



Red Hat Advanced Cluster Management for Kubernetes 2.6

Observability

Read more to learn how to optimize your managed clusters by enabling and customizing the observability service.

Red Hat Advanced Cluster Management for Kubernetes 2.6 Observability

Read more to learn how to optimize your managed clusters by enabling and customizing the observability service.

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Abstract

Read more to learn how to optimize your managed clusters by enabling and customizing the observability service.

Table of Contents

CHAPTER 1. OBSERVING ENVIRONMENTS INTRODUCTION	4
1.1. OBSERVING ENVIRONMENTS	4
1.1.1. Observability service	5
1.1.2. Metric types	5
1.1.3. Observability pod capacity requests	6
1.1.4. Persistent stores used in the observability service	8
1.1.5. Support	9
1.2. ENABLE OBSERVABILITY SERVICE	10
1.2.1. Prerequisites	10
1.2.2. Enabling observability	11
1.2.2.1. Creating the MultiClusterObservability custom resource	16
1.2.3. Enabling observability from the Red Hat OpenShift Container Platform console	18
1.2.3.1. Using the external metric query	18
1.2.3.2. Dynamic metrics for single-node OpenShift clusters	19
1.2.4. Disabling observability	21
1.3. SEARCH IN THE CONSOLE	21
1.3.1. Search components	22
1.3.2. Search customization	22
1.3.2.1. Options to increase the redisgraph memory	22
1.3.2.2. Updating saved search limit	23
1.3.3. Querying in the console	23
1.3.3.1. Querying ArgoCD applications	24
1.3.4. Updating klusterlet-addon-search deployments on managed clusters	24
1.4. CUSTOMIZING OBSERVABILITY	25
1.4.1. Creating custom rules	26
1.4.2. Configuring AlertManager	27
1.4.3. Adding custom metrics	28
1.4.4. Removing default metrics	28
1.4.5. Exporting metrics to external endpoints	29
1.4.5.1. Creating the Kubernetes secret for an external endpoint	29
1.4.5.2. Updating the multiclusterobservability CR	30
1.4.5.3. Viewing the status of metric export	31
1.4.6. Adding advanced configuration	31
1.4.7. Updating the multiclusterobservability CR replicas from the console	31
1.4.8. Forwarding alerts	32
1.4.8.1. Disabling forward alerts for managed clusters	32
1.4.9. Silencing alerts	33
1.4.10. Suppressing alerts	34
1.4.11. Customizing route certification	34
1.4.11.1. Customizing certificates for accessing the object store	35
1.4.12. Viewing and exploring data	35
1.4.12.1. Viewing the etcd table	36
1.4.12.2. Viewing the cluster fleet service-level overview for the Kubernetes API server dashboard	36
1.4.12.3. Viewing the cluster service-level overview for the Kubernetes API server dashboard	36
1.4.13. Disabling observability	36
1.4.13.1. Disabling observability on all clusters	36
1.4.13.2. Disabling observability on a single cluster	37
1.5. DESIGNING YOUR GRAFANA DASHBOARD	37
1.5.1. Setting up the Grafana developer instance	37
1.5.2. Design your Grafana dashboard	38
1.5.2.1. Design your Grafana dashboard with a ConfigMap	38

1.5.3. Uninstalling the Grafana developer instance	39
1.6. OBSERVABILITY WITH RED HAT INSIGHTS	40
1.6.1. Prerequisites	40
1.6.2. Red Hat Insights from the Red Hat Advanced Cluster Management console	40
1.7. MANAGING INSIGHT POLICYREPORTS	40
1.7.1. Searching for insight policy reports	41
1.7.2. Viewing identified issues from the console	41

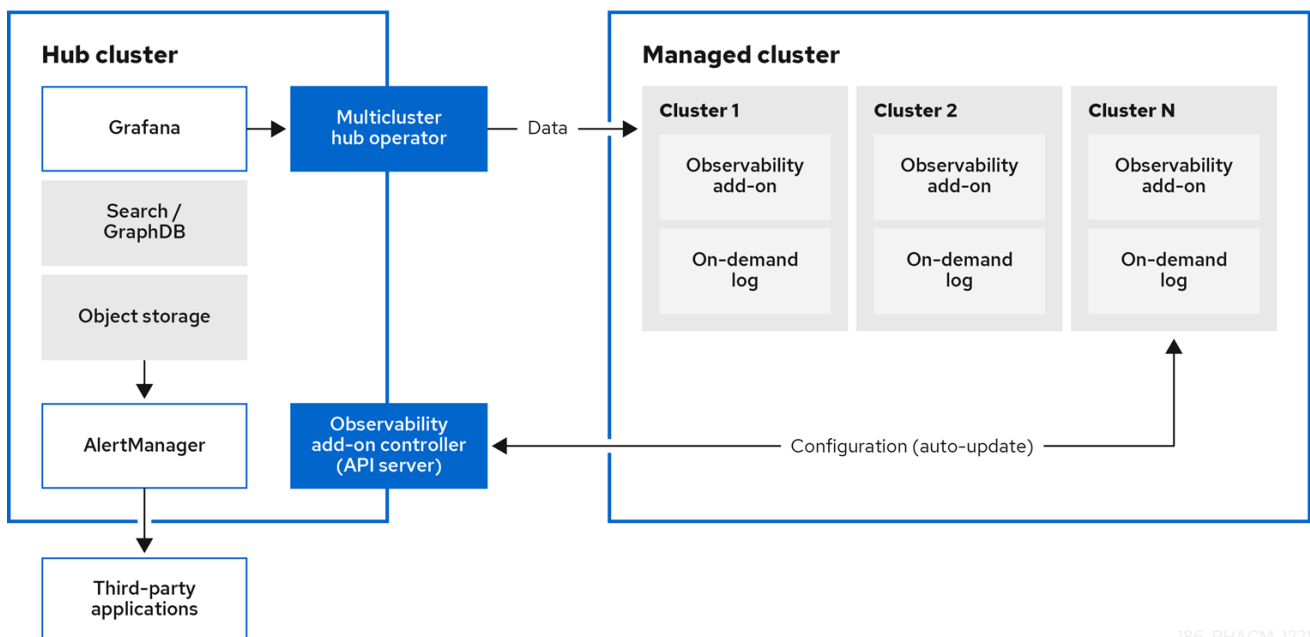
CHAPTER 1. OBSERVING ENVIRONMENTS INTRODUCTION

With the observability service enabled, you can use Red Hat Advanced Cluster Management for Kubernetes to gain insight about and optimize your managed clusters. This information can save cost and prevent unnecessary events.

- [Observing environments](#)
- [Enable observability service](#)
- [Search in the console](#)
- [Customizing observability](#)
- [Designing your Grafana dashboard](#)
- [Observability with Red Hat Insights](#)
- [Managing insight PolicyReports](#)

1.1. OBSERVING ENVIRONMENTS

You can use Red Hat Advanced Cluster Management for Kubernetes to gain insight and optimize your managed clusters. Enable the observability service operator, **multicluster-observability-operator**, on your hub cluster to monitor the health of your managed clusters. Learn about the architecture for the multicluster observability service in the following sections.



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Note: The *on-demand log* provides access for engineers to get logs for a given pod in real-time. Logs from the hub cluster are not aggregated. These logs can be accessed with the search service and other parts of the console.

- [Observability service](#)
- [Metric types](#)
- [Observability pod capacity requests](#)

- [Persistent stores used in the observability service](#)
- [Support](#)

1.1.1. Observability service

By default, observability is included with the product installation, but not enabled. Due to the requirement for persistent storage, the observability service is not enabled by default. Red Hat Advanced Cluster Management supports the following S3 compatible, stable object stores:

- Amazon S3

Note: The object store interface in Thanos support APIs that are AWS S3 restful API compatible, or other S3 compatible object stores like Minio and Ceph.
- Google Cloud Storage
- Azure storage
- Red Hat OpenShift Data Foundation

Important: When you configure your object store, ensure that you meet the encryption requirements necessary when sensitive data is persisted. For a complete list of the supported object stores, see [Thanos documentation](#).

When the service is enabled, the **observability-endpoint-operator** is automatically deployed to each imported or created cluster. This controller collects the data from Red Hat OpenShift Container Platform Prometheus, then sends it to the Red Hat Advanced Cluster Management hub cluster.

If the hub cluster imports itself as the **local-cluster**, observability is also enabled on it and metrics are collected from the hub cluster.

The observability service deploys an instance of Prometheus AlertManager, which enables alerts to be forwarded with third-party applications. It also includes an instance of Grafana to enable data visualization with dashboards (static) or data exploration. Red Hat Advanced Cluster Management supports version 8.1.3 of Grafana. You can also design your Grafana dashboard. For more information, see [Designing your Grafana dashboard](#).

You can customize the observability service by creating custom [recording rules](#) or [alerting rules](#).

For more information about enabling observability, see [Enable observability service](#).

1.1.2. Metric types

By default, OpenShift Container Platform sends metrics to Red Hat using the Telemetry service. The **acm_managed_cluster_info** is available with Red Hat Advanced Cluster Management and is included with telemetry, but is *not* displayed on the Red Hat Advanced Cluster Management *Observe environments overview* dashboard.

View the following table of metric types that are supported by the framework:

Table 1.1. Parameter table

Metric name	Metric type	Labels/tags	Status
-------------	-------------	-------------	--------

Metric name	Metric type	Labels/tags	Status
acm_managed_cluster_info	Gauge	hub_cluster_id, managed_cluster_id, vendor, cloud, version, available, created_via, core_worker, socket_worker	Stable
policy_governance_info	Gauge	type, policy, policy_namespace, cluster_namespace	Stable. See Governance metric for more details.
policyreport_info	Gauge	managed_cluster_id, category, policy, result, severity	Stable. See Managing insight PolicyReports for more details.
config_policies_evaluation_duration_seconds_bucket	Histogram	None.	Stable. See Governance metric for more details.
config_policies_evaluation_duration_seconds_count	Histogram	None.	Stable. See Governance metric for more details.
config_policies_evaluation_duration_seconds_sum	Histogram	None.	Stable. See Governance metric for more details.

Learn from the OpenShift Container Platform documentation what types of metrics are collected and sent using telemetry. See [Information collected by Telemetry](#) for information.

1.1.3. Observability pod capacity requests

Observability components require 2701mCPU and 11972Mi memory to install the observability service. The following table is a list of the pod capacity requests for five managed clusters with **observability-addons** enabled:

Table 1.2. Observability pod capacity requests

Deployment or StatefulSet	Container name	CPU (mCPU)	Memory (Mi)	Replicas	Pod total CPU	Pod total memory
observability-alertmanager	alertmanager	4	200	3	12	600
	config-reloader	4	25	3	12	75

Deployment or StatefulSet	Container name	CPU (mCPU)	Memory (Mi)	Replicas	Pod total CPU	Pod total memory
	alertmanager-proxy	1	20	3	3	60
observability-grafana	grafana	4	100	2	8	200
	grafana-dashboard-loader	4	50	2	8	100
observability-observatorium-api	observatorium-api	20	128	2	40	256
observability-observatorium-operator	observatorium-operator	100	100	1	10	50
observability-rbac-query-proxy	rbac-query-proxy	20	100	2	40	200
	oauth-proxy	1	20	2	2	40
observability-thanos-compact	thanos-compact	100	512	1	100	512
observability-thanos-query	thanos-query	300	1024	2	600	2048
observability-thanos-query-frontend	thanos-query-frontend	100	256	2	200	512
observability-thanos-query-frontend-memcached	memcached	45	128	3	135	384
	exporter	5	50	3	15	150

Deployment or StatefulSet	Container name	CPU (mCPU)	Memory (Mi)	Replicas	Pod total CPU	Pod total memory
observability-thanos-receive-controller	thanos-receive-controller	4	32	1	4	32
observability-thanos-receive-default	thanos-receive	300	512	3	900	1536
observability-thanos-rule	thanos-rule	50	512	3	150	1536
	configmap-reloader	4	25	3	12	75
observability-thanos-store-memcached	memcached	45	128	3	135	384
	exporter	5	50	3	15	150
observability-thanos-store-shard	thanos-store	100	1024	3	300	3072

1.1.4. Persistent stores used in the observability service

When you install Red Hat Advanced Cluster Management the following persistent volumes (PV) must be created so that Persistent Volume Claims (PVC) can attach to it automatically. As a reminder, you must define a storage class in the **MultiClusterObservability** CR when there is no default storage class specified or you want to use a non-default storage class to host the PVs. It is recommended to use Block Storage, similar to what Prometheus uses. Also each replica of **alertmanager**, **thanos-compact**, **thanos-ruler**, **thanos-receive-default** and **thanos-store-shard** must have its own PV. View the following table:

Table 1.3. Table list of persistent volumes

Persistent volume name	Purpose
alertmanager	Alertmanager stores the nflog data and silenced alerts in its storage. nflog is an append-only log of active and resolved notifications along with the notified receiver, and a hash digest of contents that the notification identified.

thanos-compact	The compactor needs local disk space to store intermediate data for its processing, as well as bucket state cache. The required space depends on the size of the underlying blocks. The compactor must have enough space to download all of the source blocks, then build the compacted blocks on the disk. On-disk data is safe to delete between restarts and should be the first attempt to get crash-looping compactors unstuck. However, it is recommended to give the compactor persistent disks in order to effectively use bucket state cache in between restarts.
thanos-rule	The thanos ruler evaluates Prometheus recording and alerting rules against a chosen query API by issuing queries at a fixed interval. Rule results are written back to the disk in the Prometheus 2.0 storage format. The amount of hours or days of data retained in this stateful set was fixed in the API version observability.open-cluster-management.io/v1beta1 . It has been exposed as an API parameter in observability.open-cluster-management.io/v1beta2: <i>RetentionInLocal</i>
thanos-receive-default	Thanos receiver accepts incoming data (Prometheus remote-write requests) and writes these into a local instance of the Prometheus TSDB. Periodically (every 2 hours), TSDB blocks are uploaded to the object storage for long term storage and compaction. The amount of hours or days of data retained in this stateful set, which acts a local cache was fixed in API Version observability.open-cluster-management.io/v1beta . It has been exposed as an API parameter in observability.open-cluster-management.io/v1beta2: <i>RetentionInLocal</i>
thanos-store-shard	It acts primarily as an API gateway and therefore does not need significant amounts of local disk space. It joins a Thanos cluster on startup and advertises the data it can access. It keeps a small amount of information about all remote blocks on local disk and keeps it in sync with the bucket. This data is generally safe to delete across restarts at the cost of increased startup times.

Note: The time series historical data is stored in object stores. Thanos uses object storage as the primary storage for metrics and meta data related to them. For more details about the object storage and downsampling, see [Enable observability service](#)

1.1.5. Support

Red Hat Advanced Cluster Management is tested with and fully supported by Red Hat OpenShift Data Foundation (formerly Red Hat OpenShift Container Storage).

Red Hat Advanced Cluster Management supports the function of the multicluster observability operator on user-provided third-party object storage that is S3 API compatible.

Red Hat Advanced Cluster Management use commercial, reasonable efforts to assist in the identification of the root cause.

If a support ticket is raised and the root cause has been determined to be a result of the customer-provided S3 compatible object storage, then the issue must be resolved using the customer support channels.

Red Hat Advanced Cluster Management does not commit to fix support tickets raised by customers, where the root cause identified is the S3 compatible object storage provider.

See [Customizing observability](#) to learn how to configure the observability service, view metrics and other data.

1.2. ENABLE OBSERVABILITY SERVICE

Monitor the health of your managed clusters with the observability service (**multicluster-observability-operator**).

Required access: Cluster administrator, the **open-cluster-management:cluster-manager-admin** role, or S3 administrator.

- [Prerequisites](#)
- [Enabling observability](#)
- [Creating the MultiClusterObservability CR](#)
- [Enabling observability from the Red Hat OpenShift Container Platform console](#)
- [Using the external metric query](#)
- [Disabling observability](#)

1.2.1. Prerequisites

- You must install Red Hat Advanced Cluster Management for Kubernetes. See [Installing while connected online](#) for more information.
- You must define a storage class in the **MultiClusterObservability** CR, if there is no default storage class specified.
- Direct network access to the hub cluster is required. Network access to load balancers and proxies are not supported. For more information, see [Networking](#).
- You must configure an object store to create a storage solution. Red Hat Advanced Cluster Management supports the following cloud providers with stable object stores:
 - [Amazon Web Services S3 \(AWS S3\)](#)
 - [Red Hat Ceph \(S3 compatible API\)](#)
 - [Google Cloud Storage](#)
 - [Azure storage](#)

- [Red Hat OpenShift Data Foundation \(formerly known as Red Hat OpenShift Container Storage\)](#)
- [Red Hat OpenShift on IBM \(ROKS\)](#)
Important: When you configure your object store, ensure that you meet the encryption requirements necessary when sensitive data is persisted. For more information on Thanos supported object stores, see [Thanos documentation](#).

1.2.2. Enabling observability

Enable the observability service by creating a **MultiClusterObservability** custom resource (CR) instance. Before you enable observability, see [Observability pod capacity requests](#) for more information.

Note: When observability is enabled or disabled on OpenShift Container Platform managed clusters that are managed by Red Hat Advanced Cluster Management, the observability endpoint operator updates the **cluster-monitoring-config ConfigMap** by adding additional alertmanager configuration that restarts the local Prometheus automatically.

Complete the following steps to enable the observability service:

1. Log in to your Red Hat Advanced Cluster Management hub cluster.
2. Create a namespace for the observability service with the following command:

```
oc create namespace open-cluster-management-observability
```

3. Generate your pull-secret. If Red Hat Advanced Cluster Management is installed in the **open-cluster-management** namespace, run the following command:

```
DOCKER_CONFIG_JSON=`oc extract secret/multiclusterhub-operator-pull-secret -n open-cluster-management --to=-`
```

If the **multiclusterhub-operator-pull-secret** is not defined in the namespace, copy the **pull-secret** from the **openshift-config** namespace into the **open-cluster-management-observability** namespace. Run the following command:

```
DOCKER_CONFIG_JSON=`oc extract secret/pull-secret -n openshift-config --to=-`
```

Then, create the pull-secret in the **open-cluster-management-observability** namespace, run the following command:

```
oc create secret generic multiclusterhub-operator-pull-secret \
  -n open-cluster-management-observability \
  --from-literal=.dockerconfigjson="$DOCKER_CONFIG_JSON" \
  --type=kubernetes.io/dockerconfigjson
```

Important: If you modify the global pull secret for your cluster by using the OpenShift Container Platform documentation, be sure to also update the global pull secret in the observability namespace. See [Updating the global pull secret](#) for more details.

4. Create a secret for your object storage for your cloud provider. Your secret must contain the credentials to your storage solution. For example, run the following command:

```
oc create -f thanos-object-storage.yaml -n open-cluster-management-observability
```

View the following examples of secrets for the supported object stores:

- For Amazon S3 or S3 compatible, your secret might resemble the following file:

```
apiVersion: v1
kind: Secret
metadata:
  name: thanos-object-storage
  namespace: open-cluster-management-observability
type: Opaque
stringData:
  thanos.yaml: |
    type: s3
    config:
      bucket: YOUR_S3_BUCKET
      endpoint: YOUR_S3_ENDPOINT
      insecure: true
      access_key: YOUR_ACCESS_KEY
      secret_key: YOUR_SECRET_KEY
```

For more details, see [Amazon Simple Storage Service user guide](#) .

- For Google, your secret might resemble the following file:

```
apiVersion: v1
kind: Secret
metadata:
  name: thanos-object-storage
  namespace: open-cluster-management-observability
type: Opaque
stringData:
  thanos.yaml: |
    type: GCS
    config:
      bucket: YOUR_GCS_BUCKET
      service_account: YOUR_SERVICE_ACCOUNT
```

For more details, see [Google Cloud Storage](#) .

- For Azure your secret might resemble the following file:

```
apiVersion: v1
kind: Secret
metadata:
  name: thanos-object-storage
  namespace: open-cluster-management-observability
type: Opaque
stringData:
  thanos.yaml: |
    type: AZURE
    config:
      storage_account: YOUR_STORAGE_ACCT
      storage_account_key: YOUR_STORAGE_KEY
      container: YOUR_CONTAINER
      endpoint: blob.core.windows.net
      max_retries: 0
```


For more details, see [Azure Storage documentation](#).

Note: If you use Azure as an object storage for a Red Hat OpenShift Container Platform cluster, the storage account associated with the cluster is not supported. You must create a new storage account.

- For Red Hat OpenShift Data Foundation, your secret might resemble the following file:

```
apiVersion: v1
kind: Secret
metadata:
  name: thanos-object-storage
  namespace: open-cluster-management-observability
type: Opaque
stringData:
  thanos.yaml: |
    type: s3
    config:
      bucket: YOUR_RH_DATA_FOUNDATION_BUCKET
      endpoint: YOUR_RH_DATA_FOUNDATION_ENDPOINT
      insecure: false
      access_key: YOUR_RH_DATA_FOUNDATION_ACCESS_KEY
      secret_key: YOUR_RH_DATA_FOUNDATION_SECRET_KEY
```

For more details, see [Red Hat OpenShift Data Foundation](#). For Red Hat OpenShift on IBM (ROKS), your secret might resemble the following file:

```
apiVersion: v1
kind: Secret
metadata:
  name: thanos-object-storage
  namespace: open-cluster-management-observability
type: Opaque
stringData:
  thanos.yaml: |
    type: s3
    config:
      bucket: YOUR_ROKS_S3_BUCKET
      endpoint: YOUR_ROKS_S3_ENDPOINT
      insecure: true
      access_key: YOUR_ROKS_ACCESS_KEY
      secret_key: YOUR_ROKS_SECRET_KEY
```

For more details, follow the IBM Cloud documentation, [Cloud Object Storage](#). Be sure to use the service credentials to connect with the object storage. For more details, follow the IBM Cloud documentation, [Cloud Object Store](#) and [Service Credentials](#).

- For Amazon S3 or S3 compatible storage, you can also use short term, limited-privilege credentials generated with AWS Security Token Service (AWS STS). Refer to [AWS Security Token Service documentation](#) for more details. Generating access keys using AWS Security Service require the following additional steps:
 - Create an IAM policy that limits access to an S3 bucket

- Create an IAM role with a trust policy to generate JWT tokens for OpenShift Container Platform service accounts
- Specify annotations for the observability service accounts that requires access to the S3 bucket. You can find an example of how observability on Red Hat OpenShift Service on AWS (ROSA) cluster can be configured to work with AWS STS tokens in the *Set environment* step. See [Red Hat OpenShift Service on AWS \(ROSA\)](#) for more details, along with [ROSA with STS explained](#) for an in-depth description of the requirements and setup to use STS tokens.

Complete the following steps to generate access keys using the AWS Security Service:

1. Set up the AWS environment. Run the following commands:

```
export POLICY_VERSION=$(date +"%m-%d-%y")
export TRUST_POLICY_VERSION=$(date +"%m-%d-%y")
export CLUSTER_NAME=<my-cluster>
export S3_BUCKET=$CLUSTER_NAME-acm-observability
export REGION=us-east-2
export NAMESPACE=open-cluster-management-observability
export SA=tbid
export SCRATCH_DIR=/tmp/scratch
export OIDC_PROVIDER=$(oc get authentication.config.openshift.io cluster -o json | jq -r
.spec.serviceAccountIssuer | sed -e "s/^https:////")
export AWS_ACCOUNT_ID=$(aws sts get-caller-identity --query Account --output text)
export AWS_PAGER=""
rm -rf $SCRATCH_DIR
mkdir -p $SCRATCH_DIR
```

2. Create an S3 bucket with the following command:

```
aws s3 mb s3://$S3_BUCKET
```

3. Create a **s3-policy** JSON file for access to your S3 bucket. Run the following command:

```
{
  "Version": "$POLICY_VERSION",
  "Statement": [
    {
      "Sid": "Statement",
      "Effect": "Allow",
      "Action": [
        "s3:ListBucket",
        "s3:GetObject",
        "s3:DeleteObject",
        "s3:PutObject",
        "s3:PutObjectAcl",
        "s3:CreateBucket",
        "s3:DeleteBucket"
      ],
      "Resource": [
        "arn:aws:s3:::$S3_BUCKET/*",
        "arn:aws:s3:::$S3_BUCKET"
      ]
    }
  ]
}
```

```

    }
  ]
}

```

4. Apply the policy with the following command:

```

S3_POLICY=$(aws iam create-policy --policy-name $CLUSTER_NAME-acm-obs \
--policy-document file://$SCRATCH_DIR/s3-policy.json \
--query 'Policy.Arn' --output text)
echo $$S3_POLICY

```

5. Create a **TrustPolicy** JSON file. Run the following command:

```

{
  "Version": "$TRUST_POLICY_VERSION",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "Federated": "arn:aws:iam:${AWS_ACCOUNT_ID}:oidc-provider/${OIDC_PROVIDER}"
      },
      "Action": "sts:AssumeRoleWithWebIdentity",
      "Condition": {
        "StringEquals": {
          "${OIDC_PROVIDER}:sub": [
            "system:serviceaccount:${NAMESPACE}:observability-thanos-query",
            "system:serviceaccount:${NAMESPACE}:observability-thanos-store-shard",
            "system:serviceaccount:${NAMESPACE}:observability-thanos-compact",
            "system:serviceaccount:${NAMESPACE}:observability-thanos-rule",
            "system:serviceaccount:${NAMESPACE}:observability-thanos-receive",
          ]
        }
      }
    }
  ]
}

```

6. Create a role for AWS Prometheus and CloudWatch with the following command:

```

S3_ROLE=$(aws iam create-role \
--role-name "$CLUSTER_NAME-acm-obs-s3" \
--assume-role-policy-document file://$SCRATCH_DIR/TrustPolicy.json \
--query "Role.Arn" --output text)
echo $$S3_ROLE

```

7. Attach the policies to the role. Run the following command:

```

aws iam attach-role-policy \
--role-name "$CLUSTER_NAME-acm-obs-s3" \
--policy-arn $$S3_POLICY

```

Your secret might resemble the following file. The **config** section specifies **signature_version2: false** and does not specify **access_key** and **secret_key**:

```

apiVersion: v1
kind: Secret
metadata:
  name: thanos-object-storage
  namespace: open-cluster-management-observability
type: Opaque
stringData:
  thanos.yaml: |
type: s3
config:
  bucket: $S3_BUCKET
  endpoint: s3.$REGION.amazonaws.com
  signature_version2: false

```

8. Specify service account annotations when you the **MultiClusterObservability** custom resource (CR) as described in *Creating the MultiClusterObservability CR* section.
9. You can retrieve the S3 access key and secret key for your cloud providers with the following commands. You must decode, edit, and encode your **base64** string in the secret:

```

YOUR_CLOUD_PROVIDER_ACCESS_KEY=$(oc -n open-cluster-management-
observability get secret <object-storage-secret> -o jsonpath="{.data.thanos\.yaml}" | base64 -
-decode | grep access_key | awk '{print $2}')

echo $ACCESS_KEY

YOUR_CLOUD_PROVIDER_SECRET_KEY=$(oc -n open-cluster-management-
observability get secret <object-storage-secret> -o jsonpath="{.data.thanos\.yaml}" | base64 -
-decode | grep secret_key | awk '{print $2}')

echo $SECRET_KEY

```

You must decode, edit, and encode your **base64** string in the secret.

10. Verify that observability is enabled by checking the pods for the following deployments and stateful sets. You might receive the following information:

```

observability-thanos-query (deployment)
observability-thanos-compact (statefulset)
observability-thanos-receive-default (statefulset)
observability-thanos-rule (statefulset)
observability-thanos-store-shard-x (statefulsets)

```

1.2.2.1. Creating the MultiClusterObservability custom resource

Complete the following steps to create the **MultiClusterObservability** custom resource for your hub cluster:

1. Create the **MultiClusterObservability** custom resource YAML file named ***multiclusterobservability_cr.yaml***.

View the following default YAML file for observability:

```

apiVersion: observability.open-cluster-management.io/v1beta2
kind: MultiClusterObservability

```

```

metadata:
  name: observability
spec:
  observabilityAddonSpec: {}
  storageConfig:
    metricObjectStorage:
      name: thanos-object-storage
      key: thanos.yaml

```

You might want to modify the value for the **retentionConfig** parameter in the **advanced** section. For more information, see [Thanos Downsampling resolution and retention](#). Depending on the number of managed clusters, you might want to update the amount of storage for stateful sets. If your S3 bucket is configured to use STS tokens, annotate the service accounts to use STS with S3 role. View the following configuration:

```

spec:
  advanced:
    compact:
      eks.amazonaws.com/role-arn=$S3_ROLE
    store:
      eks.amazonaws.com/role-arn=$S3_ROLE
    rule:
      eks.amazonaws.com/role-arn=$S3_ROLE
    receive:
      eks.amazonaws.com/role-arn=$S3_ROLE
    query:
      eks.amazonaws.com/role-arn=$S3_ROLE

```

See [Observability API](#) for more information.

- To deploy on infrastructure machine sets, you must set a label for your set by updating the **nodeSelector** in the **MultiClusterObservability** YAML. Your YAML might resemble the following content:

```

nodeSelector:
  node-role.kubernetes.io/infra:

```

For more information, see [Creating infrastructure machine sets](#).

- Apply the observability YAML to your cluster by running the following command:

```

oc apply -f multiclusterobservability_cr.yaml

```

All the pods in **open-cluster-management-observability** namespace for Thanos, Grafana and AlertManager are created. All the managed clusters connected to the Red Hat Advanced Cluster Management hub cluster are enabled to send metrics back to the Red Hat Advanced Cluster Management Observability service.

- Validate that the observability service is enabled and the data is populated by launching the Grafana dashboards. Click the **Grafana link** that is near the console header, from either the console *Overview* page or the *Clusters* page.

Note: If you want to exclude specific managed clusters from collecting the observability data, add the following cluster label to your clusters: **observability: disabled**.

The observability service is enabled. After you enable the observability service, the following functions are initiated:

- All the alert managers from the managed clusters are forwarded to the Red Hat Advanced Cluster Management hub cluster.
- All the managed clusters that are connected to the Red Hat Advanced Cluster Management hub cluster are enabled to send alerts back to the Red Hat Advanced Cluster Management observability service. You can configure the Red Hat Advanced Cluster Management Alertmanager to take care of deduplicating, grouping, and routing the alerts to the correct receiver integration such as email, PagerDuty, or OpsGenie. You can also handle silencing and inhibition of the alerts.
Note: Alert forwarding to the Red Hat Advanced Cluster Management hub cluster feature is only supported by managed clusters with Red Hat OpenShift Container Platform version 4.8 or later. After you install Red Hat Advanced Cluster Management with observability enabled, alerts from OpenShift Container Platform v4.8 and later are automatically forwarded to the hub cluster. See [Forwarding alerts](#) to learn more.
- Access the OpenShift Container Platform 3.11 Grafana dashboards with the following URL: [https://\\$ACM_URL/grafana/dashboards](https://$ACM_URL/grafana/dashboards). Select the folder named *OCP 3.11* to view the OpenShift Container Platform 3.11 dashboards.

1.2.3. Enabling observability from the Red Hat OpenShift Container Platform console

Optionally, you can enable observability from the Red Hat OpenShift Container Platform console, create a project named **open-cluster-management-observability**. Be sure to create an image pull-secret named, **multiclusterhub-operator-pull-secret** in the **open-cluster-management-observability** project.

Create your object storage secret named, **thanos-object-storage** in the **open-cluster-management-observability** project. Enter the object storage secret details, then click **Create**. See step four of the *Enabling observability* section to view an example of a secret.

Create the **MultiClusterObservability** CR instance. When you receive the following message, the observability service is enabled successfully from OpenShift Container Platform: **Observability components are deployed and running**.

1.2.3.1. Using the external metric query

Observability provides an external API for metrics to be queried through the OpenShift route, **rbac-query-proxy**. View the following tasks to use **rbac-query-proxy** route:

- You can get the details of the route with the following command:

```
oc get route rbac-query-proxy -n open-cluster-management-observability
```

- To access the **rbac-query-proxy** route, you must have an OpenShift OAuth access token. The token should be associated with a user or service account, which has permission to get namespaces. For more information, see [Managing user-owned OAuth access tokens](#).
- Get the default CA certificate and store the content of the key **tls.crt** in a local file. Run the following command:

```
oc -n openshift-ingress get secret router-certs-default -o jsonpath="{.data.tls.crt}" | base64 -d > ca.crt
```

- Run the following command to query metrics:

```
curl --cacert ./ca.crt -H "Authorization: Bearer {TOKEN}" https://{PROXY_ROUTE_URL}/api/v1/query?query={QUERY_EXPRESSION}
```

Note: The **QUERY_EXPRESSION** is the standard Prometheus query expression. For example, query the metrics **cluster_infrastructure_provider** by replacing the URL in the previously mentioned command, with the following URL: https://{PROXY_ROUTE_URL}/api/v1/query?query=cluster_infrastructure_provider. For more details, see [Querying prometheus](#).

- You can also replace certificates for the **rbac-query-proxy** route. See [OpenSSL commands for generating a certificate](#) to create certificates. When you customize the **csr.cnf**, update the **DNS.1** to the hostname for the **rbac-query-proxy** route.
 - Run the following command to create **proxy-byo-ca** and **proxy-byo-cert** secrets using the generated certificates:

```
oc -n open-cluster-management-observability create secret tls proxy-byo-ca --cert ./ca.crt --key ./ca.key
```

```
oc -n open-cluster-management-observability create secret tls proxy-byo-cert --cert ./ingress.crt --key ./ingress.key
```

1.2.3.2. Dynamic metrics for single-node OpenShift clusters

Dynamic metrics collection supports automatic metric collection based on certain conditions. By default, a SNO cluster does not collect pod and container resource metrics. Once a SNO cluster reaches a specific level of resource consumption, the defined granular metrics are collected dynamically. When the cluster resource consumption is consistently less than the threshold for a period of time, granular metric collection stops.

The metrics are collected dynamically based on the conditions on the managed cluster specified by a collection rule. Because these metrics are collected dynamically, the following Red Hat Advanced Cluster Management Grafana dashboards do not display any data. When a collection rule is activated and the corresponding metrics are collected, the following panels display data for the duration of the time that the collection rule is initiated:

- Kubernetes/Compute Resources/Namespace (Pods)
- Kubernetes/Compute Resources/Namespace (Workloads)
- Kubernetes/Compute Resources/Nodes (Pods)
- Kubernetes/Compute Resources/Pod
- Kubernetes/Compute Resources/Workload

A collection rule includes the following conditions:

- A set of metrics to collect dynamically.
- Conditions written as a PromQL expression.

- A time interval for the collection, which must be set to **true**.
- A match expression to select clusters where the collect rule must be evaluated.

By default, collection rules are evaluated continuously on managed clusters every 30 seconds, or at a specific time interval. The lowest value between the collection interval and time interval takes precedence. Once the collection rule condition persists for the duration specified by the **for** attribute, the collection rule starts and the metrics specified by the rule are automatically collected on the managed cluster. Metrics collection stops automatically after the collection rule condition no longer exists on the managed cluster, at least 15 minutes after it starts.

The collection rules are grouped together as a parameter section named **collect_rules**, where it can be enabled or disabled as a group. Red Hat Advanced Cluster Management installation includes the collection rule group, **SNOResourceUsage** with two default collection rules: **HighCPUUsage** and **HighMemoryUsage**. The **HighCPUUsage** collection rule begins when the node CPU usage exceeds 70%. The **HighMemoryUsage** collection rule begins if the overall memory utilization of the SNO cluster exceeds 70% of the available node memory. Currently, the previously mentioned thresholds are fixed and cannot be changed. When a collection rule begins for more than the interval specified by the **for** attribute, the system automatically starts collecting the metrics that are specified in the **dynamic_metrics** section.

View the list of dynamic metrics that from the **collect_rules** section, in the following YAML file:

```
collect_rules:
- group: SNOResourceUsage
  annotations:
    description: >
      By default, a SNO cluster does not collect pod and container resource metrics. Once a SNO
      cluster
      reaches a level of resource consumption, these granular metrics are collected dynamically.
      When the cluster resource consumption is consistently less than the threshold for a period of
      time,
      collection of the granular metrics stops.
  selector:
    matchExpressions:
    - key: clusterType
      operator: In
      values: ["SNO"]
  rules:
- collect: SNOHighCPUUsage
  annotations:
    description: >
      Collects the dynamic metrics specified if the cluster cpu usage is constantly more than 70% for
      2 minutes
    expr: (1 - avg(rate(node_cpu_seconds_total{mode="idle"}[5m]))) * 100 > 70
    for: 2m
  dynamic_metrics:
    names:
    - container_cpu_cfs_periods_total
    - container_cpu_cfs_throttled_periods_total
    - kube_pod_container_resource_limits
    - kube_pod_container_resource_requests
    - namespace_workload_pod:kube_pod_owner:relabel
    - node_namespace_pod_container:container_cpu_usage_seconds_total:sum_irate
    - node_namespace_pod_container:container_cpu_usage_seconds_total:sum_rate
- collect: SNOHighMemoryUsage
```



```

annotations:
  description: >
    Collects the dynamic metrics specified if the cluster memory usage is constantly more than 70%
for 2 minutes
  expr: (1 - sum(:node_memory_MemAvailable_bytes:sum) /
sum(kube_node_status_allocatable{resource="memory"})) * 100 > 70
  for: 2m
  dynamic_metrics:
    names:
      - kube_pod_container_resource_limits
      - kube_pod_container_resource_requests
      - namespace_workload_pod:kube_pod_owner:relabel
    matches:
      - __name__="container_memory_cache",container!=""
      - __name__="container_memory_rss",container!=""
      - __name__="container_memory_swap",container!=""
      - __name__="container_memory_working_set_bytes",container!=""

```

A **collect_rules.group** can be disabled in the **custom-allowlist** as shown in the following example. When a **collect_rules.group** is disabled, metrics collection reverts to the previous behavior. These metrics are collected at regularly, specified intervals:

```

collect_rules:
  - group: -SNOResourceUsage

```

The data is only displayed in Grafana when the rule is initiated.

1.2.4. Disabling observability

To disable the observability service, uninstall the **observability** resource. From the OpenShift Container Platform console navigation, select **Operators > Installed Operators > Advanced Cluster Manager for Kubernetes**. Remove the **MultiClusterObservability** custom resource.

To learn more about customizing the observability service, see [Customizing observability](#).

1.3. SEARCH IN THE CONSOLE

For Red Hat Advanced Cluster Management for Kubernetes, search provides visibility into your Kubernetes resources across all of your clusters. Search indexes the Kubernetes resources and the relationships to other resources. You can create a **searchcustomization** custom resource to define the storage settings for search persistence if you want to change the storage class and storage size.

- [Search components](#)
- [Search customization](#)
 - [Options to increase the redisgraph memory](#)
 - [Updating saved search limit](#)
- [Querying in the console](#)
 - [Querying ArgoCD applications](#)
- [Updating klusterlet-addon-search deployments on managed clusters](#)

1.3.1. Search components

The search architecture is composed of the following components:

- **Collector:** Watches the Kubernetes resources and creates an index. The **search-collector** computes relationships for resources within the managed cluster.
- **Aggregator:** Receives data from the collector and writes to a database. The **search-aggregator** watches resources in the hub cluster, computes multicluster relationships, and tracks the activity from connected collectors.
- **Search API:** Provides access to the data in the search index and enforces role-based access control.

Search is enabled by default. Search is also enabled when you provision or manually import a managed cluster. If you want to disable search on your managed cluster, see [Modifying the clusterlet add-ons settings of your cluster](#) for more information.

1.3.2. Search customization

When you install Red Hat Advanced Cluster Management, the product is configured to persist the data in-memory to a file system. The StatefulSet **search-redisgraph** deploys the Redisgraph pod, which mounts the persistent volume named **persist**. If your cluster has a defined default storage class, the search component creates a Persistent Volume Claim (PVC) of 10Gi on the default storage class. If a default storage class does not exist in your cluster, search saves the index in an empty directory (**emptyDir**).

You can customize the storage settings for search by creating the **searchcustomization** custom resource. Search customization is namespace-scoped and located where search is installed in the hub cluster. View the following example of the search customization custom resource:

```
apiVersion: search.open-cluster-management.io/v1alpha1
kind: SearchCustomization
metadata:
  name: searchcustomization
  namespace: open-cluster-management
  labels:
    cluster.open-cluster-management.io/backup: ""
spec:
  persistence: true
  storageClass: gp2
  storageSize: 12Gi
```

Run the following command to view search customization custom resource definition:

```
oc get crd searchcustomizations.search.open-cluster-management.io -o yaml
```

You can disable persistence by updating the **persistence** flag to **false** in the customization custom resource, which turns off saving search index to the file system. A status for persistence can be retrieved from the search operator (**searchoperator**) custom resource. Run the following command to view search operator custom resource: **oc get searchoperator searchoperator -o yaml**.

1.3.2.1. Options to increase the redisgraph memory

Redisgraph is an in-memory database that needs linear growth of memory as the number of objects are

cached. A Red Hat Advanced Cluster Management cluster with many managed clusters, or with a large number of Kubernetes objects require limit memory updates for the redisgraph pod (**search-redisgraph-0**).

By default, the redisgraph pod (**search-redisgraph-0**) is deployed with a memory limit of **4Gi**. If you are managing larger clusters, you might need to increase this limit by editing the **redisgraph_resource.limit_memory** for the **searchoperator** in the hub cluster namespace. For example, you can update the limit to **8Gi** with the following command:

```
oc patch searchoperator searchoperator --type='merge' -p '{"spec":{"redisgraph_resource":{"limit_memory":"8Gi"}}}'
```

After the change is made, the **search-redisgraph** pod automatically restarts with the updated configuration.

1.3.2.2. Updating saved search limit

By default, there is a limit of ten saved searches for each user. Only a user with the **administrator** role can update the limit by adding the following key value to the **console-config** ConfigMap, **key:value: SAVED_SEARCH_LIMIT: x**.

1.3.3. Querying in the console

You can type any text value in the *Search box* and results include anything with that value from any property, such as a name or namespace. Users are unable to search for values that contain an empty space.

For more specific search results, include the property selector in your search. You can combine related values for the property, for a more precise scope of your search. For example, search for **cluster:dev red** to receive results that match the string "red" in the **dev** cluster.

View the following steps to make queries with search:

1. Click **Search** in the navigation menu.
2. Type a word in the *Search box*, then Search finds your resources that contain that value.
 - As you search for resources, you receive other resources that are related to your original search result, which help you visualize how the resources interact with other resources in the system.
 - Search returns and lists each cluster with the resource that you search. For resources in the *hub* cluster, the cluster name is displayed as *local-cluster*.
 - Your search results are grouped by **kind**, and each resource **kind** is grouped in a table.
 - Your search options depend on your cluster objects. You can refine your results with specific labels. Search is case-sensitive when you query labels. See the following examples: name, namespace, status, and other resource fields. Auto-complete provides suggestions to refine your search. See the following example:
 - Search for a single field, such as **kind:pod** to find all pod resources.
 - Search for multiple fields, such as **kind:pod namespace:default** to find the pods in the default namespace.

Notes:

- You can also search with conditions by using characters, such as `>`, `>=`, `<`, `<=`, `!=`.
- When you search for more than one property selector with multiple values, the search returns either of the values that were queried. View the following examples:
 - When you search for **kind:pod name:a**, any pod named **a** is returned.
 - When you search for **kind:pod name:a,b**, any pod named **a** or **b** are returned.
 - Search for **kind:pod status:!Running** to find all pod resources where the status is not **Running**.
 - Search for **kind:pod restarts:>1** to find all pods that restarted at least twice.
- By default, there is a limit of 2500 images in the search drop-down menu. To increase the image limit, you can edit the **search-api** deployment by adding the **defaultImageQueryLimit** environment variable. You can use search to find the deployment. View the following example:

```
name: defaultImageQueryLimit
value: x 1
```

- 1** **x** represents the number of images that you want to be displayed from the search drop-down menu.

- Alternatively, you can patch the deployment by using the following command:

```
oc patch deployment search-api -n open-cluster-management -p '{"spec": {"template": {"spec": {"containers": [{"name": "search-api", "env": [{"name": "defaultImageQueryLimit", "value": "X"}]}]}}}'
```

3. If you want to save your search, click the **Save search** icon.

1.3.3.1. Querying ArgoCD applications

When you search for an ArgoCD application, you are directed to the *Applications* page. Complete the following steps to access the ArgoCD application from the *Search* page:

1. Log in to your Red Hat Advanced Cluster Management hub cluster.
2. From the console header, select the *Search* icon.
3. Filter your query with the following values: **kind:application** and **apigroup:argoproj.io**
4. Select an application to view. The *Application* page displays an overview of information for the application.

1.3.4. Updating *klusterlet-addon-search* deployments on managed clusters

To collect the Kubernetes objects from the managed clusters, the **klusterlet-addon-search** pod is run on all the managed clusters where search is enabled. This deployment is run in the **open-cluster-management-agent-addon** namespace. A managed cluster with a high number of resources might require more memory for the **klusterlet-addon-search** deployment to function.

Resource requirements for the **klusterlet-addon-search** pod in a managed cluster can be specified in

the **ManagedClusterAddon** custom resource in your Red Hat Advanced Cluster Management hub cluster. There is a namespace for each managed cluster with the managed cluster name. Edit the **ManagedClusterAddon** custom resource from the namespace matching the managed cluster name. Run the following command to update the resource requirement in **xyz** managed cluster:

```
oc edit managedclusteraddon search-collector -n xyz
```

Append the resource requirements as annotations. View the following example:

```
apiVersion: addon.open-cluster-management.io/v1alpha1
kind: ManagedClusterAddOn
metadata:
  annotations:
    addon.open-cluster-management.io/search_memory_limit: 2048Mi
    addon.open-cluster-management.io/search_memory_request: 512Mi
```

The annotation overrides the resource requirements on the managed clusters and automatically restarts the pod with new resource requirements.

Learn more about the Red Hat Advanced Cluster Management for Kubernetes console, see [Web console](#).

1.4. CUSTOMIZING OBSERVABILITY

Review the following sections to learn more about customizing, managing, and viewing data that is collected by the observability service.

Collect logs about new information that is created for observability resources with the **must-gather** command. For more information, see the *Must-gather* section in the [Troubleshooting documentation](#).

- [Creating custom rules](#)
- [Configuring AlertManager](#)
- [Adding custom metrics](#)
- [Removing default metrics](#)
- [Exporting metrics to external endpoints](#)
 - [Creating the Kubernetes secret for an external endpoint](#)
 - [Updating the multiclusterobservability CR](#)
 - [Viewing the status of metric export](#)
- [Adding advanced configuration](#)
- [Updating the multiclusterobservability CR replicas from the console](#)
- [Forwarding alerts](#)
- [Silencing alerts](#)
- [Suppressing alerts](#)
- [Customizing route certification](#)

- [Customizing certificates for accessing the object store](#)
- [Viewing and exploring data](#)
 - [Viewing the etcd table](#)
 - [Viewing the cluster fleet service-level overview for the Kubernetes API server dashboard](#)
 - [Viewing the cluster service-level overview for the Kubernetes API server dashboard](#)
- [Disabling observability](#)

1.4.1. Creating custom rules

Create custom rules for the observability installation by adding Prometheus [recording rules](#) and [alerting rules](#) to the observability resource. For more information, see [Prometheus configuration](#).

- Recording rules provide you the ability to precalculate, or compute expensive expressions as needed. The results are saved as a new set of time series.
- Alerting rules provide you the ability to specify the alert conditions based on how an alert should be sent to an external service.

Define custom rules with Prometheus to create alert conditions, and send notifications to an external messaging service. **Note:** When you update your custom rules, **observability-thanos-rule** pods are restarted automatically.

Create a ConfigMap named **thanos-ruler-custom-rules** in the **open-cluster-management-observability** namespace. The key must be named, **custom_rules.yaml**, as shown in the following example. You can create multiple rules in the configuration.

- By default, the out-of-the-box alert rules are defined in the **thanos-ruler-default-rules** ConfigMap in the **open-cluster-management-observability** namespace. For example, you can create a custom alert rule that notifies you when your CPU usage passes your defined value. Your YAML might resemble the following content:

```
data:
  custom_rules.yaml: |
    groups:
      - name: cluster-health
        rules:
          - alert: ClusterCPUHealth-jb
            annotations:
              summary: Notify when CPU utilization on a cluster is greater than the defined
utilization limit
              description: "The cluster has a high CPU usage: {{ $value }} core for {{ $labels.cluster
}} {{ $labels.clusterID }}."
            expr: |
              max(cluster:cpu_usage_cores:sum) by (clusterID, cluster, prometheus) > 0
            for: 5s
            labels:
              cluster: "{{ $labels.cluster }}"
              prometheus: "{{ $labels.prometheus }}"
              severity: critical
```

- You can also create a custom recording rule within the **thanos-ruler-custom-rules** ConfigMap.

For example, you can create a recording rule that provides you the ability to get the sum of the container memory cache of a pod. Your YAML might resemble the following content:

```
data:
  custom_rules.yaml: |
    groups:
      - name: container-memory
        recording_rules:
          - record: pod:container_memory_cache:sum
            expr: sum(container_memory_cache{pod!=""}) BY (pod, container)
```

Note: If this is the first new custom rule, it is created immediately. For changes to the ConfigMap, the configuration is automatically reloaded. The configuration is reloaded due to the **config-reload** within the **observability-thanos-ruler** sidecar.

To verify that the alert rules are functioning appropriately, launch the Grafana dashboard, navigate to the **Explore** page, and query **ALERTS**. The alert is only available in Grafana if the alert is initiated.

1.4.2. Configuring AlertManager

Integrate external messaging tools such as email, Slack, and PagerDuty to receive notifications from AlertManager. You must override the **alertmanager-config** secret in the **open-cluster-management-observability** namespace to add integrations, and configure routes for AlertManager. Complete the following steps to update the custom receiver rules:

1. Extract the data from the **alertmanager-config** secret. Run the following command:

```
oc -n open-cluster-management-observability get secret alertmanager-config --template='{{
index .data "alertmanager.yaml" }}' |base64 -d > alertmanager.yaml
```

2. Edit and save the **alertmanager.yaml** file configuration by running the following command:

```
oc -n open-cluster-management-observability create secret generic alertmanager-config --
from-file=alertmanager.yaml --dry-run -o=yaml | oc -n open-cluster-management-
observability replace secret --filename=-
```

Your updated secret might resemble the following content:

```
global
  smtp_smarthost: 'localhost:25'
  smtp_from: 'alertmanager@example.org'
  smtp_auth_username: 'alertmanager'
  smtp_auth_password: 'password'
templates:
- '/etc/alertmanager/template/*.tmpl'
route:
  group_by: ['alertname', 'cluster', 'service']
  group_wait: 30s
  group_interval: 5m
  repeat_interval: 3h
  receiver: team-X-mails
  routes:
```

```
- match_re:
  service: ^(foo1|foo2|baz)$
  receiver: team-X-mails
```

Your changes are applied immediately after it is modified. For an example of AlertManager, see [prometheus/alertmanager](#).

1.4.3. Adding custom metrics

Add metrics to the **metrics_list.yaml** file, to be collected from managed clusters.

Before you add a custom metric, verify that **mco observability** is enabled with the following command: **oc get mco observability -o yaml**. Check for the following message in the **status.conditions.message** reads: **Observability components are deployed and running**.

Create a file named **observability-metrics-custom-allowlist.yaml** and add the name of the custom metric to the **metrics_list.yaml** parameter. Your YAML for the ConfigMap might resemble the following content:

```
kind: ConfigMap
apiVersion: v1
metadata:
  name: observability-metrics-custom-allowlist
data:
  metrics_list.yaml: |
    names:
      - node_memory_MemTotal_bytes
    rules:
      - record: apiserver_request_duration_seconds:histogram_quantile_90
        expr:
          histogram_quantile(0.90,sum(rate(apiserver_request_duration_seconds_bucket{job="apiserver",
            verb!="WATCH"}[5m])) by (verb,le))
```

- In the **names** section, add the name of the custom metrics that is to be collected from the managed cluster.
- In the **rules** section, enter only one value for the **expr** and **record** parameter pair to define the query expression. The metrics are collected as the name that is defined in the **record** parameter from your managed cluster. The metric value returned are the results after you run the query expression.
- The **names** and **rules** sections are optional. You can use either one or both of the sections.

Create the **observability-metrics-custom-allowlist** ConfigMap in the **open-cluster-management-observability** namespace with the following command: **oc apply -n open-cluster-management-observability -f observability-metrics-custom-allowlist.yaml**.

Verify that data from your custom metric is being collected by querying the metric from the **Explore** page, from the Grafana dashboard. You can also use the custom metrics in your own dashboard. For more information about viewing the dashboard, see [Designing your Grafana dashboard](#).

1.4.4. Removing default metrics

If you want data to not be collected in your managed cluster for a specific metric, remove the metric from the **observability-metrics-custom-allowlist.yaml** file. When you remove a metric, the metric data

is not collected in your managed clusters. As mentioned previously, first verify that **mco observability** is enabled.

Add the name of the default metric to the **metrics_list.yaml** parameter with a hyphen - at the start of the metric name. For example, **-cluster_infrastructure_provider**.

Create the **observability-metrics-custom-allowlist** ConfigMap in the **open-cluster-management-observability** namespace with the following command: **oc apply -n open-cluster-management-observability -f observability-metrics-custom-allowlist.yaml**.

Verify that the specific metric is not being collected from your managed clusters. When you query the metric from the Grafana dashboard, the metric is not displayed.

1.4.5. Exporting metrics to external endpoints

You can customize observability to export the metrics to external endpoints, which support Prometheus Remote Write protocol in real time. For more information, see [Prometheus Remote Write protocol](#).

1.4.5.1. Creating the Kubernetes secret for an external endpoint

You must create a Kubernetes secret with the access information of the external endpoint in the **open-cluster-management-observability** namespace. View the following example secret:

```
apiVersion: v1
kind: Secret
metadata:
  name: victoriametrics
  namespace: open-cluster-management-observability
type: Opaque
stringData:
  ep.yaml: |
    url: http://victoriametrics:8428/api/v1/write
    http_client_config:
      basic_auth:
        username: test
        password: test
```

The **ep.yaml** is the key of the content and is used in the **multiclusterobservability** CR in next step. Currently, observability supports exporting metrics to endpoints without any security checks, with basic authentication or with **tls** enablement. View the following tables for a full list of supported parameters:

Name	Description	Schema
url <i>required</i>	URL for the external endpoint.	string
http_client_config <i>optional</i>	Advanced configuration for the HTTP client.	HttpClientConfig

HttpClientConfig

Name	Description	Schema
basic_auth <i>optional</i>	HTTP client configuration for basic authentication.	BasicAuth
tls_config <i>optional</i>	HTTP client configuration for TLS.	TLSConfig

BasicAuth

Name	Description	Schema
username <i>optional</i>	User name for basic authorization.	string
password <i>optional</i>	Password for basic authorization.	string

TLSConfig

Name	Description	Schema
secret_name <i>required</i>	Name of the secret that contains certificates.	string
ca_file_key <i>optional</i>	Key of the CA certificate in the secret (only optional if insecure_skip_verify is set to true).	string
cert_file_key <i>required</i>	Key of the client certificate in the secret.	string
key_file_key <i>required</i>	Key of the client key in the secret.	string
insecure_skip_verify <i>optional</i>	Parameter to skip the verification for target certificate.	bool

1.4.5.2. Updating the *multiclusterobservability* CR

After you create the Kubernetes secret, you must update the **multiclusterobservability** CR to add **writeStorage** in the **spec.storageConfig** parameter. View the following example:

```
spec:
  storageConfig:
    writeStorage:
```

```
- key: ep.yaml
  name: victoriametrics
```

The value for **writeStorage** is a list. You can add an item to the list when you want to export metrics to one external endpoint. If you add more than one item to the list, then the metrics are exported to multiple external endpoints. Each item contains two attributes: *name* and *key*. *Name* is the name of the Kubernetes secret that contains endpoint access information, and *key* is the key of the content in the secret. View the following description table for the

1.4.5.3. Viewing the status of metric export

After the metrics export is enabled, you can view the status of metrics export by checking the **acm_remote_write_requests_total** metric. From the OpenShift console of your hub cluster, navigate to the *Metrics* page by clicking **Metrics** in the *Observe* section.

Then query the **acm_remote_write_requests_total** metric. The value of that metric is the total number of requests with a specific response for one external endpoint, on one observatorium API instance. The **name** label is the name for the external endpoint. The **code** label is the return code of the HTTP request for the metrics export.

1.4.6. Adding *advanced* configuration

Add the **advanced** configuration section to update the retention for each observability component, according to your needs.

Edit the **MultiClusterObservability** CR and add the **advanced** section with the following command: **oc edit mco observability -o yaml**. Your YAML file might resemble the following contents:

```
spec:
  advanced:
    retentionConfig:
      blockDuration: 2h
      deleteDelay: 48h
      retentionInLocal: 24h
      retentionResolutionRaw: 30d
      retentionResolution5m: 180d
      retentionResolution1h: 0d
    receive:
      resources:
        limits:
          memory: 4096Gi
      replicas: 3
```

For descriptions of all the parameters that can be added into the **advanced** configuration, see the [Observability API](#).

1.4.7. Updating the *multiclusterobservability* CR replicas from the console

If your workload increases, increase the number of replicas of your observability pods. Navigate to the Red Hat OpenShift Container Platform console from your hub cluster. Locate the **multiclusterobservability** custom resource (CR), and update the **replicas** parameter value for the component where you want to change the replicas. Your updated YAML might resemble the following content:

```
spec:
  advanced:
    receive:
      replicas: 6
```

For more information about the parameters within the **mco observability** CR, see the [Observability API](#).

1.4.8. Forwarding alerts

After you enable observability, alerts from your OpenShift Container Platform managed clusters are automatically sent to the hub cluster. You can use the **alertmanager-config** YAML file to configure alerts with an external notification system.

View the following example of the **alertmanager-config** YAML file:

```
global:
  slack_api_url: '<slack_webhook_url>'

route:
  receiver: 'slack-notifications'
  group_by: [alertname, datacenter, app]

receivers:
- name: 'slack-notifications'
  slack_configs:
  - channel: '#alerts'
    text: 'https://internal.myorg.net/wiki/alerts/{{ .GroupLabels.app }}/{{ .GroupLabels.alertname }}'
```

If you want to configure a proxy for alert forwarding, add the following **global** entry to the **alertmanager-config** YAML file:

```
global:
  slack_api_url: '<slack_webhook_url>'
  http_config:
    proxy_url: http://****
```

To learn more, see the [Prometheus Alertmanager documentation](#).

1.4.8.1. Disabling forward alerts for managed clusters

Disable alert forwarding for managed clusters. Add the following annotation to the **MultiClusterObservability** custom resource:

```
metadata:
  annotations:
    mco-disable-alerting: "true"
```

When you set the annotation, the alert forwarding configuration on the managed clusters is reverted. Any changes made to the **ocp-monitoring-config** ConfigMap in the **openshift-monitoring** namespace are reverted. Setting the annotation ensures that the **ocp-monitoring-config** ConfigMap is no longer managed or updated by the observability operator endpoint. After you update the configuration, the Prometheus instance on your managed cluster restarts.

Important: Metrics on your managed cluster are lost if you have a Prometheus instance with a persistent volume for metrics, and the Prometheus instance restarts. However, metrics from the hub cluster are not affected.

When the changes are reverted, a ConfigMap named **cluster-monitoring-reverted** is created in the **open-cluster-management-addon-observability** namespace. Any new, manually added alert forward configurations are not reverted from the ConfigMap.

Verify that the hub cluster alert manager is no longer propagating managed cluster alerts to third-party messaging tools. See the previous section, *Configuring AlertManager*.

1.4.9. Silencing alerts

Add alerts that you do not want to receive. You can silence alerts by the alert name, match label, or time duration. After you add the alert that you want to silence, an ID is created. Your ID for your silenced alert might resemble the following string, **d839aca9-ed46-40be-84c4-dca8773671da**.

Continue reading for ways to silence alerts:

- To silence a Red Hat Advanced Cluster Management alert, you must have access to the **alertmanager-main** pod in the **open-cluster-management-observability** namespace. For example, enter the following command in the pod terminal to silence **SampleAlert**:

```
amtool silence add --alertmanager.url="http://localhost:9093" --author="user" --
comment="Silencing sample alert" alertname="SampleAlert"
```

- Silence an alert by using multiple match labels. The following command uses **match-label-1** and **match-label-2**:

```
amtool silence add --alertmanager.url="http://localhost:9093" --author="user" --
comment="Silencing sample alert" <match-label-1>=<match-value-1> <match-label-2>=
<match-value-2>
```

- If you want to silence an alert for a specific period of time, use the **--duration** flag. Run the following command to silence the **SampleAlert** for an hour:

```
amtool silence add --alertmanager.url="http://localhost:9093" --author="user" --
comment="Silencing sample alert" --duration="1h" alertname="SampleAlert"
```

You can also specify a start or end time for the silenced alert. Enter the following command to silence the **SampleAlert** at a specific start time:

```
amtool silence add --alertmanager.url="http://localhost:9093" --author="user" --
comment="Silencing sample alert" --start="2023-04-14T15:04:05-07:00"
alertname="SampleAlert"
```

- To view all silenced alerts that are created, run the following command:

```
amtool silence --alertmanager.url="http://localhost:9093"
```

- If you no longer want an alert to be silenced, end the silencing of the alert by running the following command:

```
amtool silence expire --alertmanager.url="http://localhost:9093" "d839aca9-ed46-40be-84c4-dca8773671da"
```

- To end the silencing of all alerts, run the following command:

```
amtool silence expire --alertmanager.url="http://localhost:9093" $(amtool silence query --alertmanager.url="http://localhost:9093" -q)
```

1.4.10. Suppressing alerts

Suppress Red Hat Advanced Cluster Management alerts across your clusters globally that are less severe. Suppress alerts by defining an inhibition rule in the **alertmanager-config** in the **open-cluster-management-observability** namespace.

An inhibition rule mutes an alert when there is a set of parameter matches that match another set of existing matchers. In order for the rule to take effect, both the target and source alerts must have the same label values for the label names in the **equal** list. Your **inhibit_rules** might resemble the following:

```
global:
  resolve_timeout: 1h
inhibit_rules: 1
- equal:
  - namespace
  source_match: 2
  severity: critical
target_match_re:
  severity: warning|info
```

- The **inhibit_rules** parameter section is defined to look for alerts in the same namespace. When a **critical** alert is initiated within a namespace and if there are any other alerts that contain the severity level **warning** or **info** in that namespace, only the **critical** alerts are routed to the AlertManager receiver. The following alerts might be displayed when there are matches:

```
ALERTS{alertname="foo", namespace="ns-1", severity="critical"}
ALERTS{alertname="foo", namespace="ns-1", severity="warning"}
```

- If the value of the **source_match** and **target_match_re** parameters do not match, the alert is routed to the receiver:

```
ALERTS{alertname="foo", namespace="ns-1", severity="critical"}
ALERTS{alertname="foo", namespace="ns-2", severity="warning"}
```

- To view suppressed alerts in Red Hat Advanced Cluster Management, enter the following command:

```
amtool alert --alertmanager.url="http://localhost:9093" --inhibited
```

1.4.11. Customizing route certification

If you want to customize the OpenShift Container Platform route certification, you must add the routes in the **alt_names** section. To ensure your OpenShift Container Platform routes are accessible, add the

following information: **alertmanager.apps.<domainname>**, **observatorium-api.apps.<domainname>**, **rbac-query-proxy.apps.<domainname>**.

Note: Users are responsible for certificate rotations and updates.

1.4.11.1. Customizing certificates for accessing the object store

You can customize certificates for accessing the object store. Edit the **http_config** section by adding the certificate in the object store secret. View the following example:

```
thanos.yaml: |
  type: s3
  config:
    bucket: "thanos"
    endpoint: "minio:9000"
    insecure: false
    access_key: "minio"
    secret_key: "minio123"
  http_config:
    tls_config:
      ca_file: /etc/minio/certs/ca.crt
      insecure_skip_verify: false
```

You must provide a secret in the **open-cluster-management-observability** namespace. The secret must contain the **ca.crt** that you defined in the previous secret example. If you want to enable Mutual TLS, you need to provide **public.crt**, and **private.key** in the previous secret. View the following example:

```
thanos.yaml: |
  type: s3
  config:
    ...
  http_config:
    tls_config:
      ca_file: /etc/minio/certs/ca.crt
      cert_file: /etc/minio/certs/public.crt
      key_file: /etc/minio/certs/private.key
      insecure_skip_verify: false
```

You can also configure the secret name, the **TLSecretName** parameter in the **MultiClusterObservability** CR. View the following example where the secret name is **tls-certs-secret**:

```
metricObjectStorage:
  key: thanos.yaml
  name: thanos-object-storage
  tlsSecretName: tls-certs-secret
```

This secret can be mounted into all components that need to access the object store, and it includes the following components: **receiver**, **store**, **ruler**, **compact**.

1.4.12. Viewing and exploring data

View the data from your managed clusters by accessing Grafana from the hub cluster. You can query specific alerts and add filters for the query.

For example, to `cluster_infrastructure_provider` from a single node cluster, use the following query expression: **`cluster_infrastructure_provider{clusterType="SNO"}`**

Note: Do not set the **`ObservabilitySpec.resources.CPU.limits`** parameter if observability is enabled on single node managed clusters. When you set the CPU limits, it causes the observability pod to be counted against the capacity for your managed cluster. See [Management Workload Partitioning](#) for more information.

1.4.12.1. Viewing the etcd table

View the etcd table from the hub cluster dashboard in Grafana to learn the stability of the etcd as a data store.

Select the Grafana link from your hub cluster to view the `etcd` table data, which is collected from your hub cluster. The *Leader election changes* across managed clusters are displayed.

1.4.12.2. Viewing the cluster fleet service-level overview for the Kubernetes API server dashboard

View the cluster fleet Kubernetes API service-level overview from the hub cluster dashboard in Grafana.

After you navigate to the Grafana dashboard, access the managed dashboard menu by selecting **Kubernetes > Service-Level Overview > API Server**. The *Fleet Overview* and *Top Cluster* details are displayed.

View the total number of clusters that are exceeding or meeting the targeted *service-level objective* (SLO) value for the past seven or 30-day period, offending and non-offending clusters, and API Server Request Duration.

1.4.12.3. Viewing the cluster service-level overview for the Kubernetes API server dashboard

View the Kubernetes API service-level overview table from the hub cluster dashboard in Grafana.

After you navigate to the Grafana dashboard, access the managed dashboard menu by selecting **Kubernetes > Service-Level Overview > API Server**. The *Fleet Overview* and *Top Cluster* details are displayed.

View the error budget for the past seven or 30-day period, the remaining downtime, and trend.

1.4.13. Disabling observability

You can disable observability, which stops data collection on the Red Hat Advanced Cluster Management hub cluster.

1.4.13.1. Disabling observability on all clusters

Disable observability by removing observability components on all managed clusters.

Update the **`multicluster-observability-operator`** resource by setting **`enableMetrics`** to **`false`**. Your updated resource might resemble the following change:

```
spec:
  imagePullPolicy: Always
  imagePullSecret: multiclusterhub-operator-pull-secret
```



```
observabilityAddonSpec: # The ObservabilityAddonSpec defines the global settings for all managed
clusters which have observability add-on enabled
enableMetrics: false #indicates the observability addon push metrics to hub server
```

1.4.13.2. Disabling observability on a single cluster

Disable observability by removing observability components on specific managed clusters. Add the **observability: disabled** label to the **managedclusters.cluster.open-cluster-management.io** custom resource.

From the Red Hat Advanced Cluster Management console *Clusters* page, add the **observability=disabled** label to the specified cluster.

Note: When a managed cluster with the observability component is detached, the **metrics-collector** deployments are removed.

For more information about monitoring data from the console with the observability service, see [Observing environments introduction](#).

1.5. DESIGNING YOUR GRAFANA DASHBOARD

You can design your Grafana dashboard by creating a **grafana-dev** instance.

- [Setting up the Grafana developer instance](#)
- [Design your Grafana dashboard](#)
- [Uninstalling the Grafana developer instance](#)

1.5.1. Setting up the Grafana developer instance

First, clone the [stolostron/multicluster-observability-operator/](#) repository, so that you are able to run the scripts that are in the **tools** folder. Be sure to use the most current **grafana-dev** instance.

Complete the following steps to set up the Grafana developer instance:

1. Run the **setup-grafana-dev.sh** to setup your Grafana instance. When you run the script the following resources are created: **secret/grafana-dev-config**, **deployment.apps/grafana-dev**, **service/grafana-dev**, **ingress.extensions/grafana-dev**, **persistentvolumeclaim/grafana-dev**:

```
./setup-grafana-dev.sh --deploy
secret/grafana-dev-config created
deployment.apps/grafana-dev created
service/grafana-dev created
serviceaccount/grafana-dev created
clusterrolebinding.rbac.authorization.k8s.io/open-cluster-management:grafana-crb-dev
created
route.route.openshift.io/grafana-dev created
persistentvolumeclaim/grafana-dev created
oauthclient.oauth.openshift.io/grafana-proxy-client-dev created
deployment.apps/grafana-dev patched
service/grafana-dev patched
route.route.openshift.io/grafana-dev patched
```

```
oauthclient.oauth.openshift.io/grafana-proxy-client-dev patched
clusterrolebinding.rbac.authorization.k8s.io/open-cluster-management:grafana-crb-dev
patched
```

2. Switch the user role to Grafana administrator with the **switch-to-grafana-admin.sh** script.
 - a. Select the Grafana URL, https://grafana-dev-open-cluster-management-observability.{OPENSHIFT_INGRESS_DOMAIN}, and log in.
 - b. Then run the following command to add the switched user as Grafana administrator. For example, after you log in using **kubeadmin**, run following command:

```
./switch-to-grafana-admin.sh kube:admin
User <kube:admin> switched to be grafana admin
```

The Grafana developer instance is set up.

1.5.2. Design your Grafana dashboard

After you set up the Grafana instance, you can design the dashboard. Complete the following steps to refresh the Grafana console and design your dashboard:

1. From the Grafana console, create a dashboard by selecting the **Create** icon from the navigation panel. Select **Dashboard**, and then click **Add new panel**.
2. From the *New Dashboard/Edit Panel* view, navigate to the *Query* tab.
3. Configure your query by selecting **Observatorium** from the data source selector and enter a PromQL query.
4. From the Grafana dashboard header, click the **Save** icon that is in the dashboard header.
5. Add a descriptive name and click **Save**.

1.5.2.1. Design your Grafana dashboard with a ConfigMap

Design your Grafana dashboard with a ConfigMap. You can use the **generate-dashboard-configmap-yaml.sh** script to generate the dashboard ConfigMap, and to save the ConfigMap locally:

```
./generate-dashboard-configmap-yaml.sh "Your Dashboard Name"
Save dashboard <your-dashboard-name> to ./your-dashboard-name.yaml
```

If you do not have permissions to run the previously mentioned script, complete the following steps:

1. Select a dashboard and click the **Dashboard settings** icon.
2. Click the **JSON Model** icon from the navigation panel.
3. Copy the dashboard JSON data and paste it in the **data** section.
4. Modify the **name** and replace **\$your-dashboard-name**. Enter a universally unique identifier (UUID) in the **uid** field in **data.\$your-dashboard-name.json.\$\$your_dashboard_json**. You can use a program such as [uuidegen](#) to create a UUID. Your ConfigMap might resemble the following file:

```

kind: ConfigMap
apiVersion: v1
metadata:
  name: $your-dashboard-name
  namespace: open-cluster-management-observability
  labels:
    grafana-custom-dashboard: "true"
data:
  $your-dashboard-name.json: |-
    $your_dashboard_json

```

Notes:

- If your dashboard is created within the **grafana-dev** instance, you can take the name of the dashboard and pass it as an argument in the script. For example, a dashboard named *Demo Dashboard* is created in the **grafana-dev** instance. From the CLI, you can run the following script:

```
./generate-dashboard-configmap-yaml.sh "Demo Dashboard"
```

After running the script, you might receive the following message:

```
Save dashboard <demo-dashboard> to ./demo-dashboard.yaml
```

- If your dashboard is not in the *General* folder, you can specify the folder name in the **annotations** section of this ConfigMap:

```

annotations:
  observability.open-cluster-management.io/dashboard-folder: Custom

```

After you complete your updates for the ConfigMap, you can install it to import the dashboard to the Grafana instance.

Verify that the YAML file is created by applying the YAML from the CLI or OpenShift Container Platform console. A ConfigMap within the **open-cluster-management-observability** namespace is created. Run the following command from the CLI:

```
oc apply -f demo-dashboard.yaml
```

From the OpenShift Container Platform console, create the ConfigMap using the **demo-dashboard.yaml** file. The dashboard is located in the *Custom* folder.

1.5.3. Uninstalling the Grafana developer instance

When you uninstall the instance, the related resources are also deleted. Run the following command:

```

./setup-grafana-dev.sh --clean
secret "grafana-dev-config" deleted
deployment.apps "grafana-dev" deleted
serviceaccount "grafana-dev" deleted
route.route.openshift.io "grafana-dev" deleted
persistentvolumeclaim "grafana-dev" deleted
oauthclient.oauth.openshift.io "grafana-proxy-client-dev" deleted
clusterrolebinding.rbac.authorization.k8s.io "open-cluster-management:grafana-crb-dev" deleted

```

1.6. OBSERVABILITY WITH RED HAT INSIGHTS

Red Hat Insights is integrated with Red Hat Advanced Cluster Management observability, and is enabled to help identify existing or potential problems in your clusters. Red Hat Insights helps you to identify, prioritize, and resolve stability, performance, network, and security risks. Red Hat OpenShift Container Platform offers cluster health monitoring through OpenShift Cluster Manager. OpenShift Cluster Manager collects anonymized, aggregated information about the health, usage, and size of the clusters. For more information, see [Red Hat Insights product documentation](#).

When you create or import an OpenShift cluster, anonymized data from your managed cluster is automatically sent to Red Hat. This information is used to create insights, which provide cluster health information. Red Hat Advanced Cluster Management administrator can use this health information to create alerts based on severity.

Required access: Cluster administrator

1.6.1. Prerequisites

- Ensure that Red Hat Insights is enabled. For more information, see [Modifying the global cluster pull secret to disable remote health reporting](#).
- Install OpenShift Container Platform version 4.0 or later.
- Hub cluster user, who is registered to OpenShift Cluster Manager, must be able to manage all the Red Hat Advanced Cluster Management managed clusters in OpenShift Cluster Manager.

1.6.2. Red Hat Insights from the Red Hat Advanced Cluster Management console

Continue reading to view functionality descriptions of the integration:

- When you select a cluster from the *Clusters* page, you can select the **Number of identified issues** from the *Status* card. The *Status* card displays information about *Nodes*, *Applications*, *Policy violations*, and *Identified issues*. The *Identified issues* card represents the information from Red Hat insights. The *Identified issues* status displays the number of issues by severity. The triage levels used for the issues are the following severity categories: *Critical*, *Major*, *Low*, and *Warning*.
- After you click the number, the *Potential issue* side panel is displayed. A summary and chart of the total issues are displayed in the panel. You can also use the search feature to search for recommended remediations. The remediation option displays the *Description* of the vulnerability, *Category* that vulnerability is associated with, and the *Total risk*.
- From the *Description* section, you can select the link to the vulnerability. View steps to resolve your vulnerability by selecting the *How to remediate* tab. You can also view why the vulnerability occurred by clicking the *Reason* tab.

See [Managing insight PolicyReports](#) for more information.

1.7. MANAGING INSIGHT POLICYREPORTS

Red Hat Advanced Cluster Management for Kubernetes **PolicyReports** are violations that are generated by the **insights-client**. The **PolicyReports** are used to define and configure alerts that are sent to incident management systems. When there is a violation, alerts from a **PolicyReport** are sent to incident management system.

View the following sections to learn how to manage and view insight **PolicyReports**:

- [Searching for insight policy reports](#)
- [Viewing identified issues from the console](#)

1.7.1. Searching for insight policy reports

You can search for a specific insight **PolicyReport** that has a violation, across your managed clusters.

After you log into your Red Hat Advanced Cluster Management hub cluster, click the *Search* icon in the console header to navigate to the *Search* page. Enter the following query: **kind:policyreport**.

Note: The **PolicyReport** name matches the name of the cluster.

You can also further specify your query by the insight policy violation and categories. When you select a **PolicyReport** name, you are redirected to the *Details* page of the associated cluster. The *Insights* sidebar is automatically displayed.

If the search service is disabled and you want to search for an insight, run the following command from your hub cluster:

```
oc get policyreport --all-namespaces
```

1.7.2. Viewing identified issues from the console

You can view the identified issues on a specific cluster.

After you log into your Red Hat Advanced Cluster Management cluster, select **Overview** from the navigation menu. Select a severity to view the **PolicyReports** that are associated with that severity. Details of the cluster issues and the severities are displayed from the *Cluster issues* summary card.

Alternatively, you can select **Clusters** from the navigation menu. Select a managed cluster from the table to view more details. From the *Status* card, view the number of identified issues.

Select the number of potential issues to view the severity chart and recommended remediations for the issues. Click the link to the vulnerability to view steps on *How to remediate* and the *Reason* for the vulnerability.

Note: After the issue is resolved, the Red Hat Insights are received by Red Hat Advanced Cluster Management every 30 minutes and Red Hat Insights is updated every two hours.

Be sure to verify which component sent the alert message from the **PolicyReport**. Navigate to the *Governance* page and select a specific **policyreport**. Select the *Status* tab and click the **View details** link to view the **PolicyReport** YAML file.

Locate the **source** parameter, which informs you of the component that sent the violation. The value options are **grc** and **insights**.

Learn how to create custom alert rules for the **PolicyReports**, see [Configuring AlertManager](#) for more information.