Red Hat

OpenShift Container Platform 4.2

Monitoring

Configuring and using the monitoring stack in OpenShift Container Platform 4.2

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Abstract

This document provides instructions for configuring and using the Prometheus monitoring stack in OpenShift Container Platform.

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CHAPTER 1. CLUSTER MONITORING

1.1. ABOUT CLUSTER MONITORING

OpenShift Container Platform includes a pre-configured, pre-installed, and self-updating monitoring stack that is based on the Prometheus open source project and its wider eco-system. It provides monitoring of cluster components and includes a set of alerts to immediately notify the cluster administrator about any occurring problems and a set of Grafana dashboards. The cluster monitoring stack is only supported for monitoring OpenShift Container Platform clusters.

IMPORTANT

To ensure compatibility with future OpenShift Container Platform updates, configuring only the specified monitoring stack options is supported.

1.1.1. Stack components and monitored targets

The monitoring stack includes these components:

Table 1.1. Monitoring stack components

Component	Description
Cluster Monitoring Operator	The OpenShift Container Platform Cluster Monitoring Operator (CMO) is the central component of the stack. It controls the deployed monitoring components and resources and ensures that they are always up to date.
Prometheus Operator	The Prometheus Operator (PO) creates, configures, and manages Prometheus and Alertmanager instances. It also automatically generates monitoring target configurations based on familiar Kubernetes label queries.
Prometheus	The Prometheus is the systems and service monitoring system, around which the monitoring stack is based.
Prometheus Adapter	The Prometheus Adapter exposes cluster resource metrics API for horizontal pod autoscaling. Resource metrics are CPU and memory utilization.
Alertmanager	The Alertmanager service handles alerts sent by Prometheus.
kube-state-metrics	The **kube-state-metrics** exporter agent converts Kubernetes objects to metrics that Prometheus can use.

Component	Description
openshift-state-metrics	The **openshift-state-metrics** exporter expands upon **kube-state-metrics** by adding metrics for OpenShift Container Platform-specific resources.
node-exporter	**node-exporter** is an agent deployed on every node to collect metrics about it.
Grafana	The Grafana analytics platform provides dashboards for analyzing and visualizing the metrics. The Grafana instance that is provided with the monitoring stack, along with its dashboards, is read-only.

All the components of the monitoring stack are monitored by the stack and are automatically updated when OpenShift Container Platform is updated.

In addition to the components of the stack itself, the monitoring stack monitors:

- CoreDNS
- Elasticsearch (if Logging is installed)
- Etcd
- Fluentd (if Logging is installed)
- HAProxy
- Image registry
- Kubelets
- Kubernetes apiserver
- Kubernetes controller manager
- Kubernetes scheduler
- Metering (if Metering is installed)
- OpenShift apiserver
- OpenShift controller manager
- Operator Lifecycle Manager (OLM)
- Telemeter client

NOTE

Each OpenShift Container Platform component is responsible for its monitoring configuration. For problems with a component's monitoring, open a bug in Bugzilla against that component, not against the general monitoring component.

Other OpenShift Container Platform framework components might be exposing metrics as well. For details, see their respective documentation.

Next steps

Configure the monitoring stack.

1.2. CONFIGURING THE MONITORING STACK

Prior to OpenShift Container Platform 4, the Prometheus Cluster Monitoring stack was configured through the Ansible inventory file. For that purpose, the stack exposed a subset of its available configuration options as Ansible variables. You configured the stack before you installed OpenShift Container Platform.

In OpenShift Container Platform 4, Ansible is not the primary technology to install OpenShift Container Platform anymore. The installation program provides only a very low number of configuration options before installation. Configuring most OpenShift framework components, including the Prometheus Cluster Monitoring stack, happens post-installation.

This section explains what configuration is supported, shows how to configure the monitoring stack, and demonstrates several common configuration scenarios.

Prerequisites

- The monitoring stack imposes additional resource requirements. Consult the computing resources recommendations in Scaling the Cluster Monitoring Operator and verify that you have sufficient resources.

1.2.1. Maintenance and support

The supported way of configuring OpenShift Container Platform Monitoring is by configuring it using the options described in this document. **Do not use other configurations, as they are unsupported.** Configuration paradigms might change across Prometheus releases, and such cases can only be handled gracefully if all configuration possibilities are controlled. If you use configurations other than those described in this section, your changes will disappear because the cluster-monitoring-operator reconciles any differences. The operator reverses everything to the defined state by default and by design.

Explicitly unsupported cases include:

- **Creating additional ServiceMonitor objects in theopenshift-* namespaces.** This extends the targets the cluster monitoring Prometheus instance scrapes, which can cause collisions and load differences that cannot be accounted for. These factors might make the Prometheus setup unstable.
- **Creating unexpected ConfigMap objects or PrometheusRule objects.** This causes the cluster monitoring Prometheus instance to include additional alerting and recording rules.
- **Modifying resources of the stack.**The Prometheus Monitoring Stack ensures its resources are always in the state it expects them to be. If they are modified, the stack will reset them.

- **Using resources of the stack for your purposes.** The resources created by the Prometheus Cluster Monitoring stack are not meant to be used by any other resources, as there are no guarantees about their backward compatibility.
- **Stopping the Cluster Monitoring Operator from reconciling the monitoring stack.**
- **Adding new alerting rules.**
- **Modifying the monitoring stack Grafana instance.**

1.2.2. Creating cluster monitoring ConfigMap

To configure the Prometheus Cluster Monitoring stack, you must create the cluster monitoring ConfigMap.

Prerequisites

- An installed **oc** CLI tool
- Administrative privileges for the cluster

Procedure

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

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

2. If it does not exist, create it:

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

3. Start editing the **cluster-monitoring-config** ConfigMap:

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

4. Create the **data** section if it does not exist yet:

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

1.2.3. Configuring the cluster monitoring stack

You can configure the Prometheus Cluster Monitoring stack using ConfigMaps. ConfigMaps configure the Cluster Monitoring Operator, which in turn configures components of the stack.

Prerequisites

- Make sure you have the **cluster-monitoring-config** ConfigMap object with the **data/config.yaml** section.

Procedure

1. Start editing the **cluster-monitoring-config** ConfigMap:

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

2. Put your configuration under **data/config.yaml** as key-value pair **<component_name>: <component_configuration>**:

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

   Substitute **<component>** and **<configuration_for_the_component>** accordingly.

   For example, create this ConfigMap to configure a Persistent Volume Claim (PVC) for Prometheus:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
    prometheusK8s:
      volumeClaimTemplate: spec: storageClassName: fast volumeMode: filesystem
resources: requests: storage: 40Gi
```

   Here, **prometheusK8s** defines the Prometheus component and the following lines define its configuration.

3. Save the file to apply the changes. The pods affected by the new configuration are restarted automatically.

1.2.4. Configurable monitoring components

This table shows the monitoring components you can configure and the keys used to specify the components in the ConfigMap:

Table 1.2. Configurable monitoring components

Component	Key
Prometheus Operator	**prometheusOperator**

Component	Key
Prometheus	**prometheusK8s**
Alertmanager	**alertmanagerMain**
kube-state-metrics	**kubeStateMetrics**
openshift-state-metrics	**openshiftStateMetrics**
Grafana	**grafana**
Telemeter Client	**telemeterClient**
Prometheus Adapter	**k8sPrometheusAdapter**

From this list, only Prometheus and Alertmanager have extensive configuration options. All other components usually provide only the **nodeSelector** field for being deployed on a specified node.

1.2.5. Moving monitoring components to different nodes

You can move any of the monitoring stack components to specific nodes.

Prerequisites

- Make sure you have the **cluster-monitoring-config** ConfigMap object with the **data/config.yaml** section.

Procedure

1. Start editing the **cluster-monitoring-config** ConfigMap:

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

2. Specify the **nodeSelector** constraint for the component under **data/config.yaml**:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
    <component>:
      nodeSelector:
        <node_key>: <node_value>
        <node_key>: <node_value>
        <...>
```

Substitute **<component>** accordingly and substitute **<node_key>: <node_value>** with the map of key-value pairs that specifies the destination node. Often, only a single key-value pair is used.

The component can only run on a node that has each of the specified key-value pairs as labels. The node can have additional labels as well.

For example, to move components to the node that is labeled **foo: bar**, use:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
    prometheusOperator: nodeSelector: foo: bar prometheusK8s: nodeSelector: foo:
bar alertmanagerMain: nodeSelector: foo: bar kubeStateMetrics: nodeSelector: foo:
bar grafana: nodeSelector: foo: bar telemeterClient: nodeSelector: foo: bar
k8sPrometheusAdapter: nodeSelector: foo: bar
    openshiftStateMetrics:
      nodeSelector:
        node-role.kubernetes.io/infra: ""
```

3. Save the file to apply the changes. The components affected by the new configuration are moved to new nodes automatically.

Additional resources

- See the Kubernetes documentation for details on the **nodeSelector** constraint.

1.2.6. Assigning tolerations to monitoring components

You can assign tolerations to any of the monitoring stack components to enable moving them to tainted nodes.

Prerequisites

- Make sure you have the **cluster-monitoring-config** ConfigMap object with the **data/config.yaml** section.

Procedure

1. Start editing the **cluster-monitoring-config** ConfigMap:

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

2. Specify **tolerations** for the component:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
```

```
data:
  config.yaml: |
    <component>:
      tolerations:
        <toleration_specification>
```

Substitute **<component>** and **<toleration_specification>** accordingly.

For example, a **oc adm taint nodes node1 key1=value1:NoSchedule** taint prevents the scheduler from placing pods in the **foo: bar** node. To make the **alertmanagerMain** component ignore that taint and to place **alertmanagerMain** in **foo: bar** normally, use this toleration:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
    alertmanagerMain:
      nodeSelector:
        foo: bar
      tolerations: - key: "key1" operator: "Equal" value: "value1" effect: "NoSchedule"
```

3. Save the file to apply the changes. The new component placement configuration is applied automatically.

Additional resources

- See the OpenShift Container Platform documentation on taints and tolerations.
- See the Kubernetes documentation on taints and tolerations.

1.2.7. Configuring persistent storage

Running cluster monitoring with persistent storage means that your metrics are stored to a persistent volume (PV) and can survive a pod being restarted or recreated. This is ideal if you require your metrics or alerting data to be guarded from data loss. For production environments, it is highly recommended to configure persistent storage. Because of the high IO demands, it is advantageous to use local storage.

IMPORTANT

See Recommended configurable storage technology .

Prerequisites

- Dedicate sufficient local persistent storage to ensure that the disk does not become full. How much storage you need depends on the number of pods. For information on system requirements for persistent storage, see Prometheus database storage requirements.
- Make sure you have a persistent Volume (PV) ready to be claimed by the persistent volume claim (PVC), one PV for each replica. Because Prometheus has two replicas and Alertmanager has three replicas, you need five PVs to support the entire monitoring stack. The PVs should be available from the Local Storage Operator. This does not apply if you enable dynamically provisioned storage.

- Use the block type of storage.
- Configure local persistent storage.

1.2.7.1. Configuring a local persistent volume claim

For the Prometheus or Alertmanager to use a persistent volume (PV), you first must configure a persistent volume claim (PVC).

Prerequisites

- Make sure you have the **cluster-monitoring-config** ConfigMap object with the **data/config.yaml** section.

Procedure

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

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

2. Put your PVC configuration for the component under **data/config.yaml**:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
    <component>:
      volumeClaimTemplate:
        metadata:
          name: <PVC_name_prefix>
        spec:
          storageClassName: <storage_class>
          resources:
            requests:
              storage: <amount_of_storage>
```

See the Kubernetes documentation on PersistentVolumeClaims for information on how to specify **volumeClaimTemplate**.

For example, to configure a PVC that claims local persistent storage for Prometheus, use:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
    prometheusK8s:
      volumeClaimTemplate:
        metadata:
          name: localpvc
        spec:
          storageClassName: local-storage
          resources:
            requests:
              storage: 40Gi
```

In the above example, the storage class created by the Local Storage Operator is called **local-storage**.

To configure a PVC that claims local persistent storage for Alertmanager, use:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
    alertmanagerMain:
      volumeClaimTemplate:
        metadata:
          name: localpvc
        spec:
          storageClassName: local-storage
          resources:
            requests:
              storage: 40Gi
```

3. Save the file to apply the changes. The pods affected by the new configuration are restarted automatically and the new storage configuration is applied.

1.2.7.2. Modifying retention time for Prometheus metrics data

By default, the Prometheus Cluster Monitoring stack configures the retention time for Prometheus data to be 15 days. You can modify the retention time to change how soon the data is deleted.

Prerequisites

- Make sure you have the **cluster-monitoring-config** ConfigMap object with the **data/config.yaml** section.

Procedure

1. Start editing the **cluster-monitoring-config** ConfigMap:

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

2. Put your retention time configuration under **data/config.yaml**:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
```

```
data:
  config.yaml: |
    prometheusK8s:
      retention: <time_specification>
```

Substitute **<time_specification>** with a number directly followed by **ms** (milliseconds), **s** (seconds), **m** (minutes), **h** (hours), **d** (days), **w** (weeks), or **y** (years).

For example, to configure retention time to be 24 hours, use:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cluster-monitoring-config
  namespace: openshift-monitoring
data:
  config.yaml: |
    prometheusK8s:
      retention: 24h
```

3. Save the file to apply the changes. The pods affected by the new configuration are restarted automatically.

1.2.8. Configuring Alertmanager

The Prometheus Alertmanager is a component that manages incoming alerts, including:

- Alert silencing
- Alert inhibition
- Alert aggregation
- Reliable deduplication of alerts
- Grouping alerts
- Sending grouped alerts as notifications through receivers such as email, PagerDuty, and HipChat

1.2.8.1. Alertmanager default configuration

The default configuration of the OpenShift Container Platform Monitoring Alertmanager cluster is this:

```
global:
  resolve_timeout: 5m
route:
  group_wait: 30s
  group_interval: 5m
  repeat_interval: 12h
  receiver: default
  routes:
  - match:
      alertname: Watchdog
    repeat_interval: 5m
    receiver: watchdog
receivers:
- name: default
- name: watchdog
```

OpenShift Container Platform monitoring ships with the Watchdog alert, which fires continuously. Alertmanager repeatedly sends notifications for the Watchdog alert to the notification provider, for example, to PagerDuty. The provider is usually configured to notify the administrator when it stops receiving the Watchdog alert. This mechanism helps ensure continuous operation of Prometheus as well as continuous communication between Alertmanager and the notification provider.

1.2.8.2. Applying custom Alertmanager configuration

You can overwrite the default Alertmanager configuration by editing the **alertmanager-main** secret inside the **openshift-monitoring** namespace.

Prerequisites

- An installed **jq** tool for processing JSON data

Procedure

1. Print the currently active Alertmanager configuration into file **alertmanager.yaml**:

```
$ oc -n openshift-monitoring get secret alertmanager-main --template='{{ index .data
"alertmanager.yaml" }}' |base64 -d > alertmanager.yaml
```

2. Change the configuration in file **alertmanager.yaml** to your new configuration:

```
global:
  resolve_timeout: 5m
route:
  group_wait: 30s
  group_interval: 5m
  repeat_interval: 12h
  receiver: default
  routes:
  - match:
      alertname: Watchdog
    repeat_interval: 5m
    receiver: watchdog
  - match:
      service: <your_service> (1)
    routes:
    - match:
        <your_matching_rules> (2)
      receiver: <receiver> (3)
receivers:
- name: default
- name: watchdog
- name: <receiver>
  <receiver_configuration>
```

(1) **service** specifies the service that fires the alerts.

2 **<your_matching_rules>** specify the target alerts.

3 **receiver** specifies the receiver to use for the alert.

For example, this listing configures PagerDuty for notifications:

```
global:
  resolve_timeout: 5m
route:
  group_wait: 30s
  group_interval: 5m
  repeat_interval: 12h
  receiver: default
  routes:
  - match:
      alertname: Watchdog
    repeat_interval: 5m
    receiver: watchdog
  - match: service: example-app routes: - match: severity: critical receiver: team-
frontend-page
receivers:
- name: default
- name: watchdog
- name: team-frontend-page pagerduty_configs: - service_key: "your-key"
```

With this configuration, alerts of **critical** severity fired by the **example-app** service are sent using the **team-frontend-page** receiver, which means that these alerts are paged to a chosen person.

3. Apply the new configuration in the file:

```
$ oc -n openshift-monitoring create secret generic alertmanager-main --from-
file=alertmanager.yaml --dry-run -o=yaml |  oc -n openshift-monitoring replace secret --
filename=-
```

Additional resources

- See the PagerDuty official site for more information on PagerDuty.
- See the PagerDuty Prometheus Integration Guide to learn how to retrieve the **service_key**.
- See Alertmanager configuration for configuring alerting through different alert receivers.

1.2.8.3. Alerting rules

OpenShift Container Platform Cluster Monitoring by default ships with a set of pre-defined alerting rules.

Note that:

- The default alerting rules are used specifically for the OpenShift Container Platform cluster and nothing else. For example, you get alerts for a persistent volume in the cluster, but you do not get them for persistent volume in your custom namespace.

- Currently you cannot add custom alerting rules.
- Some alerting rules have identical names. This is intentional. They are sending alerts about the same event with different thresholds, with different severity, or both.
- With the inhibition rules, the lower severity is inhibited when the higher severity is firing.

1.2.8.4. Listing acting alerting rules

You can list the alerting rules that currently apply to the cluster.

Procedure

1. Configure the necessary port forwarding:

```
$ oc -n openshift-monitoring port-forward svc/prometheus-operated 9090
```

2. Fetch the JSON object containing acting alerting rules and their properties:

```
$ curl -s http://localhost:9090/api/v1/rules | jq '[.data.groups[].rules[] |
select(.type=="alerting")]'
[
  {
    "name": "ClusterOperatorDown",
    "query": "cluster_operator_up{job=\"cluster-version-operator\"} == 0",
    "duration": 600,
    "labels": {
      "severity": "critical"
    },
    "annotations": {
      "message": "Cluster operator {{ $labels.name }} has not been available for 10 mins.
Operator may be down or disabled, cluster will not be kept up to date and upgrades will not be
possible."
    },
    "alerts": [],
    "health": "ok",
    "type": "alerting"
  },
  {
    "name": "ClusterOperatorDegraded",
    ...
```

Additional resources

- See also the Alertmanager documentation.

Next steps

- Manage cluster alerts.
- Learn about remote health reporting and, if necessary, opt out of it.

1.3. MANAGING CLUSTER ALERTS

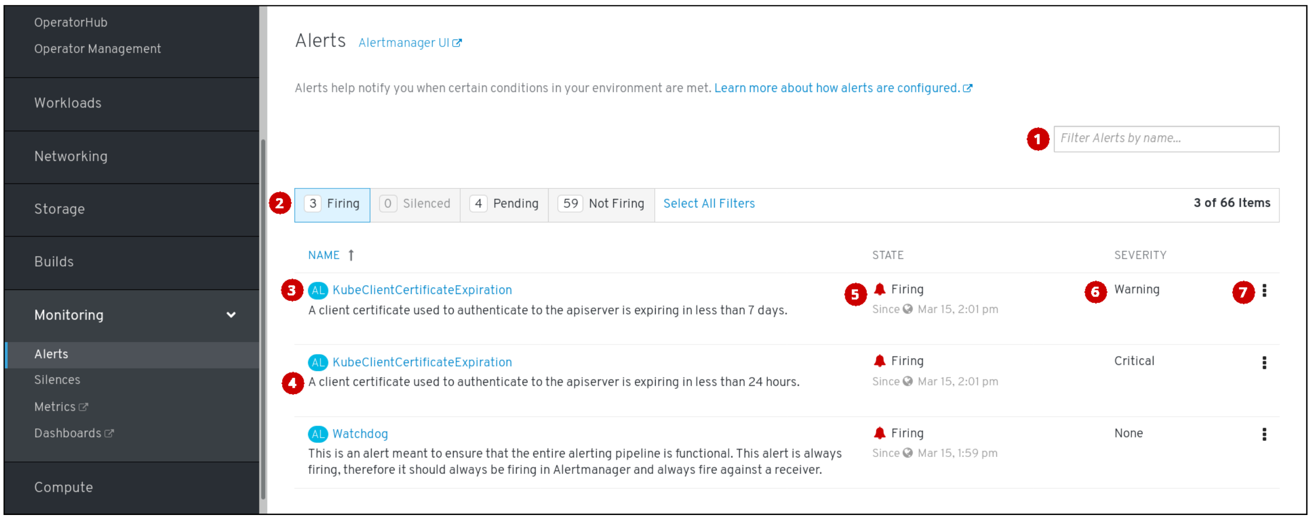
OpenShift Container Platform 4.2 provides a web interface to the Alertmanager, which enables you to manage alerts. This section demonstrates how to use the Alerting UI.

1.3.1. Contents of the Alerting UI

This section shows and explains the contents of the Alerting UI, a web interface to the Alertmanager.

The main three pages of the Alerting UI are the **Alerts**, the **Silences**, and the **YAML** pages.

The **Alerts** page is accessible by clicking **Monitoring → Alerting → Alerts** in the OpenShift Container Platform web console.

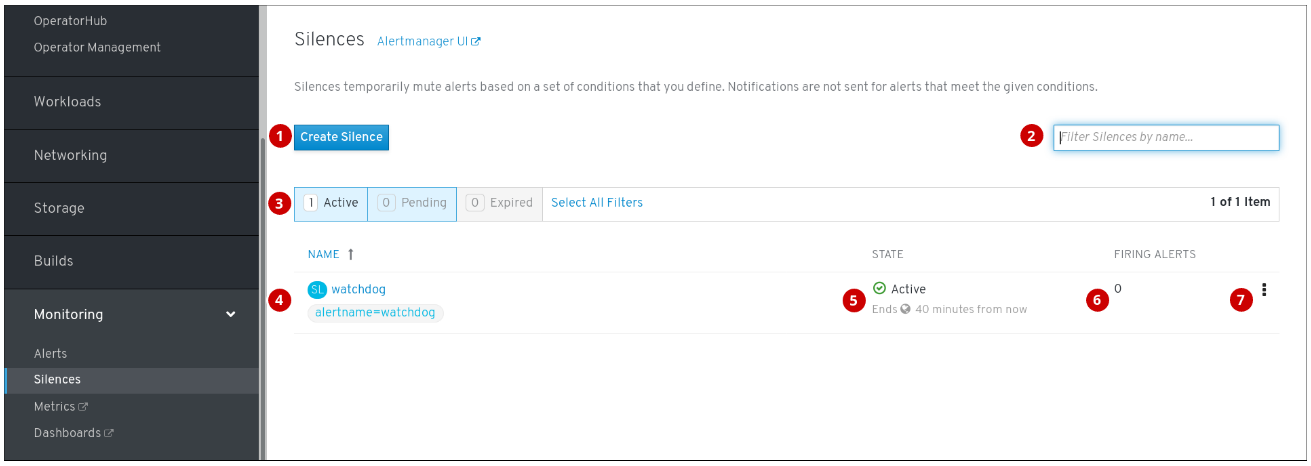


Alerts help notify you when certain conditions in your environment are met. Learn more about how alerts are configured.

NAME	STATE	SEVERITY
AL KubeClientCertificateExpiration A client certificate used to authenticate to the apiserver is expiring in less than 7 days.	Firing Since Mar 15, 2:01 pm	Warning
AL KubeClientCertificateExpiration A client certificate used to authenticate to the apiserver is expiring in less than 24 hours.	Firing Since Mar 15, 2:01 pm	Critical
AL Watchdog This is an alert meant to ensure that the entire alerting pipeline is functional. This alert is always firing, therefore it should always be firing in Alertmanager and always fire against a receiver.	Firing Since Mar 15, 1:59 pm	None

1. Filtering alerts by their names.
2. Filtering the alerts by their states. To fire, some alerts need a certain condition to be true for the duration of a timeout. If a condition of an alert is currently true, but the timeout has not been reached, such an alert is in the **Pending** state.
3. Alert name.
4. Description of an alert.
5. Current state of the alert and when the alert went into this state.
6. Value of the Severity label of the alert.
7. Actions you can do with the alert.

The **Silences** page is accessible by clicking **Monitoring → Alerting → Silences** in the OpenShift Container Platform web console.



Silences temporarily mute alerts based on a set of conditions that you define. Notifications are not sent for alerts that meet the given conditions.

1. Creating a silence for an alert.

2. Filtering silences by their name.

3. Filtering silences by their states. If a silence is pending, it is currently not active because it is scheduled to start at a later time. If a silence expired, it is no longer active because it has reached its end time.

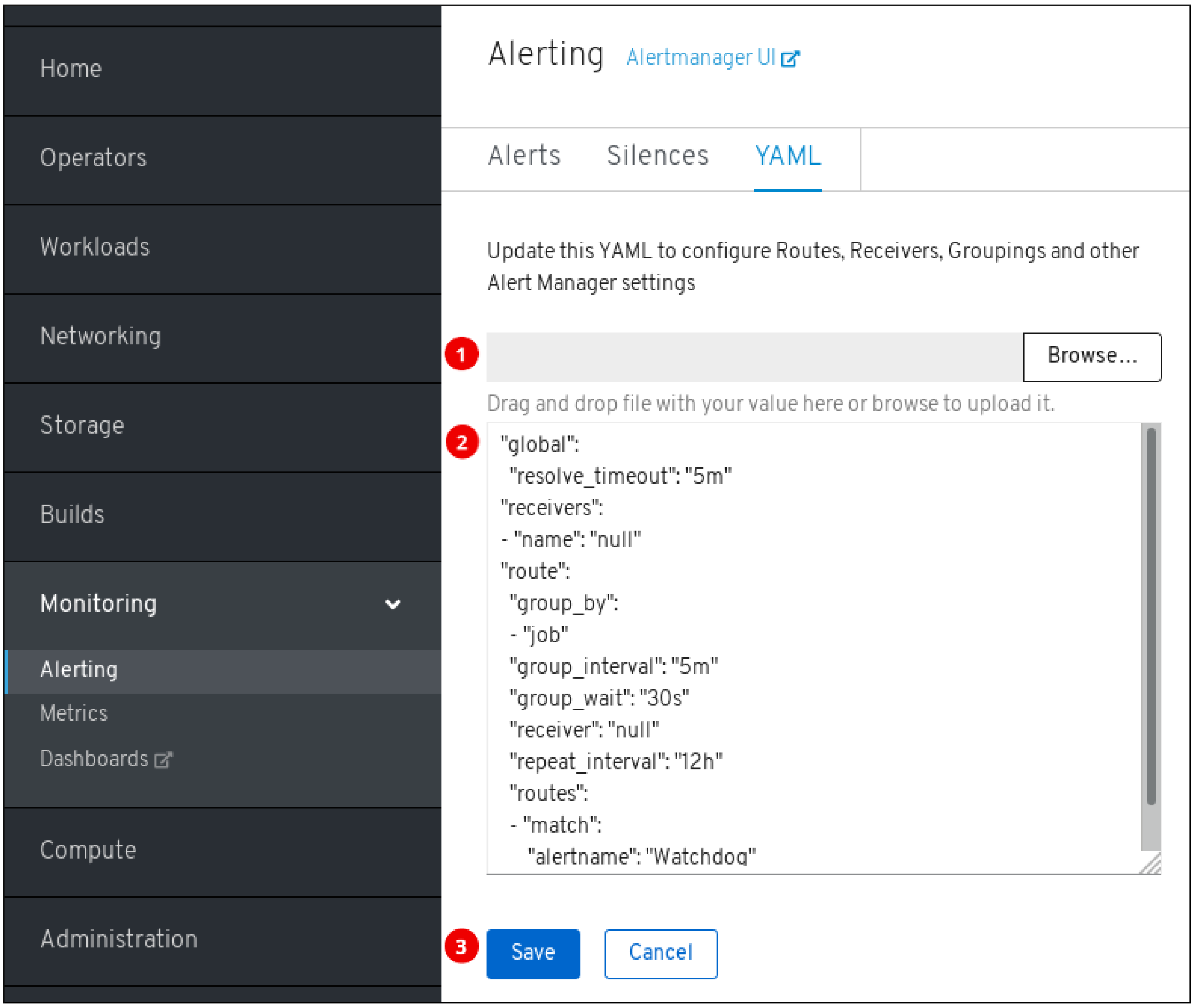
4. Description of a silence. It includes the specification of alerts that it matches.

5. Current state of the silence. For active silences, it shows when it ends, and for pending silences, it shows when it starts.

6. Number of alerts that are being silenced by the silence.

7. Actions you can do with a silence.

The **YAML** page is accessible by clicking **Monitoring → Alerting → YAML** in the OpenShift Container Platform web console.



Update this YAML to configure Routes, Receivers, Groupings and other Alert Manager settings

Drag and drop file with your value here or browse to upload it.

```
"global":
  "resolve_timeout": "5m"
"receivers":
- "name": "null"
"route":
  "group_by":
  - "job"
  "group_interval": "5m"
  "group_wait": "30s"
  "receiver": "null"
  "repeat_interval": "12h"
  "routes":
  - "match":
    "alertname": "Watchdog"
```

1. Upload a file with Alertmanager configuration.
2. Examine and edit the current Alertmanager configuration.
3. Save the updated Alertmanager configuration.

Also, next to the title of each of these pages is a link to the old Alertmanager interface.

Additional resources

- See Configuring Alertmanager for more information on changing Alertmanager configuration.

1.3.2. Getting information about alerts and alerting rules

You can find an alert and see information about it or its governing alerting rule.

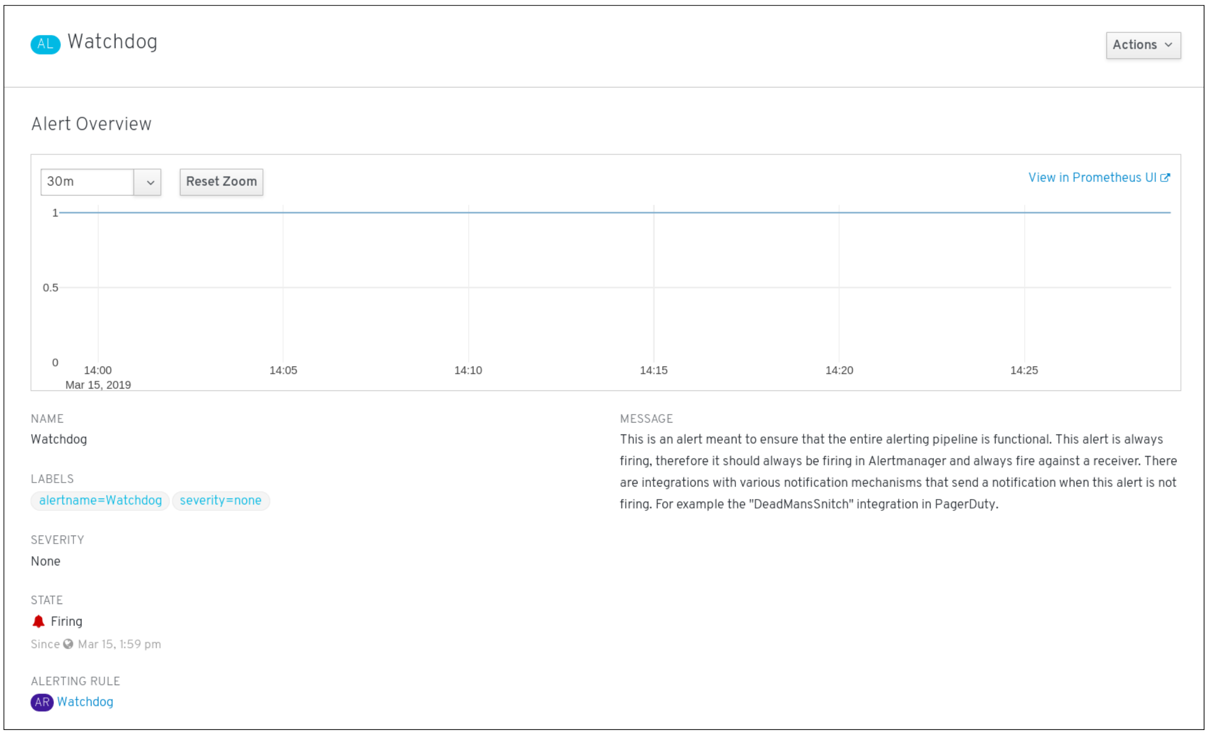
Procedure

1. Open the OpenShift Container Platform web console and navigate to the **Monitoring** → **Alerting** → **Alerts** page.
2. Optional: Filter the alerts by name using the **Filter Alerts by name** field.

3. Optional: Filter the alerts by state using one or more of the state buttons **Firing**, **Silenced**, **Pending**, **Not firing**.

4. Optional: Sort the alerts by clicking one or more of the **Name**, **State**, and **Severity** column headers.

5. After you see the alert, you can see either details of the alert or details of its governing alerting rule.
   To see alert details, click on the name of the alert. This is the page with alert details:



NAME
Watchdog

LABELS
alertname=Watchdog severity=none

SEVERITY
None

STATE
Firing
Since Mar 15, 1:59 pm

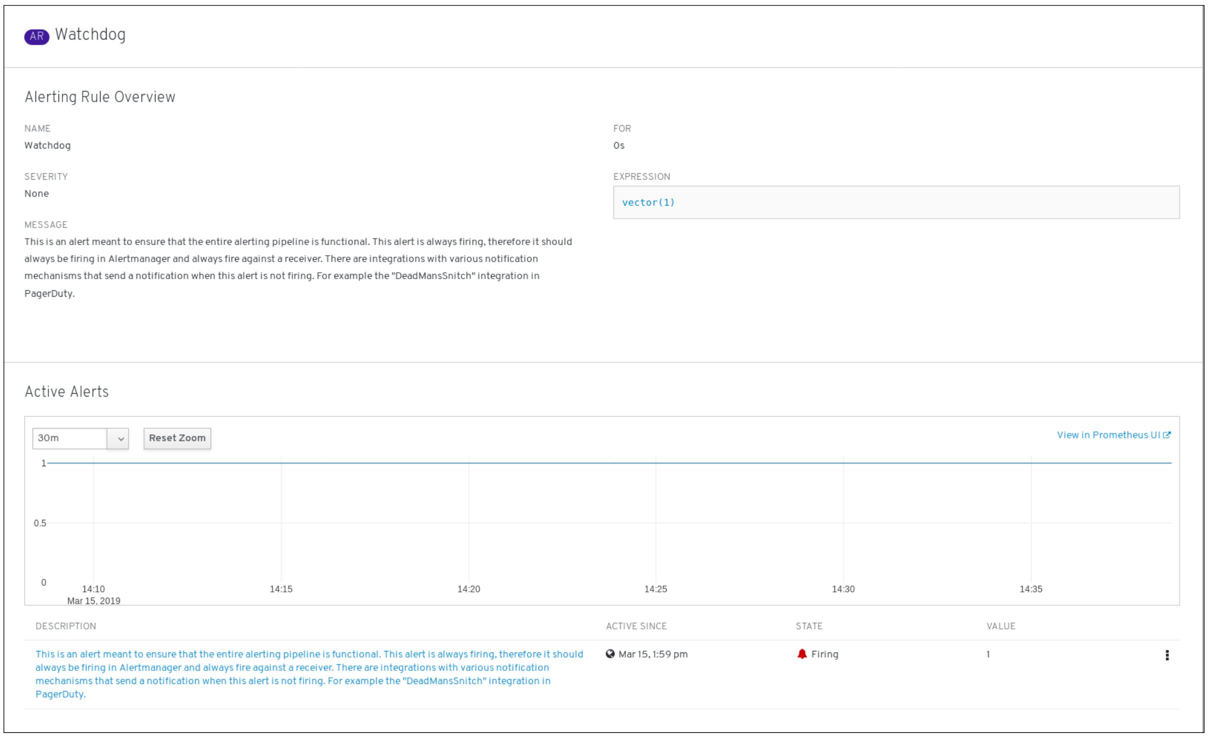
ALERTING RULE
AR Watchdog

MESSAGE
This is an alert meant to ensure that the entire alerting pipeline is functional. This alert is always firing, therefore it should always be firing in Alertmanager and always fire against a receiver. There are integrations with various notification mechanisms that send a notification when this alert is not firing. For example the "DeadMansSnitch" integration in PagerDuty.

   The page has the graph with timeseries of the alert. It also has information about the alert, including:

   - A link to its governing alerting rule
   - Description of the alert

   To see alerting rule details, click the button in the last column and select **View Alerting Rule**. This is the page with alerting rule details:



AR Watchdog

Alerting Rule Overview

NAME
Watchdog

SEVERITY
None

MESSAGE
This is an alert meant to ensure that the entire alerting pipeline is functional. This alert is always firing, therefore it should always be firing in Alertmanager and always fire against a receiver. There are integrations with various notification mechanisms that send a notification when this alert is not firing. For example the "DeadMansSnitch" integration in PagerDuty.

FOR
0s

EXPRESSION
```
vector(1)
```

Active Alerts

DESCRIPTION	ACTIVE SINCE	STATE	VALUE
This is an alert meant to ensure that the entire alerting pipeline is functional. This alert is always firing, therefore it should always be firing in Alertmanager and always fire against a receiver. There are integrations with various notification mechanisms that send a notification when this alert is not firing. For example the "DeadMansSnitch" integration in PagerDuty.	Mar 15, 1:59 pm	Firing	1

The page has information about the alerting rule, including:

- Alerting rule name, severity, and description
- The expression that defines the condition for firing the alert
- The time for which the condition should be true for an alert to fire
- Graph for each alert governed by the alerting rule, showing the value with which the alert is firing
- Table of all alerts governed by the alerting rule

1.3.3. Silencing alerts

You can either silence a specific alert or silence alerts that match a specification that you define.

Procedure

To silence a set of alerts by creating an alert specification:

1. Navigate to the **Monitoring** → **Alerting** → **Silences** page of the OpenShift Container Platform web console.
2. Click **Create Silence**.
3. Populate the **Create Silence** form.
4. To create the silence, click **Create**.

To silence a specific alert:

1. Navigate to the **Monitoring** → **Alerting** → **Alerts** page of the OpenShift Container Platform web console.

2. For the alert that you want to silence, click the button in the last column and click **Silence Alert**. The **Create Silence** form will appear with prepopulated specification of the chosen alert.

3. Optional: Modify the silence.

4. To create the silence, click **Create**.

1.3.4. Getting information about silences

You can find a silence and view its details.

Procedure

1. Open the OpenShift Container Platform web console and navigate to the **Monitoring → Alerting → Silences** page.

2. Optional: Filter the silences by name using the **Filter Silences by name** field.

3. Optional: Filter the silences by state using one or more of the state buttons **Active**, **Pending**, **Expired**.

4. Optional: Sort the silences by clicking one or more of the **Name**, **State**, and **Firing alerts** column headers.

5. After you see the silence, you can click its name to see the details, including:

   - Alert specification
   - State
   - Start time
   - End time
   - Number and list of firing alerts

1.3.5. Editing silences

You can edit a silence, which will expire the existing silence and create a new silence with the changed configuration.

Procedure

1. Navigate to the **Monitoring → Alerting → Silences** page.

2. For the silence you want to modify, click the button in the last column and click **Edit silence**. Alternatively, you can click **Actions → Edit Silence** in the **Silence Overview** screen for a particular silence.

3. In the **Edit Silence** screen, enter your changes and click the **Save** button. This will expire the existing silence and create one with the chosen configuration.

1.3.6. Expiring silences

You can expire a silence. Expiring a silence deactivates it forever.

Procedure

1. Navigate to the **Monitoring** → **Alerting** → **Silences** page.
2. For the silence you want to expire, click the button in the last column and click **Expire Silence**. Alternatively, you can click the **Actions** → **Expire Silence** button in the **Silence Overview** page for a particular silence.
3. Confirm by clicking **Expire Silence**. This expires the silence.

Next steps

Examine cluster metrics.

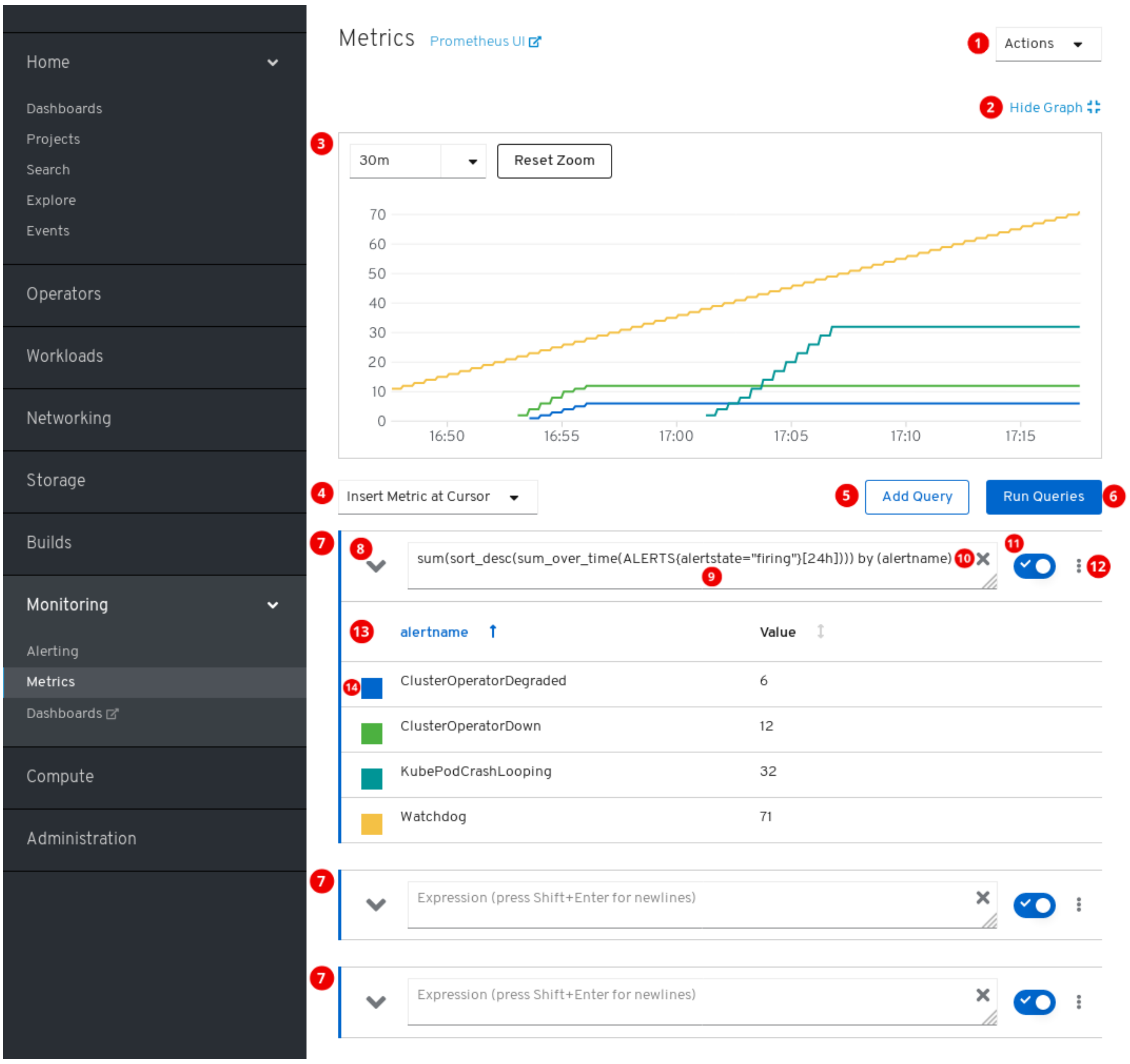
1.4. EXAMINING CLUSTER METRICS

OpenShift Container Platform 4.2 provides a web interface to Prometheus, which enables you to run Prometheus Query Language (PromQL) queries and examine the metrics visualized on a plot. This functionality provides an extensive overview of the cluster state and enables you to troubleshoot problems.

1.4.1. Contents of the Metrics UI

This section shows and explains the contents of the Metrics UI, a web interface to Prometheus.

The **Metrics** page is accessible by clicking **Monitoring** → **Metrics** in the OpenShift Container Platform web console.



```
sum(sort_desc(sum_over_time(ALERTS{alertstate="firing"}[24h]))) by (alertname)
```

	alertname	Value
🟦	ClusterOperatorDegraded	6
🟩	ClusterOperatorDown	12
🟦	KubePodCrashLooping	32
🟨	Watchdog	71

1. Actions.
   - Add query.
   - Expand or collapse all query tables.
   - Delete all queries.
2. Hide the plot.
3. The interactive plot.
4. The catalog of available metrics.
5. Add query.
6. Run queries.
7. Query forms.
8. Expand or collapse the form.

9. The query.
10. Clear query.
11. Enable or disable query.
12. Actions for a specific query.
    - Enable or disable query.
    - Show or hide all series of the query from the plot.
    - Delete query.
13. The metrics table for a query.
14. Color assigned to the graph of the metric. Clicking the square shows or hides the metric’s graph.

Additionally, there is a link to the old Prometheus interface next to the title of the page.

1.4.2. Running metrics queries

You begin working with metrics by entering one or several Prometheus Query Language (PromQL) queries.

Procedure

1. Open the OpenShift Container Platform web console and navigate to the **Monitoring → Metrics** page.
2. In the query field, enter your PromQL query.
    - To show all available metrics and PromQL functions, click **Insert Metric at Cursor**.
3. For multiple queries, click **Add Query**.
4. For deleting queries, click ⋮ for the query, then select **Delete query**.
5. For keeping but not running a query, click the **Disable query** button.
6. Once you finish creating queries, click the **Run Queries** button. The metrics from the queries are visualized on the plot. If a query is invalid, the UI shows an error message.

    NOTE

    Queries that operate on large amounts of data might timeout or overload the browser when drawing timeseries graphs. To avoid this, hide the graph and calibrate your query using only the metrics table. Then, after finding a feasible query, enable the plot to draw the graphs.

7. Optional: The page URL now contains the queries you ran. To use this set of queries again in the future, save this URL.

Additional resources

See the Prometheus Query Language documentation.

1.4.3. Exploring the visualized metrics

After running the queries, the metrics are displayed on the interactive plot. The X axis of the plot represents time. The Y axis represents the metrics values. Each metric is shown as a colored graph. You can manipulate the plot and explore the metrics.

Procedure

1. Initially, all metrics from all enabled queries are shown on the plot. You can select which metrics are shown.
   - To hide all metrics from a query, click ⋮ for the query and click **Hide all series**.
   - To hide a specific metric, go to the query table and click the colored square near the metric name.
2. To zoom into the plot and change the shown time range, do one of the following:
   - Visually select the time range by clicking and dragging on the plot horizontally.
   - Use the menu in the left upper corner to select the time range.

   To reset the time range, click **Reset Zoom**.
3. To display outputs of all queries at a specific point in time, hold the mouse cursor on the plot at that point. The query outputs will appear in a pop-up box.
4. For more detailed information about metrics of a specific query, expand the table of that query using the drop-down button. Every metric is shown with its current value.
5. To hide the plot, click **Hide Graph**.

Next steps

Access the Prometheus, Alertmanager, and Grafana.

1.5. ACCESSING PROMETHEUS, ALERTMANAGER, AND GRAFANA

To work with data gathered by the monitoring stack, you might want to use the Prometheus, Alertmanager, and Grafana interfaces. They are available by default.

1.5.1. Accessing Prometheus, Alerting UI, and Grafana using the web console

You can access Prometheus, Alerting, and Grafana web UIs using a web browser through the OpenShift Container Platform web console.

NOTE

The Alerting UI accessed in this procedure is the new interface for Alertmanager.

Prerequisites

- Authentication is performed against the OpenShift Container Platform identity and uses the same credentials or means of authentication as is used elsewhere in OpenShift Container Platform. You must use a role that has read access to all namespaces, such as the **cluster-monitoring-view** cluster role.

Procedure

1. Navigate to the OpenShift Container Platform web console and authenticate.
2. To access Prometheus, navigate to the "Monitoring" → "Metrics" page.
   To access the Alerting UI, navigate to the "Monitoring" → "Alerting" page.

   To access Grafana, navigate to the "Monitoring" → "Dashboards" page.

1.5.2. Accessing Prometheus, Alertmanager, and Grafana directly

You can access Prometheus, Alertmanager, and Grafana web UIs using the **oc** tool and a web browser.

NOTE

The Alertmanager UI accessed in this procedure is the old interface for Alertmanager.

Prerequisites

- Authentication is performed against the OpenShift Container Platform identity and uses the same credentials or means of authentication as is used elsewhere in OpenShift Container Platform. You must use a role that has read access to all namespaces, such as the **cluster-monitoring-view** cluster role.

Procedure

1. Run:

```
$ oc -n openshift-monitoring get routes
NAME                HOST/PORT                                                          ...
alertmanager-main   alertmanager-main-openshift-monitoring.apps._url_.openshift.com ...
grafana             grafana-openshift-monitoring.apps._url_.openshift.com             ...
prometheus-k8s      prometheus-k8s-openshift-monitoring.apps._url_.openshift.com      ...
```

2. Prepend **https:**// to the address, you cannot access web UIs using unencrypted connection. For example, this is the resulting URL for Alertmanager:

```
https://alertmanager-main-openshift-monitoring.apps._url_.openshift.com
```

3. Navigate to the address using a web browser and authenticate.

Additional resources

- For documentation on the new interface for Alertmanager, see Managing cluster alerts.

IMPORTANT

The monitoring routes are managed by the Cluster Monitoring Operator and cannot be modified by the user.

CHAPTER 2. EXPOSING CUSTOM APPLICATION METRICS FOR AUTOSCALING

You can export custom application metrics for the horizontal pod autoscaler.

IMPORTANT

Prometheus Adapter is a Technology Preview feature only. Technology Preview features are not supported with Red Hat production service level agreements (SLAs) and might not be functionally complete. Red Hat does not recommend using them in production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process.

For more information about the support scope of Red Hat Technology Preview features, see https://access.redhat.com/support/offerings/techpreview/.

2.1. EXPOSING CUSTOM APPLICATION METRICS FOR HORIZONTAL POD AUTOSCALING

You can use the **prometheus-adapter** resource to expose custom application metrics for the horizontal pod autoscaler.

Prerequisites

- Make sure you have a custom Prometheus instance installed. In this example, it is presumed that Prometheus was installed in the **default** namespace.
- Make sure you configured monitoring for your application. In this example, it is presumed that the application and the service monitor for it were installed in the **default** namespace.

Procedure

1. Create a YAML file for your configuration. In this example, it is called **deploy.yaml**.
2. Add configuration for creating the service account, necessary roles, and role bindings for **prometheus-adapter**:

```
kind: ServiceAccount
apiVersion: v1
metadata:
  name: custom-metrics-apiserver
  namespace: default
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  name: custom-metrics-server-resources
rules:
- apiGroups:
  - custom.metrics.k8s.io
  resources: ["*"]
  verbs: ["*"]
---
apiVersion: rbac.authorization.k8s.io/v1
```

```
kind: ClusterRole
metadata:
  name: custom-metrics-resource-reader
rules:
- apiGroups:
  - ""
  resources:
  - namespaces
  - pods
  - services
  verbs:
  - get
  - list
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: custom-metrics:system:auth-delegator
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: system:auth-delegator
subjects:
- kind: ServiceAccount
  name: custom-metrics-apiserver
  namespace: default
---
apiVersion: rbac.authorization.k8s.io/v1
kind: RoleBinding
metadata:
  name: custom-metrics-auth-reader
  namespace: kube-system
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: Role
  name: extension-apiserver-authentication-reader
subjects:
- kind: ServiceAccount
  name: custom-metrics-apiserver
  namespace: default
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: custom-metrics-resource-reader
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: custom-metrics-resource-reader
subjects:
- kind: ServiceAccount
  name: custom-metrics-apiserver
  namespace: default
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
```

```
metadata:
  name: hpa-controller-custom-metrics
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: custom-metrics-server-resources
subjects:
- kind: ServiceAccount
  name: horizontal-pod-autoscaler
  namespace: kube-system
---
```

3. Add configuration for the custom metrics for **prometheus-adapter**:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: adapter-config
  namespace: default
data:
  config.yaml: |
    rules:
    - seriesQuery: 'http_requests_total{namespace!="",pod!=""}' (1)
      resources:
        overrides:
          namespace: {resource: "namespace"}
          pod: {resource: "pod"}
          service: {resource: "service"}
      name:
        matches: "^(.*)_total"
        as: "${1}_per_second" (2)
      metricsQuery: 'sum(rate(<<.Series>>{<<.LabelMatchers>>}[2m])) by (<<.GroupBy>>)'
---
```

(1) Specifies the chosen metric to be the number of HTTP requests.

(2) Specifies the frequency for the metric.

4. Add configuration for registering **prometheus-adapter** as an API service:

```
apiVersion: v1
kind: Service
metadata:
  annotations:
    service.alpha.openshift.io/serving-cert-secret-name: prometheus-adapter-tls
  labels:
    name: prometheus-adapter
  name: prometheus-adapter
  namespace: default
spec:
  ports:
  - name: https
    port: 443
    targetPort: 6443
  selector:
    app: prometheus-adapter
  type: ClusterIP
---
apiVersion: apiregistration.k8s.io/v1beta1
kind: APIService
metadata:
  name: v1beta1.custom.metrics.k8s.io
spec:
  service:
    name: prometheus-adapter
    namespace: default
  group: custom.metrics.k8s.io
  version: v1beta1
  insecureSkipTLSVerify: true
  groupPriorityMinimum: 100
  versionPriority: 100
---
```

5. Show the Prometheus Adapter image to use:

```
$ kubectl get -n openshift-monitoring deploy/prometheus-adapter -o jsonpath="{..image}"
quay.io/openshift-release-dev/ocp-v4.2-art-
dev@sha256:76db3c86554ad7f581ba33844d6a6ebc891236f7db64f2d290c3135ba81c264c
```

6. Add configuration for deploying **prometheus-adapter**:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: prometheus-adapter
  name: prometheus-adapter
  namespace: default
spec:
  replicas: 1
  selector:
    matchLabels:
      app: prometheus-adapter
  template:
    metadata:
      labels:
        app: prometheus-adapter
      name: prometheus-adapter
    spec:
      serviceAccountName: custom-metrics-apiserver
      containers:
      - name: prometheus-adapter
        image: openshift-release-dev/ocp-v4.2-art-dev (1)
        args:
        - --secure-port=6443
        - --tls-cert-file=/var/run/serving-cert/tls.crt
        - --tls-private-key-file=/var/run/serving-cert/tls.key
        - --logtostderr=true
        - --prometheus-url=http://prometheus-operated.default.svc:9090/
        - --metrics-relist-interval=1m
        - --v=4
        - --config=/etc/adapter/config.yaml
        ports:
        - containerPort: 6443
        volumeMounts:
        - mountPath: /var/run/serving-cert
          name: volume-serving-cert
          readOnly: true
        - mountPath: /etc/adapter/
          name: config
          readOnly: true
        - mountPath: /tmp
          name: tmp-vol
      volumes:
      - name: volume-serving-cert
        secret:
          secretName: prometheus-adapter-tls
      - name: config
        configMap:
          name: adapter-config
      - name: tmp-vol
        emptyDir: {}
```

1. **image: openshift-release-dev/ocp-v4.2-art-dev** specifies the Prometheus Adapter image found in the previous step.

7. Apply the configuration file to the cluster:

```
$ oc apply -f deploy.yaml
```

8. Now the application's metrics are exposed and can be used to configure horizontal pod autoscaling.

Additional resources

- See the horizontal pod autoscaling documentation .
- See the Kubernetes documentation on horizontal pod autoscaler .