for all resources in the namespace that are affected by the reconfiguration, are available in the OpenShift console under Home → Events:



Streaming events...

Showing 491 events

HPA example-registry-quay-app
Generated from horizontal-pod-autoscaler
NS quay-enterprise
Sep 24, 12:16 pm
29 times in the last an hour
failed to get cpu utilization: did not receive metrics for any ready pods

P example-registry-quay-app-c7698bfcb-lsxf2
Generated from kubelet on docs-k95lz-worker-d-tzg54.c.quay-devel.internal
NS quay-enterprise
Sep 24, 12:16 pm
Readiness probe failed: Get "http://10.128.2.40:8080/health/instance": dial tcp 10.128.2.40:8080: connect: connection refused

D example-registry-quay-app
Generated from deployment-controller
NS quay-enterprise
a few seconds ago
Scaled down replica set example-registry-quay-app-c7698bfcb to 0

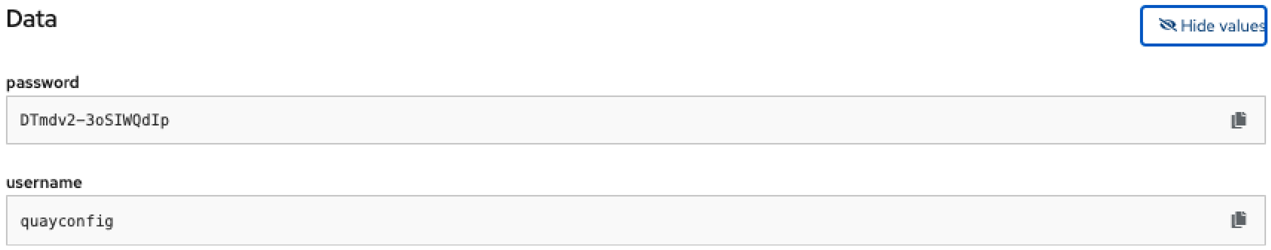
P example-registry-quay-app-c7698bfcb-lsxf2
Generated from kubelet on docs-k95lz-worker-d-tzg54.c.quay-devel.internal
NS quay-enterprise
a few seconds ago
Stopping container quay-app

RS example-registry-quay-app-c7698bfcb
Generated from replicaset-controller
NS quay-enterprise
a few seconds ago
Deleted pod: example-registry-quay-app-c7698bfcb-lsxf2

6.3. ACCESSING UPDATED INFORMATION AFTER RECONFIGURATION

6.3.1. Accessing the updated config tool credentials in the UI

Since a new pod has been created for the config tool, a new secret will have been created, and you will need to use the updated password when you next attempt to login:



Data

password

DTmdv2-3oSIWQdIp

username

quayconfig

6.3.2. Accessing the updated config.yaml in the UI

Use the config bundle to access the updated **config.yaml** file.

1. On the QuayRegistry details screen, click on the Config Bundle Secret

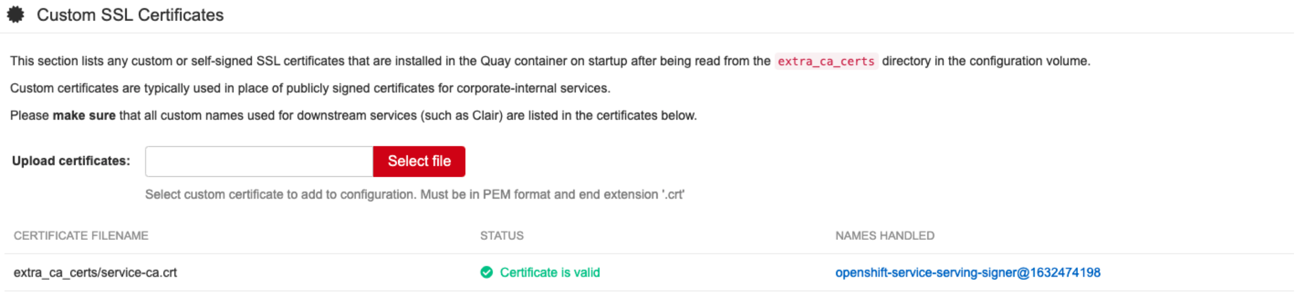
2. In the Data section of the Secret details screen, click Reveal values to see the **config.yaml** file

3. Check that the change has been applied. In this case, **4w** should be in the list of **TAG_EXPIRATION_OPTIONS**:

```
...
SERVER_HOSTNAME: example-quay-openshift-operators.apps.docs.quayteam.org
SETUP_COMPLETE: true
SUPER_USERS:
- quayadmin
TAG_EXPIRATION_OPTIONS:
- 2w
- 4w
...
```

6.4. CUSTOM SSL CERTIFICATES UI

The config tool can be used to load custom certificates to facilitate access to resources such as external databases. Select the custom certs to be uploaded, ensuring that they are in PEM format, with an extension **.crt**.



Custom SSL Certificates

This section lists any custom or self-signed SSL certificates that are installed in the Quay container on startup after being read from the `extra_ca_certs` directory in the configuration volume.

Custom certificates are typically used in place of publicly signed certificates for corporate-internal services.

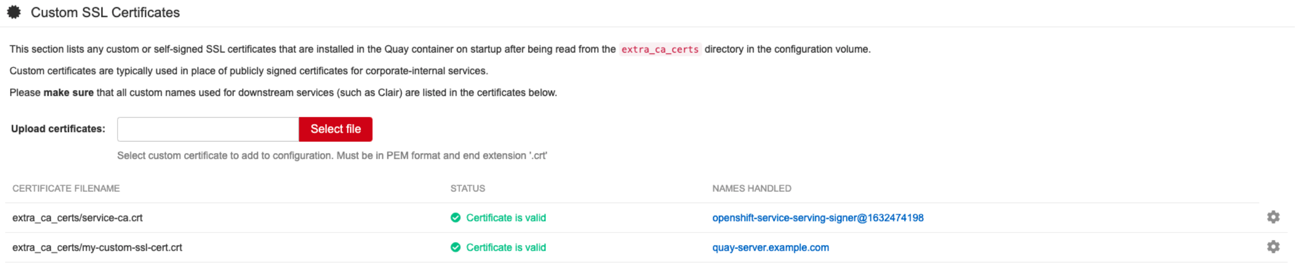
Please **make sure** that all custom names used for downstream services (such as Clair) are listed in the certificates below.

Upload certificates: Select file

Select custom certificate to add to configuration. Must be in PEM format and end extension '.crt'

CERTIFICATE FILENAME	STATUS	NAMES HANDLED
extra_ca_certs/service-ca.crt	✓ Certificate is valid	openshift-service-serving-signer@1632474198

The config tool also displays a list of any uploaded certificates. Once you upload your custom SSL cert, it will appear in the list:



Custom SSL Certificates

This section lists any custom or self-signed SSL certificates that are installed in the Quay container on startup after being read from the `extra_ca_certs` directory in the configuration volume.

Custom certificates are typically used in place of publicly signed certificates for corporate-internal services.

Please **make sure** that all custom names used for downstream services (such as Clair) are listed in the certificates below.

Upload certificates: Select file

Select custom certificate to add to configuration. Must be in PEM format and end extension '.crt'

CERTIFICATE FILENAME	STATUS	NAMES HANDLED
extra_ca_certs/service-ca.crt	✓ Certificate is valid	openshift-service-serving-signer@1632474198
extra_ca_certs/my-custom-ssl-cert.crt	✓ Certificate is valid	quay-server.example.com

6.5. EXTERNAL ACCESS TO THE REGISTRY

When running on OpenShift, the **Routes** API is available and will automatically be used as a managed component. After creating the **QuayRegistry**, the external access point can be found in the status block of the **QuayRegistry**:

```
status:
  registryEndpoint: some-quay.my-namespace.apps.mycluster.com
```

CHAPTER 7. QUAY OPERATOR FEATURES

7.1. CONSOLE MONITORING AND ALERTING

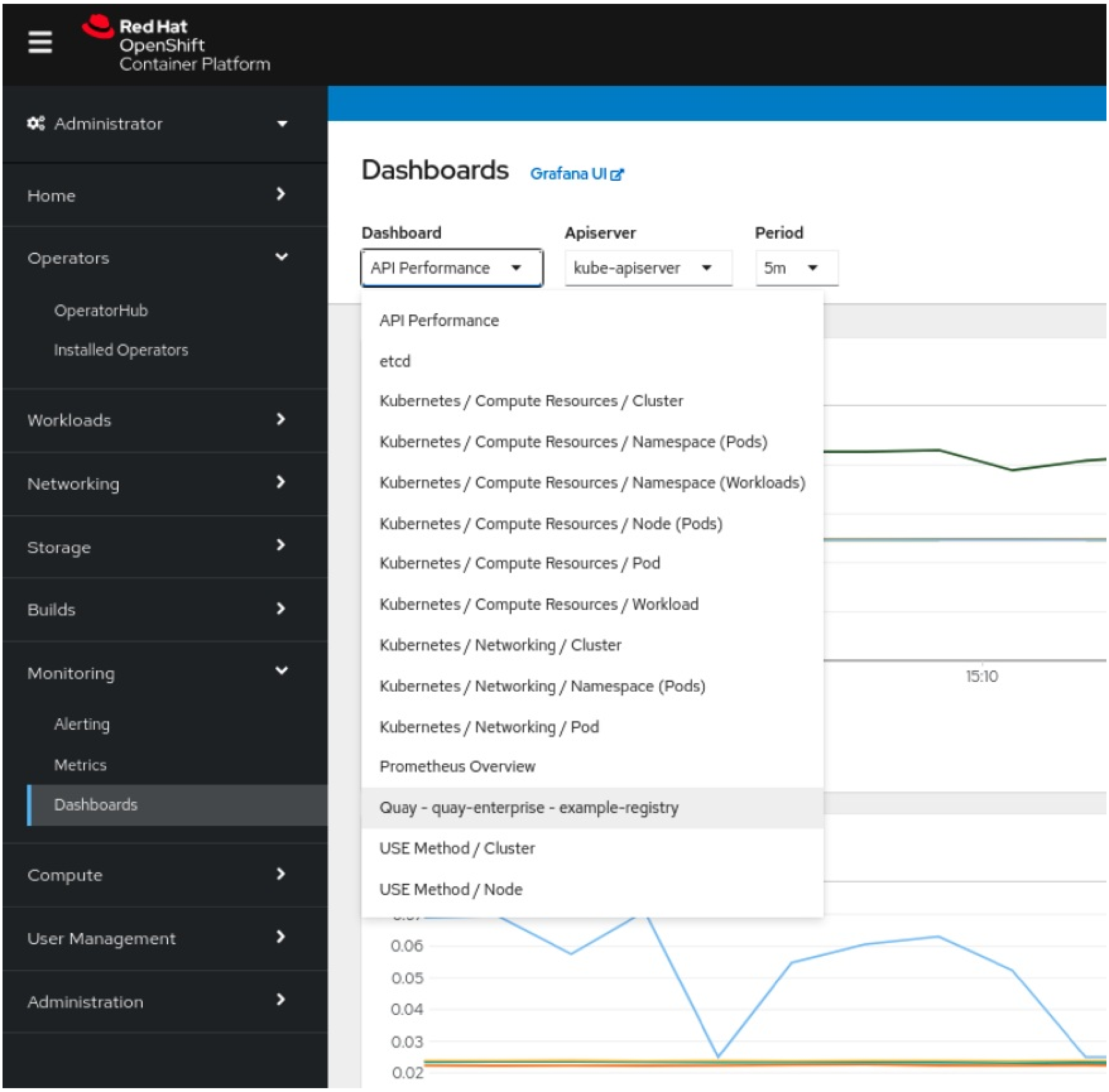
Red Hat Quay 3.6 provides support for monitoring Quay instances that were deployed using the Operator, from inside the OpenShift console. The new monitoring features include a Grafana dashboard, access to individual metrics, and alerting to notify for frequently restarting Quay pods.

NOTE

To enable the monitoring features, the Operator must be installed in "all namespaces" mode.

7.1.1. Dashboard

In the OpenShift console, navigate to Monitoring → Dashboards and search for the dashboard of your desired Quay registry instance:


Red Hat
OpenShift
Container Platform
Administrator
Home
Operators
OperatorHub
Installed Operators
Workloads
Networking
Storage
Builds
Monitoring
Alerting
Metrics
Dashboards
Compute
User Management
Administration
Dashboards
Grafana UI
API Performance
etcd
Kubernetes / Compute Resources / Cluster
Kubernetes / Compute Resources / Namespace (Pods)
Kubernetes / Compute Resources / Namespace (Workloads)
Kubernetes / Compute Resources / Node (Pods)
Kubernetes / Compute Resources / Pod
Kubernetes / Compute Resources / Workload
Kubernetes / Networking / Cluster
Kubernetes / Networking / Namespace (Pods)
Kubernetes / Networking / Pod
Prometheus Overview
Quay - quay-enterprise - example-registry
USE Method / Cluster
USE Method / Node
15:10
0.06
0.05
0.04
0.03
0.02

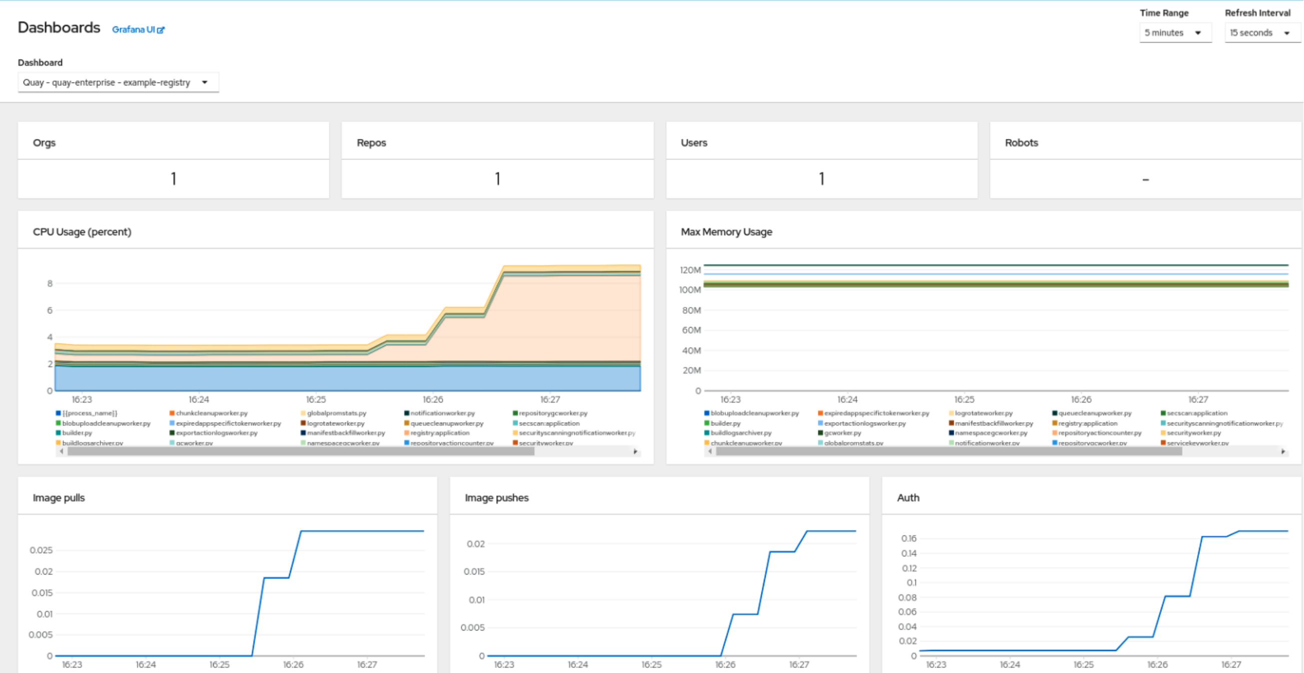
Dashboard: API Performance

Apiserver: kube-apiserver

Period: 5m

The dashboard shows various statistics including:

- The number of Organizations, Repositories, Users and Robot accounts
- CPU Usage and Max Memory Usage
- Rates of Image Pulls and Pushes, and Authentication requests
- API request rate
- Latencies



Dashboards Grafana UI

Time Range: 5 minutes

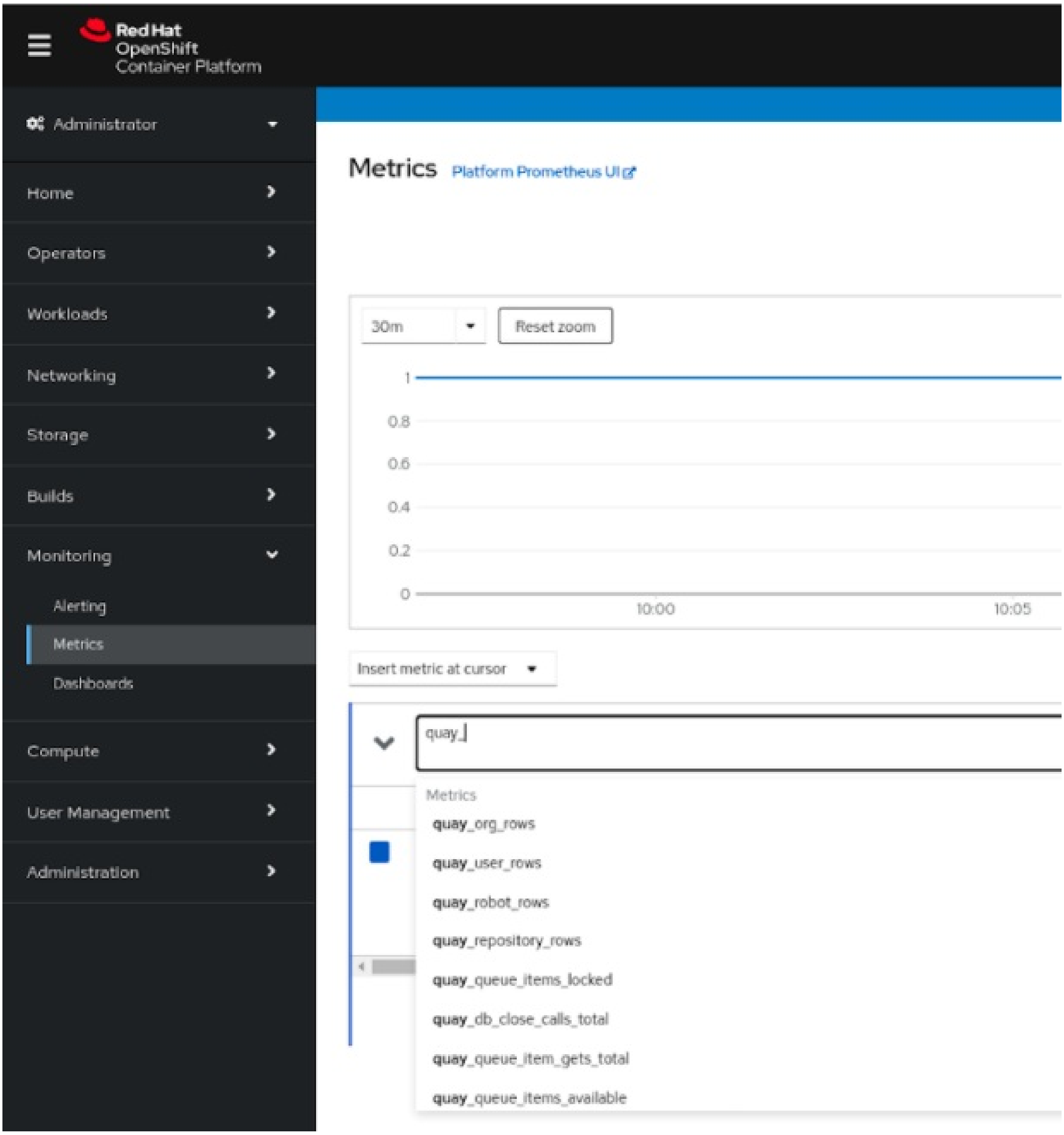
Refresh Interval: 15 seconds

Dashboard: Quay - quay-enterprise - example-registry

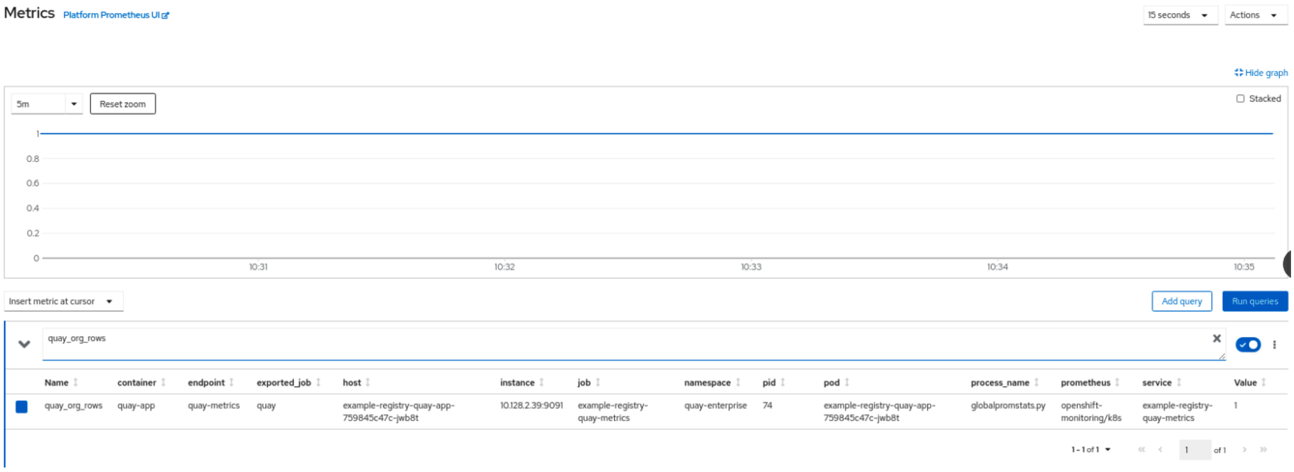
Orgs	Repos	Users	Robots
1	1	1	-

7.1.2. Metrics

You can see the underlying metrics behind the Quay dashboard, by accessing Monitoring → Metrics in the UI. In the Expression field, enter the text **quay_** to see the list of metrics available:



Select a sample metric, for example, **quay_org_rows**:

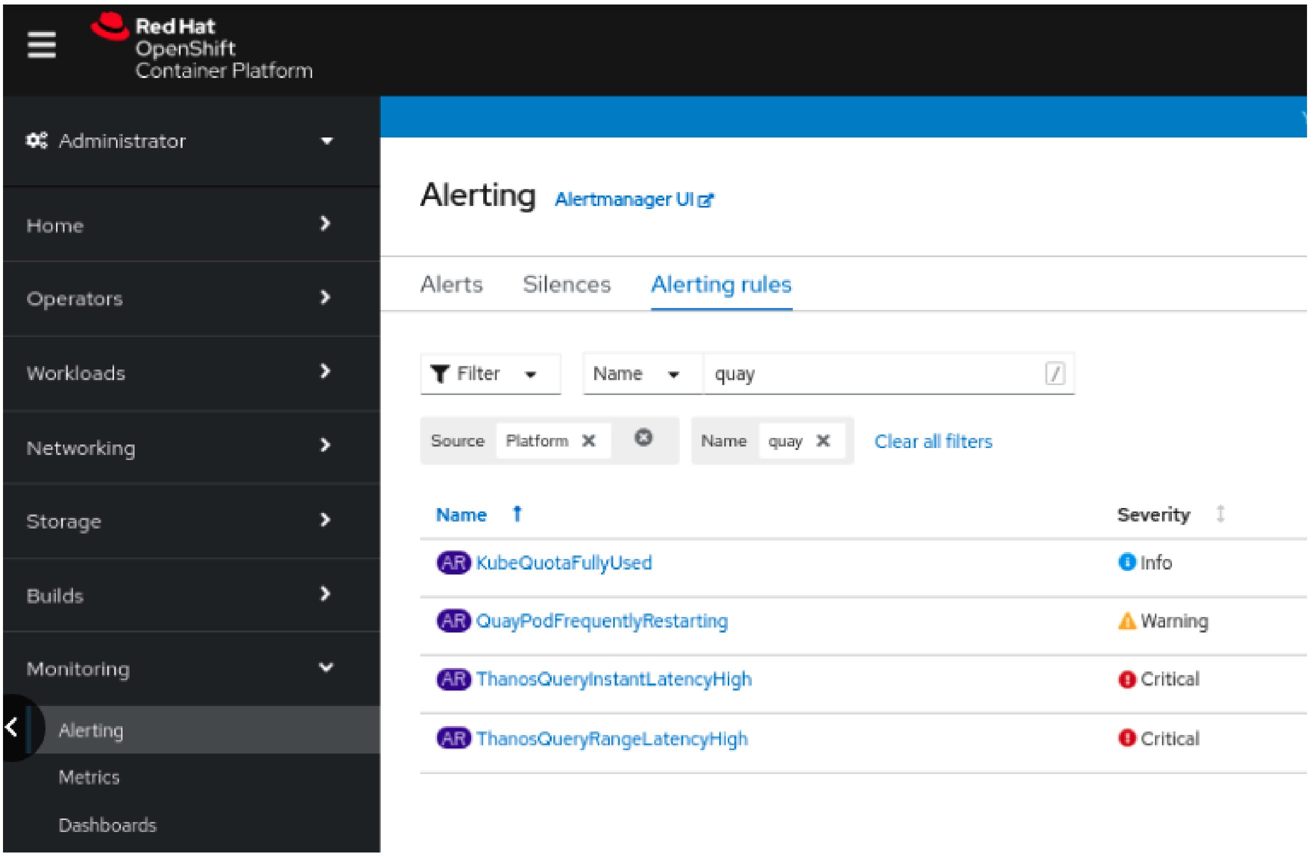


	Name	container	endpoint	exported_job	host	instance	job	namespace	pid	pod	process_name	prometheus	service	Value
🟦	quay_org_rows	quay-app	quay-metrics	quay	example-registry-quay-app-759845c47c-jwb8t	10.128.2.39:9091	example-registry-quay-metrics	quay-enterprise	74	example-registry-quay-app-759845c47c-jwb8t	globalpromstats.py	openshift-monitoring/k8s	example-registry-quay-metrics	1

This metric shows the number of organizations in the registry, and it is directly surfaced in the dashboard as well.

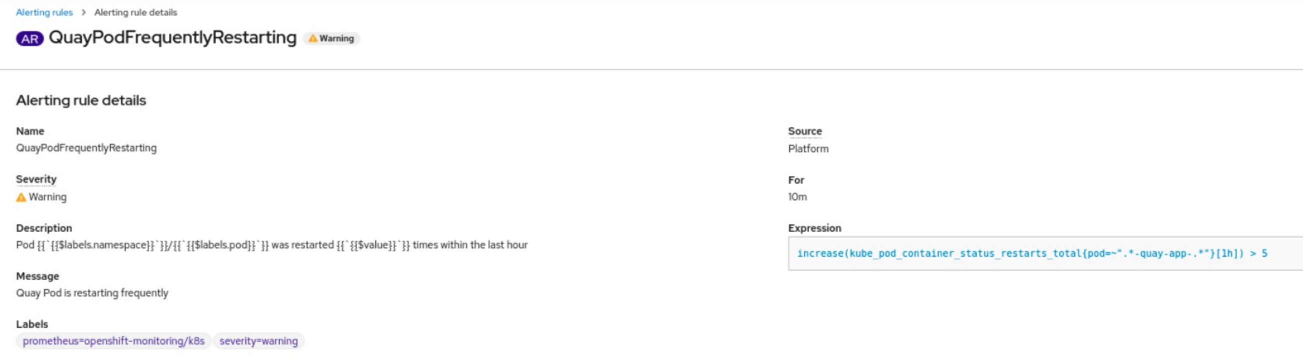
7.1.3. Alerting

An alert is raised if the Quay pods restart too often. The alert can be configured by accessing the Alerting rules tab from Monitoring → Alerting in the consol UI and searching for the Quay-specific alert:



Name	Severity
AR KubeQuotaFullyUsed	Info
AR QuayPodFrequentlyRestarting	⚠ Warning
AR ThanosQueryInstantLatencyHigh	Critical
AR ThanosQueryRangeLatencyHigh	Critical

Select the QuayPodFrequentlyRestarting rule detail to configure the alert:


Alerting rules > Alerting rule details
AR QuayPodFrequentlyRestarting ⚠ Warning

Alerting rule details

Name
QuayPodFrequentlyRestarting

Severity
⚠ Warning

Description
Pod {{`{{$labels.namespace}}`}}/{{`{{$labels.pod}}`}} was restarted {{`{{$value}}`}} times within the last hour

Message
Quay Pod is restarting frequently

Labels
prometheus=openshift-monitoring/k8s severity=warning

Source
Platform

For
10m

Expression

```
increase(kube_pod_container_status_restarts_total{pod=~".*-quay-app-.*"}[1h]) > 5
```

7.2. MANUALLY UPDATING THE VULNERABILITY DATABASES FOR CLAIR IN AN AIR-GAPPED OPENSHIFT CLUSTER

Clair utilizes packages called **updaters** that encapsulate the logic of fetching and parsing different vulnerability databases. Clair supports running updaters in a different environment and importing the results. This is aimed at supporting installations that disallow the Clair cluster from talking to the Internet directly.

To manually update the vulnerability databases for Clair in an air-gapped OpenShift cluster, use the following steps:

- Obtain the **clairctl** program
- Retrieve the Clair config
- Use **clairctl** to export the updaters bundle from a Clair instance that has access to the internet
- Update the Clair config in the air-gapped OpenShift cluster to allow access to the Clair database
- Transfer the updaters bundle from the system with internet access, to make it available inside the air-gapped environment
- Use **clairctl** to import the updaters bundle into the Clair instance for the air-gapped OpenShift cluster

7.2.1. Obtaining clairctl

To obtain the **clairctl** program from a Clair deployment in an OpenShift cluster, use the **oc cp** command, for example:

```
$ oc -n quay-enterprise cp example-registry-clair-app-64dd48f866-6ptgw:/usr/bin/clairctl ./clairctl
$ chmod u+x ./clairctl
```

For a standalone Clair deployment, use the **podman cp** command, for example:

```
$ sudo podman cp clairv4:/usr/bin/clairctl ./clairctl
$ chmod u+x ./clairctl
```

7.2.2. Retrieving the Clair config

7.2.2.1. Clair on OpenShift config

To retrieve the configuration file for a Clair instance deployed using the OpenShift Operator, retrieve and decode the config secret using the appropriate namespace, and save it to file, for example:

```
$ kubectl get secret -n quay-enterprise example-registry-clair-config-secret  -o "jsonpath=
{$.data['config\.yaml']}" | base64 -d > clair-config.yaml
```

An excerpt from a Clair configuration file is shown below:

clair-config.yaml

```
http_listen_addr: :8080
introspection_addr: ""
log_level: info
indexer:
    connstring: host=example-registry-clair-postgres port=5432 dbname=postgres user=postgres
password=postgres sslmode=disable
    scanlock_retry: 10
    layer_scan_concurrency: 5
    migrations: true
```

```
  scanner:
    package: {}
    dist: {}
    repo: {}
  airgap: false
matcher:
  connstring: host=example-registry-clair-postgres port=5432 dbname=postgres user=postgres
password=postgres sslmode=disable
  max_conn_pool: 100
  indexer_addr: ""
  migrations: true
  period: null
  disable_updaters: false
notifier:
  connstring: host=example-registry-clair-postgres port=5432 dbname=postgres user=postgres
password=postgres sslmode=disable
  migrations: true
  indexer_addr: ""
  matcher_addr: ""
  poll_interval: 5m
  delivery_interval: 1m
  ...
```

7.2.2.2. Standalone Clair config

For standalone Clair deployments, the config file is the one specified in CLAIR_CONF environment variable in the **podman run** command, for example:

```
sudo podman run -d --rm --name clairv4 \
 -p 8081:8081 -p 8089:8089 \
 -e CLAIR_CONF=/clair/config.yaml -e CLAIR_MODE=combo \
 -v /etc/clairv4/config:/clair:Z \
 registry.redhat.io/quay/clair-rhel8:v3.6.8
```

7.2.3. Exporting the updaters bundle

From a Clair instance that has access to the internet, use **clairctl** with the appropriate configuration file to export the updaters bundle:

```
$ ./clairctl --config ./config.yaml export-updaters updates.gz
```

7.2.4. Configuring access to the Clair database in the air-gapped OpenShift cluster

- Use **kubectl** to determine the Clair database service:

```
$ kubectl get svc -n quay-enterprise

NAME                          TYPE         CLUSTER-IP       EXTERNAL-IP   PORT(S)
AGE
example-registry-clair-app          ClusterIP     172.30.224.93    <none>
80/TCP,8089/TCP               4d21h
```

```
example-registry-clair-postgres      ClusterIP     172.30.246.88    <none>       5432/TCP
4d21h
...
```

- Forward the Clair database port so that it is accessible from the local machine, for example:

  ```
  $ kubectl port-forward -n quay-enterprise service/example-registry-clair-postgres 5432:5432
  ```

- Update the Clair configuration file, replacing the value of the **host** in the multiple **connstring** fields with **localhost**, for example:

  clair-config.yaml

  ```
      ...
      connstring: host=localhost port=5432 dbname=postgres user=postgres
  password=postgres sslmode=disable
      ...
  ```

NOTE

As an alternative to using **kubectl port-forward**, you can use **kubefwd** instead. With this method, there is no need to modify the **connstring** field in the Clair configuration file to use **localhost**.

7.2.5. Importing the updaters bundle into the air-gapped environment

After transferring the updaters bundle to the air-gapped environment, use **clairctl** to import the bundle into the Clair database deployed by the OpenShift Operator:

```
$ ./clairctl --config ./clair-config.yaml import-updaters updates.gz
```

7.3. FIPS READINESS AND COMPLIANCE

FIPS (the Federal Information Processing Standard developed by the National Institute of Standards and Technology, NIST) is regarded as the gold standard for securing and encrypting sensitive data, particularly in heavily regulated areas such as banking, healthcare and the public sector. Red Hat Enterprise Linux and Red Hat OpenShift Container Platform support this standard by providing a FIPS mode in which the system would only allow usage of certain, FIPS-validated cryptographic modules, like **openssl**. This ensures FIPS compliance.

Red Hat Quay supports running on RHEL and OCP in FIPS mode in production since version 3.5. Furthermore, Red Hat Quay itself also commits to exclusively using cryptography libraries that are validated or are in the process of being validated by NIST. Red Hat Quay 3.5 has pending FIPS 140-2 validation based on the RHEL 8.3 cryptography libraries. As soon as that validation is finalized, Red Hat Quay will be officially FIPS compliant.

CHAPTER 8. ADVANCED CONCEPTS

8.1. DEPLOYING QUAY ON INFRASTRUCTURE NODES

By default, Quay-related pods are placed on arbitrary worker nodes when using the Operator to deploy the registry. The OpenShift Container Platform documentation shows how to use machine sets to configure nodes to only host infrastructure components (see https://docs.openshift.com/container-platform/4.7/machine_management/creating-infrastructure-machinesets.html).

If you are not using OCP MachineSet resources to deploy infra nodes, this section shows you how to manually label and taint nodes for infrastructure purposes.

Once you have configured your infrastructure nodes, either manually or using machine sets, you can then control the placement of Quay pods on these nodes using node selectors and tolerations.

8.1.1. Label and taint nodes for infrastructure use

In the cluster used in this example, there are three master nodes and six worker nodes:

```
$ oc get nodes
NAME                                           STATUS   ROLES    AGE     VERSION
user1-jcnp6-master-0.c.quay-devel.internal       Ready    master   3h30m   v1.20.0+ba45583
user1-jcnp6-master-1.c.quay-devel.internal       Ready    master   3h30m   v1.20.0+ba45583
user1-jcnp6-master-2.c.quay-devel.internal       Ready    master   3h30m   v1.20.0+ba45583
user1-jcnp6-worker-b-65plj.c.quay-devel.internal   Ready    worker   3h21m   v1.20.0+ba45583
user1-jcnp6-worker-b-jr7hc.c.quay-devel.internal   Ready    worker   3h21m   v1.20.0+ba45583
user1-jcnp6-worker-c-jrq4v.c.quay-devel.internal   Ready    worker   3h21m   v1.20.0+ba45583
user1-jcnp6-worker-c-pwxfp.c.quay-devel.internal   Ready    worker   3h21m   v1.20.0+ba45583
user1-jcnp6-worker-d-h5tv2.c.quay-devel.internal   Ready    worker   3h22m   v1.20.0+ba45583
user1-jcnp6-worker-d-m9gg4.c.quay-devel.internal   Ready    worker   3h21m   v1.20.0+ba45583
```

Label the final three worker nodes for infrastructure use:

```
$ oc label node --overwrite user1-jcnp6-worker-c-pwxfp.c.quay-devel.internal node-role.kubernetes.io/infra=
$ oc label node --overwrite user1-jcnp6-worker-d-h5tv2.c.quay-devel.internal node-role.kubernetes.io/infra=
$ oc label node --overwrite user1-jcnp6-worker-d-m9gg4.c.quay-devel.internal node-role.kubernetes.io/infra=
```

Now, when you list the nodes in the cluster, the last 3 worker nodes will have an added role of **infra**:

```
$ oc get nodes
NAME                                           STATUS   ROLES          AGE     VERSION
user1-jcnp6-master-0.c.quay-devel.internal       Ready    master         4h14m   v1.20.0+ba45583
user1-jcnp6-master-1.c.quay-devel.internal       Ready    master         4h15m   v1.20.0+ba45583
user1-jcnp6-master-2.c.quay-devel.internal       Ready    master         4h14m   v1.20.0+ba45583
user1-jcnp6-worker-b-65plj.c.quay-devel.internal   Ready    worker         4h6m    v1.20.0+ba45583
user1-jcnp6-worker-b-jr7hc.c.quay-devel.internal   Ready    worker         4h5m    v1.20.0+ba45583
user1-jcnp6-worker-c-jrq4v.c.quay-devel.internal   Ready    worker         4h5m    v1.20.0+ba45583
user1-jcnp6-worker-c-pwxfp.c.quay-devel.internal   Ready    infra,worker   4h6m    v1.20.0+ba45583
user1-jcnp6-worker-d-h5tv2.c.quay-devel.internal   Ready    infra,worker   4h6m    v1.20.0+ba45583
user1-jcnp6-worker-d-m9gg4.c.quay-devel.internal   Ready    infra,worker   4h6m    v1.20.0+ba45583
```

With an infra node being assigned as a worker, there is a chance that user workloads could get inadvertently assigned to an infra node. To avoid this, you can apply a taint to the infra node and then add tolerations for the pods you want to control.

```
$ oc adm taint nodes user1-jcnp6-worker-c-pwxfp.c.quay-devel.internal node-
role.kubernetes.io/infra:NoSchedule
$ oc adm taint nodes user1-jcnp6-worker-d-h5tv2.c.quay-devel.internal node-
role.kubernetes.io/infra:NoSchedule
$ oc adm taint nodes user1-jcnp6-worker-d-m9gg4.c.quay-devel.internal node-
role.kubernetes.io/infra:NoSchedule
```

8.1.2. Create a Project with node selector and toleration

If you have already deployed Quay using the Quay Operator, remove the installed operator and any specific namespace(s) you created for the deployment.

Create a Project resource, specifying a node selector and toleration as shown in the following example:

quay-registry.yaml

```
kind: Project
apiVersion: project.openshift.io/v1
metadata:
  name: quay-registry
  annotations:
    openshift.io/node-selector: 'node-role.kubernetes.io/infra='
    scheduler.alpha.kubernetes.io/defaultTolerations: >-
      [{"operator": "Exists", "effect": "NoSchedule", "key":
      "node-role.kubernetes.io/infra"}
      ]
```

Use the **oc apply** command to create the project:

```
$ oc apply -f quay-registry.yaml
project.project.openshift.io/quay-registry created
```

Any subsequent resources created in the **quay-registry** namespace should now be scheduled on the dedicated infrastructure nodes.

8.1.3. Install the Quay Operator in the namespace

When installing the Quay Operator, specify the appropriate project namespace explicitly, in this case **quay-registry**. This will result in the operator pod itself landing on one of the three infrastructure nodes:

```
$ oc get pods -n quay-registry -o wide
NAME                                    READY   STATUS    RESTARTS   AGE   IP           NODE

quay-operator.v3.4.1-6f6597d8d8-bd4dp   1/1     Running   0          30s   10.131.0.16   user1-jcnp6-
worker-d-h5tv2.c.quay-devel.internal
```

8.1.4. Create the registry

Create the registry as explained earlier, and then wait for the deployment to be ready. When you list the Quay pods, you should now see that they have only been scheduled on the three nodes that you have labelled for infrastructure purposes:

```
$ oc get pods -n quay-registry -o wide
NAME                                                READY   STATUS      RESTARTS   AGE     IP          NODE

example-registry-clair-app-789d6d984d-gpbwd          1/1     Running     1          5m57s   10.130.2.80
user1-jcnp6-worker-d-m9gg4.c.quay-devel.internal
example-registry-clair-postgres-7c8697f5-zkzht       1/1     Running     0          4m53s   10.129.2.19
user1-jcnp6-worker-c-pwxfp.c.quay-devel.internal
example-registry-quay-app-56dd755b6d-glbf7           1/1     Running     1          5m57s   10.129.2.17
user1-jcnp6-worker-c-pwxfp.c.quay-devel.internal
example-registry-quay-config-editor-7bf9bccc7b-dpc6d   1/1     Running     0          5m57s
10.131.0.23   user1-jcnp6-worker-d-h5tv2.c.quay-devel.internal
example-registry-quay-database-8dc7cfd69-dr2cc       1/1     Running     0          5m43s   10.129.2.18
  user1-jcnp6-worker-c-pwxfp.c.quay-devel.internal
example-registry-quay-mirror-78df886bcc-v75p9        1/1     Running     0          5m16s   10.131.0.24
user1-jcnp6-worker-d-h5tv2.c.quay-devel.internal
example-registry-quay-postgres-init-8s8g9            0/1     Completed   0          5m54s   10.130.2.79
user1-jcnp6-worker-d-m9gg4.c.quay-devel.internal
example-registry-quay-redis-5688ddcdb6-ndp4t         1/1     Running     0          5m56s   10.130.2.78
user1-jcnp6-worker-d-m9gg4.c.quay-devel.internal
quay-operator.v3.4.1-6f6597d8d8-bd4dp                1/1     Running     0          22m     10.131.0.16
user1-jcnp6-worker-d-h5tv2.c.quay-devel.internal
```

8.2. ENABLING MONITORING WHEN OPERATOR IS INSTALLED IN A SINGLE NAMESPACE

When Red Hat Quay Operator is installed in a single namespace, the monitoring component is unmanaged. To configure monitoring, you need to enable it for user-defined namespaces in OpenShift Container Platform. For more information, see the OCP documentation for Configuring the monitoring stack and Enabling monitoring for user-defined projects.

The following steps show you how to configure monitoring for Quay, based on the OCP documentation.

8.2.1. Creating a cluster monitoring config map

1. Check whether the **cluster-monitoring-config** ConfigMap object exists:

```
$ oc -n openshift-monitoring get configmap cluster-monitoring-config

Error from server (NotFound): configmaps "cluster-monitoring-config" not found
```

2. If the ConfigMap object does not exist:

   a. Create the following YAML manifest. In this example, the file is called **cluster-monitoring-config.yaml**:

```
$ cat cluster-monitoring-config.yaml

apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
```

b. Create the ConfigMap object:

```
$ oc apply -f cluster-monitoring-config.yaml configmap/cluster-monitoring-config created
```

```
$ oc -n openshift-monitoring get configmap cluster-monitoring-config

NAME                        DATA   AGE
cluster-monitoring-config   1      12s
```

8.2.2. Creating a user-defined workload monitoring config map

1. Check whether the **user-workload-monitoring-config** ConfigMap object exists:

```
$ oc -n openshift-user-workload-monitoring get configmap user-workload-monitoring-config

Error from server (NotFound): configmaps "user-workload-monitoring-config" not found
```

2. If the ConfigMap object does not exist:

a. Create the following YAML manifest. In this example, the file is called **user-workload-monitoring-config.yaml**:

```
$ cat user-workload-monitoring-config.yaml

apiVersion: v1
kind: ConfigMap
metadata:
  name: user-workload-monitoring-config
  namespace: openshift-user-workload-monitoring
data:
  config.yaml: |
```

b. Create the ConfigMap object:

```
$ oc apply -f user-workload-monitoring-config.yaml

configmap/user-workload-monitoring-config created
```

8.2.3. Enable monitoring for user-defined projects

1. Check whether monitoring for user-defined projects is running:

```
$ oc get pods -n openshift-user-workload-monitoring

No resources found in openshift-user-workload-monitoring namespace.
```

2. Edit the **cluster-monitoring-config** ConfigMap:

```
$ oc -n openshift-monitoring edit configmap cluster-monitoring-config
```

3. Set **enableUserWorkload: true** to enable monitoring for user-defined projects on the cluster:

```
apiVersion: v1
data:
  config.yaml: |
    enableUserWorkload: true
kind: ConfigMap
metadata:
  annotations:
```

4. Save the file to apply the changes and then check that the appropriate pods are running:

```
$ oc get pods -n openshift-user-workload-monitoring

NAME                                   READY   STATUS    RESTARTS   AGE
prometheus-operator-6f96b4b8f8-gq6rl   2/2     Running   0          15s
prometheus-user-workload-0             5/5     Running   1          12s
prometheus-user-workload-1             5/5     Running   1          12s
thanos-ruler-user-workload-0           3/3     Running   0          8s
thanos-ruler-user-workload-1           3/3     Running   0          8s
```

8.2.4. Create a Service object to expose Quay metrics

1. Create a YAML file for the Service object:

```
$ cat quay-service.yaml

apiVersion: v1
kind: Service
metadata:
  annotations:
  labels:
    quay-component: monitoring
    quay-operator/quayregistry: example-registry
  name: example-registry-quay-metrics
  namespace: quay-enterprise
spec:
  ports:
  - name: quay-metrics
    port: 9091
    protocol: TCP
    targetPort: 9091
  selector:
    quay-component: quay-app
    quay-operator/quayregistry: example-registry
  type: ClusterIP
```

2. Create the Service object:

```
$  oc apply -f quay-service.yaml

service/example-registry-quay-metrics created
```

8.2.5. Create a ServiceMonitor object

Configure OpenShift Monitoring to scrape the metrics by creating a ServiceMonitor resource.

1. Create a YAML file for the ServiceMonitor resource:

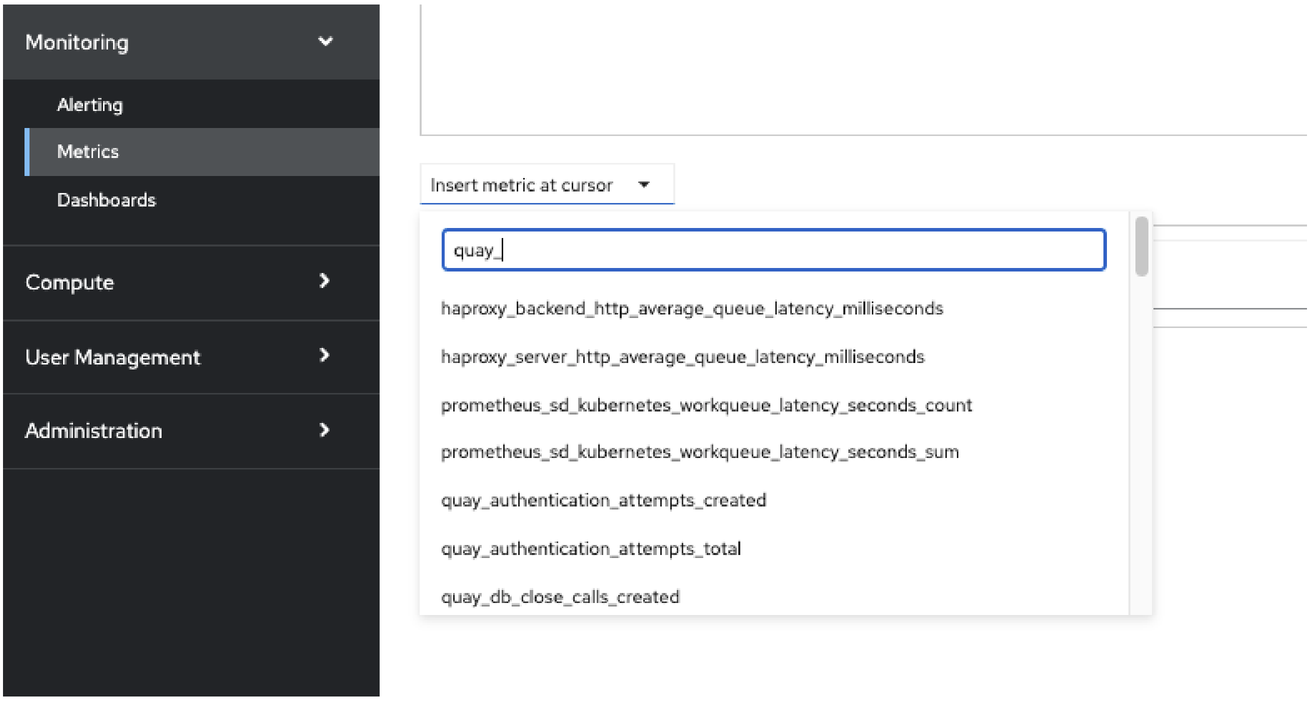
```
$ cat quay-service-monitor.yaml

apiVersion: monitoring.coreos.com/v1
kind: ServiceMonitor
metadata:
  labels:
    quay-operator/quayregistry: example-registry
  name: example-registry-quay-metrics-monitor
  namespace: quay-enterprise
spec:
  endpoints:
  - port: quay-metrics
  namespaceSelector:
    any: true
  selector:
    matchLabels:
      quay-component: monitoring
```

2. Create the ServiceMonitor:

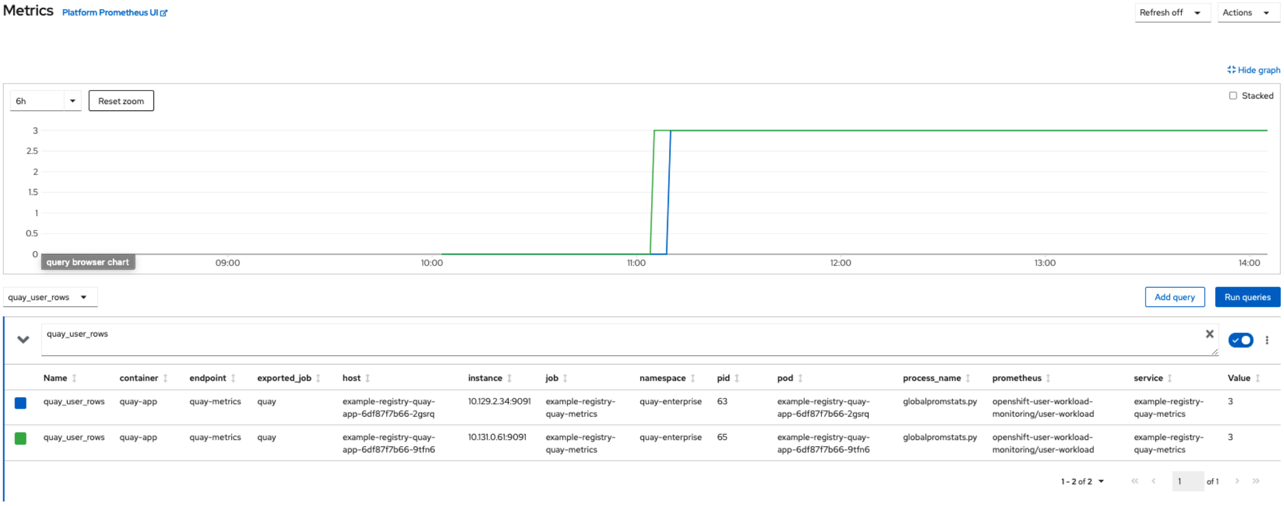
```
$  oc apply -f quay-service-monitor.yaml

servicemonitor.monitoring.coreos.com/example-registry-quay-metrics-monitor created
```

8.2.6. View the metrics in OpenShift

You can access the metrics in the OpenShift console under Monitoring → Metrics. In the Expression field, enter the text **quay_** to see the list of metrics available:


Monitoring
Alerting
Metrics
Dashboards
Compute
User Management
Administration
Insert metric at cursor
quay_
haproxy_backend_http_average_queue_latency_milliseconds
haproxy_server_http_average_queue_latency_milliseconds
prometheus_sd_kubernetes_workqueue_latency_seconds_count
prometheus_sd_kubernetes_workqueue_latency_seconds_sum
quay_authentication_attempts_created
quay_authentication_attempts_total
quay_db_close_calls_created

For example, if you have added users to your registry, select the **quay-users_rows** metric:



quay_user_rows

	Name	container	endpoint	exported_job	host	instance	job	namespace	pid	pod	process_name	prometheus	service	Value
🟦	quay_user_rows	quay-app	quay-metrics	quay	example-registry-quay-app-6df87f7b66-2gsrq	10.129.2.34:9091	example-registry-quay-metrics	quay-enterprise	63	example-registry-quay-app-6df87f7b66-2gsrq	globalpromstats.py	openshift-user-workload-monitoring/user-workload	example-registry-quay-metrics	3
🟩	quay_user_rows	quay-app	quay-metrics	quay	example-registry-quay-app-6df87f7b66-9tfn6	10.131.0.61:9091	example-registry-quay-metrics	quay-enterprise	65	example-registry-quay-app-6df87f7b66-9tfn6	globalpromstats.py	openshift-user-workload-monitoring/user-workload	example-registry-quay-metrics	3

1 - 2 of 2 1 of 1

8.3. RESIZING MANAGED STORAGE

The Quay Operator creates default object storage using the defaults provided by RHOCS when creating a **NooBaa** object (50 Gib). There are two ways to extend this storage; you can resize an existing PVC or add more PVCs to a new storage pool.

8.3.1. Resize Noobaa PVC

1. Log into the OpenShift console and select **Storage → Persistent Volume Claims**.
2. Select the **PersistentVolumeClaim** named like **noobaa-default-backing-store-noobaa-pvc-***.
3. From the Action menu, select **Expand PVC**.
4. Enter the new size of the Persistent Volume Claim and select **Expand**.

After a few minutes (depending on the size of the PVC), the expanded size should reflect in the PVC's **Capacity** field.

NOTE

Expanding CSI volumes is a Technology Preview feature only. For more information, see https://access.redhat.com/documentation/en-us/openshift_container_platform/4.6/html/storage/expanding-persistent-volumes.

8.3.2. Add Another Storage Pool

1. Log into the OpenShift console and select **Networking → Routes**. Make sure the **openshift-storage** project is selected.
2. Click on the **Location** field for the **noobaa-mgmt** Route.
3. Log into the Noobaa Management Console.
4. On the main dashboard, under **Storage Resources**, select **Add Storage Resources**.
5. Select **Deploy Kubernetes Pool**
6. Enter a new pool name. Click **Next**.
7. Choose the number of Pods to manage the pool and set the size per node. Click **Next**.
8. Click **Deploy**.

After a few minutes, the additional storage pool will be added to the Noobaa resources and available for use by Red Hat Quay.

8.4. CUSTOMIZING DEFAULT OPERATOR IMAGES

NOTE

Using this mechanism is not supported for production Quay environments and is strongly encouraged only for development/testing purposes. There is no guarantee your deployment will work correctly when using non-default images with the Quay Operator.

In certain circumstances, it may be useful to override the default images used by the Operator. This can be done by setting one or more environment variables in the Quay Operator **ClusterServiceVersion**.

8.4.1. Environment Variables

The following environment variables are used in the Operator to override component images:

Environment Variable	Component
RELATED_IMAGE_COMPONENT_QUAY	**base**
RELATED_IMAGE_COMPONENT_CLAIR	**clair**

RELATED_IMAGE_COMPONENT_POSTGRES	**postgres** and **clair** databases
RELATED_IMAGE_COMPONENT_REDIS	**redis**

NOTE

Override images **must** be referenced by manifest (@sha256:), not by tag (:latest).

8.4.2. Applying Overrides to a Running Operator

When the Quay Operator is installed in a cluster via the Operator Lifecycle Manager (OLM), the managed component container images can be easily overridden by modifying the **ClusterServiceVersion** object, which is OLM's representation of a running Operator in the cluster. Find the Quay Operator's **ClusterServiceVersion** either by using a Kubernetes UI or **kubectl**/**oc**:

```
$ oc get clusterserviceversions -n <your-namespace>
```

Using the UI, **oc edit**, or any other method, modify the Quay **ClusterServiceVersion** to include the environment variables outlined above to point to the override images:

JSONPath: **spec.install.spec.deployments[0].spec.template.spec.containers[0].env**

```
- name: RELATED_IMAGE_COMPONENT_QUAY
  value:
quay.io/projectquay/quay@sha256:c35f5af964431673f4ff5c9e90bdf45f19e38b8742b5903d41c10cc7f63
39a6d
- name: RELATED_IMAGE_COMPONENT_CLAIR
  value:
quay.io/projectquay/clair@sha256:70c99feceb4c0973540d22e740659cd8d616775d3ad1c1698ddf71d
0221f3ce6
- name: RELATED_IMAGE_COMPONENT_POSTGRES
  value: centos/postgresql-10-
centos7@sha256:de1560cb35e5ec643e7b3a772ebaac8e3a7a2a8e8271d9e91ff023539b4dfb33
- name: RELATED_IMAGE_COMPONENT_REDIS
  value: centos/redis-32-
centos7@sha256:06dbb609484330ec6be6090109f1fa16e936afcf975d1cbc5fff3e6c7cae7542
```

Note that this is done at the Operator level, so every QuayRegistry will be deployed using these same overrides.

8.5. AWS S3 CLOUDFRONT

If you use AWS S3 CloudFront for backend registry storage, specify the private key as shown in the following example:

```
$ oc create secret generic --from-file config.yaml=./config_awss3cloudfront.yaml --from-file default-
cloudfront-signing-key.pem=./default-cloudfront-signing-key.pem test-config-bundle
```

CHAPTER 9. BACKING UP AND RESTORING RED HAT QUAY ON AN OPENSHIFT CONTAINER PLATFORM DEPLOYMENT

Use the content within this section to back up and restore Red Hat Quay on an OpenShift Container Platform deployment.

9.1. BACKING UP RED HAT QUAY

This procedure is exclusively for OpenShift Container Platform and NooBaa deployments.

Prerequisites

- A Red Hat Quay deployment on OpenShift Container Platform.

Procedure

1. Backup the **QuayRegistry** custom resource by exporting it:

```
$ oc get quayregistry <quay-registry-name> -n <quay-namespace> -o yaml > quay-registry.yaml
```

2. Edit the resulting **quayregistry.yaml** and remove the status section and the following metadata fields:

```
  metadata.creationTimestamp
  metadata.finalizers
  metadata.generation
  metadata.resourceVersion
  metadata.uid
```

3. Backup the managed keys secret:

NOTE

If you are running a version older than Red Hat Quay 3.7.0, this step can be skipped. Some secrets are automatically generated while deploying Quay for the first time. These are stored in a secret called **<quay-registry-name>-quay-registry-managed-secret-keys** in the QuayRegistry namespace.

```
$ oc get secret -n <quay-namespace> <quay-registry-name>-quay-registry-managed-secret-keys -o yaml > managed-secret-keys.yaml
```

4. Edit the the resulting **managed-secret-keys.yaml** file and remove all owner references. Your **managed-secret-keys.yaml** file should look similar to the following:

```
apiVersion: v1
kind: Secret
type: Opaque
metadata:
  name: <quayname>-quay-registry-managed-secret-keys
  namespace: <quay-namespace>
data:
```

```
CONFIG_EDITOR_PW: <redacted>
DATABASE_SECRET_KEY: <redacted>
DB_ROOT_PW: <redacted>
DB_URI: <redacted>
SECRET_KEY: <redacted>
SECURITY_SCANNER_V4_PSK: <redacted>
```

All information under the **data** property should remain the same.

5. Backup the current Quay configuration:

```
$ oc get secret -n <quay-namespace>  $(oc get quayregistry <quay-registry-name> -n
<quay-namespace>  -o jsonpath='{.spec.configBundleSecret}') -o yaml > config-bundle.yaml
```

6. Backup the **/conf/stack/config.yaml** file mounted inside of the Quay pods:

```
$ oc exec -it quay-pod-name -- cat /conf/stack/config.yaml > quay-config.yaml
```

7. Scale down the Quay the Quay Operator:

```
$  oc scale --replicas=0 deployment $(oc get deployment -n <quay-operator-namespace>
|awk '/^quay-operator/ {print $1}') -n <quay-operator-namespace>
```

8. Scale down the Quay namespace:

```
$ oc scale --replicas=0 deployment $(oc get deployment -n <quay-namespace> -l quay-
component=quay -o jsonpath='{.items[0].metadata.name}') -n <quay-namespace>
```

9. Wait for the **registry-quay-app** pods to disappear. You can check their status by running the following command:

```
$ oc get pods -n <quay-namespace>
```

Example output:

```
registry-quay-config-editor-77847fc4f5-nsbbv   1/1     Running            0          9m1s
registry-quay-database-66969cd859-n2ssm        1/1     Running            0          6d1h
registry-quay-mirror-758fc68ff7-5wxlp          1/1     Running            0          8m29s
registry-quay-mirror-758fc68ff7-lbl82          1/1     Running            0          8m29s
registry-quay-redis-7cc5f6c977-956g8           1/1     Running            0          5d21h
```

10. Identify the Quay PostgreSQL pod name:

```
$ oc get pod -l quay-component=postgres -n <quay-namespace> -o
jsonpath='{.items[0].metadata.name}'
```

Exampe output:

```
quayregistry-quay-database-59f54bb7-58xs7
```

1. Obtain the Quay database name:

```
$ oc -n <quay-namespace> rsh $(oc get pod -l app=quay -o NAME -n <quay-namespace>
|head -n 1) cat /conf/stack/config.yaml|awk -F"/" '/^DB_URI/ {print $4}'
quayregistry-quay-database
```

2. Download a backup database:

```
$ oc exec quayregistry-quay-database-59f54bb7-58xs7 -- /usr/bin/pg_dump -C quayregistry-
quay-database  > backup.sql
```

3. Decode and export the **AWS_ACCESS_KEY_ID**:

```
$ export AWS_ACCESS_KEY_ID=$(oc get secret -l app=noobaa -n <quay-namespace>  -o
jsonpath='{.items[0].data.AWS_ACCESS_KEY_ID}' |base64 -d)
```

4. Decode and export the **AWS_SECRET_ACCESS_KEY_ID**:

```
$ export AWS_SECRET_ACCESS_KEY=$(oc get secret -l app=noobaa -n <quay-
namespace> -o jsonpath='{.items[0].data.AWS_SECRET_ACCESS_KEY}' |base64 -d)
```

5. Create a new directory and copy all blobs to it:

```
$ mkdir blobs
```

```
$ aws s3 sync --no-verify-ssl --endpoint https://$(oc get route s3 -n openshift-storage  -o
jsonpath='{.spec.host}')  s3://$(oc get cm -l app=noobaa -n <quay-namespace> -o
jsonpath='{.items[0].data.BUCKET_NAME}') ./blobs
```

NOTE

You can also use rclone or sc3md instead of the AWS command line utility.

1. Scale up the Quay the Quay Operator:

```
$  oc scale --replicas=1 deployment $(oc get deployment -n <quay-operator-namespace>
|awk '/^quay-operator/ {print $1}') -n <quay-operator-namespace>
```

2. Scale up the Quay namespace:

```
$ oc scale --replicas=1 deployment $(oc get deployment -n <quay-namespace> -l quay-
component=quay -o jsonpath='{.items[0].metadata.name}') -n <quay-namespace>
```

3. Check the status of the Operator:

```
$ oc get quayregistry <quay-registry-name> -n <quay-namespace> -o yaml
```

Example output:

```
apiVersion: quay.redhat.com/v1
kind: QuayRegistry
metadata:
  ...
  name: example-registry
  namespace: <quay-namespace>
  ...
spec:
  components:
  - kind: quay
    managed: true
  ...
  - kind: clairpostgres
    managed: true
  configBundleSecret: init-config-bundle-secret
status:
  configEditorCredentialsSecret: example-registry-quay-config-editor-credentials-fg2gdgtm24
  configEditorEndpoint: https://example-registry-quay-config-editor-quay-
enterprise.apps.docs.gcp.quaydev.org
  currentVersion: 3.7.0
  lastUpdated: 2022-05-11 13:28:38.199476938 +0000 UTC
  registryEndpoint: https://example-registry-quay-quay-enterprise.apps.docs.gcp.quaydev.org
     0         5d21h
```

9.2. RESTORING RED HAT QUAY

This procedure is used to restore Red Hat Quay when the Red Hat Quay Operator manages the database. It should be performed after a backup of your Quay registry has been performed.

Prerequisites

- Red Hat Quay is deployed on OpenShift Container Platform using the Quay Operator.
- Your Red Hat Quay database has been backed up.

Procedure

1. Restore the backed up Quay configuration and the randomly generated keys:

   ```
   $ oc create -f ./config-bundle.yaml
   ```

   ```
   $ oc create -f ./managed-secret-keys.yaml
   ```

   > **NOTE**
   >
   > If you receive the error **Error from server (AlreadyExists): error when creating "./config-bundle.yaml": secrets "config-bundle-secret" already exists**, you must delete your exist resource with **$ oc delete Secret config-bundle-secret -n <quay-namespace>** and recreate it with **$ oc create -f ./config-bundle.yaml**.

2. Restore the QuayRegistry custom resource:

   ```
   $ oc create -f ./quay-registry.yaml
   ```

3. Scale down the Quay the Quay Operator:

```
$  oc scale --replicas=0 deployment $(oc get deployment -n <quay-operator-namespace>
|awk '/^quay-operator/ {print $1}') -n <quay-operator-namespace>
```

4. Scale down the Quay namespace:

```
$ oc scale --replicas=0 deployment $(oc get deployment -n <quay-namespace> -l quay-
component=quay -o jsonpath='{.items[0].metadata.name}') -n <quay-namespace>
```

5. Identify your Quay database pod:

```
$ oc get pod -l quay-component=postgres -n  <quay-namespace> -o
jsonpath='{.items[0].metadata.name}'
```

Example output:

```
quayregistry-quay-database-59f54bb7-58xs7
```

6. Upload the backup by copying it from the local environment and into the pod:

```
$ oc cp ./backup.sql -n <quay-namespace> registry-quay-database-66969cd859-
n2ssm:/tmp/backup.sql
```

7. Open a remote terminal to the database:

```
$ oc rsh -n <quay-namespace> registry-quay-database-66969cd859-n2ssm
```

8. Enter psql:

```
bash-4.4$ psql
```

9. You can list the database by running the following command:

```
postgres=# \l
```

Example output:

```
                                        List of databases
           Name            |           Owner            | Encoding |  Collate   |   Ctype    |   Access
privileges
---------------------------+----------------------------+----------+------------+------------+---------------
--------
 postgres                  | postgres                   | UTF8     | en_US.utf8 | en_US.utf8 |
 quayregistry-quay-database | quayregistry-quay-database | UTF8     | en_US.utf8 |
en_US.utf8 |
```

10. Drop the database:

```
postgres=# DROP DATABASE "quayregistry-quay-database";
```

Example output:

```
DROP DATABASE
```

11. Exit the postgres CLI to re-enter bash-4.4:

    ```
    \q
    ```

12. Redirect your PostgreSQL database to your backup database:

    ```
    sh-4.4$ psql < /tmp/backup.sql
    ```

13. Exit bash:

    ```
    sh-4.4$ exit
    ```

14. Export the **AWS_ACCESS_KEY_ID**:

    ```
    $ export AWS_ACCESS_KEY_ID=$(oc get secret -l app=noobaa -n <quay-namespace>  -o
    jsonpath='{.items[0].data.AWS_ACCESS_KEY_ID}' |base64 -d)
    ```

15. Export the **AWS_SECRET_ACCESS_KEY**:

    ```
    $ export AWS_SECRET_ACCESS_KEY=$(oc get secret -l app=noobaa -n <quay-
    namespace> -o jsonpath='{.items[0].data.AWS_SECRET_ACCESS_KEY}' |base64 -d)
    ```

16. Upload all blobs to the bucket by running the following command:

    ```
    $ aws s3 sync --no-verify-ssl --endpoint https://$(oc get route s3 -n openshift-storage  -o
    jsonpath='{.spec.host}') ./blobs  s3://$(oc get cm -l app=noobaa -n <quay-namespace> -o
    jsonpath='{.items[0].data.BUCKET_NAME}')
    ```

17. Scale up the Quay the Quay Operator:

    ```
    $  oc scale --replicas=1 deployment $(oc get deployment -n <quay-operator-namespace>
    |awk '/^quay-operator/ {print $1}') -n <quay-operator-namespace>
    ```

18. Scale up the Quay namespace:

    ```
    $ oc scale --replicas=1 deployment $(oc get deployment -n <quay-namespace> -l quay-
    component=quay -o jsonpath='{.items[0].metadata.name}') -n <quay-namespace>
    ```

19. Check the status of the Operator and ensure it has come back online:

    ```
    $ oc get quayregistry -n <quay-namespace> <registry-name> -o yaml
    ```

    Example output:

    ```
    apiVersion: quay.redhat.com/v1
    kind: QuayRegistry
    metadata:
      ...
      name: example-registry
      namespace: quay-enterprise
      ...
    ```

```
spec:
  components:
  - kind: quay
    managed: true
  ...
  - kind: clairpostgres
    managed: true
  configBundleSecret: init-config-bundle-secret
status:
  configEditorCredentialsSecret: example-registry-quay-config-editor-credentials-fg2gdgtm24
  configEditorEndpoint: https://example-registry-quay-config-editor-quay-
enterprise.apps.docs.gcp.quaydev.org
  currentVersion: 3.7.0
  lastUpdated: 2022-05-11 13:28:38.199476938 +0000 UTC
  registryEndpoint: https://example-registry-quay-quay-enterprise.apps.docs.gcp.quaydev.org
     0          5d21h
```

CHAPTER 10. UPGRADING THE QUAY OPERATOR OVERVIEW

The Quay Operator follows a *synchronized versioning* scheme, which means that each version of the Operator is tied to the version of Quay and the components that it manages. There is no field on the **QuayRegistry** custom resource which sets the version of Quay to deploy; the Operator only knows how to deploy a single version of all components. This scheme was chosen to ensure that all components work well together and to reduce the complexity of the Operator needing to know how to manage the lifecycles of many different versions of Quay on Kubernetes.

10.1. OPERATOR LIFECYCLE MANAGER

The Quay Operator should be installed and upgraded using the Operator Lifecycle Manager (OLM). When creating a **Subscription** with the default **approvalStrategy: Automatic**, OLM will automatically upgrade the Quay Operator whenever a new version becomes available.

WARNING

When the Quay Operator is installed via Operator Lifecycle Manager, it may be configured to support automatic or manual upgrades. This option is shown on the **Operator Hub** page for the Quay Operator during installation. It can also be found in the Quay Operator **Subscription** object via the **approvalStrategy** field. Choosing **Automatic** means that your Quay Operator will automatically be upgraded whenever a new Operator version is released. If this is not desirable, then the **Manual** approval strategy should be selected.

10.2. UPGRADING THE QUAY OPERATOR

The standard approach for upgrading installed Operators on OpenShift is documented at Upgrading installed Operators.

NOTE

In general, Red Hat Quay only supports upgrading from one minor version to the next, for example, 3.4 → 3.5. However, for 3.6, multiple upgrade paths are supported:

- 3.3.z → 3.6
- 3.4.z → 3.6
- 3.5.z → 3.6

For users on standalone deployments of Quay wanting to upgrade to 3.6, see the Standalone upgrade guide.

10.2.1. Upgrading Quay

To update Quay from one minor version to the next, for example, 3.4 → 3.5, you need to change the update channel for the Quay Operator.

For **z** stream upgrades, for example, 3.4.2 → 3.4.3, updates are released in the major-minor channel that the user initially selected during install. The procedure to perform a **z** stream upgrade depends on the **approvalStrategy** as outlined above. If the approval strategy is set to **Automatic**, the Quay Operator will upgrade automatically to the newest **z** stream. This results in automatic, rolling Quay updates to newer **z** streams with little to no downtime. Otherwise, the update must be manually approved before installation can begin.

10.2.2. Notes on upgrading directly from 3.3.z or 3.4.z to 3.6

10.2.2.1. Upgrading with edge routing enabled

- Previously, when running a 3.3.z version of Red Hat Quay with edge routing enabled, users were unable to upgrade to 3.4.z versions of Red Hat Quay. This has been resolved with the release of Red Hat Quay 3.6.

- When upgrading from 3.3.z to 3.6, if **tls.termination** is set to **none** in your Red Hat Quay 3.3.z deployment, it will change to HTTPS with TLS edge termination and use the default cluster wildcard certificate. For example:

```
apiVersion: redhatcop.redhat.io/v1alpha1
kind: QuayEcosystem
metadata:
  name: quay33
spec:
  quay:
    imagePullSecretName: redhat-pull-secret
    enableRepoMirroring: true
    image: quay.io/quay/quay:v3.3.4-2
    ...
    externalAccess:
      hostname: quayv33.apps.devcluster.openshift.com
      tls:
        termination: none
    database:
...
```

10.2.2.2. Upgrading with custom TLS certificate/key pairs without Subject Alternative Names

There is an issue for customers using their own TLS certificate/key pairs without Subject Alternative Names (SANs) when upgrading from Red Hat Quay 3.3.4 to Red Hat Quay 3.6 directly. During the upgrade to Red Hat Quay 3.6, the deployment is blocked, with the error message from the Quay Operator pod logs indicating that the Quay TLS certificate must have SANs.

If possible, you should regenerate your TLS certificates with the correct hostname in the SANs. A possible workaround involves defining an environment variable in the **quay-app**, **quay-upgrade** and **quay-config-editor** pods after upgrade to enable CommonName matching:

```
GODEBUG=x509ignoreCN=0
```

The **GODEBUG=x509ignoreCN=0** flag enables the legacy behavior of treating the CommonName field on X.509 certificates as a host name when no SANs are present. However, this workaround is not recommended, as it will not persist across a redeployment.

10.2.2.3. Configuring Clair v4 when upgrading from 3.3.z or 3.4.z to 3.6 using the Quay Operator

To set up Clair v4 on a new Red Hat Quay deployment on OpenShift, it is highly recommended to use the Quay Operator. By default, the Quay Operator will install or upgrade a Clair deployment along with your Red Hat Quay deployment and configure Clair security scanning automatically.

For instructions on setting up Clair v4 on OpenShift, see Setting Up Clair on a Red Hat Quay OpenShift deployment.

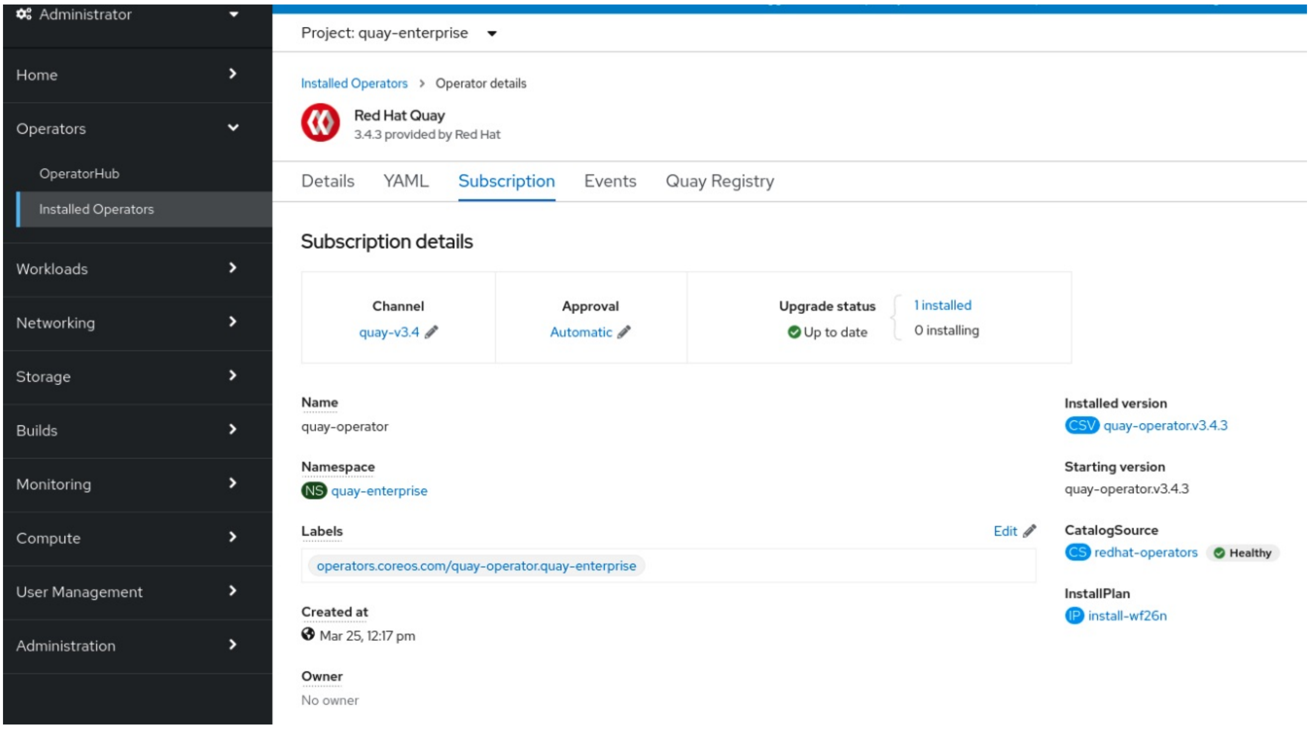
10.2.3. Changing the update channel for an Operator

The subscription of an installed Operator specifies an update channel, which is used to track and receive updates for the Operator. To upgrade the Quay Operator to start tracking and receiving updates from a newer channel, change the update channel in the **Subscription** tab for the installed Quay Operator. For subscriptions with an **Automatic** approval strategy, the upgrade begins automatically and can be monitored on the page that lists the Installed Operators.

10.2.4. Manually approving a pending Operator upgrade

If an installed Operator has the approval strategy in its subscription set to **Manual**, when new updates are released in its current update channel, the update must be manually approved before installation can begin. If the Quay Operator has a pending upgrade, this status will be displayed in the list of Installed Operators. In the **Subscription** tab for the Quay Operator, you can preview the install plan and review the resources that are listed as available for upgrade. If satisfied, click **Approve** and return to the page that lists Installed Operators to monitor the progress of the upgrade.

The following image shows the **Subscription** tab in the UI, including the update **Channel**, the **Approval** strategy, the **Upgrade status** and the **InstallPlan**:



Subscription details

Channel: quay-v3.4

Approval: Automatic

Upgrade status: Up to date — 1 installed, 0 installing

Name: quay-operator

Namespace: NS quay-enterprise

Labels: operators.coreos.com/quay-operator.quay-enterprise

Created at: Mar 25, 12:17 pm

Owner: No owner

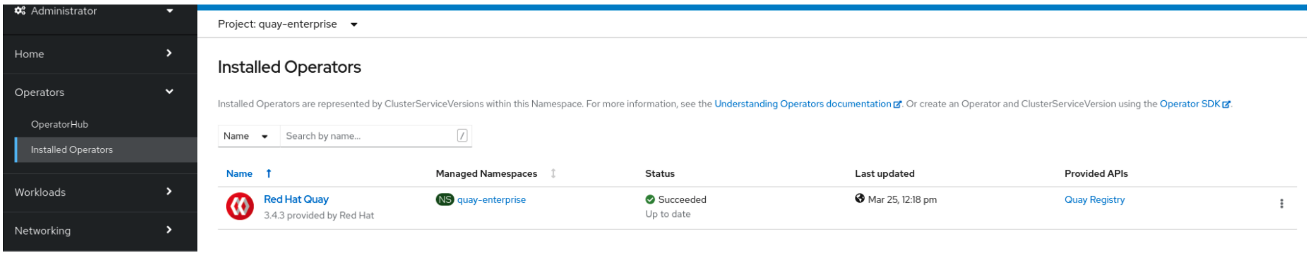
Installed version: CSV quay-operator.v3.4.3

Starting version: quay-operator.v3.4.3

CatalogSource: CS redhat-operators ✓ Healthy

InstallPlan: IP install-wf26n

The list of Installed Operators provides a high-level summary of the current Quay installation:



Installed Operators

Installed Operators are represented by ClusterServiceVersions within this Namespace. For more information, see the Understanding Operators documentation. Or create an Operator and ClusterServiceVersion using the Operator SDK.

Name | Search by name...

Name	Managed Namespaces	Status	Last updated	Provided APIs
Red Hat Quay 3.4.3 provided by Red Hat	NS quay-enterprise	Succeeded Up to date	Mar 25, 12:18 pm	Quay Registry

10.3. UPGRADING A QUAYREGISTRY

When the Quay Operator starts, it immediately looks for any **QuayRegistries** it can find in the namespace(s) it is configured to watch. When it finds one, the following logic is used:

- If **status.currentVersion** is unset, reconcile as normal.
- If **status.currentVersion** equals the Operator version, reconcile as normal.
- If **status.currentVersion** does not equal the Operator version, check if it can be upgraded. If it can, perform upgrade tasks and set the **status.currentVersion** to the Operator's version once complete. If it cannot be upgraded, return an error and leave the **QuayRegistry** and its deployed Kubernetes objects alone.

10.4. ENABLING FEATURES IN QUAY 3.6

10.4.1. Console monitoring and alerting

The support for monitoring Quay 3.6 in the OpenShift console requires that the Operator is installed in all namespaces. If you previously installed the Operator in a specific namespace, delete the Operator itself and reinstall it for all namespaces once the upgrade has taken place.

10.4.2. OCI and Helm support

Support for Helm and some OCI artifacts is now enabled by default in Red Hat Quay 3.6. If you want to explicitly enable the feature, for example, if you are upgrading from a version where it is not enabled by default, you need to reconfigure your Quay deployment to enable the use of OCI artifacts using the following properties:

```
FEATURE_GENERAL_OCI_SUPPORT: true
```

10.5. UPGRADING A QUAYECOSYSTEM

Upgrades are supported from previous versions of the Operator which used the **QuayEcosystem** API for a limited set of configurations. To ensure that migrations do not happen unexpectedly, a special label needs to be applied to the **QuayEcosystem** for it to be migrated. A new **QuayRegistry** will be created for the Operator to manage, but the old **QuayEcosystem** will remain until manually deleted to ensure that you can roll back and still access Quay in case anything goes wrong. To migrate an existing **QuayEcosystem** to a new **QuayRegistry**, follow these steps:

1. Add **"quay-operator/migrate": "true"** to the **metadata.labels** of the **QuayEcosystem**.

   ```
   $ oc edit quayecosystem <quayecosystemname>
   ```

```
metadata:
  labels:
    quay-operator/migrate: "true"
```

2. Wait for a **QuayRegistry** to be created with the same **metadata.name** as your **QuayEcosystem**. The **QuayEcosystem** will be marked with the label **"quay-operator/migration-complete": "true"**.

3. Once the **status.registryEndpoint** of the new **QuayRegistry** is set, access Quay and confirm all data and settings were migrated successfully.

4. When you are confident everything worked correctly, you may delete the **QuayEcosystem** and Kubernetes garbage collection will clean up all old resources.

10.5.1. Reverting QuayEcosystem Upgrade

If something goes wrong during the automatic upgrade from **QuayEcosystem** to **QuayRegistry**, follow these steps to revert back to using the **QuayEcosystem**:

1. Delete the **QuayRegistry** using either the UI or **kubectl**:

```
$ kubectl delete -n <namespace> quayregistry <quayecosystem-name>
```

2. If external access was provided using a **Route**, change the **Route** to point back to the original **Service** using the UI or **kubectl**.

NOTE

If your **QuayEcosystem** was managing the Postgres database, the upgrade process will migrate your data to a new Postgres database managed by the upgraded Operator. Your old database will not be changed or removed but Quay will no longer use it once the migration is complete. If there are issues during the data migration, the upgrade process will exit and it is recommended that you continue with your database as an unmanaged component.

10.5.2. Supported QuayEcosystem Configurations for Upgrades

The Quay Operator will report errors in its logs and in **status.conditions** if migrating a **QuayEcosystem** component fails or is unsupported. All unmanaged components should migrate successfully because no Kubernetes resources need to be adopted and all the necessary values are already provided in Quay's **config.yaml**.

Database

Ephemeral database not supported (**volumeSize** field must be set).

Redis

Nothing special needed.

External Access

Only passthrough **Route** access is supported for automatic migration. Manual migration required for other methods.

- **LoadBalancer** without custom hostname: After the **QuayEcosystem** is marked with label **"quay-operator/migration-complete": "true"**, delete the **metadata.ownerReferences** field from existing **Service** *before* deleting the **QuayEcosystem** to prevent Kubernetes from garbage collecting the **Service** and removing the load balancer. A new **Service** will be created with **metadata.name** format **<QuayEcosystem-name>-quay-app**. Edit the **spec.selector** of the existing **Service** to match the **spec.selector** of the new **Service** so traffic to the old load balancer endpoint will now be directed to the new pods. You are now responsible for the old **Service**; the Quay Operator will not manage it.

- **LoadBalancer**/**NodePort**/**Ingress** with custom hostname: A new **Service** of type **LoadBalancer** will be created with **metadata.name** format **<QuayEcosystem-name>-quay-app**. Change your DNS settings to point to the **status.loadBalancer** endpoint provided by the new **Service**.

Clair

Nothing special needed.

Object Storage

QuayEcosystem did not have a managed object storage component, so object storage will always be marked as unmanaged. Local storage is not supported.

Repository Mirroring

Nothing special needed.

ADDITIONAL RESOURCES

- For more details on the Red Hat Quay Operator, see the upstream quay-operator project.