Red Hat OpenShift Service on AWS 4

Security and compliance

Configuring security context constraints on AWS clusters

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Legal Notice

Abstract

This document provides instructions for configuring security context constraints.

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CHAPTER 1. VIEWING AUDIT LOGS

Red Hat OpenShift Service on AWS auditing provides a security-relevant chronological set of records documenting the sequence of activities that have affected the system by individual users, administrators, or other components of the system.

1.1. ABOUT THE API AUDIT LOG

Audit works at the API server level, logging all requests coming to the server. Each audit log contains the following information:

Table 1.1. Audit log fields

Field	Description
level	The audit level at which the event was generated.
auditID	A unique audit ID, generated for each request.
stage	The stage of the request handling when this event instance was generated.
requestURI	The request URI as sent by the client to a server.
verb	The Kubernetes verb associated with the request. For non-resource requests, this is the lowercase HTTP method.
user	The authenticated user information.
impersonatedUser	Optional. The impersonated user information, if the request is impersonating another user.
sourceIPs	Optional. The source IPs, from where the request originated and any intermediate proxies.
userAgent	Optional. The user agent string reported by the client. Note that the user agent is provided by the client, and must not be trusted.
objectRef	Optional. The object reference this request is targeted at. This does not apply for **List**-type requests, or non-resource requests.
responseStatus	Optional. The response status, populated even when the **ResponseObject** is not a **Status** type. For successful responses, this will only include the code. For non-status type error responses, this will be auto-populated with the error message.

Field	Description
requestObject	Optional. The API object from the request, in JSON format. The **RequestObject** is recorded as is in the request (possibly re-encoded as JSON), prior to version conversion, defaulting, admission or merging. It is an external versioned object type, and might not be a valid object on its own. This is omitted for non-resource requests and is only logged at request level and higher.
responseObject	Optional. The API object returned in the response, in JSON format. The **ResponseObject** is recorded after conversion to the external type, and serialized as JSON. This is omitted for non-resource requests and is only logged at response level.
requestReceivedTimestamp	The time that the request reached the API server.
stageTimestamp	The time that the request reached the current audit stage.
annotations	Optional. An unstructured key value map stored with an audit event that may be set by plugins invoked in the request serving chain, including authentication, authorization and admission plugins. Note that these annotations are for the audit event, and do not correspond to the **metadata.annotations** of the submitted object. Keys should uniquely identify the informing component to avoid name collisions, for example **podsecuritypolicy.admission.k8s.io/policy**. Values should be short. Annotations are included in the metadata level.

Example output for the Kubernetes API server:

{"kind":"Event","apiVersion":"audit.k8s.io/v1","level":"Metadata","auditID":"ad209ce1-fec7-4130-8192-c4cc63f1d8cd","stage":"ResponseComplete","requestURI":"/api/v1/namespaces/openshift-kube-controller-manager/configmaps/cert-recovery-controller-lock?timeout=35s","verb":"update","user":{"username":"system:serviceaccount:openshift-kube-controller-manager:localhost-recovery-client","uid":"dd4997e3-d565-4e37-80f8-7fc122ccd785","groups":["system:serviceaccounts","system:serviceaccounts:openshift-kube-controller-manager","system:authenticated"]},"sourceIPs":["::1"],"userAgent":"cluster-kube-controller-manager-operator/v0.0.0 (linux/amd64) kubernetes/$Format","objectRef":{"resource":"configmaps","namespace":"openshift-kube-controller-manager","name":"cert-recovery-controller-lock","uid":"5c57190b-6993-425d-8101-8337e48c7548","apiVersion":"v1","resourceVersion":"574307"},"responseStatus":{"metadata":{},"code":200},"requestReceivedTimestamp":"2020-04-02T08:27:20.200962Z","stageTimestamp":"2020-04-02T08:27:20.206710Z","annotations":{"authorization.k8s.io/decision":"allow","authorization.k8s.io/reason":"RBAC: allowed by ClusterRoleBinding \"system:openshift:operator:kube-controller-manager-recovery\" of ClusterRole \"cluster-admin\" to ServiceAccount \"localhost-recovery-client/openshift-kube-controller-manager\""}}

1.2. VIEWING THE AUDIT LOGS

You can view the logs for the OpenShift API server, Kubernetes API server, OpenShift OAuth API server, and OpenShift OAuth server for each control plane node.

Procedure

To view the audit logs:

- View the OpenShift API server audit logs:
  a. List the OpenShift API server audit logs that are available for each control plane node:

```
$ oc adm node-logs --role=master --path=openshift-apiserver/
```

Example output

```
ci-ln-m0wpfjb-f76d1-vnb5x-master-0 audit-2021-03-09T00-12-19.834.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-0 audit.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-1 audit-2021-03-09T00-11-49.835.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-1 audit.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-2 audit-2021-03-09T00-13-00.128.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-2 audit.log
```

  b. View a specific OpenShift API server audit log by providing the node name and the log name:

```
$ oc adm node-logs <node_name> --path=openshift-apiserver/<log_name>
```

For example:

```
$ oc adm node-logs ci-ln-m0wpfjb-f76d1-vnb5x-master-0 --path=openshift-apiserver/audit-2021-03-09T00-12-19.834.log
```

Example output

```
{"kind":"Event","apiVersion":"audit.k8s.io/v1","level":"Metadata","auditID":"381acf6d-5f30-4c7d-8175-c9c317ae5893","stage":"ResponseComplete","requestURI":"/metrics","verb":"get","user":{"username":"system:serviceaccount:openshift-monitoring:prometheus-k8s","uid":"825b60a0-3976-4861-a342-3b2b561e8f82","groups":["system:serviceaccounts","system:serviceaccounts:openshift-monitoring","system:authenticated"]},"sourceIPs":["10.129.2.6"],"userAgent":"Prometheus/2.23.0","responseStatus":{"metadata":{},"code":200},"requestReceivedTimestamp":"2021-03-08T18:02:04.086545Z","stageTimestamp":"2021-03-08T18:02:04.107102Z","annotations":{"authorization.k8s.io/decision":"allow","authorization.k8s.io/reason":"RBAC: allowed by ClusterRoleBinding \"prometheus-k8s\" of ClusterRole \"prometheus-k8s\" to ServiceAccount \"prometheus-k8s/openshift-monitoring\""}}
```

- View the Kubernetes API server audit logs:
  a. List the Kubernetes API server audit logs that are available for each control plane node:

```
$ oc adm node-logs --role=master --path=kube-apiserver/
```

Example output

```
ci-ln-m0wpfjb-f76d1-vnb5x-master-0 audit-2021-03-09T14-07-27.129.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-0 audit.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-1 audit-2021-03-09T19-24-22.620.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-1 audit.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-2 audit-2021-03-09T18-37-07.511.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-2 audit.log
```

b. View a specific Kubernetes API server audit log by providing the node name and the log name:

```
$ oc adm node-logs <node_name> --path=kube-apiserver/<log_name>
```

For example:

```
$ oc adm node-logs ci-ln-m0wpfjb-f76d1-vnb5x-master-0 --path=kube-apiserver/audit-2021-03-09T14-07-27.129.log
```

Example output

```
{"kind":"Event","apiVersion":"audit.k8s.io/v1","level":"Metadata","auditID":"cfce8a0b-b5f5-4365-8c9f-79c1227d10f9","stage":"ResponseComplete","requestURI":"/api/v1/namespaces/openshift-kube-scheduler/serviceaccounts/openshift-kube-scheduler-sa","verb":"get","user":{"username":"system:serviceaccount:openshift-kube-scheduler-operator:openshift-kube-scheduler-operator","uid":"2574b041-f3c8-44e6-a057-baef7aa81516","groups":["system:serviceaccounts","system:serviceaccounts:openshift-kube-scheduler-operator","system:authenticated"]},"sourceIPs":["10.128.0.8"],"userAgent":"cluster-kube-scheduler-operator/v0.0.0 (linux/amd64) kubernetes/$Format","objectRef":{"resource":"serviceaccounts","namespace":"openshift-kube-scheduler","name":"openshift-kube-scheduler-sa","apiVersion":"v1"},"responseStatus":{"metadata":{},"code":200},"requestReceivedTimestamp":"2021-03-08T18:06:42.512619Z","stageTimestamp":"2021-03-08T18:06:42.516145Z","annotations":{"authentication.k8s.io/legacy-token":"system:serviceaccount:openshift-kube-scheduler-operator:openshift-kube-scheduler-operator","authorization.k8s.io/decision":"allow","authorization.k8s.io/reason":"RBAC: allowed by ClusterRoleBinding \"system:openshift:operator:cluster-kube-scheduler-operator\" of ClusterRole \"cluster-admin\" to ServiceAccount \"openshift-kube-scheduler-operator/openshift-kube-scheduler-operator\""}}
```

- View the OpenShift OAuth API server audit logs:

a. List the OpenShift OAuth API server audit logs that are available for each control plane node:

```
$ oc adm node-logs --role=master --path=oauth-apiserver/
```

Example output

```
ci-ln-m0wpfjb-f76d1-vnb5x-master-0 audit-2021-03-09T13-06-26.128.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-0 audit.log
```

```
ci-ln-m0wpfjb-f76d1-vnb5x-master-1 audit-2021-03-09T18-23-21.619.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-1 audit.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-2 audit-2021-03-09T17-36-06.510.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-2 audit.log
```

b. View a specific OpenShift OAuth API server audit log by providing the node name and the log name:

```
$ oc adm node-logs <node_name> --path=oauth-apiserver/<log_name>
```

For example:

```
$ oc adm node-logs ci-ln-m0wpfjb-f76d1-vnb5x-master-0 --path=oauth-apiserver/audit-2021-03-09T13-06-26.128.log
```

Example output

```
{"kind":"Event","apiVersion":"audit.k8s.io/v1","level":"Metadata","auditID":"dd4c44e2-3ea1-4830-9ab7-c91a5f1388d6","stage":"ResponseComplete","requestURI":"/apis/user.openshift.io/v1/users/~","verb":"get","user":{"username":"system:serviceaccount:openshift-monitoring:prometheus-k8s","groups":["system:serviceaccounts","system:serviceaccounts:openshift-monitoring","system:authenticated"]},"sourceIPs":["10.0.32.4","10.128.0.1"],"userAgent":"dockerregistry/v0.0.0 (linux/amd64) kubernetes/$Format","objectRef":{"resource":"users","name":"~","apiGroup":"user.openshift.io","apiVersion":"v1"},"responseStatus":{"metadata":{},"code":200},"requestReceivedTimestamp":"2021-03-08T17:47:43.653187Z","stageTimestamp":"2021-03-08T17:47:43.660187Z","annotations":{"authorization.k8s.io/decision":"allow","authorization.k8s.io/reason":"RBAC: allowed by ClusterRoleBinding \"basic-users\" of ClusterRole \"basic-user\" to Group \"system:authenticated\""}}
```

- View the OpenShift OAuth server audit logs:

a. List the OpenShift OAuth server audit logs that are available for each control plane node:

```
$ oc adm node-logs --role=master --path=oauth-server/
```

Example output

```
ci-ln-m0wpfjb-f76d1-vnb5x-master-0 audit-2022-05-11T18-57-32.395.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-0 audit.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-1 audit-2022-05-11T19-07-07.021.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-1 audit.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-2 audit-2022-05-11T19-06-51.844.log
ci-ln-m0wpfjb-f76d1-vnb5x-master-2 audit.log
```

b. View a specific OpenShift OAuth server audit log by providing the node name and the log name:

```
$ oc adm node-logs <node_name> --path=oauth-server/<log_name>
```

For example:

```
$ oc adm node-logs ci-ln-m0wpfjb-f76d1-vnb5x-master-0 --path=oauth-server/audit-2022-05-11T18-57-32.395.log
```

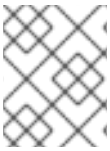
Example output

```
{"kind":"Event","apiVersion":"audit.k8s.io/v1","level":"Metadata","auditID":"13c20345-f33b-4b7d-b3b6-e7793f805621","stage":"ResponseComplete","requestURI":"/login","verb":"post","user":{"username":"system:anonymous","groups":["system:unauthenticated"]},"sourceIPs":["10.128.2.6"],"userAgent":"Mozilla/5.0 (X11; Linux x86_64; rv:91.0) Gecko/20100101 Firefox/91.0","responseStatus":{"metadata":{},"code":302},"requestReceivedTimestamp":"2022-05-11T17:31:16.280155Z","stageTimestamp":"2022-05-11T17:31:16.297083Z","annotations":{"authentication.openshift.io/decision":"error","authentication.openshift.io/username":"kubeadmin","authorization.k8s.io/decision":"allow","authorization.k8s.io/reason":""}}
```

The possible values for the **authentication.openshift.io/decision** annotation are **allow**, **deny**, or **error**.

1.3. FILTERING AUDIT LOGS

You can use **jq** or another JSON parsing tool to filter the API server audit logs.



NOTE

The amount of information logged to the API server audit logs is controlled by the audit log policy that is set.

The following procedure provides examples of using **jq** to filter audit logs on control plane node **node-1.example.com**. See the jq Manual for detailed information on using **jq**.

Prerequisites

- You have access to the cluster as a user with the **dedicated-admin** role.
- You have installed **jq**.

Procedure

- Filter OpenShift API server audit logs by user:

```
$ oc adm node-logs node-1.example.com  \
  --path=openshift-apiserver/audit.log \
  | jq 'select(.user.username == "myusername")'
```

- Filter OpenShift API server audit logs by user agent:

```
$ oc adm node-logs node-1.example.com  \
  --path=openshift-apiserver/audit.log \
  | jq 'select(.userAgent == "cluster-version-operator/v0.0.0 (linux/amd64)
```

```
kubernetes/$Format")'
```

- Filter Kubernetes API server audit logs by a certain API version and only output the user agent:

```
$ oc adm node-logs node-1.example.com  \
  --path=kube-apiserver/audit.log \
  | jq 'select(.requestURI | startswith("/apis/apiextensions.k8s.io/v1beta1")) | .userAgent'
```

- Filter OpenShift OAuth API server audit logs by excluding a verb:

```
$ oc adm node-logs node-1.example.com  \
  --path=oauth-apiserver/audit.log \
  | jq 'select(.verb != "get")'
```

- Filter OpenShift OAuth server audit logs by events that identified a username and failed with an error:

```
$ oc adm node-logs node-1.example.com  \
  --path=oauth-server/audit.log \
  | jq 'select(.annotations["authentication.openshift.io/username"] != null and
.annotations["authentication.openshift.io/decision"] == "error")'
```

1.4. GATHERING AUDIT LOGS

You can use the must-gather tool to collect the audit logs for debugging your cluster, which you can review or send to Red Hat Support.

Procedure

1. Run the **oc adm must-gather** command with **-- /usr/bin/gather_audit_logs**:

```
$ oc adm must-gather -- /usr/bin/gather_audit_logs
```

2. Create a compressed file from the **must-gather** directory that was just created in your working directory. For example, on a computer that uses a Linux operating system, run the following command:

```
$ tar cvaf must-gather.tar.gz must-gather.local.472290403699006248 1
```

1 Replace **must-gather-local.472290403699006248** with the actual directory name.

3. Attach the compressed file to your support case on the the **Customer Support** page of the Red Hat Customer Portal.

1.5. ADDITIONAL RESOURCES

- Must-gather tool
- About log forwarding

CHAPTER 2. ADDING ADDITIONAL CONSTRAINTS FOR IP-BASED AWS ROLE ASSUMPTION

You can implement an additional layer of security in your AWS account to prevent role assumption from non-allowlisted IP addresses.

2.1. CREATE AN IDENTITY-BASED IAM POLICY

You can create an identity-based Identity and Access Management (IAM) policy that denies access to all AWS actions when the request originates from an IP address other than Red Hat provided IPs.

Prerequisites

- You have access to the see AWS Management Console with the permissions required to create and modify IAM policies.

Procedure

1. Sign in to the AWS Management Console using your AWS account credentials.
2. Navigate to the IAM service.
3. In the IAM console, select **Policies** from the left navigation menu.
4. Click **Create policy**.
5. Select the **JSON** tab to define the policy using JSON format.
6. To get the IP addresses that you need to enter into the JSON policy document, run the following command:

```
$ ocm get /api/clusters_mgmt/v1/trusted_ip_addresses
```

NOTE

These IP addresses are not permanent and are subject to change. You must continuously review the API output and make the necessary updates in the JSON policy document.

7. Copy and paste the following **policy_document.json** file into the editor:

```
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Deny",
         "Action": "*",
         "Resource": "*",
         "Condition": {
            "NotIpAddress": {
               "aws:SourceIp": []
            },
            "Bool": {
```

```
                "aws:ViaAWSService": "false"
            }
        }
    }
  ]
}
```

8. Copy and paste all of the IP addresses, which you got in Step 6, into the **"aws:SourceIp": []** array in your **policy_document.json** file.
9. Click **Review and create**.
10. Provide a name and description for the policy, and review the details for accuracy.
11. Click **Create policy** to save the policy.

NOTE

The condition key **aws:ViaAWSService** must be set to false to enable subsequent calls to succeed based on the initial call. For example, if you make an initial call to **aws ec2 describe-instances**, all subsequent calls made within the AWS API server to retrieve information about the EBS volumes attached to the ec2 instance will fail if the condition key **aws:ViaAWSService** is not set to false. The subsequent calls would fail because they would originate from AWS IP addresses, which are not included in the AllowList.

2.2. ATTACHING THE IDENTITY-BASED IAM POLICY

Once you have created an identity-based IAM policy, attach it to the relevant IAM users, groups, or roles in your AWS account to prevent IP-based role assumption for those entities.

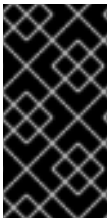
Procedure

1. Navigate to the IAM console in the AWS Management Console.
2. Select the default IAM **ManagedOpenShift-Support-Role** role to which you want to attach the policy.

NOTE

You can change the default IAM **ManagedOpenShift-Support-Role** role. For more information about roles, see Red Hat support access.

3. In the **Permissions** tab, select **Add Permissions** or **Create inline policy** from the **Add Permissions** drop-down list.
4. Search for the policy you created earlier by:
   a. Entering the policy name.
   b. Filtering by the appropriate category.
5. Select the policy and click **Attach policy**.



IMPORTANT

To ensure effective IP-based role assumption prevention, you must keep the allowlisted IPs up to date. Failure to do so may result in Red Hat site reliability engineering (SRE) being unable to access your account and affect your SLA. If you have further questions or require assistance, please reach out to our support team.

2.3. ADDITIONAL RESOURCES

- For more information about denying access based on the source IP, see AWS: Denies access to AWS based on the source IP in the AWS documentation.